

Supplementary Table S1

| Supplementary Table S1: DEG results of structural cEC subtypes |         |                |              |              |             |
|----------------------------------------------------------------|---------|----------------|--------------|--------------|-------------|
| names                                                          | scores  | logfoldchanges | pvals        | pvals_adj    | comparison  |
| Emcn                                                           | 71.0444 | 4.09625        | 0            | 0            | Fene ECs    |
| Plvap                                                          | 64.4399 | 5.23012        | 0            | 0            | Fene ECs    |
| Rgcc                                                           | 63.417  | 6.4792         | 0            | 0            | Fene ECs    |
| Ly6e                                                           | 61.0568 | 3.34326        | 0            | 0            | Fene ECs    |
| Cd81                                                           | 59.9221 | 2.44331        | 0            | 0            | Fene ECs    |
| Cd200                                                          | 59.4662 | 5.38655        | 0            | 0            | Fene ECs    |
| Ehd4                                                           | 58.0748 | 4.60923        | 0            | 0            | Fene ECs    |
| Bsg                                                            | 35.0229 | 5.65322        | 1.00793e-268 | 3.25409e-264 | nonFene ECs |
| Itm2a                                                          | 33.8505 | 6.53928        | 3.57155e-251 | 3.84358e-247 | nonFene ECs |
| Slco1a4                                                        | 33.7317 | 11.248         | 1.98275e-249 | 1.60033e-245 | nonFene ECs |
| Cldn5                                                          | 32.0129 | 4.60699        | 7.22145e-225 | 3.33064e-221 | nonFene ECs |
| Spock2                                                         | 31.8691 | 11.2683        | 7.16625e-223 | 2.89203e-219 | nonFene ECs |
| Pltp                                                           | 31.4253 | 4.91431        | 9.13713e-217 | 3.27769e-213 | nonFene ECs |
| Ptn                                                            | 30.6539 | 10.7194        | 2.34322e-206 | 6.87737e-203 | nonFene ECs |
| Maf                                                            | 74.7392 | 6.26226        | 0            | 0            | Sinus ECs   |
| Mrc1                                                           | 71.2253 | 6.94004        | 0            | 0            | Sinus ECs   |
| Stab2                                                          | 70.6412 | 12.8127        | 0            | 0            | Sinus ECs   |
| Plxnc1                                                         | 68.6608 | 10.4398        | 0            | 0            | Sinus ECs   |
| Ptprb                                                          | 68.4635 | 2.25198        | 0            | 0            | Sinus ECs   |
| Dnase1l3                                                       | 68.3553 | 14.5779        | 0            | 0            | Sinus ECs   |
| Ralgapa2                                                       | 68.148  | 6.111          | 0            | 0            | Sinus ECs   |

## Supplementary Table S2

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |          |                |           |          |             |             |                      |
|---------------------------------------------------------------------------|----------|----------------|-----------|----------|-------------|-------------|----------------------|
| gene_name                                                                 | baseMean | log2FoldChange | lfcSE     | stat     | pvalue      | padj        | Group                |
| Gm16070                                                                   | 18.7559  | 4.16757        | 0.37479   | 11.1197  | 1.00561e-28 | 6.11986e-28 | Conti_fene_vs_others |
| Crispld1                                                                  | 56.534   | 4.58357        | 0.241917  | 18.9468  | 4.68913e-80 | 6.24241e-79 | Conti_fene_vs_others |
| Tmem182                                                                   | 12.6652  | 6.88309        | 1.07235   | 6.41871  | 1.3743e-10  | 4.40687e-10 | Conti_fene_vs_others |
| Slc40a1                                                                   | 208.98   | -6.56755       | 0.205408  | -31.9733 | 2.5643e-224 | 9.539e-223  | Conti_fene_vs_others |
| Myo1b                                                                     | 132.686  | 3.16411        | 0.108079  | 29.2758  | 2.1087e-188 | 6.6105e-187 | Conti_fene_vs_others |
| Stk17b                                                                    | 10.8625  | 3.31201        | 0.378201  | 8.75729  | 2.00005e-18 | 8.9907e-18  | Conti_fene_vs_others |
| Plcl1                                                                     | 20.2546  | 4.5816         | 0.409559  | 11.1867  | 4.73984e-29 | 2.90958e-28 | Conti_fene_vs_others |
| Adam23                                                                    | 1250.73  | -12.2806       | 0.590197  | -20.8076 | 3.69533e-96 | 5.7922e-95  | Conti_fene_vs_others |
| Map2                                                                      | 18.5628  | 5.9739         | 0.656129  | 9.10476  | 8.64566e-20 | 4.07245e-19 | Conti_fene_vs_others |
| Fn1                                                                       | 34.8701  | -3.51373       | 0.235436  | -14.9244 | 2.28726e-50 | 2.0945e-49  | Conti_fene_vs_others |
| Igfbp5                                                                    | 2381.27  | 7.20877        | 0.48087   | 14.9911  | 8.39494e-51 | 7.74217e-50 | Conti_fene_vs_others |
| Serpine2                                                                  | 34.3578  | 8.03404        | 0.968434  | 8.29591  | 1.07756e-16 | 4.54559e-16 | Conti_fene_vs_others |
| Col4a3                                                                    | 88.5456  | 3.82965        | 0.155259  | 24.6662  | 2.4636e-134 | 5.1766e-133 | Conti_fene_vs_others |
| Arl4c                                                                     | 24.4968  | -3.07859       | 0.210396  | -14.6323 | 1.74687e-48 | 1.55212e-47 | Conti_fene_vs_others |
| Gpc1                                                                      | 25.1922  | -6.62807       | 0.600567  | -11.0364 | 2.55187e-28 | 1.53556e-27 | Conti_fene_vs_others |
| Tnfrsf11a                                                                 | 49.8268  | 3.02084        | 0.168952  | 17.8799  | 1.69118e-71 | 2.05922e-70 | Conti_fene_vs_others |
| Cxcr4                                                                     | 19.2596  | 5.75875        | 0.609883  | 9.4424   | 3.64339e-21 | 1.79845e-20 | Conti_fene_vs_others |
| Cd55b                                                                     | 15.7391  | -7.67668       | 1.07092   | -7.16833 | 7.59209e-13 | 2.71253e-12 | Conti_fene_vs_others |
| Gm15675                                                                   | 280.862  | -10.3888       | 0.64611   | -16.079  | 3.57905e-58 | 3.64444e-57 | Conti_fene_vs_others |
| Cd55                                                                      | 1048.56  | -8.32222       | 0.165125  | -50.3996 | 0           | 0           | Conti_fene_vs_others |
| Gm16083                                                                   | 140.707  | -4.47063       | 0.136183  | -32.8281 | 2.3411e-236 | 9.2155e-235 | Conti_fene_vs_others |
| Gm19461                                                                   | 17.2244  | -5.84927       | 0.559557  | -10.4534 | 1.41373e-25 | 7.89306e-25 | Conti_fene_vs_others |
| Prelp                                                                     | 51.97    | -3.15136       | 0.15836   | -19.9    | 4.07244e-88 | 5.91797e-87 | Conti_fene_vs_others |
| Cfh                                                                       | 194.827  | -5.49295       | 0.14947   | -36.7496 | 1.1819e-295 | 6.0851e-294 | Conti_fene_vs_others |
| Npl                                                                       | 98.2929  | -6.27339       | 0.270594  | -23.1838 | 6.6349e-119 | 1.2597e-117 | Conti_fene_vs_others |
| Dnm3                                                                      | 304.699  | 3.0358         | 0.0776505 | 39.0957  | 0           | 0           | Conti_fene_vs_others |
| Dnm3os                                                                    | 20.4078  | -4.46982       | 0.338016  | -13.2237 | 6.40202e-40 | 4.92553e-39 | Conti_fene_vs_others |
| Fmo2                                                                      | 57.1095  | 3.32024        | 0.340235  | 9.75867  | 1.69369e-22 | 8.68286e-22 | Conti_fene_vs_others |
| Sele                                                                      | 38.8029  | -5.65903       | 0.377956  | -14.9727 | 1.10704e-50 | 1.01914e-49 | Conti_fene_vs_others |
| Selp                                                                      | 55.6814  | -5.51665       | 0.490746  | -11.2414 | 2.55428e-29 | 1.5773e-28  | Conti_fene_vs_others |
| Pbx1                                                                      | 4827.8   | 3.41565        | 0.0395898 | 86.2762  | 0           | 0           | Conti_fene_vs_others |
| Fcgr2b                                                                    | 1664.44  | -12.956        | 0.645376  | -20.0751 | 1.21877e-89 | 1.79286e-88 | Conti_fene_vs_others |
| Cd84                                                                      | 167.375  | -7.31201       | 0.29316   | -24.9421 | 2.6029e-137 | 5.5823e-136 | Conti_fene_vs_others |
| Ackr1                                                                     | 18.1752  | -5.93846       | 0.566323  | -10.486  | 1.00191e-25 | 5.61801e-25 | Conti_fene_vs_others |
| Enah                                                                      | 33.5044  | 7.41622        | 0.791816  | 9.36609  | 7.52718e-21 | 3.67588e-20 | Conti_fene_vs_others |
| 1700047M11Rik                                                             | 46.8933  | -9.24897       | 1.06579   | -8.67807 | 4.02547e-18 | 1.79039e-17 | Conti_fene_vs_others |
| Susd4                                                                     | 11.2818  | -3.36139       | 0.37265   | -9.02024 | 1.87673e-19 | 8.75265e-19 | Conti_fene_vs_others |
| Dusp10                                                                    | 61.3838  | -4.736         | 0.215748  | -21.9516 | 8.3678e-107 | 1.4505e-105 | Conti_fene_vs_others |
| G0s2                                                                      | 17.6495  | 6.19383        | 0.722417  | 8.57376  | 1.00161e-17 | 4.3821e-17  | Conti_fene_vs_others |
| Cd34                                                                      | 585.644  | 3.85331        | 0.0625414 | 61.6122  | 0           | 0           | Conti_fene_vs_others |
| Camk1d                                                                    | 1238.9   | -3.12676       | 0.0329298 | -94.9522 | 0           | 0           | Conti_fene_vs_others |
| Proser2                                                                   | 34.3964  | 4.38673        | 0.298248  | 14.7083  | 5.70066e-49 | 5.13555e-48 | Conti_fene_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                      |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|----------------------|
| Itga8                                                                     | 466.279 | -5.8779  | 0.122349  | -48.0421 | 0           | 0           | Conti_fene_vs_others |
| Mrc1                                                                      | 2302.74 | -5.54871 | 0.0507165 | -109.406 | 0           | 0           | Conti_fene_vs_others |
| Slc39a12                                                                  | 11.8824 | -3.07339 | 0.321403  | -9.56244 | 1.15015e-21 | 5.7745e-21  | Conti_fene_vs_others |
| Adamts12                                                                  | 15.5836 | 3.40678  | 0.334065  | 10.1979  | 2.02502e-24 | 1.09444e-23 | Conti_fene_vs_others |
| Olfm1                                                                     | 132.742 | -4.28162 | 0.129161  | -33.1494 | 5.7734e-241 | 2.3256e-239 | Conti_fene_vs_others |
| Ass1                                                                      | 25.8134 | 4.13022  | 0.312592  | 13.2128  | 7.4015e-40  | 5.68887e-39 | Conti_fene_vs_others |
| St6galnac4                                                                | 47.9206 | 3.02895  | 0.174541  | 17.3538  | 1.8456e-67  | 2.12257e-66 | Conti_fene_vs_others |
| Zeb2                                                                      | 863.712 | -5.2498  | 0.0708468 | -74.1007 | 0           | 0           | Conti_fene_vs_others |
| Galnt13                                                                   | 11.927  | -5.54614 | 0.676283  | -8.20092 | 2.38554e-16 | 9.94977e-16 | Conti_fene_vs_others |
| Dpp4                                                                      | 873.342 | -10.6467 | 0.400692  | -26.5708 | 1.4774e-155 | 3.7846e-154 | Conti_fene_vs_others |
| Gm13561                                                                   | 19.074  | -7.94976 | 1.07099   | -7.42282 | 1.14649e-13 | 4.26171e-13 | Conti_fene_vs_others |
| Fign                                                                      | 98.4539 | -4.5082  | 0.161983  | -27.8314 | 1.8115e-170 | 5.2065e-169 | Conti_fene_vs_others |
| B3galt1                                                                   | 962.556 | -6.34652 | 0.0933194 | -68.0085 | 0           | 0           | Conti_fene_vs_others |
| Rapgef4                                                                   | 577.985 | 4.55026  | 0.0806499 | 56.42    | 0           | 0           | Conti_fene_vs_others |
| Rapgef4os1                                                                | 44.4875 | 3.96622  | 0.224966  | 17.6303  | 1.442e-69   | 1.70118e-68 | Conti_fene_vs_others |
| Gpr155                                                                    | 129.116 | -4.1238  | 0.127102  | -32.4448 | 6.4206e-231 | 2.465e-229  | Conti_fene_vs_others |
| Hoxd3os1                                                                  | 25.8335 | 7.9156   | 1.06791   | 7.41222  | 1.24207e-13 | 4.60708e-13 | Conti_fene_vs_others |
| Hoxd8                                                                     | 32.6357 | 8.25035  | 1.0658    | 7.74099  | 9.86437e-15 | 3.86058e-14 | Conti_fene_vs_others |
| Hoxd4                                                                     | 15.9857 | 7.21858  | 1.06955   | 6.7492   | 1.48665e-11 | 5.00236e-11 | Conti_fene_vs_others |
| Ccdc141                                                                   | 29.0516 | -5.70569 | 0.424001  | -13.4568 | 2.80807e-41 | 2.22541e-40 | Conti_fene_vs_others |
| Tfpi                                                                      | 522.328 | -3.22565 | 0.0526554 | -61.2596 | 0           | 0           | Conti_fene_vs_others |
| Aplnr                                                                     | 202.989 | 9.44341  | 0.64736   | 14.5876  | 3.36965e-48 | 2.98205e-47 | Conti_fene_vs_others |
| Cd82                                                                      | 27.1055 | -3.71639 | 0.236657  | -15.7037 | 1.42677e-55 | 1.40144e-54 | Conti_fene_vs_others |
| Mpped2                                                                    | 43.2324 | 4.78871  | 0.301327  | 15.8921  | 7.18812e-57 | 7.17382e-56 | Conti_fene_vs_others |
| Fmn1                                                                      | 171.332 | -10.2496 | 0.789843  | -12.9767 | 1.6588e-38  | 1.23351e-37 | Conti_fene_vs_others |
| 3110099E03Rik                                                             | 23.9545 | 7.80346  | 1.06831   | 7.30446  | 2.78373e-13 | 1.01606e-12 | Conti_fene_vs_others |
| Thbs1                                                                     | 11.2263 | 3.38322  | 0.405036  | 8.35289  | 6.66155e-17 | 2.83006e-16 | Conti_fene_vs_others |
| Bub1b                                                                     | 11.3189 | -3.49817 | 0.358149  | -9.76735 | 1.55466e-22 | 7.98591e-22 | Conti_fene_vs_others |
| Ehd4                                                                      | 1057.75 | 3.73337  | 0.0851566 | 43.8412  | 0           | 0           | Conti_fene_vs_others |
| Frmd5                                                                     | 19.6441 | -6.52921 | 0.663316  | -9.84329 | 7.3278e-23  | 3.79927e-22 | Conti_fene_vs_others |
| Sord                                                                      | 62.0128 | -3.92191 | 0.16706   | -23.4761 | 7.1512e-122 | 1.4004e-120 | Conti_fene_vs_others |
| Slc28a2                                                                   | 23.831  | 6.33629  | 0.662557  | 9.56338  | 1.13975e-21 | 5.72413e-21 | Conti_fene_vs_others |
| Gatm                                                                      | 1130.12 | -7.25179 | 0.114311  | -63.439  | 0           | 0           | Conti_fene_vs_others |
| Hdc                                                                       | 78.4756 | -4.16352 | 0.158208  | -26.3167 | 1.2355e-152 | 3.0445e-151 | Conti_fene_vs_others |
| Mall                                                                      | 17.4718 | 3.40073  | 0.313893  | 10.834   | 2.37471e-27 | 1.39476e-26 | Conti_fene_vs_others |
| Morrbid                                                                   | 245.61  | -4.07389 | 0.0875988 | -46.5062 | 0           | 0           | Conti_fene_vs_others |
| Il1a                                                                      | 184.834 | -10.3592 | 0.788737  | -13.134  | 2.10353e-39 | 1.59862e-38 | Conti_fene_vs_others |
| Bmp2                                                                      | 1435.99 | -5.97889 | 0.0689623 | -86.6979 | 0           | 0           | Conti_fene_vs_others |
| Flrt3                                                                     | 26.1248 | 3.65938  | 0.27893   | 13.1194  | 2.55002e-39 | 1.93416e-38 | Conti_fene_vs_others |
| Slc24a3                                                                   | 10.8523 | 3.36056  | 0.637025  | 5.2754   | 1.32468e-07 | 3.57782e-07 | Conti_fene_vs_others |
| Ralgapa2                                                                  | 2167.18 | -5.37986 | 0.0528386 | -101.817 | 0           | 0           | Conti_fene_vs_others |
| Acss1                                                                     | 28.2678 | 7.17134  | 0.792493  | 9.04909  | 1.4416e-19  | 6.7415e-19  | Conti_fene_vs_others |
| Tcf15                                                                     | 119.955 | 5.52241  | 0.22792   | 24.2296  | 1.0863e-129 | 2.2254e-128 | Conti_fene_vs_others |
| Tox2                                                                      | 23.0095 | -3.71306 | 0.257359  | -14.4275 | 3.47282e-47 | 3.02854e-46 | Conti_fene_vs_others |
| Sdc4                                                                      | 23.487  | -3.41825 | 0.23875   | -14.3173 | 1.70569e-46 | 1.47262e-45 | Conti_fene_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                      |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|----------------------|
| Sulf2                                                                     | 22.4972 | 6.83954  | 0.797147  | 8.58003  | 9.48517e-18 | 4.15568e-17 | Conti_fene_vs_others |
| Zbp1                                                                      | 21.9658 | 3.254    | 0.26816   | 12.1346  | 6.92896e-34 | 4.67615e-33 | Conti_fene_vs_others |
| Srms                                                                      | 15.0152 | 4.78673  | 0.501084  | 9.55274  | 1.26314e-21 | 6.33771e-21 | Conti_fene_vs_others |
| Pkia                                                                      | 19.115  | 5.75077  | 0.603464  | 9.5296   | 1.57883e-21 | 7.88603e-21 | Conti_fene_vs_others |
| Stmn2                                                                     | 48.4279 | 3.94116  | 0.330185  | 11.9362  | 7.66388e-33 | 5.06657e-32 | Conti_fene_vs_others |
| Pag1                                                                      | 12.8919 | 4.40329  | 0.474409  | 9.28163  | 1.66906e-20 | 8.05219e-20 | Conti_fene_vs_others |
| Nlgn1                                                                     | 12.9411 | 5.17278  | 0.635799  | 8.13588  | 4.08964e-16 | 1.68987e-15 | Conti_fene_vs_others |
| Tnik                                                                      | 259.364 | -6.62823 | 0.188014  | -35.2539 | 2.9898e-272 | 1.3553e-270 | Conti_fene_vs_others |
| Egfm1                                                                     | 75.7256 | -6.9153  | 0.452752  | -15.2739 | 1.14104e-52 | 1.08316e-51 | Conti_fene_vs_others |
| Spry1                                                                     | 106.197 | 3.00276  | 0.118048  | 25.4367  | 9.9035e-143 | 2.235e-141  | Conti_fene_vs_others |
| Pabpc4l                                                                   | 39.8792 | -3.68085 | 0.215256  | -17.0998 | 1.48858e-65 | 1.66039e-64 | Conti_fene_vs_others |
| P2ry1                                                                     | 65.9321 | -3.39164 | 0.147441  | -23.0033 | 4.317e-117  | 8.097e-116  | Conti_fene_vs_others |
| Arhgef26                                                                  | 31.3155 | 8.19134  | 1.06574   | 7.68603  | 1.51775e-14 | 5.89399e-14 | Conti_fene_vs_others |
| B3galnt1                                                                  | 18.3429 | 7.12461  | 0.969845  | 7.34613  | 2.04029e-13 | 7.48925e-13 | Conti_fene_vs_others |
| Gucy1b1                                                                   | 11.7865 | -3.23211 | 0.341918  | -9.45286 | 3.29692e-21 | 1.63053e-20 | Conti_fene_vs_others |
| Cd1d1                                                                     | 31.2066 | 3.72174  | 0.252088  | 14.7637  | 2.51274e-49 | 2.27419e-48 | Conti_fene_vs_others |
| Lmna                                                                      | 114.674 | 3.29853  | 0.116623  | 28.2838  | 5.4723e-176 | 1.6146e-174 | Conti_fene_vs_others |
| S100a6                                                                    | 382.706 | 4.08798  | 0.801903  | 5.09785  | 3.43526e-07 | 8.96071e-07 | Conti_fene_vs_others |
| Igsf3                                                                     | 41.6606 | -6.12965 | 0.39811   | -15.3969 | 1.71766e-53 | 1.64255e-52 | Conti_fene_vs_others |
| Inka2                                                                     | 10.331  | 4.40461  | 0.53346   | 8.25668  | 1.49786e-16 | 6.28956e-16 | Conti_fene_vs_others |
| Dennd2d                                                                   | 19.2429 | -6.79812 | 0.724985  | -9.37691 | 6.79349e-21 | 3.32072e-20 | Conti_fene_vs_others |
| Vcam1                                                                     | 178.723 | -4.41527 | 0.163595  | -26.989  | 1.9892e-160 | 5.2691e-159 | Conti_fene_vs_others |
| Frrs1                                                                     | 62.1697 | -6.71722 | 0.392829  | -17.0996 | 1.49416e-65 | 1.66542e-64 | Conti_fene_vs_others |
| Plppr5                                                                    | 31.6114 | -6.22215 | 0.471373  | -13.2001 | 8.76761e-40 | 6.72226e-39 | Conti_fene_vs_others |
| Dkk2                                                                      | 129.43  | 4.26584  | 1.02025   | 4.18118  | 2.90002e-05 | 6.51908e-05 | Conti_fene_vs_others |
| Gm30648                                                                   | 60.9118 | -4.93391 | 0.223433  | -22.0823 | 4.6766e-108 | 8.1981e-107 | Conti_fene_vs_others |
| Slc39a8                                                                   | 263.172 | -4.7302  | 0.104422  | -45.299  | 0           | 0           | Conti_fene_vs_others |
| Emcn                                                                      | 4337.55 | 3.57771  | 0.0254286 | 140.696  | 0           | 0           | Conti_fene_vs_others |
| Adh6b                                                                     | 10.2266 | -5.08728 | 0.644097  | -7.89831 | 2.82714e-15 | 1.13238e-14 | Conti_fene_vs_others |
| Clca3a1                                                                   | 30.5687 | -4.10488 | 0.25561   | -16.0591 | 4.93295e-58 | 5.01651e-57 | Conti_fene_vs_others |
| Ssx2ip                                                                    | 56.0758 | -3.6298  | 0.160336  | -22.6388 | 1.8007e-113 | 3.2979e-112 | Conti_fene_vs_others |
| Penk                                                                      | 11.2641 | 6.71359  | 1.10326   | 6.08524  | 1.1632e-09  | 3.54918e-09 | Conti_fene_vs_others |
| Cga                                                                       | 61.9567 | 9.17315  | 1.07209   | 8.55633  | 1.16513e-17 | 5.08178e-17 | Conti_fene_vs_others |
| Aqp7                                                                      | 43.9265 | 8.38876  | 0.969024  | 8.65691  | 4.84718e-18 | 2.14971e-17 | Conti_fene_vs_others |
| Cntfr                                                                     | 50.8844 | -7.91777 | 0.650765  | -12.1669 | 4.6665e-34  | 3.16853e-33 | Conti_fene_vs_others |
| 4930578G10Rik                                                             | 12.0206 | -6.98544 | 0.973777  | -7.17355 | 7.30754e-13 | 2.61387e-12 | Conti_fene_vs_others |
| Msmg                                                                      | 26.0979 | 5.06673  | 0.416951  | 12.1519  | 5.60687e-34 | 3.79709e-33 | Conti_fene_vs_others |
| Hrct1                                                                     | 29.2566 | 3.98189  | 0.286188  | 13.9136  | 5.24064e-44 | 4.3275e-43  | Conti_fene_vs_others |
| Spaar                                                                     | 28.8974 | 4.30194  | 0.310335  | 13.8623  | 1.0722e-43  | 8.8163e-43  | Conti_fene_vs_others |
| Col15a1                                                                   | 239.414 | 7.91431  | 0.353657  | 22.3785  | 6.3736e-111 | 1.151e-109  | Conti_fene_vs_others |
| Ctnnal1                                                                   | 48.3072 | -5.32944 | 0.285579  | -18.6619 | 1.01161e-77 | 1.30211e-76 | Conti_fene_vs_others |
| Susd1                                                                     | 46.939  | -3.99831 | 0.202887  | -19.707  | 1.87649e-86 | 2.6793e-85  | Conti_fene_vs_others |
| Col27a1                                                                   | 44.3457 | -4.70597 | 0.24714   | -19.0417 | 7.69571e-81 | 1.03245e-79 | Conti_fene_vs_others |
| Ptprd                                                                     | 16.4542 | -4.06855 | 0.349855  | -11.6292 | 2.92699e-31 | 1.87368e-30 | Conti_fene_vs_others |
| Lurap1l                                                                   | 74.9848 | 4.28067  | 0.191562  | 22.3462  | 1.3153e-110 | 2.3699e-109 | Conti_fene_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                      |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|----------------------|
| Adams1                                                                    | 43.7088 | 5.62406  | 0.455444  | 12.3485  | 4.96231e-35 | 3.43539e-34 | Conti_fene_vs_others |
| Gm12648                                                                   | 57.9496 | -7.84271 | 0.604458  | -12.9748 | 1.70085e-38 | 1.26357e-37 | Conti_fene_vs_others |
| Kank4                                                                     | 20.1736 | 3.51398  | 0.303542  | 11.5766  | 5.41584e-31 | 3.44139e-30 | Conti_fene_vs_others |
| Dock7                                                                     | 167.209 | -5.31455 | 0.153252  | -34.6785 | 1.6602e-263 | 7.313e-262  | Conti_fene_vs_others |
| Rab3b                                                                     | 47.7127 | -4.3007  | 0.216826  | -19.8348 | 1.49118e-87 | 2.15286e-86 | Conti_fene_vs_others |
| Ptch2                                                                     | 48.4063 | -4.04467 | 0.193258  | -20.9288 | 2.92487e-97 | 4.6407e-96  | Conti_fene_vs_others |
| Gm12840                                                                   | 105.01  | -6.63569 | 0.295691  | -22.4413 | 1.5552e-111 | 2.8217e-110 | Conti_fene_vs_others |
| Rhbd12                                                                    | 64.3296 | 8.9385   | 0.962878  | 9.28311  | 1.6461e-20  | 7.94389e-20 | Conti_fene_vs_others |
| Ptpru                                                                     | 267.961 | 4.94522  | 0.124311  | 39.7812  | 0           | 0           | Conti_fene_vs_others |
| Grrp1                                                                     | 141.05  | 4.36952  | 0.144894  | 30.1567  | 8.7645e-200 | 2.9057e-198 | Conti_fene_vs_others |
| Alpl                                                                      | 45.849  | 3.68699  | 0.222111  | 16.5998  | 6.99674e-62 | 7.45664e-61 | Conti_fene_vs_others |
| Mfap2                                                                     | 35.3752 | 5.76208  | 0.445019  | 12.9479  | 2.41402e-38 | 1.78741e-37 | Conti_fene_vs_others |
| Fblim1                                                                    | 18.6533 | 5.48681  | 0.558262  | 9.82839  | 8.49702e-23 | 4.38792e-22 | Conti_fene_vs_others |
| Tmem51                                                                    | 101.121 | -3.36944 | 0.115344  | -29.2121 | 1.3625e-187 | 4.2542e-186 | Conti_fene_vs_others |
| Tmem51os1                                                                 | 13.2606 | -3.29959 | 0.311269  | -10.6004 | 2.96609e-26 | 1.69185e-25 | Conti_fene_vs_others |
| Tnfrsf1b                                                                  | 13.1029 | 3.53516  | 0.372212  | 9.4977   | 2.14569e-21 | 1.06524e-20 | Conti_fene_vs_others |
| Zfp979                                                                    | 48.9602 | 5.3615   | 0.329938  | 16.25    | 2.23304e-59 | 2.31169e-58 | Conti_fene_vs_others |
| Rbp7                                                                      | 388.909 | 9.90162  | 0.554168  | 17.8675  | 2.11086e-71 | 2.56219e-70 | Conti_fene_vs_others |
| Ctnnbip1                                                                  | 113.927 | 3.33391  | 0.121207  | 27.5058  | 1.495e-166  | 4.1586e-165 | Conti_fene_vs_others |
| C1stn1                                                                    | 127.055 | 5.02929  | 0.184638  | 27.2387  | 2.2639e-163 | 6.1648e-162 | Conti_fene_vs_others |
| Smim1                                                                     | 18.3545 | -3.15841 | 0.254044  | -12.4325 | 1.74029e-35 | 1.21671e-34 | Conti_fene_vs_others |
| Megf6                                                                     | 17.668  | -4.18463 | 0.478237  | -8.75011 | 2.1315e-18  | 9.57053e-18 | Conti_fene_vs_others |
| Cfap69                                                                    | 17.1008 | -3.65402 | 0.303036  | -12.058  | 1.75912e-33 | 1.1795e-32  | Conti_fene_vs_others |
| Hgf                                                                       | 309.09  | -11.9682 | 1.0643    | -11.2451 | 2.44814e-29 | 1.51236e-28 | Conti_fene_vs_others |
| Gsap                                                                      | 53.3555 | -3.5739  | 0.17081   | -20.9233 | 3.2875e-97  | 5.20013e-96 | Conti_fene_vs_others |
| Msx1                                                                      | 15.8085 | 4.09794  | 0.401301  | 10.2116  | 1.75891e-24 | 9.52936e-24 | Conti_fene_vs_others |
| C1qtnf7                                                                   | 33.8289 | -3.41245 | 0.232212  | -14.6954 | 6.89778e-49 | 6.19247e-48 | Conti_fene_vs_others |
| Bst1                                                                      | 14.8896 | 4.11522  | 0.406694  | 10.1187  | 4.56396e-24 | 2.4513e-23  | Conti_fene_vs_others |
| D5Ert615e                                                                 | 242.531 | 4.4659   | 0.118537  | 37.6753  | 0           | 0           | Conti_fene_vs_others |
| Pcdh7                                                                     | 89.4455 | 4.25358  | 0.463171  | 9.1836   | 4.16918e-20 | 1.98489e-19 | Conti_fene_vs_others |
| Uchl1                                                                     | 42.4631 | 5.6809   | 0.400022  | 14.2015  | 8.97043e-46 | 7.62192e-45 | Conti_fene_vs_others |
| Bend4                                                                     | 36.6984 | -5.34764 | 0.327632  | -16.3221 | 6.87244e-60 | 7.18625e-59 | Conti_fene_vs_others |
| Lnx1                                                                      | 15.6336 | 7.18765  | 1.08117   | 6.64802  | 2.97057e-11 | 9.838e-11   | Conti_fene_vs_others |
| Kit                                                                       | 389.053 | -4.5891  | 0.0989942 | -46.3573 | 0           | 0           | Conti_fene_vs_others |
| Cxcl10                                                                    | 140.35  | -3.71855 | 0.405434  | -9.17177 | 4.65305e-20 | 2.21255e-19 | Conti_fene_vs_others |
| Rasgef1b                                                                  | 262.306 | -5.83235 | 0.143841  | -40.5472 | 0           | 0           | Conti_fene_vs_others |
| Tmem150c                                                                  | 10.6715 | 5.16499  | 0.664097  | 7.77745  | 7.39989e-15 | 2.9122e-14  | Conti_fene_vs_others |
| Hpse                                                                      | 45.8165 | -7.28286 | 0.552238  | -13.1879 | 1.03007e-39 | 7.8783e-39  | Conti_fene_vs_others |
| Gpat3                                                                     | 17.2113 | -4.28465 | 0.356675  | -12.0127 | 3.04619e-33 | 2.0311e-32  | Conti_fene_vs_others |
| Sparcl1                                                                   | 703.885 | 3.8962   | 0.0969809 | 40.1749  | 0           | 0           | Conti_fene_vs_others |
| Sez6l                                                                     | 10.2685 | 5.69034  | 0.801723  | 7.09764  | 1.26909e-12 | 4.48172e-12 | Conti_fene_vs_others |
| Cabp1                                                                     | 13.0009 | 6.62683  | 0.969232  | 6.83719  | 8.07617e-12 | 2.74965e-11 | Conti_fene_vs_others |
| Cux2                                                                      | 46.1103 | -6.76699 | 0.464741  | -14.5608 | 4.9878e-48  | 4.40155e-47 | Conti_fene_vs_others |
| Hvcn1                                                                     | 30.9621 | -4.37339 | 0.2662    | -16.4289 | 1.18742e-60 | 1.25005e-59 | Conti_fene_vs_others |
| Rflna                                                                     | 40.0556 | 4.85738  | 0.312453  | 15.546   | 1.69472e-54 | 1.6408e-53  | Conti_fene_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                      |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|----------------------|
| Hspb1                                                                     | 912.362 | 3.34942  | 0.051042  | 65.621   | 0           | 0           | Conti_fene_vs_others |
| Cldn15                                                                    | 70.2472 | 5.45333  | 0.283957  | 19.2048  | 3.37404e-82 | 4.59798e-81 | Conti_fene_vs_others |
| Agfg2                                                                     | 129.705 | -3.04272 | 0.092025  | -33.0641 | 9.7666e-240 | 3.8939e-238 | Conti_fene_vs_others |
| Snx8                                                                      | 218.072 | -3.24476 | 0.0780271 | -41.5851 | 0           | 0           | Conti_fene_vs_others |
| Sdk1                                                                      | 100.57  | 3.22008  | 0.21319   | 15.1042  | 1.51837e-51 | 1.41881e-50 | Conti_fene_vs_others |
| N4bp2l1                                                                   | 71.8408 | -4.12555 | 0.172561  | -23.9078 | 2.5421e-126 | 5.0871e-125 | Conti_fene_vs_others |
| Ppp1r9a                                                                   | 89.4402 | -9.88694 | 0.963972  | -10.2565 | 1.10697e-24 | 6.0288e-24  | Conti_fene_vs_others |
| Pdk4                                                                      | 119.209 | -3.75708 | 0.12374   | -30.3627 | 1.7096e-202 | 5.7166e-201 | Conti_fene_vs_others |
| Dync1i1                                                                   | 15.4114 | 4.27639  | 0.423271  | 10.1032  | 5.3471e-24  | 2.86895e-23 | Conti_fene_vs_others |
| Tfec                                                                      | 100.358 | -7.89864 | 0.459497  | -17.1898 | 3.16777e-66 | 3.56666e-65 | Conti_fene_vs_others |
| Wnt2                                                                      | 348.221 | -8.37357 | 0.29201   | -28.6756 | 7.6789e-181 | 2.3095e-179 | Conti_fene_vs_others |
| Cped1                                                                     | 259.903 | 5.14468  | 0.134268  | 38.3166  | 0           | 0           | Conti_fene_vs_others |
| Aass                                                                      | 419.924 | -11.8326 | 0.871085  | -13.5837 | 5.00078e-42 | 4.01224e-41 | Conti_fene_vs_others |
| Cadps2                                                                    | 229.357 | -4.57376 | 0.105412  | -43.3893 | 0           | 0           | Conti_fene_vs_others |
| Akr1b8                                                                    | 82.6051 | -8.35717 | 0.595     | -14.0457 | 8.18901e-45 | 6.83839e-44 | Conti_fene_vs_others |
| Chrm2                                                                     | 23.5642 | 6.90812  | 0.796267  | 8.67563  | 4.11256e-18 | 1.82808e-17 | Conti_fene_vs_others |
| Ptn                                                                       | 99.4585 | -4.19699 | 0.447356  | -9.38178 | 6.48656e-21 | 3.17168e-20 | Conti_fene_vs_others |
| Dennd2a                                                                   | 90.1476 | -5.14781 | 0.204743  | -25.1428 | 1.694e-139  | 3.7099e-138 | Conti_fene_vs_others |
| Gimap3                                                                    | 19.1961 | 5.75445  | 0.599344  | 9.60124  | 7.89863e-22 | 3.98365e-21 | Conti_fene_vs_others |
| Hoxa7                                                                     | 39.0637 | 8.21831  | 0.965576  | 8.51131  | 1.71986e-17 | 7.4553e-17  | Conti_fene_vs_others |
| Creb5                                                                     | 17.4228 | 4.24467  | 0.397432  | 10.6803  | 1.25929e-26 | 7.25208e-26 | Conti_fene_vs_others |
| Tril                                                                      | 48.6789 | 4.10998  | 0.229462  | 17.9114  | 9.60824e-72 | 1.17452e-70 | Conti_fene_vs_others |
| Aqp1                                                                      | 2347.76 | -3.09713 | 0.0876104 | -35.3512 | 9.6172e-274 | 4.3982e-272 | Conti_fene_vs_others |
| Pde1c                                                                     | 227.107 | -3.98611 | 0.10656   | -37.4073 | 2.9713e-306 | 1.6268e-304 | Conti_fene_vs_others |
| Ndnf                                                                      | 15.664  | -4.47736 | 0.423849  | -10.5636 | 4.39529e-26 | 2.49334e-25 | Conti_fene_vs_others |
| Loxl3                                                                     | 38.0951 | -3.93384 | 0.215149  | -18.2843 | 1.10443e-74 | 1.38156e-73 | Conti_fene_vs_others |
| Rtkn                                                                      | 22.5024 | -3.16427 | 0.236817  | -13.3617 | 1.01264e-40 | 7.91631e-40 | Conti_fene_vs_others |
| Tgfa                                                                      | 44.3893 | -3.20224 | 0.168596  | -18.9935 | 1.92889e-80 | 2.57887e-79 | Conti_fene_vs_others |
| Efcc1                                                                     | 15.2095 | -4.99917 | 0.456997  | -10.9392 | 7.48817e-28 | 4.46962e-27 | Conti_fene_vs_others |
| Nup210                                                                    | 23.6584 | 6.32613  | 0.654509  | 9.66546  | 4.22733e-22 | 2.14876e-21 | Conti_fene_vs_others |
| Ssu2                                                                      | 26.1031 | 5.98525  | 0.560038  | 10.6872  | 1.16811e-26 | 6.73449e-26 | Conti_fene_vs_others |
| Timp4                                                                     | 35.3329 | 7.78283  | 0.886216  | 8.78209  | 1.60465e-18 | 7.23837e-18 | Conti_fene_vs_others |
| Cacna1c                                                                   | 11.7002 | 3.97876  | 0.486974  | 8.17038  | 3.07424e-16 | 1.27606e-15 | Conti_fene_vs_others |
| Vwf                                                                       | 40.801  | -4.35793 | 0.357279  | -12.1976 | 3.20287e-34 | 2.18331e-33 | Conti_fene_vs_others |
| Clec1b                                                                    | 156.144 | -5.45835 | 0.170595  | -31.996  | 1.2388e-224 | 4.6304e-223 | Conti_fene_vs_others |
| Gm43914                                                                   | 11.6023 | -5.76914 | 0.663263  | -8.69812 | 3.37426e-18 | 1.50592e-17 | Conti_fene_vs_others |
| Kap                                                                       | 227.946 | 10.7651  | 0.965035  | 11.1551  | 6.76268e-29 | 4.12688e-28 | Conti_fene_vs_others |
| Emp1                                                                      | 108.899 | 4.9205   | 0.194294  | 25.325   | 1.6928e-141 | 3.7709e-140 | Conti_fene_vs_others |
| Arhgdib                                                                   | 245.54  | -3.13328 | 0.0705378 | -44.4199 | 0           | 0           | Conti_fene_vs_others |
| Rerg                                                                      | 98.6001 | -10.0317 | 0.965352  | -10.3918 | 2.70205e-25 | 1.49783e-24 | Conti_fene_vs_others |
| Slco1c1                                                                   | 70.3425 | -9.83095 | 1.07043   | -9.18415 | 4.14789e-20 | 1.97536e-19 | Conti_fene_vs_others |
| Slco1a4                                                                   | 126.51  | -5.33726 | 0.25752   | -20.7256 | 2.03481e-95 | 3.13881e-94 | Conti_fene_vs_others |
| Kcnj8                                                                     | 39.9067 | 3.33111  | 0.199688  | 16.6815  | 1.78534e-62 | 1.91847e-61 | Conti_fene_vs_others |
| Lrmp                                                                      | 64.7225 | -3.15832 | 0.13488   | -23.4158 | 2.9498e-121 | 5.7333e-120 | Conti_fene_vs_others |
| Tmtc1                                                                     | 129.037 | 3.99672  | 0.134505  | 29.7144  | 5.0071e-194 | 1.622e-192  | Conti_fene_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                      |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|----------------------|
| Peg3                                                                      | 24.3184 | 3.02273  | 0.250234  | 12.0796  | 1.35361e-33 | 9.0917e-33  | Conti_fene_vs_others |
| Ehd2                                                                      | 174.315 | 3.68394  | 0.105164  | 35.0304  | 7.7453e-269 | 3.4707e-267 | Conti_fene_vs_others |
| C5ar2                                                                     | 143.106 | -10.2773 | 0.871757  | -11.7892 | 4.43982e-32 | 2.89576e-31 | Conti_fene_vs_others |
| Pglyrp1                                                                   | 35.5906 | -4.45124 | 0.25906   | -17.1823 | 3.60641e-66 | 4.05761e-65 | Conti_fene_vs_others |
| Igsf23                                                                    | 13.2758 | -4.66477 | 0.443528  | -10.5174 | 7.18218e-26 | 4.04329e-25 | Conti_fene_vs_others |
| Spint2                                                                    | 67.1868 | -4.10795 | 0.168497  | -24.3799 | 2.7963e-131 | 5.805e-130  | Conti_fene_vs_others |
| Chst8                                                                     | 78.2424 | 3.73803  | 0.168123  | 22.2339  | 1.614e-109  | 2.8747e-108 | Conti_fene_vs_others |
| Sult2b1                                                                   | 29.3452 | 7.51193  | 0.876649  | 8.56891  | 1.0447e-17  | 4.56677e-17 | Conti_fene_vs_others |
| Lmtk3                                                                     | 42.8801 | 4.37156  | 0.263271  | 16.6048  | 6.43465e-62 | 6.8623e-61  | Conti_fene_vs_others |
| Gm2788                                                                    | 11.3865 | -4.43633 | 0.443516  | -10.0026 | 1.4839e-23  | 7.84801e-23 | Conti_fene_vs_others |
| Gm29683                                                                   | 20.1118 | -5.41335 | 0.464449  | -11.6554 | 2.15322e-31 | 1.38235e-30 | Conti_fene_vs_others |
| B130024G19Rik                                                             | 149.504 | -3.04309 | 0.0905697 | -33.5995 | 1.7073e-247 | 7.023e-246  | Conti_fene_vs_others |
| Gm42397                                                                   | 20.1259 | -7.44281 | 0.888089  | -8.38071 | 5.26095e-17 | 2.2467e-16  | Conti_fene_vs_others |
| Sema4b                                                                    | 45.2083 | -3.02085 | 0.166217  | -18.1742 | 8.26605e-74 | 1.02823e-72 | Conti_fene_vs_others |
| Prss23                                                                    | 183.826 | 4.10746  | 0.217207  | 18.9104  | 9.36822e-80 | 1.23971e-78 | Conti_fene_vs_others |
| Me3                                                                       | 31.7902 | 4.33087  | 0.297042  | 14.58    | 3.76515e-48 | 3.33017e-47 | Conti_fene_vs_others |
| Dlg2                                                                      | 54.3657 | 5.31021  | 0.313624  | 16.9318  | 2.62419e-64 | 2.88364e-63 | Conti_fene_vs_others |
| Thrsp                                                                     | 356.83  | 4.09483  | 0.0845799 | 48.4138  | 0           | 0           | Conti_fene_vs_others |
| Acer3                                                                     | 457.578 | -3.97335 | 0.0676592 | -58.7259 | 0           | 0           | Conti_fene_vs_others |
| Map6                                                                      | 10.7863 | 6.65111  | 1.07536   | 6.18503  | 6.2089e-10  | 1.92238e-09 | Conti_fene_vs_others |
| Tpbgl                                                                     | 396.883 | -6.11333 | 0.12929   | -47.2837 | 0           | 0           | Conti_fene_vs_others |
| Gm10605                                                                   | 69.137  | -5.40597 | 0.244346  | -22.1243 | 1.8468e-108 | 3.2484e-107 | Conti_fene_vs_others |
| Anapc15                                                                   | 334.12  | -4.28206 | 0.0826332 | -51.82   | 0           | 0           | Conti_fene_vs_others |
| Cavin3                                                                    | 533.528 | 5.90396  | 0.122179  | 48.3224  | 0           | 0           | Conti_fene_vs_others |
| Apbb1                                                                     | 13.899  | 3.71507  | 0.373898  | 9.93606  | 2.90087e-23 | 1.52384e-22 | Conti_fene_vs_others |
| Lmo1                                                                      | 16.4328 | 6.67143  | 0.879004  | 7.58976  | 3.2051e-14  | 1.22749e-13 | Conti_fene_vs_others |
| Lyve1                                                                     | 469.172 | -10.6431 | 0.548879  | -19.3905 | 9.27733e-84 | 1.29143e-82 | Conti_fene_vs_others |
| Dkk3                                                                      | 13.2829 | -6.85083 | 0.886552  | -7.72749 | 1.09684e-14 | 4.28514e-14 | Conti_fene_vs_others |
| Mical2                                                                    | 77.4015 | -3.6936  | 0.145083  | -25.4586 | 5.6706e-143 | 1.2853e-141 | Conti_fene_vs_others |
| Pth                                                                       | 68.5529 | 9.32043  | 1.72657   | 5.39825  | 6.72937e-08 | 1.85227e-07 | Conti_fene_vs_others |
| 4933406I18Rik                                                             | 18.1272 | -6.41099 | 0.663396  | -9.6639  | 4.29218e-22 | 2.18102e-21 | Conti_fene_vs_others |
| Pde3b                                                                     | 36.2177 | -4.1539  | 0.23923   | -17.3636 | 1.556e-67   | 1.79217e-66 | Conti_fene_vs_others |
| Xylt1                                                                     | 55.9938 | 3.5236   | 0.176908  | 19.9177  | 2.86047e-88 | 4.16846e-87 | Conti_fene_vs_others |
| Gprc5b                                                                    | 24.0639 | 3.78861  | 0.292916  | 12.9341  | 2.89013e-38 | 2.13688e-37 | Conti_fene_vs_others |
| Vwa3a                                                                     | 37.432  | 3.81018  | 0.248278  | 15.3464  | 3.74265e-53 | 3.57021e-52 | Conti_fene_vs_others |
| Prkcb                                                                     | 148.45  | -3.47901 | 0.107565  | -32.3433 | 1.7233e-229 | 6.5836e-228 | Conti_fene_vs_others |
| Nupr1                                                                     | 21.18   | 6.45533  | 0.719342  | 8.97394  | 2.86082e-19 | 1.32745e-18 | Conti_fene_vs_others |
| Cpxm2                                                                     | 23.1216 | 7.46045  | 0.966185  | 7.72155  | 1.14923e-14 | 4.48415e-14 | Conti_fene_vs_others |
| Ebf3                                                                      | 58.13   | 4.10995  | 0.212446  | 19.3459  | 2.20716e-83 | 3.05875e-82 | Conti_fene_vs_others |
| Ifitm1                                                                    | 12.8224 | -3.25868 | 0.376901  | -8.646   | 5.33378e-18 | 2.36013e-17 | Conti_fene_vs_others |
| Stxbp2                                                                    | 11.499  | -4.32822 | 0.431757  | -10.0247 | 1.18743e-23 | 6.29721e-23 | Conti_fene_vs_others |
| Clec4g                                                                    | 1747.37 | -14.4676 | 1.06328   | -13.6065 | 3.66337e-42 | 2.94528e-41 | Conti_fene_vs_others |
| Cd209b                                                                    | 12.226  | -7.30782 | 1.08332   | -6.74578 | 1.52203e-11 | 5.11808e-11 | Conti_fene_vs_others |
| Mcf2l                                                                     | 288.283 | 4.78164  | 0.11985   | 39.8969  | 0           | 0           | Conti_fene_vs_others |
| Tmem255b                                                                  | 26.4311 | 6.00549  | 0.560029  | 10.7235  | 7.89328e-27 | 4.56764e-26 | Conti_fene_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                      |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|----------------------|
| Csmd1                                                                     | 113.033 | -10.2276 | 0.967881  | -10.567  | 4.23648e-26 | 2.405e-25   | Conti_fene_vs_others |
| Plat                                                                      | 155.824 | 3.74961  | 0.125765  | 29.8143  | 2.5503e-195 | 8.3133e-194 | Conti_fene_vs_others |
| Nrg1                                                                      | 150.806 | -6.63705 | 0.45405   | -14.6174 | 2.17408e-48 | 1.9284e-47  | Conti_fene_vs_others |
| Gm6213                                                                    | 35.7488 | 4.62253  | 0.330874  | 13.9707  | 2.35351e-44 | 1.95589e-43 | Conti_fene_vs_others |
| Msr1                                                                      | 452.626 | -9.49093 | 0.373693  | -25.3976 | 2.6779e-142 | 5.9998e-141 | Conti_fene_vs_others |
| Hpgd                                                                      | 335.28  | -9.50671 | 0.436141  | -21.7973 | 2.4602e-105 | 4.2083e-104 | Conti_fene_vs_others |
| Palld                                                                     | 1013.05 | -6.5536  | 0.192854  | -33.9822 | 4.0852e-253 | 1.7214e-251 | Conti_fene_vs_others |
| Tll1                                                                      | 88.9568 | 8.53773  | 0.714721  | 11.9456  | 6.8493e-33  | 4.53384e-32 | Conti_fene_vs_others |
| Psd3                                                                      | 2263.38 | -3.2002  | 0.0403851 | -79.242  | 0           | 0           | Conti_fene_vs_others |
| Lpl                                                                       | 55.9023 | 6.57695  | 0.465873  | 14.1175  | 2.96445e-45 | 2.49428e-44 | Conti_fene_vs_others |
| Plvap                                                                     | 2772.51 | 4.27263  | 0.0684281 | 62.4398  | 0           | 0           | Conti_fene_vs_others |
| F2rl3                                                                     | 10.267  | 6.28067  | 0.977584  | 6.42468  | 1.32146e-10 | 4.24445e-10 | Conti_fene_vs_others |
| Nkd1                                                                      | 62.179  | -4.56822 | 0.198242  | -23.0437 | 1.7011e-117 | 3.2062e-116 | Conti_fene_vs_others |
| Tox3                                                                      | 26.6249 | 4.45368  | 0.33565   | 13.2688  | 3.51067e-40 | 2.71985e-39 | Conti_fene_vs_others |
| Irx3                                                                      | 180.559 | 9.275    | 0.646222  | 14.3526  | 1.02549e-46 | 8.88318e-46 | Conti_fene_vs_others |
| Crnde                                                                     | 20.221  | 7.26393  | 0.966856  | 7.51293  | 5.78168e-14 | 2.19053e-13 | Conti_fene_vs_others |
| Irx5                                                                      | 59.0885 | 8.526    | 0.872933  | 9.76707  | 1.55895e-22 | 8.0053e-22  | Conti_fene_vs_others |
| Mt2                                                                       | 65.6249 | -3.81427 | 0.156485  | -24.3748 | 3.1687e-131 | 6.5605e-130 | Conti_fene_vs_others |
| Cx3cl1                                                                    | 44.553  | 4.83464  | 0.297294  | 16.2621  | 1.83212e-59 | 1.90298e-58 | Conti_fene_vs_others |
| Ccdc102a                                                                  | 27.7888 | 3.4476   | 0.257492  | 13.3891  | 6.99949e-41 | 5.4995e-40  | Conti_fene_vs_others |
| Mmp15                                                                     | 89.0813 | 4.24818  | 0.176656  | 24.0478  | 8.8026e-128 | 1.7799e-126 | Conti_fene_vs_others |
| Car7                                                                      | 54.5564 | 3.21276  | 0.178733  | 17.9752  | 3.04607e-72 | 3.74414e-71 | Conti_fene_vs_others |
| Rrad                                                                      | 18.4854 | 5.10506  | 0.497079  | 10.2701  | 9.60838e-25 | 5.24029e-24 | Conti_fene_vs_others |
| Has3                                                                      | 15.6737 | 4.69647  | 0.473427  | 9.92016  | 3.40195e-23 | 1.78104e-22 | Conti_fene_vs_others |
| Maf                                                                       | 3517.65 | -4.75686 | 0.0331668 | -143.423 | 0           | 0           | Conti_fene_vs_others |
| Plcg2                                                                     | 13.165  | 3.22489  | 0.360658  | 8.94168  | 3.83312e-19 | 1.77121e-18 | Conti_fene_vs_others |
| Foxf1                                                                     | 27.0779 | 3.81083  | 0.277783  | 13.7187  | 7.84339e-43 | 6.35854e-42 | Conti_fene_vs_others |
| Sipa1l2                                                                   | 141.648 | 3.64835  | 0.120534  | 30.2683  | 2.9998e-201 | 9.9878e-200 | Conti_fene_vs_others |
| Endod1                                                                    | 121.674 | 5.83825  | 0.245196  | 23.8105  | 2.5971e-125 | 5.1906e-124 | Conti_fene_vs_others |
| Fut4                                                                      | 16.6677 | 6.98941  | 0.968003  | 7.22045  | 5.18157e-13 | 1.86673e-12 | Conti_fene_vs_others |
| Bmper                                                                     | 52.7597 | -4.17215 | 0.202355  | -20.618  | 1.89415e-94 | 2.90168e-93 | Conti_fene_vs_others |
| Jam3                                                                      | 303.558 | 4.50198  | 0.101781  | 44.2318  | 0           | 0           | Conti_fene_vs_others |
| Kirrel3                                                                   | 94.5986 | 4.5427   | 0.215868  | 21.0439  | 2.60146e-98 | 4.18305e-97 | Conti_fene_vs_others |
| Robo3                                                                     | 13.479  | 6.67386  | 0.971869  | 6.86703  | 6.55509e-12 | 2.23765e-11 | Conti_fene_vs_others |
| Gramd1b                                                                   | 108.196 | -3.38461 | 0.114057  | -29.6747 | 1.6289e-193 | 5.2549e-192 | Conti_fene_vs_others |
| Mir100hg                                                                  | 249.469 | -5.21899 | 0.132156  | -39.4911 | 0           | 0           | Conti_fene_vs_others |
| Fxyd2                                                                     | 22.6466 | 7.13778  | 0.875811  | 8.14992  | 3.6417e-16  | 1.50919e-15 | Conti_fene_vs_others |
| Zbtb16                                                                    | 75.8026 | 8.02027  | 0.648564  | 12.3662  | 3.98266e-35 | 2.7621e-34  | Conti_fene_vs_others |
| Scamp5                                                                    | 47.7044 | -5.66662 | 0.316769  | -17.8888 | 1.44204e-71 | 1.75723e-70 | Conti_fene_vs_others |
| Sema7a                                                                    | 174.263 | 4.07538  | 0.118271  | 34.4579  | 3.4292e-260 | 1.4853e-258 | Conti_fene_vs_others |
| Megf11                                                                    | 15.1637 | -3.35797 | 0.298839  | -11.2367 | 2.69111e-29 | 1.66114e-28 | Conti_fene_vs_others |
| Rab27a                                                                    | 119.373 | -3.37189 | 0.108768  | -31.0009 | 5.2425e-211 | 1.8195e-209 | Conti_fene_vs_others |
| Myo5a                                                                     | 21.8698 | 3.2005   | 0.264586  | 12.0963  | 1.10545e-33 | 7.4345e-33  | Conti_fene_vs_others |
| Lysmd2                                                                    | 53.4922 | 4.99466  | 0.287067  | 17.3989  | 8.40409e-68 | 9.71563e-67 | Conti_fene_vs_others |
| Gsta4                                                                     | 13.2732 | -4.6678  | 0.476829  | -9.78924 | 1.25228e-22 | 6.44332e-22 | Conti_fene_vs_others |



| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                      |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|----------------------|
| Hmgn3                                                                     | 56.4494 | 4.78586  | 0.254881  | 18.7769  | 1.16796e-78 | 1.52099e-77 | Conti_fene_vs_others |
| Plscr1                                                                    | 176.565 | 4.02514  | 0.119547  | 33.6699  | 1.5974e-248 | 6.5882e-247 | Conti_fene_vs_others |
| Plscr2                                                                    | 636.457 | 6.67869  | 0.144839  | 46.1112  | 0           | 0           | Conti_fene_vs_others |
| Slc9a9                                                                    | 1198.27 | -8.34094 | 0.159352  | -52.3428 | 0           | 0           | Conti_fene_vs_others |
| Trpc1                                                                     | 12.0143 | 5.91643  | 0.799897  | 7.3965   | 1.39825e-13 | 5.17406e-13 | Conti_fene_vs_others |
| Ephb1                                                                     | 103.23  | 6.9784   | 0.389805  | 17.9023  | 1.1314e-71  | 1.37977e-70 | Conti_fene_vs_others |
| Trf                                                                       | 10.0036 | 6.24504  | 0.971964  | 6.42517  | 1.31718e-10 | 4.23158e-10 | Conti_fene_vs_others |
| Ackr4                                                                     | 43.5375 | -5.74578 | 0.342503  | -16.7758 | 3.6663e-63  | 3.98374e-62 | Conti_fene_vs_others |
| Rtp3                                                                      | 39.4589 | 4.48888  | 0.278344  | 16.1271  | 1.6464e-58  | 1.68421e-57 | Conti_fene_vs_others |
| Vipr1                                                                     | 12.0138 | -6.3945  | 0.81012   | -7.89327 | 2.94375e-15 | 1.17788e-14 | Conti_fene_vs_others |
| Ackr2                                                                     | 24.9467 | -4.23896 | 0.283882  | -14.9322 | 2.03583e-50 | 1.86536e-49 | Conti_fene_vs_others |
| Esr1                                                                      | 38.419  | -4.57507 | 0.25524   | -17.9246 | 7.57973e-72 | 9.28741e-71 | Conti_fene_vs_others |
| Cnksr3                                                                    | 538.562 | -3.64345 | 0.0553448 | -65.8318 | 0           | 0           | Conti_fene_vs_others |
| Ust                                                                       | 22.0245 | -5.42098 | 0.442111  | -12.2616 | 1.45618e-34 | 9.98769e-34 | Conti_fene_vs_others |
| Plagl1                                                                    | 19.1467 | -5.8079  | 0.530867  | -10.9404 | 7.38763e-28 | 4.41299e-27 | Conti_fene_vs_others |
| Adgrg6                                                                    | 101.787 | -7.15144 | 0.455885  | -15.6869 | 1.85779e-55 | 1.82251e-54 | Conti_fene_vs_others |
| Cited2                                                                    | 67.039  | 3.05443  | 0.145183  | 21.0385  | 2.91699e-98 | 4.67591e-97 | Conti_fene_vs_others |
| Map3k5                                                                    | 109.022 | 5.31485  | 0.220826  | 24.0681  | 5.3974e-128 | 1.0942e-126 | Conti_fene_vs_others |
| Aldh8a1                                                                   | 11.1585 | -5.21342 | 0.572472  | -9.10686 | 8.47985e-20 | 3.99798e-19 | Conti_fene_vs_others |
| Enpp3                                                                     | 31.3338 | 7.02739  | 0.718157  | 9.78531  | 1.30191e-22 | 6.69204e-22 | Conti_fene_vs_others |
| Rspo3                                                                     | 215.287 | -8.41653 | 0.404902  | -20.7866 | 5.72134e-96 | 8.89612e-95 | Conti_fene_vs_others |
| Hey2                                                                      | 12.9101 | 6.91456  | 1.07689   | 6.42085  | 1.35514e-10 | 4.34992e-10 | Conti_fene_vs_others |
| Calhm6                                                                    | 27.5391 | -8.18459 | 0.968567  | -8.4502  | 2.90796e-17 | 1.25356e-16 | Conti_fene_vs_others |
| Dse                                                                       | 407.43  | -4.23285 | 0.0715142 | -59.189  | 0           | 0           | Conti_fene_vs_others |
| Mettl24                                                                   | 73.5249 | 3.79642  | 0.169624  | 22.3814  | 5.9706e-111 | 1.0795e-109 | Conti_fene_vs_others |
| Ccdc162                                                                   | 10.6082 | -3.54255 | 0.362498  | -9.77261 | 1.47594e-22 | 7.58406e-22 | Conti_fene_vs_others |
| Cd24a                                                                     | 605.46  | 8.34235  | 0.25636   | 32.5416  | 2.7567e-232 | 1.0689e-230 | Conti_fene_vs_others |
| Prdm1                                                                     | 108.02  | 3.37226  | 0.128382  | 26.2673  | 4.5345e-152 | 1.1121e-150 | Conti_fene_vs_others |
| Sowahc                                                                    | 13.456  | -4.06978 | 0.375947  | -10.8254 | 2.60915e-27 | 1.53035e-26 | Conti_fene_vs_others |
| Oit3                                                                      | 670.488 | -5.27924 | 0.077682  | -67.9596 | 0           | 0           | Conti_fene_vs_others |
| Spock2                                                                    | 109.799 | -4.96791 | 0.179735  | -27.6401 | 3.6694e-168 | 1.0374e-166 | Conti_fene_vs_others |
| Unc5b                                                                     | 74.9849 | 3.09816  | 0.142611  | 21.7246  | 1.2016e-104 | 2.0397e-103 | Conti_fene_vs_others |
| H2afy2                                                                    | 25.1821 | 3.37758  | 0.250637  | 13.476   | 2.16582e-41 | 1.72081e-40 | Conti_fene_vs_others |
| Tet1                                                                      | 19.341  | 3.28674  | 0.282105  | 11.6508  | 2.27427e-31 | 1.45945e-30 | Conti_fene_vs_others |
| Tmem26                                                                    | 76.9827 | 8.61898  | 0.789341  | 10.9192  | 9.33054e-28 | 5.55014e-27 | Conti_fene_vs_others |
| Bicc1                                                                     | 31.8936 | 8.21835  | 1.06709   | 7.70161  | 1.34358e-14 | 5.22543e-14 | Conti_fene_vs_others |
| Mmp11                                                                     | 14.8458 | 6.52698  | 0.881722  | 7.40254  | 1.33604e-13 | 4.94975e-13 | Conti_fene_vs_others |
| Chchd10                                                                   | 97.0344 | 4.24489  | 0.997267  | 4.25653  | 2.07628e-05 | 4.72611e-05 | Conti_fene_vs_others |
| Cfd                                                                       | 12.2194 | 6.82945  | 1.07805   | 6.33501  | 2.37327e-10 | 7.52488e-10 | Conti_fene_vs_others |
| Arhgap45                                                                  | 300.023 | -3.85296 | 0.0766673 | -50.2556 | 0           | 0           | Conti_fene_vs_others |
| Chst11                                                                    | 152.571 | 4.24084  | 0.134991  | 31.4158  | 1.2306e-216 | 4.4088e-215 | Conti_fene_vs_others |
| Stab2                                                                     | 4367.19 | -11.6699 | 0.256327  | -45.5275 | 0           | 0           | Conti_fene_vs_others |
| Igf1                                                                      | 47.6981 | 6.85937  | 0.550088  | 12.4696  | 1.09386e-35 | 7.67872e-35 | Conti_fene_vs_others |
| Dram1                                                                     | 95.1225 | 6.96514  | 0.403274  | 17.2715  | 7.71434e-67 | 8.78114e-66 | Conti_fene_vs_others |
| Rmst                                                                      | 10.3488 | 6.59     | 1.07751   | 6.11598  | 9.59646e-10 | 2.9402e-09  | Conti_fene_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                      |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|----------------------|
| Plxnc1                                                                    | 1390.13 | -9.7687  | 0.235276  | -41.5202 | 0           | 0           | Conti_fene_vs_others |
| Ppfia2                                                                    | 452.707 | -3.67792 | 0.0621627 | -59.1661 | 0           | 0           | Conti_fene_vs_others |
| Nav3                                                                      | 200.588 | 7.74567  | 0.363881  | 21.2863  | 1.5221e-100 | 2.4939e-99  | Conti_fene_vs_others |
| Kcnc2                                                                     | 10.8261 | 3.99605  | 0.520366  | 7.6793   | 1.59962e-14 | 6.19951e-14 | Conti_fene_vs_others |
| Lyz2                                                                      | 14.6323 | 4.12905  | 0.7661    | 5.38971  | 7.05721e-08 | 1.9408e-07  | Conti_fene_vs_others |
| Tafa2                                                                     | 17.5621 | -5.87644 | 0.559385  | -10.5052 | 8.17651e-26 | 4.5964e-25  | Conti_fene_vs_others |
| Gpr182                                                                    | 1346.04 | -4.18066 | 0.0394187 | -106.058 | 0           | 0           | Conti_fene_vs_others |
| Ap1b1                                                                     | 391.581 | -3.93173 | 0.067761  | -58.0234 | 0           | 0           | Conti_fene_vs_others |
| Emid1                                                                     | 74.2889 | 5.90492  | 0.320268  | 18.4374  | 6.5796e-76  | 8.29734e-75 | Conti_fene_vs_others |
| Ramp3                                                                     | 369.107 | 5.16646  | 0.11383   | 45.3877  | 0           | 0           | Conti_fene_vs_others |
| Igfbp3                                                                    | 2177.85 | 7.6026   | 0.696188  | 10.9203  | 9.21603e-28 | 5.48412e-27 | Conti_fene_vs_others |
| Tns3                                                                      | 280.323 | -3.03766 | 0.0659147 | -46.0847 | 0           | 0           | Conti_fene_vs_others |
| Gm12002                                                                   | 284.937 | 9.44994  | 0.546631  | 17.2876  | 5.83379e-67 | 6.66003e-66 | Conti_fene_vs_others |
| Meis1                                                                     | 402.341 | -3.40454 | 0.06979   | -48.7826 | 0           | 0           | Conti_fene_vs_others |
| Ccdc85a                                                                   | 353.243 | 5.5976   | 0.134965  | 41.4745  | 0           | 0           | Conti_fene_vs_others |
| Stk10                                                                     | 108.41  | 3.40778  | 0.126536  | 26.9312  | 9.4743e-160 | 2.4927e-158 | Conti_fene_vs_others |
| Lcp2                                                                      | 38.3102 | -4.14111 | 0.223064  | -18.5647 | 6.20848e-77 | 7.91925e-76 | Conti_fene_vs_others |
| Slit3                                                                     | 178.378 | 4.04639  | 0.842635  | 4.80206  | 1.57041e-06 | 3.90631e-06 | Conti_fene_vs_others |
| C1qtnf2                                                                   | 18.4778 | 3.16633  | 0.2807    | 11.2801  | 1.64519e-29 | 1.01876e-28 | Conti_fene_vs_others |
| Ebf1                                                                      | 1313.85 | 4.44037  | 0.114     | 38.9507  | 0           | 0           | Conti_fene_vs_others |
| Gpx3                                                                      | 67.0808 | 6.99268  | 0.493792  | 14.1612  | 1.5924e-45  | 1.3442e-44  | Conti_fene_vs_others |
| Hs3st3b1                                                                  | 294.265 | -3.82047 | 0.0797589 | -47.9002 | 0           | 0           | Conti_fene_vs_others |
| Usp43                                                                     | 23.2122 | 5.14643  | 0.450432  | 11.4255  | 3.11684e-30 | 1.95104e-29 | Conti_fene_vs_others |
| 9130017K11Rik                                                             | 22.2802 | 5.75176  | 0.554256  | 10.3774  | 3.14063e-25 | 1.73971e-24 | Conti_fene_vs_others |
| Arrb2                                                                     | 144.287 | -3.94435 | 0.110508  | -35.693  | 5.0792e-279 | 2.4078e-277 | Conti_fene_vs_others |
| Cxcl16                                                                    | 194.687 | -3.72682 | 0.0922197 | -40.4124 | 0           | 0           | Conti_fene_vs_others |
| Zmynd15                                                                   | 69.6916 | -4.60033 | 0.188066  | -24.4613 | 3.8165e-132 | 7.9549e-131 | Conti_fene_vs_others |
| Tlcd2                                                                     | 17.6499 | -3.00415 | 0.266365  | -11.2783 | 1.67917e-29 | 1.03939e-28 | Conti_fene_vs_others |
| Gm45606                                                                   | 12.6231 | -4.719   | 0.4668    | -10.1093 | 5.0266e-24  | 2.69792e-23 | Conti_fene_vs_others |
| Slc43a2                                                                   | 460.093 | -6.43019 | 0.132307  | -48.6003 | 0           | 0           | Conti_fene_vs_others |
| Rflnb                                                                     | 648.843 | 4.9379   | 0.087934  | 56.1547  | 0           | 0           | Conti_fene_vs_others |
| Nos2                                                                      | 20.6162 | 4.06219  | 0.338825  | 11.9891  | 4.05424e-33 | 2.69745e-32 | Conti_fene_vs_others |
| Tmem132e                                                                  | 81.4379 | -10.0449 | 1.06598   | -9.42317 | 4.37665e-21 | 2.1522e-20  | Conti_fene_vs_others |
| Slfn2                                                                     | 92.0064 | 4.39146  | 0.177384  | 24.7569  | 2.6158e-135 | 5.5414e-134 | Conti_fene_vs_others |
| Gm20234                                                                   | 10.8636 | 5.77271  | 0.800814  | 7.20855  | 5.65498e-13 | 2.03352e-12 | Conti_fene_vs_others |
| Al662270                                                                  | 34.4502 | -4.82623 | 0.288551  | -16.7258 | 8.50542e-63 | 9.17134e-62 | Conti_fene_vs_others |
| Ppm1e                                                                     | 61.3179 | 3.92463  | 0.197108  | 19.9111  | 3.26338e-88 | 4.75115e-87 | Conti_fene_vs_others |
| Hlf                                                                       | 25.5221 | 3.98647  | 0.304428  | 13.095   | 3.51881e-39 | 2.65602e-38 | Conti_fene_vs_others |
| Itga3                                                                     | 24.818  | 3.19894  | 0.252201  | 12.6841  | 7.24572e-37 | 5.24505e-36 | Conti_fene_vs_others |
| Plxdc1                                                                    | 44.9554 | -4.02483 | 0.215651  | -18.6637 | 9.78007e-78 | 1.2599e-76  | Conti_fene_vs_others |
| P3h4                                                                      | 16.4271 | 3.0762   | 0.288306  | 10.6699  | 1.40726e-26 | 8.08328e-26 | Conti_fene_vs_others |
| Fkbp10                                                                    | 15.1731 | 3.8466   | 0.372077  | 10.3382  | 4.73388e-25 | 2.60833e-24 | Conti_fene_vs_others |
| Tmem106a                                                                  | 301.197 | -3.83137 | 0.0740994 | -51.7058 | 0           | 0           | Conti_fene_vs_others |
| Meox1                                                                     | 122.768 | 7.45077  | 0.418813  | 17.7902  | 8.41786e-71 | 1.00995e-69 | Conti_fene_vs_others |
| Wnt9b                                                                     | 13.2502 | -5.9589  | 0.665705  | -8.95125 | 3.5147e-19  | 1.62552e-18 | Conti_fene_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                      |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|----------------------|
| Gh                                                                        | 528.684 | 11.979   | 0.977435  | 12.2555  | 1.56983e-34 | 1.07577e-33 | Conti_fene_vs_others |
| Sdk2                                                                      | 19.3902 | 3.82406  | 0.326896  | 11.6981  | 1.30384e-31 | 8.42269e-31 | Conti_fene_vs_others |
| Hid1                                                                      | 45.7206 | -3.29086 | 0.164886  | -19.9584 | 1.26645e-88 | 1.8525e-87  | Conti_fene_vs_others |
| Unc13d                                                                    | 10.6985 | -5.1604  | 0.581134  | -8.87988 | 6.6934e-19  | 3.06195e-18 | Conti_fene_vs_others |
| Gm11730                                                                   | 23.0024 | 7.16145  | 0.876389  | 8.17154  | 3.04487e-16 | 1.26455e-15 | Conti_fene_vs_others |
| C1qtnf1                                                                   | 116.355 | -5.21398 | 0.180829  | -28.8338 | 8.0976e-183 | 2.464e-181  | Conti_fene_vs_others |
| Pomc                                                                      | 180.46  | 5.48184  | 0.186796  | 29.3466  | 2.6383e-189 | 8.338e-188  | Conti_fene_vs_others |
| Fam49a                                                                    | 66.591  | -3.01448 | 0.156778  | -19.2277 | 2.17086e-82 | 2.96354e-81 | Conti_fene_vs_others |
| Mboat2                                                                    | 14.997  | 4.49292  | 0.471113  | 9.53683  | 1.47259e-21 | 7.3672e-21  | Conti_fene_vs_others |
| Rsad2                                                                     | 922.547 | 3.17826  | 0.0971311 | 32.7213  | 7.7632e-235 | 3.0329e-233 | Conti_fene_vs_others |
| Lamb1                                                                     | 49.7162 | 6.72966  | 0.516156  | 13.038   | 7.43419e-39 | 5.57081e-38 | Conti_fene_vs_others |
| Twist1                                                                    | 39.6556 | -5.08937 | 0.296272  | -17.178  | 3.87763e-66 | 4.3596e-65  | Conti_fene_vs_others |
| Meox2                                                                     | 19.7342 | 7.22977  | 0.980732  | 7.37181  | 1.68328e-13 | 6.19782e-13 | Conti_fene_vs_others |
| Prkd1                                                                     | 381.263 | 3.92464  | 0.0799662 | 49.0787  | 0           | 0           | Conti_fene_vs_others |
| Egln3                                                                     | 23.5399 | 3.27453  | 0.266147  | 12.3035  | 8.67619e-35 | 5.97458e-34 | Conti_fene_vs_others |
| Mdga2                                                                     | 39.0261 | 7.63499  | 0.802111  | 9.51863  | 1.75479e-21 | 8.74524e-21 | Conti_fene_vs_others |
| Slc38a6                                                                   | 325.474 | -3.06284 | 0.0631632 | -48.491  | 0           | 0           | Conti_fene_vs_others |
| Ttc9                                                                      | 11.7908 | 6.19003  | 0.880362  | 7.03123  | 2.04719e-12 | 7.18389e-12 | Conti_fene_vs_others |
| Batf                                                                      | 15.5864 | -3.22657 | 0.302621  | -10.6621 | 1.53125e-26 | 8.78578e-26 | Conti_fene_vs_others |
| Esrrb                                                                     | 45.9201 | -8.9244  | 0.965434  | -9.24393 | 2.37614e-20 | 1.13927e-19 | Conti_fene_vs_others |
| Lgmn                                                                      | 596.364 | -4.65696 | 0.0680021 | -68.4827 | 0           | 0           | Conti_fene_vs_others |
| Serpina3f                                                                 | 75.5462 | -7.34898 | 0.440109  | -16.6981 | 1.35325e-62 | 1.45617e-61 | Conti_fene_vs_others |
| Serpina3g                                                                 | 164.15  | -5.68106 | 0.177681  | -31.9734 | 2.5578e-224 | 9.5374e-223 | Conti_fene_vs_others |
| Gm28875                                                                   | 15.5917 | 4.69202  | 0.473099  | 9.91763  | 3.48961e-23 | 1.82632e-22 | Conti_fene_vs_others |
| Syne3                                                                     | 20.8057 | 4.51159  | 0.387848  | 11.6324  | 2.82152e-31 | 1.80766e-30 | Conti_fene_vs_others |
| Evl                                                                       | 85.9103 | 4.26727  | 0.177124  | 24.0919  | 3.0366e-128 | 6.1639e-127 | Conti_fene_vs_others |
| Tnfrsf2                                                                   | 237.295 | 4.67506  | 0.121226  | 38.5648  | 0           | 0           | Conti_fene_vs_others |
| Jag2                                                                      | 69.7994 | 3.30965  | 0.152729  | 21.6701  | 3.932e-104  | 6.6527e-103 | Conti_fene_vs_others |
| Crip1                                                                     | 604.843 | 3.72742  | 0.100486  | 37.0941  | 3.5037e-301 | 1.8786e-299 | Conti_fene_vs_others |
| Chrm3                                                                     | 1324.79 | 8.53073  | 0.711301  | 11.9931  | 3.86068e-33 | 2.57087e-32 | Conti_fene_vs_others |
| Gm47405                                                                   | 19.5705 | 6.92182  | 0.876337  | 7.89859  | 2.82081e-15 | 1.13014e-14 | Conti_fene_vs_others |
| Edaradd                                                                   | 11.2215 | -4.18776 | 0.423087  | -9.89811 | 4.24223e-23 | 2.2135e-22  | Conti_fene_vs_others |
| Elmo1                                                                     | 263.882 | 5.29305  | 0.139696  | 37.8899  | 0           | 0           | Conti_fene_vs_others |
| Gm47664                                                                   | 10.4097 | 5.11712  | 0.660406  | 7.74845  | 9.3024e-15  | 3.64248e-14 | Conti_fene_vs_others |
| Prl                                                                       | 42.5929 | 8.63436  | 1.09677   | 7.87251  | 3.47585e-15 | 1.38509e-14 | Conti_fene_vs_others |
| 2610307P16Rik                                                             | 154.598 | 6.60886  | 0.282156  | 23.4227  | 2.5082e-121 | 4.8811e-120 | Conti_fene_vs_others |
| Foxq1                                                                     | 21.1806 | -7.51516 | 0.883733  | -8.50388 | 1.83356e-17 | 7.93931e-17 | Conti_fene_vs_others |
| Tubb2a                                                                    | 71.8008 | 3.44642  | 0.154753  | 22.2704  | 7.1494e-110 | 1.2792e-108 | Conti_fene_vs_others |
| Bmp6                                                                      | 845.975 | -3.05052 | 0.0477016 | -63.9501 | 0           | 0           | Conti_fene_vs_others |
| Gcnt2                                                                     | 115.109 | 3.11721  | 0.117628  | 26.5006  | 9.5306e-155 | 2.4057e-153 | Conti_fene_vs_others |
| Nfil3                                                                     | 10.7014 | 5.45155  | 0.727074  | 7.49793  | 6.48326e-14 | 2.4468e-13  | Conti_fene_vs_others |
| Slc34a1                                                                   | 13.6057 | 6.98764  | 1.07408   | 6.5057   | 7.73334e-11 | 2.5114e-10  | Conti_fene_vs_others |
| Dapk1                                                                     | 46.022  | -3.27207 | 0.165855  | -19.7285 | 1.22725e-86 | 1.75391e-85 | Conti_fene_vs_others |
| A830082K12Rik                                                             | 95.3242 | -3.20167 | 0.117881  | -27.1601 | 1.9236e-162 | 5.2199e-161 | Conti_fene_vs_others |
| Edil3                                                                     | 301.368 | 10.8787  | 0.870666  | 12.4947  | 7.98046e-36 | 5.62503e-35 | Conti_fene_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                      |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|----------------------|
| Hapln1                                                                    | 62.6218 | 9.18891  | 1.06549   | 8.62409  | 6.46068e-18 | 2.84823e-17 | Conti_fene_vs_others |
| Cmya5                                                                     | 24.0601 | 4.22522  | 0.331053  | 12.763   | 2.63988e-37 | 1.9235e-36  | Conti_fene_vs_others |
| Iqgap2                                                                    | 348.921 | -8.77351 | 0.332635  | -26.3758 | 2.5963e-153 | 6.4284e-152 | Conti_fene_vs_others |
| Arhgef28                                                                  | 74.8087 | 4.35721  | 0.195881  | 22.2441  | 1.2852e-109 | 2.2943e-108 | Conti_fene_vs_others |
| Ocln                                                                      | 10.3343 | -6.77571 | 0.975527  | -6.94569 | 3.76609e-12 | 1.30392e-11 | Conti_fene_vs_others |
| Rgs7bp                                                                    | 209.856 | -5.75505 | 0.159854  | -36.002  | 7.7934e-284 | 3.7751e-282 | Conti_fene_vs_others |
| Elovl7                                                                    | 14.6856 | -5.09    | 0.491133  | -10.3638 | 3.62325e-25 | 2.00491e-24 | Conti_fene_vs_others |
| Il6st                                                                     | 1255.95 | -3.57278 | 0.0382986 | -93.2874 | 0           | 0           | Conti_fene_vs_others |
| Gpx8                                                                      | 60.8004 | 3.67516  | 0.179499  | 20.4745  | 3.63307e-93 | 5.52205e-92 | Conti_fene_vs_others |
| Gzmk                                                                      | 40.906  | 4.44551  | 0.278827  | 15.9436  | 3.15422e-57 | 3.16828e-56 | Conti_fene_vs_others |
| Esm1                                                                      | 1036.99 | 5.6849   | 0.256234  | 22.1864  | 4.65e-109   | 8.2349e-108 | Conti_fene_vs_others |
| Dnase1l3                                                                  | 2333.72 | -14.0192 | 0.787688  | -17.7979 | 7.33177e-71 | 8.80322e-70 | Conti_fene_vs_others |
| Lrrc3b                                                                    | 164.293 | 8.001    | 0.439479  | 18.2056  | 4.65567e-74 | 5.80521e-73 | Conti_fene_vs_others |
| Gm48163                                                                   | 22.9216 | -3.5091  | 0.261294  | -13.4297 | 4.05068e-41 | 3.19391e-40 | Conti_fene_vs_others |
| Thrb                                                                      | 53.6201 | 5.10672  | 0.294964  | 17.313   | 3.7504e-67  | 4.30051e-66 | Conti_fene_vs_others |
| Nid2                                                                      | 75.1501 | 3.75746  | 0.163913  | 22.9235  | 2.7065e-116 | 5.0459e-115 | Conti_fene_vs_others |
| Kcnk5                                                                     | 30.1221 | 4.02515  | 0.281821  | 14.2826  | 2.80748e-46 | 2.41447e-45 | Conti_fene_vs_others |
| Cacna2d3                                                                  | 16.0532 | 6.34371  | 0.810821  | 7.82381  | 5.12486e-15 | 2.02816e-14 | Conti_fene_vs_others |
| Prkcd                                                                     | 10.2541 | 3.14777  | 0.375753  | 8.37723  | 5.419e-17   | 2.31166e-16 | Conti_fene_vs_others |
| Sema3g                                                                    | 76.681  | 4.12373  | 0.19061   | 21.6344  | 8.5231e-104 | 1.4389e-102 | Conti_fene_vs_others |
| Vstm4                                                                     | 63.155  | -8.52035 | 0.716079  | -11.8986 | 1.20314e-32 | 7.93371e-32 | Conti_fene_vs_others |
| Sncg                                                                      | 93.1054 | 4.02271  | 0.16018   | 25.1138  | 3.5163e-139 | 7.6576e-138 | Conti_fene_vs_others |
| Pnp2                                                                      | 20.0277 | -4.11861 | 0.30856   | -13.3479 | 1.21886e-40 | 9.5141e-40  | Conti_fene_vs_others |
| Mmp14                                                                     | 203.188 | -3.05811 | 0.0759132 | -40.2843 | 0           | 0           | Conti_fene_vs_others |
| Slc7a8                                                                    | 10.0707 | -5.28666 | 0.617862  | -8.55638 | 1.16467e-17 | 5.08123e-17 | Conti_fene_vs_others |
| Atp8a2                                                                    | 10.2883 | 3.7779   | 0.444147  | 8.50597  | 1.80085e-17 | 7.80203e-17 | Conti_fene_vs_others |
| C1qtnf9                                                                   | 30.0441 | 3.22793  | 0.276847  | 11.6596  | 2.05009e-31 | 1.31668e-30 | Conti_fene_vs_others |
| Fam124a                                                                   | 535.503 | -4.84091 | 0.076049  | -63.6551 | 0           | 0           | Conti_fene_vs_others |
| Gata4                                                                     | 981.228 | -13.6348 | 1.06343   | -12.8216 | 1.2419e-37  | 9.09147e-37 | Conti_fene_vs_others |
| Extl3                                                                     | 68.0999 | 3.05507  | 0.146564  | 20.8446  | 1.70679e-96 | 2.69156e-95 | Conti_fene_vs_others |
| Stc1                                                                      | 64.6508 | 3.57175  | 0.200414  | 17.8219  | 4.77656e-71 | 5.75742e-70 | Conti_fene_vs_others |
| Loxl2                                                                     | 49.6012 | -3.72951 | 0.178346  | -20.9117 | 4.1947e-97  | 6.6284e-96  | Conti_fene_vs_others |
| Tnfrsf10b                                                                 | 28.2723 | 3.73681  | 0.268251  | 13.9303  | 4.14886e-44 | 3.43507e-43 | Conti_fene_vs_others |
| Bmp1                                                                      | 27.5827 | 5.69443  | 0.48987   | 11.6244  | 3.099e-31   | 1.98135e-30 | Conti_fene_vs_others |
| Rubcnl                                                                    | 12.4301 | -6.15527 | 0.732369  | -8.40461 | 4.29277e-17 | 1.84235e-16 | Conti_fene_vs_others |
| Serp2                                                                     | 32.003  | 5.26016  | 0.395922  | 13.2858  | 2.79763e-40 | 2.17067e-39 | Conti_fene_vs_others |
| Lacc1                                                                     | 18.3531 | -3.39766 | 0.273212  | -12.436  | 1.66697e-35 | 1.16598e-34 | Conti_fene_vs_others |
| Rgcc                                                                      | 1864.57 | 7.24509  | 0.10304   | 70.3133  | 0           | 0           | Conti_fene_vs_others |
| Diaph3                                                                    | 16.678  | -5.27252 | 0.510061  | -10.337  | 4.79122e-25 | 2.63806e-24 | Conti_fene_vs_others |
| Pcdh9                                                                     | 32.0062 | 3.40404  | 0.59199   | 5.75017  | 8.91523e-09 | 2.57424e-08 | Conti_fene_vs_others |
| Hs6st3                                                                    | 38.7071 | -6.25014 | 0.494742  | -12.6331 | 1.38632e-36 | 9.97958e-36 | Conti_fene_vs_others |
| Selenop                                                                   | 6956.2  | -3.57085 | 0.0262743 | -135.906 | 0           | 0           | Conti_fene_vs_others |
| Ccdc152                                                                   | 22.2691 | -3.28891 | 0.241394  | -13.6246 | 2.85902e-42 | 2.30456e-41 | Conti_fene_vs_others |
| Npr3                                                                      | 465.362 | 4.14346  | 0.282741  | 14.6546  | 1.25864e-48 | 1.12217e-47 | Conti_fene_vs_others |
| Sema5a                                                                    | 15.134  | 5.67025  | 0.657451  | 8.6246   | 6.43158e-18 | 2.83782e-17 | Conti_fene_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                      |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|----------------------|
| Zfpn2                                                                     | 400.288 | -3.77436 | 0.0743229 | -50.7833 | 0           | 0           | Conti_fene_vs_others |
| Sybu                                                                      | 64.6104 | 7.10915  | 0.513684  | 13.8395  | 1.47145e-43 | 1.208e-42   | Conti_fene_vs_others |
| Ccn3                                                                      | 12.4448 | 3.19759  | 0.415656  | 7.69289  | 1.43849e-14 | 5.59036e-14 | Conti_fene_vs_others |
| Enpp2                                                                     | 44.1874 | 5.43662  | 0.649843  | 8.36605  | 5.95828e-17 | 2.53823e-16 | Conti_fene_vs_others |
| Sntb1                                                                     | 1117.39 | -3.23474 | 0.0752516 | -42.9856 | 0           | 0           | Conti_fene_vs_others |
| Tg                                                                        | 222.441 | 11.0188  | 1.0758    | 10.2425  | 1.27935e-24 | 6.95787e-24 | Conti_fene_vs_others |
| Khdrbs3                                                                   | 150.177 | -6.26669 | 0.220555  | -28.4133 | 1.3864e-177 | 4.0983e-176 | Conti_fene_vs_others |
| Ly6c1                                                                     | 2440.17 | 3.96522  | 0.0494213 | 80.233   | 0           | 0           | Conti_fene_vs_others |
| Apol10b                                                                   | 20.2622 | 3.11839  | 0.269777  | 11.5592  | 6.63552e-31 | 4.20782e-30 | Conti_fene_vs_others |
| Apol9b                                                                    | 19.3976 | 5.54715  | 0.557736  | 9.94584  | 2.6295e-23  | 1.38316e-22 | Conti_fene_vs_others |
| Csf2rb                                                                    | 13.6358 | 4.4987   | 0.486926  | 9.23899  | 2.4884e-20  | 1.19236e-19 | Conti_fene_vs_others |
| Lgals1                                                                    | 262.274 | -3.05907 | 0.0974502 | -31.3911 | 2.6769e-216 | 9.5467e-215 | Conti_fene_vs_others |
| Prickle1                                                                  | 1430.1  | -3.60603 | 0.0461564 | -78.1264 | 0           | 0           | Conti_fene_vs_others |
| Krt80                                                                     | 13.8605 | 7.01188  | 1.06985   | 6.55407  | 5.59888e-11 | 1.82855e-10 | Conti_fene_vs_others |
| AU021092                                                                  | 377.344 | 3.21885  | 0.0638668 | 50.3994  | 0           | 0           | Conti_fene_vs_others |
| Abat                                                                      | 71.3846 | -3.8156  | 0.150187  | -25.4056 | 2.1878e-142 | 4.9159e-141 | Conti_fene_vs_others |
| Emp2                                                                      | 146.935 | 4.87965  | 0.163525  | 29.8405  | 1.1673e-195 | 3.8131e-194 | Conti_fene_vs_others |
| Shisa9                                                                    | 65.0155 | -4.16709 | 0.207103  | -20.1208 | 4.85026e-90 | 7.16207e-89 | Conti_fene_vs_others |
| St6gal1                                                                   | 125.651 | -4.13845 | 0.126473  | -32.722  | 7.6059e-235 | 2.979e-233  | Conti_fene_vs_others |
| Masp1                                                                     | 269.322 | -10.9029 | 0.788411  | -13.8289 | 1.70505e-43 | 1.39683e-42 | Conti_fene_vs_others |
| Bcl6                                                                      | 28.1303 | -3.40424 | 0.233801  | -14.5604 | 5.01421e-48 | 4.42234e-47 | Conti_fene_vs_others |
| Mb21d2                                                                    | 346.142 | -3.5441  | 0.0654764 | -54.1278 | 0           | 0           | Conti_fene_vs_others |
| Gm46565                                                                   | 121.325 | -3.86538 | 0.126339  | -30.5955 | 1.4069e-205 | 4.7659e-204 | Conti_fene_vs_others |
| Tfrc                                                                      | 28.7794 | -4.60505 | 0.317987  | -14.4819 | 1.57728e-47 | 1.38014e-46 | Conti_fene_vs_others |
| Itgb5                                                                     | 125.634 | 6.97932  | 0.35372   | 19.7312  | 1.16459e-86 | 1.66589e-85 | Conti_fene_vs_others |
| Sema5b                                                                    | 16.2662 | 5.09263  | 0.531952  | 9.57348  | 1.03368e-21 | 5.20151e-21 | Conti_fene_vs_others |
| Slc15a2                                                                   | 17.0535 | 7.31421  | 1.07449   | 6.80718  | 9.95325e-12 | 3.37689e-11 | Conti_fene_vs_others |
| Fstl1                                                                     | 100.879 | 3.52565  | 0.260909  | 13.5129  | 1.3116e-41  | 1.04638e-40 | Conti_fene_vs_others |
| Gramd1c                                                                   | 38.8414 | -3.16196 | 0.185179  | -17.0752 | 2.27044e-65 | 2.52526e-64 | Conti_fene_vs_others |
| Boc                                                                       | 65.321  | 7.12505  | 0.516099  | 13.8056  | 2.35796e-43 | 1.92765e-42 | Conti_fene_vs_others |
| Cd200r1                                                                   | 19.0836 | -7.95216 | 1.07212   | -7.41721 | 1.19612e-13 | 4.44197e-13 | Conti_fene_vs_others |
| Ccdc80                                                                    | 223.873 | -3.94012 | 0.09084   | -43.3743 | 0           | 0           | Conti_fene_vs_others |
| Cd200                                                                     | 826.203 | 5.24652  | 0.136482  | 38.4411  | 0           | 0           | Conti_fene_vs_others |
| Alcam                                                                     | 19.9407 | -3.47431 | 0.58662   | -5.9226  | 3.16892e-09 | 9.43214e-09 | Conti_fene_vs_others |
| Epha6                                                                     | 23.6139 | 6.3167   | 0.735051  | 8.59356  | 8.43163e-18 | 3.69931e-17 | Conti_fene_vs_others |
| Robo1                                                                     | 251.707 | -8.64342 | 0.376258  | -22.9721 | 8.8643e-117 | 1.6566e-115 | Conti_fene_vs_others |
| Robo2                                                                     | 37.2804 | 8.14942  | 0.967549  | 8.42275  | 3.67758e-17 | 1.58138e-16 | Conti_fene_vs_others |
| Itsn1                                                                     | 498.897 | -4.01796 | 0.0653778 | -61.4575 | 0           | 0           | Conti_fene_vs_others |
| Neurl1b                                                                   | 33.0046 | 4.70184  | 0.329725  | 14.2599  | 3.89075e-46 | 3.33318e-45 | Conti_fene_vs_others |
| Gm26885                                                                   | 53.2015 | -3.56358 | 0.167389  | -21.2892 | 1.4285e-100 | 2.3431e-99  | Conti_fene_vs_others |
| Slc37a1                                                                   | 20.865  | -3.43888 | 0.251328  | -13.6828 | 1.28569e-42 | 1.04012e-41 | Conti_fene_vs_others |
| Angptl4                                                                   | 32.3909 | 6.29643  | 0.570595  | 11.0348  | 2.5951e-28  | 1.56098e-27 | Conti_fene_vs_others |
| H2-Ab1                                                                    | 38.7433 | 4.74468  | 0.676261  | 7.01604  | 2.28242e-12 | 7.9931e-12  | Conti_fene_vs_others |
| H2-Aa                                                                     | 22.0882 | 3.37942  | 0.719785  | 4.69504  | 2.66551e-06 | 6.51769e-06 | Conti_fene_vs_others |
| H2-Eb1                                                                    | 19.5389 | 3.47784  | 0.821376  | 4.23416  | 2.29408e-05 | 5.20359e-05 | Conti_fene_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                      |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|----------------------|
| Rcan2                                                                     | 42.1256 | 7.16564  | 0.654434  | 10.9494  | 6.69138e-28 | 4.00324e-27 | Conti_fene_vs_others |
| Clic5                                                                     | 302.069 | 4.28502  | 0.0979965 | 43.7262  | 0           | 0           | Conti_fene_vs_others |
| Satb1                                                                     | 12.0354 | 3.13319  | 0.357243  | 8.77048  | 1.77911e-18 | 8.01837e-18 | Conti_fene_vs_others |
| Ltbp1                                                                     | 227.295 | 6.87548  | 0.253753  | 27.0951  | 1.124e-161  | 3.0237e-160 | Conti_fene_vs_others |
| Gm30938                                                                   | 43.1428 | -5.27417 | 0.293635  | -17.9617 | 3.8905e-72  | 4.77831e-71 | Conti_fene_vs_others |
| Greb1l                                                                    | 127.642 | -10.401  | 0.963491  | -10.7951 | 3.63064e-27 | 2.1191e-26  | Conti_fene_vs_others |
| Gata6                                                                     | 12.1741 | 3.33338  | 0.374508  | 8.9007   | 5.54961e-19 | 2.54921e-18 | Conti_fene_vs_others |
| Cdh2                                                                      | 11.6951 | 3.09748  | 0.402684  | 7.69209  | 1.44756e-14 | 5.62421e-14 | Conti_fene_vs_others |
| Gm49980                                                                   | 20.4311 | 3.52449  | 0.297568  | 11.8443  | 2.30353e-32 | 1.51321e-31 | Conti_fene_vs_others |
| Lims2                                                                     | 526.391 | 3.09632  | 0.0541229 | 57.209   | 0           | 0           | Conti_fene_vs_others |
| Cd14                                                                      | 13.8954 | 3.37904  | 0.343674  | 9.83209  | 8.1898e-23  | 4.23348e-22 | Conti_fene_vs_others |
| Pcdh1                                                                     | 84.4141 | 3.67011  | 0.151446  | 24.2339  | 9.7811e-130 | 2.0064e-128 | Conti_fene_vs_others |
| Gnpda1                                                                    | 88.832  | -3.41907 | 0.1237    | -27.6399 | 3.6863e-168 | 1.0403e-166 | Conti_fene_vs_others |
| Snx24                                                                     | 453.564 | -6.42008 | 0.135567  | -47.3573 | 0           | 0           | Conti_fene_vs_others |
| Ablim3                                                                    | 75.4235 | 6.00035  | 0.3494    | 17.1733  | 4.20775e-66 | 4.72051e-65 | Conti_fene_vs_others |
| Piezo2                                                                    | 574.077 | 4.0636   | 0.0703969 | 57.7242  | 0           | 0           | Conti_fene_vs_others |
| Tubb6                                                                     | 28.9643 | 3.52024  | 0.252761  | 13.9271  | 4.33361e-44 | 3.58422e-43 | Conti_fene_vs_others |
| Zbtb7c                                                                    | 10.1619 | 5.97683  | 0.882959  | 6.76909  | 1.29599e-11 | 4.37311e-11 | Conti_fene_vs_others |
| Mbp                                                                       | 11.3092 | -3.29328 | 0.413899  | -7.95671 | 1.76674e-15 | 7.13347e-15 | Conti_fene_vs_others |
| AC109619.1                                                                | 17.5846 | -7.54114 | 0.969551  | -7.77797 | 7.36996e-15 | 2.90189e-14 | Conti_fene_vs_others |
| Flrt1                                                                     | 58.1126 | -7.42973 | 0.515907  | -14.4013 | 5.078e-47   | 4.42093e-46 | Conti_fene_vs_others |
| Slc22a8                                                                   | 12.787  | -4.17707 | 0.393472  | -10.6159 | 2.51286e-26 | 1.43543e-25 | Conti_fene_vs_others |
| Fads2                                                                     | 21.5143 | -3.65224 | 0.264046  | -13.8319 | 1.63727e-43 | 1.34343e-42 | Conti_fene_vs_others |
| Gna14                                                                     | 67.9366 | -9.49434 | 0.964361  | -9.84522 | 7.18854e-23 | 3.72955e-22 | Conti_fene_vs_others |
| Gda                                                                       | 85.1262 | 5.19461  | 0.243456  | 21.3369  | 5.1582e-101 | 8.4963e-100 | Conti_fene_vs_others |
| Cemip2                                                                    | 1629.61 | -3.19099 | 0.0302628 | -105.443 | 0           | 0           | Conti_fene_vs_others |
| Trpm3                                                                     | 23.8383 | 3.24625  | 0.390976  | 8.30295  | 1.01561e-16 | 4.28773e-16 | Conti_fene_vs_others |
| Pgm5                                                                      | 73.5082 | -4.65837 | 0.187573  | -24.835  | 3.7578e-136 | 8.0041e-135 | Conti_fene_vs_others |
| Kank1                                                                     | 25.3833 | -4.36696 | 0.303556  | -14.386  | 6.33562e-47 | 5.50349e-46 | Conti_fene_vs_others |
| Slc16a12                                                                  | 22.146  | -5.30803 | 0.425389  | -12.4781 | 9.8325e-36  | 6.91164e-35 | Conti_fene_vs_others |
| A830019P07Rik                                                             | 14.5623 | -3.89644 | 0.339443  | -11.4789 | 1.68362e-30 | 1.05944e-29 | Conti_fene_vs_others |
| Entpd1                                                                    | 226.482 | 3.02453  | 0.0779106 | 38.8205  | 0           | 0           | Conti_fene_vs_others |
| Scd1                                                                      | 15.9573 | 4.4538   | 0.437172  | 10.1878  | 2.24908e-24 | 1.21469e-23 | Conti_fene_vs_others |
| Gsto1                                                                     | 37.9247 | -3.11317 | 0.176155  | -17.673  | 6.77392e-70 | 8.0158e-69  | Conti_fene_vs_others |
| Magix                                                                     | 23.2546 | 3.43351  | 0.26509   | 12.9523  | 2.28141e-38 | 1.69083e-37 | Conti_fene_vs_others |
| Lanc13                                                                    | 20.6513 | 3.92733  | 0.344087  | 11.4138  | 3.56981e-30 | 2.23278e-29 | Conti_fene_vs_others |
| Tspan7                                                                    | 1510.6  | -3.69891 | 0.0385892 | -95.8534 | 0           | 0           | Conti_fene_vs_others |
| Dipk2b                                                                    | 72.5037 | 3.40144  | 0.155296  | 21.903   | 2.4323e-106 | 4.193e-105  | Conti_fene_vs_others |
| Slc9a7                                                                    | 23.0158 | -6.28713 | 0.563365  | -11.16   | 6.40175e-29 | 3.90816e-28 | Conti_fene_vs_others |
| Klhl13                                                                    | 59.9852 | -3.00664 | 0.149821  | -20.0682 | 1.40045e-89 | 2.05624e-88 | Conti_fene_vs_others |
| 6030498E09Rik                                                             | 133.172 | -10.4646 | 0.964164  | -10.8536 | 1.91784e-27 | 1.13085e-26 | Conti_fene_vs_others |
| Tenm1                                                                     | 15.4939 | -6.49194 | 0.745649  | -8.70643 | 3.13586e-18 | 1.40114e-17 | Conti_fene_vs_others |
| Apln                                                                      | 15.9617 | 4.73335  | 0.478383  | 9.89448  | 4.39893e-23 | 2.29373e-22 | Conti_fene_vs_others |
| Mbnl3                                                                     | 42.902  | -4.62169 | 0.244321  | -18.9165 | 8.34444e-80 | 1.10706e-78 | Conti_fene_vs_others |
| Fgf13                                                                     | 16.541  | 4.51447  | 0.45594   | 9.90144  | 4.10304e-23 | 2.14232e-22 | Conti_fene_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                          |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|--------------------------|
| F8                                                                        | 1684.62 | -3.19138 | 0.0346028 | -92.2291 | 0           | 0           | Conti_fene_vs_others     |
| Dmd                                                                       | 362.105 | -3.43761 | 0.0615177 | -55.88   | 0           | 0           | Conti_fene_vs_others     |
| Ar                                                                        | 105.51  | 5.17377  | 0.22973   | 22.5211  | 2.5784e-112 | 4.7001e-111 | Conti_fene_vs_others     |
| Il13ra2                                                                   | 38.9465 | -8.9775  | 1.06693   | -8.41429 | 3.9527e-17  | 1.69827e-16 | Conti_fene_vs_others     |
| Mid1                                                                      | 601.656 | -3.84469 | 0.0602583 | -63.8034 | 0           | 0           | Conti_fene_vs_others     |
| G530011O06Rik                                                             | 10.5586 | -4.93793 | 0.551876  | -8.94754 | 3.63506e-19 | 1.68019e-18 | Conti_fene_vs_others     |
| Csprs                                                                     | 25.4615 | -4.17727 | 0.281825  | -14.8222 | 1.05252e-49 | 9.57612e-49 | Conti_fene_vs_others     |
| 2610203C22Rik                                                             | 18.6882 | -4.67068 | 1.05597   | -4.42313 | 9.7281e-06  | 7.82627e-05 | Conti_non_fene_vs_others |
| Neurl3                                                                    | 13.447  | -4.1972  | 1.05603   | -3.9745  | 7.05285e-05 | 0.000482966 | Conti_non_fene_vs_others |
| Slc39a10                                                                  | 308.189 | 4.7264   | 0.0734631 | 64.337   | 0           | 0           | Conti_non_fene_vs_others |
| Hecw2                                                                     | 125.903 | -7.13194 | 0.954509  | -7.47184 | 7.90783e-14 | 1.57289e-12 | Conti_non_fene_vs_others |
| Ankrd44                                                                   | 126.226 | -3.17467 | 0.256774  | -12.3637 | 4.1087e-35  | 2.08042e-33 | Conti_non_fene_vs_others |
| Spats2l                                                                   | 18.0573 | -4.62213 | 1.05578   | -4.37793 | 1.19813e-05 | 9.51099e-05 | Conti_non_fene_vs_others |
| Abi2                                                                      | 27.2511 | -4.28071 | 0.782721  | -5.46901 | 4.5256e-08  | 5.29981e-07 | Conti_non_fene_vs_others |
| Adam23                                                                    | 127.232 | -7.43889 | 1.05601   | -7.04436 | 1.8631e-12  | 3.33312e-11 | Conti_non_fene_vs_others |
| Fn1                                                                       | 212.602 | 8.85151  | 0.177427  | 49.8882  | 0           | 0           | Conti_non_fene_vs_others |
| Igfbp5                                                                    | 338.646 | -7.41473 | 0.645494  | -11.4869 | 1.53524e-30 | 6.782e-29   | Conti_non_fene_vs_others |
| Sgpp2                                                                     | 59.829  | 6.1843   | 0.18956   | 32.6245  | 1.8447e-233 | 7.1548e-231 | Conti_non_fene_vs_others |
| Slc19a3                                                                   | 32.3503 | 10.0978  | 0.666045  | 15.1609  | 6.41754e-52 | 4.99821e-50 | Conti_non_fene_vs_others |
| Itn2c                                                                     | 25.4276 | -3.04407 | 0.5465    | -5.57012 | 2.54559e-08 | 3.07006e-07 | Conti_non_fene_vs_others |
| Inpp5d                                                                    | 41.3468 | -3.24859 | 0.457288  | -7.10404 | 1.2116e-12  | 2.19594e-11 | Conti_non_fene_vs_others |
| Inhbb                                                                     | 13.5525 | -4.20757 | 1.05584   | -3.98504 | 6.74694e-05 | 0.000464313 | Conti_non_fene_vs_others |
| Dbi                                                                       | 45.2076 | -5.34152 | 0.863996  | -6.18235 | 6.31554e-10 | 9.09935e-09 | Conti_non_fene_vs_others |
| Mgat5                                                                     | 23.4824 | -4.69177 | 0.955462  | -4.91047 | 9.08578e-07 | 8.83537e-06 | Conti_non_fene_vs_others |
| Gm15675                                                                   | 28.8015 | -5.29497 | 1.05683   | -5.01023 | 5.4366e-07  | 5.4713e-06  | Conti_non_fene_vs_others |
| Cd55                                                                      | 108.551 | -6.32588 | 0.783201  | -8.07695 | 6.64063e-16 | 1.52404e-14 | Conti_non_fene_vs_others |
| Gm16083                                                                   | 14.9396 | -4.01989 | 0.956301  | -4.20358 | 2.62722e-05 | 0.00019581  | Conti_non_fene_vs_others |
| Tmcc2                                                                     | 27.5249 | -5.23035 | 1.05776   | -4.94475 | 7.6241e-07  | 7.52439e-06 | Conti_non_fene_vs_others |
| Pik3c2b                                                                   | 27.4403 | -4.62055 | 0.864245  | -5.34634 | 8.97511e-08 | 1.01608e-06 | Conti_non_fene_vs_others |
| Atp2b4                                                                    | 56.4933 | -4.79274 | 0.64394   | -7.44283 | 9.85503e-14 | 1.94424e-12 | Conti_non_fene_vs_others |
| Arl8a                                                                     | 12.5036 | -4.09247 | 1.05564   | -3.87676 | 0.000105856 | 0.000696358 | Conti_non_fene_vs_others |
| Csrp1                                                                     | 28.7204 | -4.68086 | 0.86414   | -5.41679 | 6.06786e-08 | 7.01276e-07 | Conti_non_fene_vs_others |
| Nr5a2                                                                     | 29.5317 | -4.70252 | 0.864504  | -5.43955 | 5.34139e-08 | 6.21389e-07 | Conti_non_fene_vs_others |
| Gm20631                                                                   | 18.1137 | 5.03108  | 0.272808  | 18.4419  | 6.05993e-76 | 6.71544e-74 | Conti_non_fene_vs_others |
| Fam129a                                                                   | 15.3054 | 3.34356  | 0.30464   | 10.9754  | 5.01649e-28 | 2.05242e-26 | Conti_non_fene_vs_others |
| 1700025G04Rik                                                             | 35.2755 | -5.5879  | 1.05544   | -5.29439 | 1.19415e-07 | 1.32788e-06 | Conti_non_fene_vs_others |
| Npl                                                                       | 10.1302 | -3.78775 | 1.05767   | -3.58122 | 0.000342    | 0.00196162  | Conti_non_fene_vs_others |
| Ralgps2                                                                   | 31.3179 | -3.9083  | 0.644723  | -6.06197 | 1.34461e-09 | 1.87193e-08 | Conti_non_fene_vs_others |
| Gas5                                                                      | 46.1258 | -3.28645 | 0.436658  | -7.52636 | 5.21736e-14 | 1.05177e-12 | Conti_non_fene_vs_others |
| Prdx6                                                                     | 12.4066 | -4.08132 | 1.05583   | -3.86552 | 0.000110852 | 0.000726269 | Conti_non_fene_vs_others |
| F5                                                                        | 10.3277 | 6.53761  | 0.492157  | 13.2836  | 2.88266e-40 | 1.67878e-38 | Conti_non_fene_vs_others |
| Ildr2                                                                     | 18.2453 | 9.82425  | 0.818729  | 11.9994  | 3.57868e-33 | 1.7264e-31  | Conti_non_fene_vs_others |
| Pbx1                                                                      | 688.793 | -4.89835 | 0.19331   | -25.3393 | 1.1787e-141 | 2.4847e-139 | Conti_non_fene_vs_others |
| Rgs5                                                                      | 46.7474 | 3.07746  | 0.302731  | 10.1657  | 2.82142e-24 | 1.00396e-22 | Conti_non_fene_vs_others |
| Fcgr2b                                                                    | 170.081 | -7.8576  | 1.05572   | -7.44289 | 9.85096e-14 | 1.94424e-12 | Conti_non_fene_vs_others |



| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                          |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|--------------------------|
| Pcp4l1                                                                    | 248.423 | 3.13595  | 0.0799985 | 39.2001  | 0           | 0           | Conti_non_fene_vs_others |
| Fcer1g                                                                    | 25.038  | -5.0932  | 1.05576   | -4.82421 | 1.40559e-06 | 1.33294e-05 | Conti_non_fene_vs_others |
| Cd84                                                                      | 17.1317 | -4.54567 | 1.05625   | -4.3036  | 1.68045e-05 | 0.000129527 | Conti_non_fene_vs_others |
| Ifi207                                                                    | 13.6284 | -4.21532 | 1.05716   | -3.98741 | 6.67989e-05 | 0.00046068  | Conti_non_fene_vs_others |
| Ifi204                                                                    | 23.3918 | -4.99588 | 1.05552   | -4.73311 | 2.21105e-06 | 2.02164e-05 | Conti_non_fene_vs_others |
| Mndal                                                                     | 111.278 | -4.63555 | 0.435446  | -10.6455 | 1.82977e-26 | 7.0828e-25  | Conti_non_fene_vs_others |
| Ifi203                                                                    | 97.353  | -4.73499 | 0.481299  | -9.83793 | 7.72877e-23 | 2.61122e-21 | Conti_non_fene_vs_others |
| Tmem63a                                                                   | 12.8172 | -3.44699 | 0.865166  | -3.9842  | 6.77082e-05 | 0.000465791 | Conti_non_fene_vs_others |
| Degs1                                                                     | 81.8767 | -3.68745 | 0.373736  | -9.86647 | 5.81751e-23 | 1.97928e-21 | Conti_non_fene_vs_others |
| Hlx                                                                       | 27.3353 | -3.98708 | 0.708721  | -5.62574 | 1.84716e-08 | 2.27009e-07 | Conti_non_fene_vs_others |
| Esrrg                                                                     | 12.6962 | -3.76947 | 0.957825  | -3.93544 | 8.30434e-05 | 0.000558412 | Conti_non_fene_vs_others |
| Lpgat1                                                                    | 17.8215 | -3.32308 | 0.710316  | -4.67832 | 2.89239e-06 | 2.57186e-05 | Conti_non_fene_vs_others |
| Slc30a1                                                                   | 89.4085 | 3.33198  | 0.111599  | 29.8566  | 7.2103e-196 | 2.37e-193   | Conti_non_fene_vs_others |
| Frmd4a                                                                    | 30.038  | -5.35602 | 1.05508   | -5.07641 | 3.84633e-07 | 3.95922e-06 | Conti_non_fene_vs_others |
| Optn                                                                      | 10.5725 | -3.52616 | 0.955686  | -3.68966 | 0.000224553 | 0.00135409  | Conti_non_fene_vs_others |
| Itih5                                                                     | 214.104 | 3.56569  | 0.104438  | 34.1417  | 1.7771e-255 | 7.3325e-253 | Conti_non_fene_vs_others |
| Prkcq                                                                     | 22.3338 | -4.92867 | 1.05733   | -4.66143 | 3.14024e-06 | 2.77696e-05 | Conti_non_fene_vs_others |
| Pfkfb3                                                                    | 13.2992 | -4.18093 | 1.05577   | -3.96006 | 7.49301e-05 | 0.000509509 | Conti_non_fene_vs_others |
| Itga8                                                                     | 47.8189 | -6.0268  | 1.0556    | -5.70934 | 1.13415e-08 | 1.42544e-07 | Conti_non_fene_vs_others |
| St8sia6                                                                   | 21.6112 | 3.22143  | 0.273201  | 11.7914  | 4.32128e-32 | 2.00484e-30 | Conti_non_fene_vs_others |
| Mrc1                                                                      | 236.666 | -8.33422 | 1.05521   | -7.89818 | 2.83002e-15 | 6.24375e-14 | Conti_non_fene_vs_others |
| Nebi                                                                      | 169.882 | 4.64312  | 0.181129  | 25.6343  | 6.328e-145  | 1.3635e-142 | Conti_non_fene_vs_others |
| Pip4k2a                                                                   | 63.2825 | -5.835   | 0.86403   | -6.75324 | 1.44582e-11 | 2.40058e-10 | Conti_non_fene_vs_others |
| Rabl6                                                                     | 19.9152 | -3.18113 | 0.644518  | -4.93567 | 7.98754e-07 | 7.86706e-06 | Conti_non_fene_vs_others |
| Olfm1                                                                     | 13.7971 | -4.23443 | 1.05552   | -4.01168 | 6.02876e-05 | 0.000418902 | Conti_non_fene_vs_others |
| Ntng2                                                                     | 18.6801 | -4.67102 | 1.05608   | -4.423   | 9.73391e-06 | 7.82627e-05 | Conti_non_fene_vs_others |
| Sh3glb2                                                                   | 15.4253 | -4.39403 | 1.05601   | -4.16099 | 3.16876e-05 | 0.000232156 | Conti_non_fene_vs_others |
| Fnbp1                                                                     | 42.2809 | -5.54888 | 0.954923  | -5.81081 | 6.21711e-09 | 8.08642e-08 | Conti_non_fene_vs_others |
| Aif1l                                                                     | 12.5548 | 5.07359  | 0.33964   | 14.9381  | 1.86184e-50 | 1.41042e-48 | Conti_non_fene_vs_others |
| Ptgs1                                                                     | 47.192  | -5.11872 | 0.781802  | -6.54734 | 5.8569e-11  | 9.24189e-10 | Conti_non_fene_vs_others |
| Zeb2                                                                      | 88.9032 | -6.92176 | 1.05604   | -6.55445 | 5.58463e-11 | 8.83382e-10 | Conti_non_fene_vs_others |
| Rnd3                                                                      | 18.3509 | -3.67628 | 0.782603  | -4.69751 | 2.63358e-06 | 2.35685e-05 | Conti_non_fene_vs_others |
| Cd302                                                                     | 10.4842 | -3.83692 | 1.05673   | -3.63096 | 0.000282374 | 0.00165191  | Conti_non_fene_vs_others |
| Ly75                                                                      | 15.2556 | 3.11965  | 0.264131  | 11.811   | 3.426e-32   | 1.60098e-30 | Conti_non_fene_vs_others |
| Pla2r1                                                                    | 36.2747 | -5.62838 | 1.05582   | -5.33081 | 9.77776e-08 | 1.09797e-06 | Conti_non_fene_vs_others |
| Dpp4                                                                      | 99.4134 | -3.07345 | 0.281447  | -10.9202 | 9.23317e-28 | 3.73818e-26 | Conti_non_fene_vs_others |
| Grb14                                                                     | 66.8146 | 6.62984  | 0.224071  | 29.5881  | 2.124e-192  | 6.5381e-190 | Conti_non_fene_vs_others |
| Cobll1                                                                    | 144.594 | 5.47253  | 0.114837  | 47.6548  | 0           | 0           | Conti_non_fene_vs_others |
| B3galt1                                                                   | 98.9528 | -7.07609 | 1.05591   | -6.7014  | 2.06429e-11 | 3.38115e-10 | Conti_non_fene_vs_others |
| Wipf1                                                                     | 55.1018 | -3.55446 | 0.435881  | -8.15465 | 3.50197e-16 | 8.218e-15   | Conti_non_fene_vs_others |
| Ccdc141                                                                   | 188.707 | 10.9558  | 0.367835  | 29.7844  | 6.2132e-195 | 1.9753e-192 | Conti_non_fene_vs_others |
| Itgav                                                                     | 12.9227 | -3.79626 | 0.955708  | -3.9722  | 7.12113e-05 | 0.000487125 | Conti_non_fene_vs_others |
| Slc43a3                                                                   | 106.15  | -6.30151 | 0.781651  | -8.06179 | 7.51834e-16 | 1.71533e-14 | Conti_non_fene_vs_others |
| Aplnr                                                                     | 29.9803 | -4.13983 | 0.710699  | -5.82501 | 5.71085e-09 | 7.45444e-08 | Conti_non_fene_vs_others |
| Ptprj                                                                     | 21.9154 | 5.14501  | 0.288912  | 17.8082  | 6.1028e-71  | 6.36299e-69 | Conti_non_fene_vs_others |



| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                          |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|--------------------------|
| Trp53i11                                                                  | 44.4124 | -3.72844 | 0.511916  | -7.28331 | 3.25728e-13 | 6.15077e-12 | Conti_non_fene_vs_others |
| Gm13889                                                                   | 25.2099 | -3.30375 | 0.589919  | -5.60034 | 2.13931e-08 | 2.61093e-07 | Conti_non_fene_vs_others |
| Ldlrad3                                                                   | 73.4413 | 3.29695  | 0.121321  | 27.1754  | 1.2688e-162 | 3.5152e-160 | Conti_non_fene_vs_others |
| Slc1a2                                                                    | 20.2645 | 10.5546  | 1.18161   | 8.93243  | 4.16738e-19 | 1.17298e-17 | Conti_non_fene_vs_others |
| Rcn1                                                                      | 22.4387 | -3.98739 | 0.782351  | -5.09668 | 3.45662e-07 | 3.57897e-06 | Conti_non_fene_vs_others |
| Fmn1                                                                      | 17.4586 | -4.57321 | 1.05568   | -4.332   | 1.4776e-05  | 0.000115405 | Conti_non_fene_vs_others |
| Meis2                                                                     | 701.2   | -9.90126 | 1.05488   | -9.38613 | 6.2247e-21  | 1.92222e-19 | Conti_non_fene_vs_others |
| Spred1                                                                    | 48.4098 | -4.30484 | 0.59005   | -7.29573 | 2.97051e-13 | 5.6367e-12  | Conti_non_fene_vs_others |
| Gchfr                                                                     | 11.0637 | -3.91486 | 1.05583   | -3.70786 | 0.000209017 | 0.00127387  | Conti_non_fene_vs_others |
| Ehd4                                                                      | 163.919 | -3.05784 | 0.218644  | -13.9855 | 1.91178e-44 | 1.22766e-42 | Conti_non_fene_vs_others |
| Frmd5                                                                     | 117.96  | 9.33369  | 0.293588  | 31.7918  | 8.4136e-222 | 3.1993e-219 | Conti_non_fene_vs_others |
| Sema6d                                                                    | 54.9069 | -4.74617 | 0.643833  | -7.37174 | 1.68418e-13 | 3.2694e-12  | Conti_non_fene_vs_others |
| Galk2                                                                     | 14.2951 | -3.95256 | 0.956185  | -4.13368 | 3.57003e-05 | 0.000258914 | Conti_non_fene_vs_others |
| Morrbid                                                                   | 26.5289 | -4.55033 | 0.865406  | -5.25803 | 1.45608e-07 | 1.59535e-06 | Conti_non_fene_vs_others |
| Mertk                                                                     | 96.1731 | -3.84165 | 0.363579  | -10.5662 | 4.27443e-26 | 1.62219e-24 | Conti_non_fene_vs_others |
| Il1a                                                                      | 18.8582 | -4.6844  | 1.05619   | -4.4352  | 9.19848e-06 | 7.46385e-05 | Conti_non_fene_vs_others |
| Sirpa                                                                     | 23.2976 | -4.99015 | 1.05566   | -4.72702 | 2.27837e-06 | 2.07731e-05 | Conti_non_fene_vs_others |
| 4930402H24Rik                                                             | 57.1576 | -4.10263 | 0.510974  | -8.02904 | 9.82394e-16 | 2.2153e-14  | Conti_non_fene_vs_others |
| Prnp                                                                      | 45.0923 | 3.2149   | 0.160656  | 20.0111  | 4.40877e-89 | 5.85611e-87 | Conti_non_fene_vs_others |
| Gpcpd1                                                                    | 319.687 | 4.54114  | 0.0626629 | 72.4694  | 0           | 0           | Conti_non_fene_vs_others |
| Bmp2                                                                      | 149.175 | -6.50045 | 0.709429  | -9.16293 | 5.05057e-20 | 1.49764e-18 | Conti_non_fene_vs_others |
| lsm1                                                                      | 16.2249 | 5.4387   | 0.313748  | 17.3346  | 2.57744e-67 | 2.51177e-65 | Conti_non_fene_vs_others |
| MacroD2                                                                   | 20.6098 | -3.86421 | 0.783166  | -4.93409 | 8.05236e-07 | 7.92285e-06 | Conti_non_fene_vs_others |
| Snx5                                                                      | 39.715  | -3.5478  | 0.51174   | -6.93283 | 4.125e-12   | 7.14889e-11 | Conti_non_fene_vs_others |
| Ralgapa2                                                                  | 231.093 | -4.90535 | 0.334502  | -14.6647 | 1.08553e-48 | 7.59987e-47 | Conti_non_fene_vs_others |
| Pigu                                                                      | 10.4758 | -3.14496 | 0.864741  | -3.63687 | 0.000275966 | 0.00161833  | Conti_non_fene_vs_others |
| 2900097C17Rik                                                             | 25.9517 | -4.84251 | 0.954929  | -5.07106 | 3.95602e-07 | 4.06136e-06 | Conti_non_fene_vs_others |
| Soga1                                                                     | 16.3106 | -3.53162 | 0.782528  | -4.51309 | 6.389e-06   | 5.33141e-05 | Conti_non_fene_vs_others |
| Lbp                                                                       | 17.215  | -4.23208 | 0.955532  | -4.42903 | 9.46586e-06 | 7.64562e-05 | Conti_non_fene_vs_others |
| Pltp                                                                      | 728.571 | 3.93123  | 0.0475905 | 82.6054  | 0           | 0           | Conti_non_fene_vs_others |
| Prex1                                                                     | 19.97   | -4.76702 | 1.0554    | -4.51681 | 6.2779e-06  | 5.24999e-05 | Conti_non_fene_vs_others |
| Zfas1                                                                     | 10.639  | -3.85918 | 1.05615   | -3.65401 | 0.000258176 | 0.0015302   | Conti_non_fene_vs_others |
| Kcnb1                                                                     | 31.5837 | -4.51426 | 0.7825    | -5.76903 | 7.97301e-09 | 1.02398e-07 | Conti_non_fene_vs_others |
| Cebpb                                                                     | 12.1361 | -3.05376 | 0.784208  | -3.89407 | 9.85778e-05 | 0.000653356 | Conti_non_fene_vs_others |
| Atp9a                                                                     | 12.4971 | -4.09198 | 1.05607   | -3.87474 | 0.00010674  | 0.000701695 | Conti_non_fene_vs_others |
| Edn3                                                                      | 29.7904 | 11.4309  | 1.0774    | 10.6097  | 2.68562e-26 | 1.02929e-24 | Conti_non_fene_vs_others |
| Cdh4                                                                      | 19.8909 | -4.76155 | 1.05709   | -4.50437 | 6.65701e-06 | 5.52888e-05 | Conti_non_fene_vs_others |
| Fabp5                                                                     | 84.6375 | -6.85078 | 1.05741   | -6.47882 | 9.24446e-11 | 1.43998e-09 | Conti_non_fene_vs_others |
| Fabp4                                                                     | 881.577 | -9.65289 | 0.864988  | -11.1596 | 6.4304e-29  | 2.67607e-27 | Conti_non_fene_vs_others |
| Cp                                                                        | 41.5479 | 6.31337  | 0.213323  | 29.5954  | 1.7127e-192 | 5.3571e-190 | Conti_non_fene_vs_others |
| Pld1                                                                      | 15.4765 | -3.74023 | 0.864635  | -4.32579 | 1.51985e-05 | 0.000118324 | Conti_non_fene_vs_others |
| Tnik                                                                      | 26.6174 | -5.18149 | 1.05624   | -4.90561 | 9.31394e-07 | 9.0403e-06  | Conti_non_fene_vs_others |
| Trpc3                                                                     | 25.5879 | -4.82138 | 0.954909  | -5.04904 | 4.4403e-07  | 4.52262e-06 | Conti_non_fene_vs_others |
| Maml3                                                                     | 107.713 | -3.59136 | 0.316163  | -11.3592 | 6.67319e-30 | 2.86947e-28 | Conti_non_fene_vs_others |
| Rnf13                                                                     | 22.4627 | -3.66967 | 0.709188  | -5.17447 | 2.28559e-07 | 2.43943e-06 | Conti_non_fene_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |          |          |             |             |                          |
|---------------------------------------------------------------------------|---------|----------|----------|----------|-------------|-------------|--------------------------|
| Schip1                                                                    | 53.0632 | -3.36749 | 0.417279 | -8.07011 | 7.02323e-16 | 1.60615e-14 | Conti_non_fene_vs_others |
| Bche                                                                      | 26.2885 | 10.9435  | 0.979965 | 11.1672  | 5.89972e-29 | 2.46581e-27 | Conti_non_fene_vs_others |
| Tmem131l                                                                  | 11.4695 | -3.63016 | 0.955628 | -3.79871 | 0.00014545  | 0.000924431 | Conti_non_fene_vs_others |
| Trim2                                                                     | 24.525  | -5.06311 | 1.05555  | -4.79668 | 1.61315e-06 | 1.51422e-05 | Conti_non_fene_vs_others |
| Dclk2                                                                     | 11.8851 | -3.33225 | 0.86505  | -3.85209 | 0.000117115 | 0.00076446  | Conti_non_fene_vs_others |
| Pbxip1                                                                    | 11.8937 | -4.02072 | 1.05576  | -3.80835 | 0.000139898 | 0.000893329 | Conti_non_fene_vs_others |
| Il6ra                                                                     | 11.1318 | 4.01978  | 0.322086 | 12.4805  | 9.54226e-36 | 4.92162e-34 | Conti_non_fene_vs_others |
| 4933434E20Rik                                                             | 15.0127 | -3.72768 | 0.864383 | -4.31254 | 1.61393e-05 | 0.000125096 | Conti_non_fene_vs_others |
| S100a1                                                                    | 43.4893 | -5.27807 | 0.86398  | -6.10903 | 1.00241e-09 | 1.41175e-08 | Conti_non_fene_vs_others |
| S100a6                                                                    | 52.6902 | -5.56908 | 0.86515  | -6.43712 | 1.21758e-10 | 1.87849e-09 | Conti_non_fene_vs_others |
| Plekho1                                                                   | 47.7592 | -4.83804 | 0.708547 | -6.82812 | 8.60336e-12 | 1.45716e-10 | Conti_non_fene_vs_others |
| Hmgcs2                                                                    | 37.4636 | 10.0177  | 0.613093 | 16.3397  | 5.15374e-60 | 4.44207e-58 | Conti_non_fene_vs_others |
| Ptgrn                                                                     | 13.2134 | 4.33223  | 0.34751  | 12.4665  | 1.13707e-35 | 5.8491e-34  | Conti_non_fene_vs_others |
| Tspan2                                                                    | 11.4676 | -3.96705 | 1.05643  | -3.75516 | 0.00017323  | 0.0010809   | Conti_non_fene_vs_others |
| Slc16a1                                                                   | 107.203 | 4.63061  | 0.112473 | 41.1709  | 0           | 0           | Conti_non_fene_vs_others |
| Slc16a4                                                                   | 58.2899 | 7.574    | 0.240048 | 31.552   | 1.6846e-218 | 6.164e-216  | Conti_non_fene_vs_others |
| Gstm7                                                                     | 18.3297 | 4.90868  | 0.265821 | 18.4661  | 3.86904e-76 | 4.33712e-74 | Conti_non_fene_vs_others |
| Fam102b                                                                   | 12.028  | -4.03486 | 1.05588  | -3.82133 | 0.000132735 | 0.000853775 | Conti_non_fene_vs_others |
| Vav3                                                                      | 99.4753 | -5.90852 | 0.708364 | -8.34108 | 7.36155e-17 | 1.80028e-15 | Conti_non_fene_vs_others |
| Usp53                                                                     | 97.0583 | 5.20862  | 0.122663 | 42.4627  | 0           | 0           | Conti_non_fene_vs_others |
| Synpo2                                                                    | 26.6889 | 6.6016   | 0.363236 | 18.1744  | 8.22992e-74 | 8.86682e-72 | Conti_non_fene_vs_others |
| Snhg8                                                                     | 10.8649 | -3.53012 | 0.955491 | -3.69456 | 0.000220271 | 0.00133204  | Conti_non_fene_vs_others |
| Enpep                                                                     | 37.7559 | -5.38691 | 0.954874 | -5.64149 | 1.68585e-08 | 2.08905e-07 | Conti_non_fene_vs_others |
| Lef1                                                                      | 256.336 | 5.19585  | 0.10274  | 50.5728  | 0           | 0           | Conti_non_fene_vs_others |
| Sgms2                                                                     | 24.6602 | 8.59978  | 0.729704 | 11.7853  | 4.648e-32   | 2.15128e-30 | Conti_non_fene_vs_others |
| Dkk2                                                                      | 18.829  | -3.72542 | 0.787631 | -4.72991 | 2.24622e-06 | 2.04896e-05 | Conti_non_fene_vs_others |
| Lmo4                                                                      | 15.76   | -3.77301 | 0.864477 | -4.36449 | 1.27417e-05 | 0.000100665 | Conti_non_fene_vs_others |
| Nexn                                                                      | 12.4635 | -3.06049 | 0.783867 | -3.90435 | 9.44792e-05 | 0.000628986 | Conti_non_fene_vs_others |
| Car8                                                                      | 64.6613 | -5.00303 | 0.644324 | -7.76478 | 8.17873e-15 | 1.76038e-13 | Conti_non_fene_vs_others |
| Asph                                                                      | 12.7327 | -4.11848 | 1.05666  | -3.89765 | 9.71325e-05 | 0.000644879 | Conti_non_fene_vs_others |
| Rad54b                                                                    | 18.7085 | 5.8191   | 0.346022 | 16.8172  | 1.82725e-63 | 1.65588e-61 | Conti_non_fene_vs_others |
| Runx1t1                                                                   | 14.121  | 4.00468  | 0.292336 | 13.6989  | 1.03075e-42 | 6.38636e-41 | Conti_non_fene_vs_others |
| Reck                                                                      | 34.5827 | 3.49706  | 0.198435 | 17.6232  | 1.63427e-69 | 1.6507e-67  | Conti_non_fene_vs_others |
| Trim14                                                                    | 10.7318 | -3.16147 | 0.865576 | -3.65245 | 0.000259752 | 0.00153907  | Conti_non_fene_vs_others |
| Col15a1                                                                   | 36.6265 | -3.43247 | 0.51372  | -6.68159 | 2.36357e-11 | 3.84537e-10 | Conti_non_fene_vs_others |
| Tmeff1                                                                    | 21.2496 | 6.46293  | 0.31175  | 20.7312  | 1.81394e-95 | 2.53078e-93 | Conti_non_fene_vs_others |
| Zfp462                                                                    | 28.2837 | -5.26937 | 1.0552   | -4.9937  | 5.92329e-07 | 5.93339e-06 | Conti_non_fene_vs_others |
| Cdkn2b                                                                    | 16.0336 | 4.74031  | 0.285348 | 16.6124  | 5.67115e-62 | 5.02194e-60 | Conti_non_fene_vs_others |
| Dock7                                                                     | 17.2657 | -4.55731 | 1.05576  | -4.3166  | 1.5845e-05  | 0.000122962 | Conti_non_fene_vs_others |
| Jak1                                                                      | 213.834 | -4.38416 | 0.290271 | -15.1037 | 1.53156e-51 | 1.17863e-49 | Conti_non_fene_vs_others |
| Pde4b                                                                     | 41.9455 | -5.22747 | 0.864546 | -6.04649 | 1.4804e-09  | 2.04921e-08 | Conti_non_fene_vs_others |
| Plpp3                                                                     | 771.23  | -5.52379 | 0.22299  | -24.7715 | 1.8197e-135 | 3.5646e-133 | Conti_non_fene_vs_others |
| Ssbp3                                                                     | 20.5334 | -3.54864 | 0.708873 | -5.00603 | 5.55655e-07 | 5.58622e-06 | Conti_non_fene_vs_others |
| Lrp8                                                                      | 40.2815 | 9.00464  | 0.427722 | 21.0525  | 2.16731e-98 | 3.13662e-96 | Conti_non_fene_vs_others |
| Cyp4b1                                                                    | 63.256  | -6.43073 | 1.05507  | -6.09507 | 1.09392e-09 | 1.53393e-08 | Conti_non_fene_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                          |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|--------------------------|
| Eri3                                                                      | 15.2348 | -3.38398 | 0.782499  | -4.32459 | 1.52817e-05 | 0.000118924 | Conti_non_fene_vs_others |
| Gm12840                                                                   | 11.6269 | -3.3003  | 0.867482  | -3.80446 | 0.000142113 | 0.000905981 | Conti_non_fene_vs_others |
| St3gal3                                                                   | 17.7363 | -3.94808 | 0.865922  | -4.5594  | 5.13005e-06 | 4.38094e-05 | Conti_non_fene_vs_others |
| Slc2a1                                                                    | 242.285 | 6.95685  | 0.100933  | 68.9253  | 0           | 0           | Conti_non_fene_vs_others |
| Hivep3                                                                    | 68.1779 | -6.53838 | 1.05511   | -6.19688 | 5.7595e-10  | 8.33537e-09 | Conti_non_fene_vs_others |
| Smap2                                                                     | 52.5571 | -4.42623 | 0.589886  | -7.50353 | 6.2123e-14  | 1.24201e-12 | Conti_non_fene_vs_others |
| Mfsd2a                                                                    | 62.7674 | 11.6388  | 0.796761  | 14.6077  | 2.50861e-48 | 1.73748e-46 | Conti_non_fene_vs_others |
| Ago3                                                                      | 74.8751 | -3.10166 | 0.324679  | -9.55302 | 1.25974e-21 | 4.00493e-20 | Conti_non_fene_vs_others |
| Gja4                                                                      | 16.7766 | -3.86926 | 0.865578  | -4.47015 | 7.81656e-06 | 6.42044e-05 | Conti_non_fene_vs_others |
| Marcks11                                                                  | 53.2832 | -6.18299 | 1.05507   | -5.86027 | 4.62125e-09 | 6.0966e-08  | Conti_non_fene_vs_others |
| Fam167b                                                                   | 119.748 | -5.64055 | 0.589253  | -9.57237 | 1.04479e-21 | 3.35456e-20 | Conti_non_fene_vs_others |
| Ptpru                                                                     | 40.1931 | -3.77625 | 0.546256  | -6.91296 | 4.7465e-12  | 8.18212e-11 | Conti_non_fene_vs_others |
| Slc9a1                                                                    | 25.8647 | -3.60489 | 0.644225  | -5.59569 | 2.1974e-08  | 2.67677e-07 | Conti_non_fene_vs_others |
| Srarp                                                                     | 75.1259 | 8.06319  | 0.272824  | 29.5546  | 5.7399e-192 | 1.7393e-189 | Conti_non_fene_vs_others |
| Plekhn2                                                                   | 12.2373 | -3.72157 | 0.955779  | -3.89375 | 9.87056e-05 | 0.00065398  | Conti_non_fene_vs_others |
| Dhrs3                                                                     | 87.6981 | -5.44636 | 0.643423  | -8.46466 | 2.56898e-17 | 6.52097e-16 | Conti_non_fene_vs_others |
| Rbp7                                                                      | 55.7474 | -5.65789 | 0.869794  | -6.50487 | 7.77619e-11 | 1.21812e-09 | Conti_non_fene_vs_others |
| Vwa1                                                                      | 103.497 | 3.5653   | 0.11275   | 31.6212  | 1.888e-219  | 7.0411e-217 | Conti_non_fene_vs_others |
| Mxra8                                                                     | 17.5291 | -3.60362 | 0.782908  | -4.60287 | 4.16715e-06 | 3.61793e-05 | Conti_non_fene_vs_others |
| Rundc3b                                                                   | 124.788 | 6.88696  | 0.141928  | 48.5243  | 0           | 0           | Conti_non_fene_vs_others |
| Abcb1a                                                                    | 381.606 | 6.97508  | 0.0841035 | 82.9345  | 0           | 0           | Conti_non_fene_vs_others |
| Crot                                                                      | 10.2755 | -3.48207 | 0.956186  | -3.64162 | 0.000270924 | 0.00159165  | Conti_non_fene_vs_others |
| Hgf                                                                       | 31.5785 | -5.42819 | 1.05836   | -5.12885 | 2.91511e-07 | 3.06078e-06 | Conti_non_fene_vs_others |
| Sema3c                                                                    | 285.65  | 6.47586  | 0.108196  | 59.8527  | 0           | 0           | Conti_non_fene_vs_others |
| Cd36                                                                      | 132.253 | -6.90835 | 0.864765  | -7.98871 | 1.36358e-15 | 3.0571e-14  | Conti_non_fene_vs_others |
| Emilin1                                                                   | 27.7218 | -5.2397  | 1.05577   | -4.96294 | 6.94338e-07 | 6.89293e-06 | Conti_non_fene_vs_others |
| Slbp                                                                      | 19.5578 | -3.45942 | 0.710148  | -4.8714  | 1.1081e-06  | 1.067e-05   | Conti_non_fene_vs_others |
| Htt                                                                       | 13.7924 | -3.25791 | 0.782761  | -4.16208 | 3.15363e-05 | 0.000231135 | Conti_non_fene_vs_others |
| Cd38                                                                      | 132.075 | -3.30525 | 0.260899  | -12.6687 | 8.81585e-37 | 4.67119e-35 | Conti_non_fene_vs_others |
| Prom1                                                                     | 124.987 | 8.20481  | 0.191491  | 42.8469  | 0           | 0           | Conti_non_fene_vs_others |
| Ldb2                                                                      | 384.156 | -5.13938 | 0.278596  | -18.4475 | 5.46608e-76 | 6.09216e-74 | Conti_non_fene_vs_others |
| D5Ert615e                                                                 | 33.9447 | -5.53296 | 1.05597   | -5.23972 | 1.60819e-07 | 1.75113e-06 | Conti_non_fene_vs_others |
| Pcdh7                                                                     | 12.5175 | -4.09322 | 1.05956   | -3.86312 | 0.00011195  | 0.000732472 | Conti_non_fene_vs_others |
| Kit                                                                       | 40.7979 | -5.49428 | 0.956212  | -5.74588 | 9.14428e-09 | 1.16668e-07 | Conti_non_fene_vs_others |
| Adgrl3                                                                    | 57.1103 | 9.07426  | 0.363226  | 24.9824  | 9.4985e-138 | 1.899e-135  | Conti_non_fene_vs_others |
| Tecrl                                                                     | 10.4608 | 8.71328  | 0.771793  | 11.2897  | 1.47604e-29 | 6.29116e-28 | Conti_non_fene_vs_others |
| Rufy3                                                                     | 18.3683 | -3.07413 | 0.644363  | -4.77081 | 1.83489e-06 | 1.70258e-05 | Conti_non_fene_vs_others |
| Cxcl9                                                                     | 24.9459 | -5.08821 | 1.07221   | -4.74555 | 2.07944e-06 | 1.91212e-05 | Conti_non_fene_vs_others |
| Art3                                                                      | 11.6964 | -3.65363 | 0.955979  | -3.82187 | 0.000132442 | 0.000852175 | Conti_non_fene_vs_others |
| Cxcl10                                                                    | 14.8003 | -4.33523 | 1.06851   | -4.05727 | 4.96492e-05 | 0.000351276 | Conti_non_fene_vs_others |
| Rasgef1b                                                                  | 26.9055 | -5.19785 | 1.056     | -4.9222  | 8.5578e-07  | 8.38189e-06 | Conti_non_fene_vs_others |
| Nudt9                                                                     | 10.1591 | -3.12701 | 0.865124  | -3.61452 | 0.000300903 | 0.00174817  | Conti_non_fene_vs_others |
| Lrrc8d                                                                    | 20.8253 | -4.18355 | 0.865718  | -4.83246 | 1.34858e-06 | 1.28264e-05 | Conti_non_fene_vs_others |
| Crif2                                                                     | 12.1987 | -3.04071 | 0.784205  | -3.87744 | 0.000105561 | 0.00069489  | Conti_non_fene_vs_others |
| Fbrsl1                                                                    | 13.128  | -3.49983 | 0.86459   | -4.04796 | 5.16656e-05 | 0.000363684 | Conti_non_fene_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                          |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|--------------------------|
| Cox6a1                                                                    | 57.2786 | -5.09317 | 0.708335  | -7.19034 | 6.46294e-13 | 1.20053e-11 | Conti_non_fene_vs_others |
| Taok3                                                                     | 24.2495 | -5.04682 | 1.056     | -4.77917 | 1.76019e-06 | 1.64033e-05 | Conti_non_fene_vs_others |
| Fbxw8                                                                     | 11.6    | -3.65242 | 0.956132  | -3.81999 | 0.000133455 | 0.000857554 | Conti_non_fene_vs_others |
| Camkk2                                                                    | 12.8343 | -4.13011 | 1.0559    | -3.91144 | 9.17478e-05 | 0.000612062 | Conti_non_fene_vs_others |
| Mlxip                                                                     | 26.7566 | -5.18883 | 1.05553   | -4.91584 | 8.84022e-07 | 8.62366e-06 | Conti_non_fene_vs_others |
| Stx2                                                                      | 26.1437 | -4.53055 | 0.864145  | -5.2428  | 1.58154e-07 | 1.72308e-06 | Conti_non_fene_vs_others |
| Agfg2                                                                     | 13.7831 | -4.23233 | 1.05715   | -4.00351 | 6.24087e-05 | 0.000431785 | Conti_non_fene_vs_others |
| Tsc22d4                                                                   | 22.5007 | -4.93952 | 1.05536   | -4.6804  | 2.8632e-06  | 2.54707e-05 | Conti_non_fene_vs_others |
| Mical2                                                                    | 12.4265 | -3.0832  | 0.782982  | -3.93777 | 8.22423e-05 | 0.000553601 | Conti_non_fene_vs_others |
| Snx8                                                                      | 23.1335 | -4.97869 | 1.05553   | -4.71676 | 2.39634e-06 | 2.17261e-05 | Conti_non_fene_vs_others |
| Ttyh3                                                                     | 12.551  | -4.09655 | 1.05564   | -3.88063 | 0.000104184 | 0.000687693 | Conti_non_fene_vs_others |
| Gna12                                                                     | 38.6443 | -5.11334 | 0.863925  | -5.91873 | 3.24444e-09 | 4.36032e-08 | Conti_non_fene_vs_others |
| Fscn1                                                                     | 29.9583 | -5.3521  | 1.05577   | -5.06937 | 3.99142e-07 | 4.09553e-06 | Conti_non_fene_vs_others |
| Slc7a1                                                                    | 180.16  | 5.83784  | 0.111086  | 52.5524  | 0           | 0           | Conti_non_fene_vs_others |
| Sgce                                                                      | 16.3078 | -4.47499 | 1.05788   | -4.23015 | 2.33536e-05 | 0.000176019 | Conti_non_fene_vs_others |
| Pdk4                                                                      | 12.4974 | -4.09104 | 1.05783   | -3.86737 | 0.000110015 | 0.00072127  | Conti_non_fene_vs_others |
| Thsd7a                                                                    | 15.8506 | -3.1262  | 0.714648  | -4.37446 | 1.21735e-05 | 9.64378e-05 | Conti_non_fene_vs_others |
| Tfec                                                                      | 10.2783 | -3.80732 | 1.05605   | -3.60524 | 0.000311865 | 0.00180484  | Conti_non_fene_vs_others |
| Wnt2                                                                      | 35.562  | -5.60003 | 1.05659   | -5.30011 | 1.15735e-07 | 1.28991e-06 | Conti_non_fene_vs_others |
| Cped1                                                                     | 39.4759 | -3.73323 | 0.546048  | -6.83681 | 8.09749e-12 | 1.37508e-10 | Conti_non_fene_vs_others |
| Aass                                                                      | 42.8508 | -5.86848 | 1.05568   | -5.55897 | 2.71365e-08 | 3.26666e-07 | Conti_non_fene_vs_others |
| Cadps2                                                                    | 24.5936 | -4.44521 | 0.865632  | -5.13522 | 2.81813e-07 | 2.9686e-06  | Conti_non_fene_vs_others |
| Kcp                                                                       | 12.102  | 6.41354  | 0.403034  | 15.9132  | 5.13508e-57 | 4.27402e-55 | Conti_non_fene_vs_others |
| Plxna4                                                                    | 55.3478 | -5.04462 | 0.708302  | -7.12213 | 1.06272e-12 | 1.94244e-11 | Conti_non_fene_vs_others |
| Ptn                                                                       | 645.288 | 9.77591  | 0.443398  | 22.0477  | 1.0052e-107 | 1.6521e-105 | Conti_non_fene_vs_others |
| Hipk2                                                                     | 171.679 | -7.28772 | 0.864118  | -8.4337  | 3.34908e-17 | 8.41304e-16 | Conti_non_fene_vs_others |
| Zfp467                                                                    | 11.1597 | -3.58479 | 0.956363  | -3.74836 | 0.000177996 | 0.00110708  | Conti_non_fene_vs_others |
| Gimap4                                                                    | 109.526 | -6.63524 | 0.863695  | -7.68239 | 1.56144e-14 | 3.28428e-13 | Conti_non_fene_vs_others |
| Tmem176a                                                                  | 46.016  | -5.37217 | 0.863994  | -6.21783 | 5.04062e-10 | 7.35537e-09 | Conti_non_fene_vs_others |
| Skap2                                                                     | 52.9705 | -4.42672 | 0.589642  | -7.50746 | 6.02845e-14 | 1.20775e-12 | Conti_non_fene_vs_others |
| Hibadh                                                                    | 21.8671 | -3.33569 | 0.644624  | -5.17464 | 2.28351e-07 | 2.43855e-06 | Conti_non_fene_vs_others |
| Aqp1                                                                      | 249.4   | -8.40984 | 1.05529   | -7.96924 | 1.59656e-15 | 3.55885e-14 | Conti_non_fene_vs_others |
| Pde1c                                                                     | 23.6398 | -5.0112  | 1.05656   | -4.74295 | 2.10631e-06 | 1.93407e-05 | Conti_non_fene_vs_others |
| Fam13a                                                                    | 17.132  | 4.79045  | 0.337518  | 14.1932  | 1.01e-45    | 6.61721e-44 | Conti_non_fene_vs_others |
| Ndnf                                                                      | 101.265 | 10.0371  | 0.374485  | 26.8024  | 3.0307e-158 | 7.7334e-156 | Conti_non_fene_vs_others |
| St3gal5                                                                   | 39.1551 | -5.73924 | 1.05507   | -5.4397  | 5.33711e-08 | 6.21264e-07 | Conti_non_fene_vs_others |
| Tcf7l1                                                                    | 80.6349 | -3.13423 | 0.315693  | -9.92811 | 3.14167e-23 | 1.08328e-21 | Conti_non_fene_vs_others |
| Dysf                                                                      | 117.974 | -3.81537 | 0.323204  | -11.8049 | 3.68426e-32 | 1.7134e-30  | Conti_non_fene_vs_others |
| Cyp26b1                                                                   | 56.3931 | -5.08785 | 0.708741  | -7.17872 | 7.03693e-13 | 1.30093e-11 | Conti_non_fene_vs_others |
| Gkn3                                                                      | 39.5264 | 6.97637  | 0.663646  | 10.5122  | 7.59137e-26 | 2.85863e-24 | Conti_non_fene_vs_others |
| Mgll                                                                      | 189.04  | -4.61463 | 0.331881  | -13.9045 | 5.94908e-44 | 3.77028e-42 | Conti_non_fene_vs_others |
| Xpc                                                                       | 20.4524 | -3.85518 | 0.78277   | -4.92505 | 8.43375e-07 | 8.27711e-06 | Conti_non_fene_vs_others |
| Slc6a6                                                                    | 579.722 | 3.32033  | 0.0622452 | 53.3427  | 0           | 0           | Conti_non_fene_vs_others |
| Nr2c2                                                                     | 26.2842 | -3.36298 | 0.589952  | -5.70042 | 1.19513e-08 | 1.4982e-07  | Conti_non_fene_vs_others |
| Prickle2                                                                  | 36.7909 | -5.64801 | 1.05515   | -5.35279 | 8.66071e-08 | 9.81058e-07 | Conti_non_fene_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                          |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|--------------------------|
| Suc1g2                                                                    | 17.5058 | -3.60697 | 0.783302  | -4.60482 | 4.12817e-06 | 3.59002e-05 | Conti_non_fene_vs_others |
| Eif4e3                                                                    | 14.7611 | -3.34312 | 0.782477  | -4.27248 | 1.93311e-05 | 0.000147652 | Conti_non_fene_vs_others |
| Pparg                                                                     | 12.6449 | -4.10851 | 1.06241   | -3.86715 | 0.000110116 | 0.000721689 | Conti_non_fene_vs_others |
| Cxcl12                                                                    | 828.897 | 4.93941  | 0.0965811 | 51.1426  | 0           | 0           | Conti_non_fene_vs_others |
| Gm9946                                                                    | 28.4864 | 10.453   | 0.809001  | 12.9209  | 3.42927e-38 | 1.90011e-36 | Conti_non_fene_vs_others |
| Cd9                                                                       | 78.409  | -3.17041 | 0.323387  | -9.80379 | 1.08444e-22 | 3.64481e-21 | Conti_non_fene_vs_others |
| Vwf                                                                       | 41.8928 | 3.36254  | 0.267603  | 12.5654  | 3.27124e-36 | 1.70078e-34 | Conti_non_fene_vs_others |
| Ntf3                                                                      | 24.8567 | -4.14603 | 0.782981  | -5.29518 | 1.189e-07   | 1.32291e-06 | Conti_non_fene_vs_others |
| Clec1b                                                                    | 16.1004 | -4.45662 | 1.0569    | -4.21667 | 2.47934e-05 | 0.000185429 | Conti_non_fene_vs_others |
| Clec1a                                                                    | 59.0075 | -3.07474 | 0.362438  | -8.48349 | 2.18536e-17 | 5.5764e-16  | Conti_non_fene_vs_others |
| Kap                                                                       | 32.3161 | -5.46169 | 1.06022   | -5.15147 | 2.58447e-07 | 2.73435e-06 | Conti_non_fene_vs_others |
| Emp1                                                                      | 15.2973 | -4.38261 | 1.05574   | -4.15122 | 3.30715e-05 | 0.000241202 | Conti_non_fene_vs_others |
| Rerg                                                                      | 10.0692 | -3.7801  | 1.05824   | -3.57206 | 0.000354182 | 0.00202079  | Conti_non_fene_vs_others |
| Eps8                                                                      | 20.3973 | 3.86191  | 0.271529  | 14.2228  | 6.61213e-46 | 4.36154e-44 | Conti_non_fene_vs_others |
| Slco1c1                                                                   | 478.791 | 15.4073  | 1.0656    | 14.4588  | 2.20672e-47 | 1.50157e-45 | Conti_non_fene_vs_others |
| Slco1a4                                                                   | 826.677 | 10.8995  | 0.172292  | 63.262   | 0           | 0           | Conti_non_fene_vs_others |
| Lmntd1                                                                    | 43.9587 | 9.86511  | 0.529804  | 18.6203  | 2.19889e-77 | 2.47925e-75 | Conti_non_fene_vs_others |
| Far2                                                                      | 35.508  | 9.73069  | 0.568898  | 17.1044  | 1.37517e-65 | 1.30729e-63 | Conti_non_fene_vs_others |
| Epn1                                                                      | 20.6857 | -4.18134 | 0.864289  | -4.83789 | 1.31222e-06 | 1.25051e-05 | Conti_non_fene_vs_others |
| C5ar2                                                                     | 14.578  | -4.31287 | 1.05681   | -4.08101 | 4.48399e-05 | 0.000319346 | Conti_non_fene_vs_others |
| Strn4                                                                     | 24.981  | -4.78125 | 0.956325  | -4.99961 | 5.74472e-07 | 5.76643e-06 | Conti_non_fene_vs_others |
| Calm3                                                                     | 35.3777 | -3.58653 | 0.545936  | -6.5695  | 5.0486e-11  | 8.01864e-10 | Conti_non_fene_vs_others |
| Pglyrp1                                                                   | 233.57  | 10.0357  | 0.256458  | 39.1319  | 0           | 0           | Conti_non_fene_vs_others |
| Exoc3l2                                                                   | 156.937 | -6.2989  | 0.643479  | -9.78881 | 1.25768e-22 | 4.20519e-21 | Conti_non_fene_vs_others |
| Nectin2                                                                   | 25.0918 | -3.85429 | 0.708884  | -5.43713 | 5.4147e-08  | 6.29163e-07 | Conti_non_fene_vs_others |
| Gmfg                                                                      | 21.3481 | -4.55658 | 0.954916  | -4.7717  | 1.82673e-06 | 1.69664e-05 | Conti_non_fene_vs_others |
| Sirt2                                                                     | 25.2496 | -3.55737 | 0.644098  | -5.52303 | 3.33206e-08 | 3.9692e-07  | Conti_non_fene_vs_others |
| Lsr                                                                       | 59.8299 | 9.97193  | 0.472352  | 21.1112  | 6.2716e-99  | 9.14471e-97 | Conti_non_fene_vs_others |
| Scn1b                                                                     | 17.3685 | -4.56575 | 1.05541   | -4.32605 | 1.51807e-05 | 0.000118233 | Conti_non_fene_vs_others |
| Chst8                                                                     | 10.8615 | -3.88956 | 1.05634   | -3.68213 | 0.000231297 | 0.00138785  | Conti_non_fene_vs_others |
| Ptov1                                                                     | 15.312  | -3.3896  | 0.782539  | -4.33154 | 1.48073e-05 | 0.000115603 | Conti_non_fene_vs_others |
| Atp10a                                                                    | 129.778 | 5.35355  | 0.105562  | 50.7149  | 0           | 0           | Conti_non_fene_vs_others |
| Selenos                                                                   | 10.6074 | -3.85363 | 1.05608   | -3.64899 | 0.000263276 | 0.00155604  | Conti_non_fene_vs_others |
| Synm                                                                      | 67.741  | 4.05979  | 0.135755  | 29.9052  | 1.684e-196  | 5.6307e-194 | Conti_non_fene_vs_others |
| B130024G19Rik                                                             | 16.2931 | -4.15043 | 0.95524   | -4.34491 | 1.39334e-05 | 0.000109397 | Conti_non_fene_vs_others |
| Fam174b                                                                   | 16.9436 | -3.23952 | 0.710234  | -4.56119 | 5.08636e-06 | 4.34919e-05 | Conti_non_fene_vs_others |
| Slco3a1                                                                   | 37.2749 | -5.06389 | 0.864199  | -5.85963 | 4.63895e-09 | 6.11578e-08 | Conti_non_fene_vs_others |
| Mfge8                                                                     | 61.9768 | -4.65883 | 0.589339  | -7.90518 | 2.6755e-15  | 5.90957e-14 | Conti_non_fene_vs_others |
| Abhd2                                                                     | 260.942 | 5.23731  | 0.0741741 | 70.6084  | 0           | 0           | Conti_non_fene_vs_others |
| Zfp710                                                                    | 34.6807 | -5.56365 | 1.05515   | -5.27284 | 1.34328e-07 | 1.48013e-06 | Conti_non_fene_vs_others |
| Ctsc                                                                      | 25.575  | 6.73348  | 0.527779  | 12.7581  | 2.80837e-37 | 1.52557e-35 | Conti_non_fene_vs_others |
| Thrsp                                                                     | 49.8369 | -6.08704 | 1.05556   | -5.76664 | 8.08653e-09 | 1.03787e-07 | Conti_non_fene_vs_others |
| Aqp11                                                                     | 34.3022 | 4.68055  | 0.19438   | 24.0794  | 4.1056e-128 | 7.5829e-126 | Conti_non_fene_vs_others |
| Myo7a                                                                     | 18.6273 | -4.34497 | 0.955052  | -4.54946 | 5.37845e-06 | 4.57074e-05 | Conti_non_fene_vs_others |
| Arrb1                                                                     | 24.9472 | -5.08864 | 1.05558   | -4.8207  | 1.43054e-06 | 1.35594e-05 | Conti_non_fene_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                          |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|--------------------------|
| Tpbgl                                                                     | 40.7734 | -5.79686 | 1.05523   | -5.49346 | 3.94123e-08 | 4.66051e-07 | Conti_non_fene_vs_others |
| Anapc15                                                                   | 34.7399 | -5.56597 | 1.05644   | -5.26859 | 1.37473e-07 | 1.51392e-06 | Conti_non_fene_vs_others |
| Dchs1                                                                     | 16.1066 | -3.16383 | 0.708981  | -4.46251 | 8.10061e-06 | 6.6229e-05  | Conti_non_fene_vs_others |
| Lyve1                                                                     | 47.9082 | -6.02943 | 1.05689   | -5.7049  | 1.16415e-08 | 1.46125e-07 | Conti_non_fene_vs_others |
| Tmc7                                                                      | 18.8371 | 9.56742  | 0.746219  | 12.8212  | 1.24764e-37 | 6.81565e-36 | Conti_non_fene_vs_others |
| Vps35l                                                                    | 17.5745 | -3.61954 | 0.782853  | -4.62353 | 3.77266e-06 | 3.29267e-05 | Conti_non_fene_vs_others |
| Dnah3                                                                     | 14.1932 | 5.85608  | 0.346163  | 16.9171  | 3.36385e-64 | 3.07713e-62 | Conti_non_fene_vs_others |
| Prkcb                                                                     | 15.6249 | -4.41311 | 1.05581   | -4.17983 | 2.91725e-05 | 0.000215437 | Conti_non_fene_vs_others |
| Al467606                                                                  | 11.8963 | 3.20203  | 0.338762  | 9.45216  | 3.31904e-21 | 1.03984e-19 | Conti_non_fene_vs_others |
| Chst15                                                                    | 57.4417 | -3.05732 | 0.361736  | -8.4518  | 2.86845e-17 | 7.24321e-16 | Conti_non_fene_vs_others |
| Fam53b                                                                    | 15.8883 | -4.43775 | 1.05554   | -4.20426 | 2.61932e-05 | 0.000195371 | Conti_non_fene_vs_others |
| Adam12                                                                    | 26.6757 | -5.18525 | 1.05551   | -4.91258 | 8.98858e-07 | 8.75517e-06 | Conti_non_fene_vs_others |
| Ptpre                                                                     | 16.474  | -4.49071 | 1.05586   | -4.25314 | 2.1079e-05  | 0.000160308 | Conti_non_fene_vs_others |
| Inpp5a                                                                    | 66.6004 | -3.37624 | 0.37401   | -9.02714 | 1.76221e-19 | 5.09307e-18 | Conti_non_fene_vs_others |
| Hras                                                                      | 31.8597 | -5.44186 | 1.05526   | -5.15687 | 2.51117e-07 | 2.66261e-06 | Conti_non_fene_vs_others |
| Ctsd                                                                      | 74.9563 | -5.21096 | 0.643802  | -8.09404 | 5.77175e-16 | 1.33411e-14 | Conti_non_fene_vs_others |
| Clec4g                                                                    | 178.37  | -7.9263  | 1.05591   | -7.50661 | 6.06803e-14 | 1.21442e-12 | Conti_non_fene_vs_others |
| Kbtbd11                                                                   | 12.4083 | 4.1302   | 0.325897  | 12.6733  | 8.31059e-37 | 4.41554e-35 | Conti_non_fene_vs_others |
| Csmd1                                                                     | 12.3697 | -3.39569 | 0.873542  | -3.88726 | 0.000101381 | 0.000670331 | Conti_non_fene_vs_others |
| Agpat5                                                                    | 36.4283 | -5.63442 | 1.0553    | -5.33918 | 9.33691e-08 | 1.05396e-06 | Conti_non_fene_vs_others |
| Tcim                                                                      | 142.827 | -3.53856 | 0.269138  | -13.1478 | 1.753e-39   | 1.00878e-37 | Conti_non_fene_vs_others |
| Rab11fip1                                                                 | 28.653  | 9.94932  | 0.669288  | 14.8655  | 5.51729e-50 | 4.11526e-48 | Conti_non_fene_vs_others |
| Nrg1                                                                      | 16.1685 | -4.12716 | 0.99877   | -4.13225 | 3.59234e-05 | 0.00026024  | Conti_non_fene_vs_others |
| Purg                                                                      | 10.2221 | -3.45057 | 0.956342  | -3.6081  | 0.000308453 | 0.00178883  | Conti_non_fene_vs_others |
| Tusc3                                                                     | 21.1932 | -3.60483 | 0.709209  | -5.08288 | 3.71745e-07 | 3.83471e-06 | Conti_non_fene_vs_others |
| Msr1                                                                      | 46.1648 | -5.97642 | 1.05716   | -5.65328 | 1.57411e-08 | 1.95684e-07 | Conti_non_fene_vs_others |
| Sorbs2                                                                    | 269.883 | 3.56097  | 0.0767558 | 46.3935  | 0           | 0           | Conti_non_fene_vs_others |
| Sorbs2os                                                                  | 21.0899 | 4.45437  | 0.246314  | 18.0841  | 4.25107e-73 | 4.55475e-71 | Conti_non_fene_vs_others |
| Ankrd37                                                                   | 14.2007 | 5.78882  | 0.354377  | 16.3352  | 5.54336e-60 | 4.75674e-58 | Conti_non_fene_vs_others |
| Snx25                                                                     | 13.3732 | -4.18915 | 1.05568   | -3.9682  | 7.2417e-05  | 0.000494153 | Conti_non_fene_vs_others |
| Slc25a4                                                                   | 45.3254 | -4.18746 | 0.589911  | -7.09847 | 1.26149e-12 | 2.27996e-11 | Conti_non_fene_vs_others |
| Enpp6                                                                     | 21.4752 | -4.56599 | 0.956348  | -4.77441 | 1.80237e-06 | 1.67803e-05 | Conti_non_fene_vs_others |
| Hpgd                                                                      | 34.3089 | -5.54785 | 1.05605   | -5.25341 | 1.4931e-07  | 1.63407e-06 | Conti_non_fene_vs_others |
| Palld                                                                     | 103.841 | -7.14566 | 1.05572   | -6.76849 | 1.30133e-11 | 2.16996e-10 | Conti_non_fene_vs_others |
| Tll1                                                                      | 12.9226 | -3.81177 | 0.956406  | -3.98552 | 6.73323e-05 | 0.000463692 | Conti_non_fene_vs_others |
| Psd3                                                                      | 256.696 | -3.79697 | 0.22105   | -17.177  | 3.94716e-66 | 3.78947e-64 | Conti_non_fene_vs_others |
| Isyna1                                                                    | 39.1603 | 3.81237  | 0.174716  | 21.8205  | 1.4833e-105 | 2.3579e-103 | Conti_non_fene_vs_others |
| Plvap                                                                     | 397.807 | -4.99553 | 0.260664  | -19.1646 | 7.31041e-82 | 8.86068e-80 | Conti_non_fene_vs_others |
| Inpp4b                                                                    | 54.9491 | -5.92643 | 0.954988  | -6.20577 | 5.44301e-10 | 7.88911e-09 | Conti_non_fene_vs_others |
| Cacna1a                                                                   | 14.8966 | 3.81669  | 0.277047  | 13.7763  | 3.53972e-43 | 2.20726e-41 | Conti_non_fene_vs_others |
| Man2b1                                                                    | 27.8859 | -3.44264 | 0.589622  | -5.83871 | 5.26059e-09 | 6.90247e-08 | Conti_non_fene_vs_others |
| Nkd1                                                                      | 57.9605 | 3.22038  | 0.136371  | 23.6148  | 2.7189e-123 | 4.9278e-121 | Conti_non_fene_vs_others |
| Chd9                                                                      | 40.4945 | -3.78541 | 0.54608   | -6.93197 | 4.15011e-12 | 7.18599e-11 | Conti_non_fene_vs_others |
| Irx3                                                                      | 27.5433 | -3.69454 | 0.644573  | -5.73176 | 9.9394e-09  | 1.26148e-07 | Conti_non_fene_vs_others |
| Mt1                                                                       | 34.1923 | -5.54327 | 1.05675   | -5.24558 | 1.55793e-07 | 1.69831e-06 | Conti_non_fene_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |          |          |             |             |                          |
|---------------------------------------------------------------------------|---------|----------|----------|----------|-------------|-------------|--------------------------|
| Plip                                                                      | 51.5206 | 8.38928  | 0.312301 | 26.8627  | 5.9864e-159 | 1.5479e-156 | Conti_non_fene_vs_others |
| Adgrg3                                                                    | 21.1704 | -4.52981 | 0.954923 | -4.74364 | 2.09912e-06 | 1.92838e-05 | Conti_non_fene_vs_others |
| Cmtm3                                                                     | 25.6634 | -4.50028 | 0.864282 | -5.20695 | 1.91968e-07 | 2.07401e-06 | Conti_non_fene_vs_others |
| Ces2e                                                                     | 21.7456 | -3.04896 | 0.590753 | -5.16115 | 2.45443e-07 | 2.60529e-06 | Conti_non_fene_vs_others |
| Zfhx3                                                                     | 94.9539 | -3.91514 | 0.372942 | -10.498  | 8.82374e-26 | 3.30984e-24 | Conti_non_fene_vs_others |
| Mtss2                                                                     | 15.3665 | -4.39035 | 1.05584  | -4.15814 | 3.20844e-05 | 0.000234709 | Conti_non_fene_vs_others |
| Rfwd3                                                                     | 10.1858 | -3.44726 | 0.955572 | -3.60754 | 0.000309116 | 0.0017916   | Conti_non_fene_vs_others |
| Maf                                                                       | 364.056 | -8.95558 | 1.05561  | -8.48379 | 2.17978e-17 | 5.56949e-16 | Conti_non_fene_vs_others |
| Cmip                                                                      | 82.6593 | -6.81657 | 1.05511  | -6.46052 | 1.04341e-10 | 1.61491e-09 | Conti_non_fene_vs_others |
| Cdh13                                                                     | 111.629 | -3.36784 | 0.300649 | -11.2019 | 3.99161e-29 | 1.67191e-27 | Conti_non_fene_vs_others |
| Wfdc1                                                                     | 69.7598 | 5.41421  | 0.148644 | 36.4239  | 1.7836e-290 | 8.2355e-288 | Conti_non_fene_vs_others |
| Cottl1                                                                    | 36.9115 | -5.65337 | 1.05521  | -5.35759 | 8.43397e-08 | 9.57612e-07 | Conti_non_fene_vs_others |
| 6430548M08Rik                                                             | 24.1505 | -5.04138 | 1.05539  | -4.77677 | 1.78132e-06 | 1.65923e-05 | Conti_non_fene_vs_others |
| Irf8                                                                      | 10.6826 | -3.86584 | 1.05613  | -3.66039 | 0.000251833 | 0.00149672  | Conti_non_fene_vs_others |
| Fendrr                                                                    | 13.3226 | 3.18942  | 0.297083 | 10.7358  | 6.91431e-27 | 2.71986e-25 | Conti_non_fene_vs_others |
| Slc7a5                                                                    | 67.109  | 4.04531  | 0.12968  | 31.1945  | 1.2662e-213 | 4.385e-211  | Conti_non_fene_vs_others |
| Car5a                                                                     | 24.7139 | 8.67968  | 0.494928 | 17.5373  | 7.44359e-69 | 7.36497e-67 | Conti_non_fene_vs_others |
| Spg7                                                                      | 10.81   | -3.88178 | 1.05575  | -3.67679 | 0.00023619  | 0.00141372  | Conti_non_fene_vs_others |
| Pard3                                                                     | 44.7107 | 4.6764   | 0.175637 | 26.6254  | 3.4461e-156 | 8.15e-154   | Conti_non_fene_vs_others |
| Casp4                                                                     | 12.7571 | -3.78376 | 0.955894 | -3.95835 | 7.54699e-05 | 0.00051264  | Conti_non_fene_vs_others |
| Icam1                                                                     | 17.1066 | -3.26301 | 0.708984 | -4.60237 | 4.17707e-06 | 3.62443e-05 | Conti_non_fene_vs_others |
| Slc44a2                                                                   | 40.3005 | -3.20191 | 0.457286 | -7.00198 | 2.52371e-12 | 4.46554e-11 | Conti_non_fene_vs_others |
| Prkcsh                                                                    | 11.2996 | -3.94545 | 1.056    | -3.73623 | 0.000186796 | 0.00115736  | Conti_non_fene_vs_others |
| Jam3                                                                      | 45.5778 | -3.76014 | 0.511167 | -7.356   | 1.89509e-13 | 3.64598e-12 | Conti_non_fene_vs_others |
| Arhgap32                                                                  | 23.5591 | -4.06784 | 0.782885 | -5.19596 | 2.03663e-07 | 2.19546e-06 | Conti_non_fene_vs_others |
| Kirrel3                                                                   | 13.5929 | -3.883   | 0.963359 | -4.03069 | 5.56141e-05 | 0.000389078 | Conti_non_fene_vs_others |
| St3gal4                                                                   | 158.553 | -4.60032 | 0.361889 | -12.712  | 5.07433e-37 | 2.72594e-35 | Conti_non_fene_vs_others |
| Gramd1b                                                                   | 11.8639 | -3.67505 | 0.956676 | -3.84148 | 0.000122297 | 0.000795606 | Conti_non_fene_vs_others |
| Ubash3b                                                                   | 32.8342 | -5.48398 | 1.05569  | -5.19467 | 2.05085e-07 | 2.20834e-06 | Conti_non_fene_vs_others |
| Mir100hg                                                                  | 25.7368 | -5.13293 | 1.05573  | -4.86197 | 1.16221e-06 | 1.11688e-05 | Conti_non_fene_vs_others |
| Mcam                                                                      | 28.6229 | -4.97741 | 0.955054 | -5.21165 | 1.87165e-07 | 2.02437e-06 | Conti_non_fene_vs_others |
| Cadm1                                                                     | 21.3295 | 5.30931  | 0.323102 | 16.4323  | 1.12352e-60 | 9.85899e-59 | Conti_non_fene_vs_others |
| Zbtb16                                                                    | 11.5339 | -3.29101 | 0.865874 | -3.8008  | 0.000144229 | 0.000917362 | Conti_non_fene_vs_others |
| Plet1os                                                                   | 12.7412 | -4.11762 | 1.05592  | -3.89954 | 9.63743e-05 | 0.000640942 | Conti_non_fene_vs_others |
| Dixdc1                                                                    | 13.8863 | 7.75378  | 0.506742 | 15.3012  | 7.50231e-53 | 5.91432e-51 | Conti_non_fene_vs_others |
| Slc35f2                                                                   | 20.3036 | 7.65732  | 0.410799 | 18.64    | 1.52107e-77 | 1.72503e-75 | Conti_non_fene_vs_others |
| Ube2q2                                                                    | 12.7249 | -3.77998 | 0.956532 | -3.95176 | 7.75784e-05 | 0.000525674 | Conti_non_fene_vs_others |
| Ptpn9                                                                     | 35.9631 | -4.71508 | 0.782248 | -6.0276  | 1.66409e-09 | 2.29365e-08 | Conti_non_fene_vs_others |
| Stra6                                                                     | 10.707  | 7.78358  | 0.854462 | 9.10933  | 8.28896e-20 | 2.42821e-18 | Conti_non_fene_vs_others |
| Hexa                                                                      | 33.2397 | -5.19658 | 0.954854 | -5.44228 | 5.26029e-08 | 6.13057e-07 | Conti_non_fene_vs_others |
| Lrrc49                                                                    | 43.7534 | 3.40284  | 0.157121 | 21.6575  | 5.1677e-104 | 7.9538e-102 | Conti_non_fene_vs_others |
| Paqr5                                                                     | 60.8802 | 7.61387  | 0.263157 | 28.9328  | 4.6204e-184 | 1.3785e-181 | Conti_non_fene_vs_others |
| Calml4                                                                    | 12.8749 | -4.13432 | 1.05598  | -3.91516 | 9.03461e-05 | 0.000604583 | Conti_non_fene_vs_others |
| Map2k1                                                                    | 18.7703 | -4.35559 | 0.95504  | -4.56063 | 5.09995e-06 | 4.35889e-05 | Conti_non_fene_vs_others |
| Plekho2                                                                   | 16.8092 | -4.51828 | 1.05619  | -4.2779  | 1.88665e-05 | 0.000144387 | Conti_non_fene_vs_others |



| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |          |          |             |             |                          |
|---------------------------------------------------------------------------|---------|----------|----------|----------|-------------|-------------|--------------------------|
| Dapk2                                                                     | 43.675  | -5.89603 | 1.05538  | -5.58664 | 2.31508e-08 | 2.81129e-07 | Conti_non_fene_vs_others |
| Rab27a                                                                    | 12.5698 | -4.10023 | 1.05689  | -3.87951 | 0.000104667 | 0.00069041  | Conti_non_fene_vs_others |
| Unc13c                                                                    | 28.8743 | 10.2389  | 0.734303 | 13.9437  | 3.4371e-44  | 2.19262e-42 | Conti_non_fene_vs_others |
| Gsta4                                                                     | 85.492  | 10.002   | 0.407919 | 24.5194  | 9.1652e-133 | 1.7598e-130 | Conti_non_fene_vs_others |
| Myo6                                                                      | 105.064 | -4.41594 | 0.416789 | -10.5951 | 3.13855e-26 | 1.20051e-24 | Conti_non_fene_vs_others |
| Ctsh                                                                      | 82.851  | 5.38904  | 0.174538 | 30.8759  | 2.5135e-209 | 8.5517e-207 | Conti_non_fene_vs_others |
| Tbc1d2b                                                                   | 14.3416 | -3.31899 | 0.782487 | -4.2416  | 2.21936e-05 | 0.00016806  | Conti_non_fene_vs_others |
| Slc9a9                                                                    | 122.745 | -7.38694 | 1.05599  | -6.99529 | 2.64718e-12 | 4.67549e-11 | Conti_non_fene_vs_others |
| Chst2                                                                     | 32.6712 | -5.47732 | 1.0555   | -5.18932 | 2.11069e-07 | 2.26648e-06 | Conti_non_fene_vs_others |
| Ephb1                                                                     | 14.6058 | -4.31702 | 1.05673  | -4.08525 | 4.40292e-05 | 0.000314217 | Conti_non_fene_vs_others |
| Slco2a1                                                                   | 53.7034 | -5.2912  | 0.781787 | -6.76808 | 1.305e-11   | 2.17422e-10 | Conti_non_fene_vs_others |
| Alas1                                                                     | 61.5121 | 3.61553  | 0.13551  | 26.681   | 7.821e-157  | 1.8959e-154 | Conti_non_fene_vs_others |
| Slc38a3                                                                   | 33.8938 | 8.09622  | 0.356872 | 22.6866  | 6.0755e-114 | 1.052e-111  | Conti_non_fene_vs_others |
| Sema3f                                                                    | 40.1476 | -4.86734 | 0.782306 | -6.22178 | 4.91547e-10 | 7.18356e-09 | Conti_non_fene_vs_others |
| Clasp2                                                                    | 38.8649 | -3.72183 | 0.546773 | -6.8069  | 9.97227e-12 | 1.6773e-10  | Conti_non_fene_vs_others |
| Itga9                                                                     | 106.073 | -6.88429 | 0.955327 | -7.20621 | 5.75301e-13 | 1.07587e-11 | Conti_non_fene_vs_others |
| Ctdspl                                                                    | 80.4655 | -6.48027 | 0.954984 | -6.78574 | 1.15495e-11 | 1.93586e-10 | Conti_non_fene_vs_others |
| Myrip                                                                     | 18.8418 | 3.81927  | 0.243713 | 15.6712  | 2.38071e-55 | 1.93988e-53 | Conti_non_fene_vs_others |
| Ulk4                                                                      | 18.6543 | 4.62091  | 0.264245 | 17.4872  | 1.79282e-68 | 1.75596e-66 | Conti_non_fene_vs_others |
| Reps1                                                                     | 12.562  | -3.76937 | 0.955403 | -3.94532 | 7.96943e-05 | 0.000538319 | Conti_non_fene_vs_others |
| Map3k5                                                                    | 15.7744 | -4.09918 | 0.957137 | -4.28275 | 1.84599e-05 | 0.000141499 | Conti_non_fene_vs_others |
| Epb41l2                                                                   | 95.3989 | -3.33673 | 0.309582 | -10.7782 | 4.36391e-27 | 1.72713e-25 | Conti_non_fene_vs_others |
| Rspo3                                                                     | 22.0193 | -4.90848 | 1.07712  | -4.55706 | 5.18748e-06 | 4.42396e-05 | Conti_non_fene_vs_others |
| Tpd52l1                                                                   | 23.9281 | 6.88913  | 0.314889 | 21.878   | 4.2119e-106 | 6.7506e-104 | Conti_non_fene_vs_others |
| Dse                                                                       | 42.6442 | -5.56412 | 0.95586  | -5.82106 | 5.84746e-09 | 7.62095e-08 | Conti_non_fene_vs_others |
| Marcks                                                                    | 200.365 | -5.80486 | 0.481255 | -12.0619 | 1.67824e-33 | 8.21869e-32 | Conti_non_fene_vs_others |
| Fyn                                                                       | 187.735 | -3.84836 | 0.259662 | -14.8206 | 1.07741e-49 | 7.94453e-48 | Conti_non_fene_vs_others |
| E130307A14Rik                                                             | 13.1297 | -3.15453 | 0.782563 | -4.03102 | 5.55344e-05 | 0.000388661 | Conti_non_fene_vs_others |
| Mettl24                                                                   | 11.0305 | -3.22254 | 0.865566 | -3.72305 | 0.000196833 | 0.0012095   | Conti_non_fene_vs_others |
| Cd24a                                                                     | 92.2204 | -3.4504  | 0.324631 | -10.6287 | 2.19203e-26 | 8.4513e-25  | Conti_non_fene_vs_others |
| Dcbld1                                                                    | 48.3836 | -3.49386 | 0.457958 | -7.62921 | 2.36199e-14 | 4.92008e-13 | Conti_non_fene_vs_others |
| Gja1                                                                      | 44.2898 | -5.91618 | 1.05606  | -5.60213 | 2.11733e-08 | 2.58736e-07 | Conti_non_fene_vs_others |
| P4ha1                                                                     | 20.3737 | -3.23594 | 0.645161 | -5.01572 | 5.28361e-07 | 5.33117e-06 | Conti_non_fene_vs_others |
| Oit3                                                                      | 69.1592 | -6.55941 | 1.05537  | -6.21529 | 5.12301e-10 | 7.45315e-09 | Conti_non_fene_vs_others |
| Spock2                                                                    | 711.591 | 10.2984  | 0.154945 | 66.4648  | 0           | 0           | Conti_non_fene_vs_others |
| Psap                                                                      | 149.927 | -3.31095 | 0.244223 | -13.5571 | 7.19256e-42 | 4.41409e-40 | Conti_non_fene_vs_others |
| Col13a1                                                                   | 79.1118 | -5.29266 | 0.643678 | -8.22253 | 1.99248e-16 | 4.74696e-15 | Conti_non_fene_vs_others |
| Tspan15                                                                   | 41.2479 | -5.21257 | 0.863854 | -6.03409 | 1.59866e-09 | 2.20503e-08 | Conti_non_fene_vs_others |
| Ctnna3                                                                    | 22.9485 | -4.9675  | 1.05694  | -4.69989 | 2.603e-06   | 2.33379e-05 | Conti_non_fene_vs_others |
| Tmem26                                                                    | 10.8978 | -3.89355 | 1.05658  | -3.68504 | 0.000228664 | 0.00137491  | Conti_non_fene_vs_others |
| Slc16a9                                                                   | 29.7141 | 5.54092  | 0.245871 | 22.5359  | 1.8474e-112 | 3.1705e-110 | Conti_non_fene_vs_others |
| Fam13c                                                                    | 82.3362 | 3.25176  | 0.130732 | 24.8734  | 1.4421e-136 | 2.8538e-134 | Conti_non_fene_vs_others |
| Bcr                                                                       | 10.6972 | -3.1682  | 0.865333 | -3.66124 | 0.000250994 | 0.00149265  | Conti_non_fene_vs_others |
| Chchd10                                                                   | 13.2786 | -4.1794  | 1.0577   | -3.95142 | 7.76877e-05 | 0.000526047 | Conti_non_fene_vs_others |
| Adarb1                                                                    | 62.1312 | -3.47689 | 0.402373 | -8.64096 | 5.57412e-18 | 1.47274e-16 | Conti_non_fene_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |          |          |             |             |                          |
|---------------------------------------------------------------------------|---------|----------|----------|----------|-------------|-------------|--------------------------|
| Pdxk                                                                      | 36.3025 | 5.32896  | 0.197274 | 27.0129  | 1.0413e-160 | 2.7663e-158 | Conti_non_fene_vs_others |
| Bsg                                                                       | 2009.97 | 5.02474  | 0.036754 | 136.713  | 0           | 0           | Conti_non_fene_vs_others |
| Arhgap45                                                                  | 31.3997 | -5.41994 | 1.05578  | -5.13357 | 2.84296e-07 | 2.98665e-06 | Conti_non_fene_vs_others |
| Sgta                                                                      | 12.2942 | -3.40606 | 0.864673 | -3.93913 | 8.17769e-05 | 0.000550659 | Conti_non_fene_vs_others |
| Tbxa2r                                                                    | 39.9905 | -4.26611 | 0.644376 | -6.62052 | 3.57926e-11 | 5.76996e-10 | Conti_non_fene_vs_others |
| Stab2                                                                     | 446.199 | -9.24907 | 1.05564  | -8.76156 | 1.92568e-18 | 5.24504e-17 | Conti_non_fene_vs_others |
| Dram1                                                                     | 13.4467 | -4.19691 | 1.05572  | -3.97542 | 7.02556e-05 | 0.000481267 | Conti_non_fene_vs_others |
| Chpt1                                                                     | 14.7973 | -3.36637 | 0.782787 | -4.30049 | 1.70421e-05 | 0.00013115  | Conti_non_fene_vs_others |
| Ntn4                                                                      | 81.8115 | -3.69023 | 0.37813  | -9.75916 | 1.68549e-22 | 5.60666e-21 | Conti_non_fene_vs_others |
| Tmcc3                                                                     | 176.264 | -4.2835  | 0.309681 | -13.832  | 1.63471e-43 | 1.02929e-41 | Conti_non_fene_vs_others |
| Plxnc1                                                                    | 142.446 | -7.01702 | 0.864376 | -8.11802 | 4.7386e-16  | 1.10584e-14 | Conti_non_fene_vs_others |
| Gm35533                                                                   | 54.8168 | -6.22424 | 1.06044  | -5.86948 | 4.37156e-09 | 5.79478e-08 | Conti_non_fene_vs_others |
| Ppfia2                                                                    | 47.5819 | -6.01974 | 1.05677  | -5.69636 | 1.22392e-08 | 1.53033e-07 | Conti_non_fene_vs_others |
| Nav3                                                                      | 28.3461 | -5.27277 | 1.05566  | -4.99476 | 5.89097e-07 | 5.90711e-06 | Conti_non_fene_vs_others |
| Ptprr                                                                     | 64.5575 | 3.49382  | 0.157325 | 22.2077  | 2.892e-109  | 4.7935e-107 | Conti_non_fene_vs_others |
| Dyrk2                                                                     | 10.9026 | -3.20288 | 0.865199 | -3.7019  | 0.000213988 | 0.00129764  | Conti_non_fene_vs_others |
| Gpr182                                                                    | 140.667 | -7.29026 | 0.955375 | -7.63079 | 2.33325e-14 | 4.86545e-13 | Conti_non_fene_vs_others |
| Ap1b1                                                                     | 44.0938 | -3.5357  | 0.482757 | -7.32396 | 2.40755e-13 | 4.59543e-12 | Conti_non_fene_vs_others |
| Emid1                                                                     | 10.8532 | -3.54893 | 0.95602  | -3.7122  | 0.000205467 | 0.00125381  | Conti_non_fene_vs_others |
| Znrf3                                                                     | 31.4053 | 4.41977  | 0.207186 | 21.3324  | 5.6788e-101 | 8.4715e-99  | Conti_non_fene_vs_others |
| Igfbp3                                                                    | 315.128 | -5.37083 | 0.331963 | -16.179  | 7.09337e-59 | 5.95505e-57 | Conti_non_fene_vs_others |
| Tns3                                                                      | 29.8561 | -5.34679 | 1.05555  | -5.06542 | 4.07502e-07 | 4.17469e-06 | Conti_non_fene_vs_others |
| Upp1                                                                      | 21.904  | -4.59504 | 0.954974 | -4.8117  | 1.49654e-06 | 1.41159e-05 | Conti_non_fene_vs_others |
| Ddc                                                                       | 36.2783 | 8.33655  | 0.366062 | 22.7736  | 8.3852e-115 | 1.465e-112  | Conti_non_fene_vs_others |
| Gm12002                                                                   | 40.8233 | -5.49331 | 0.955402 | -5.74973 | 8.93855e-09 | 1.14193e-07 | Conti_non_fene_vs_others |
| Cnrip1                                                                    | 15.5938 | -4.40993 | 1.05554  | -4.17788 | 2.94236e-05 | 0.000216798 | Conti_non_fene_vs_others |
| Meis1                                                                     | 42.392  | -5.85297 | 1.05563  | -5.5445  | 2.94794e-08 | 3.5399e-07  | Conti_non_fene_vs_others |
| Ugp2                                                                      | 16.1701 | -4.15036 | 0.955713 | -4.34269 | 1.40752e-05 | 0.000110376 | Conti_non_fene_vs_others |
| Mdh1                                                                      | 16.7662 | -3.5345  | 0.782571 | -4.51652 | 6.28637e-06 | 5.25481e-05 | Conti_non_fene_vs_others |
| Slit3                                                                     | 24.4328 | -5.0582  | 1.05685  | -4.78611 | 1.70048e-06 | 1.59081e-05 | Conti_non_fene_vs_others |
| Rnf145                                                                    | 20.8077 | -4.50872 | 0.955202 | -4.72017 | 2.35648e-06 | 2.1445e-05  | Conti_non_fene_vs_others |
| Adam19                                                                    | 23.8114 | -5.02028 | 1.05545  | -4.75654 | 1.96935e-06 | 1.81952e-05 | Conti_non_fene_vs_others |
| Btnl9                                                                     | 151.913 | -6.24672 | 0.643401 | -9.70891 | 2.76281e-22 | 9.12761e-21 | Conti_non_fene_vs_others |
| Mgat1                                                                     | 41.2527 | -3.80842 | 0.546903 | -6.96361 | 3.31657e-12 | 5.78923e-11 | Conti_non_fene_vs_others |
| Tbc1d9b                                                                   | 23.3787 | -3.73908 | 0.708802 | -5.27521 | 1.32603e-07 | 1.4622e-06  | Conti_non_fene_vs_others |
| Tcf7                                                                      | 18.4952 | 5.83899  | 0.301428 | 19.3711  | 1.35301e-83 | 1.65024e-81 | Conti_non_fene_vs_others |
| 2026-09-08 00:00:00                                                       | 10.0302 | -3.77189 | 1.05604  | -3.57172 | 0.000354644 | 0.00202283  | Conti_non_fene_vs_others |
| Fnip1                                                                     | 47.1429 | -3.82248 | 0.511286 | -7.47621 | 7.6494e-14  | 1.52461e-12 | Conti_non_fene_vs_others |
| 2410006H16Rik                                                             | 15.4438 | -3.74974 | 0.864854 | -4.33569 | 1.45303e-05 | 0.000113577 | Conti_non_fene_vs_others |
| Hs3st3b1                                                                  | 31.1997 | -5.1028  | 0.956098 | -5.33711 | 9.44412e-08 | 1.06421e-06 | Conti_non_fene_vs_others |
| Gas7                                                                      | 37.063  | -5.65889 | 1.05598  | -5.35889 | 8.37346e-08 | 9.51298e-07 | Conti_non_fene_vs_others |
| Arrb2                                                                     | 15.0695 | -4.36029 | 1.05602  | -4.12898 | 3.64381e-05 | 0.000263673 | Conti_non_fene_vs_others |
| Cxcl16                                                                    | 21.9908 | -3.65069 | 0.709577 | -5.14488 | 2.67688e-07 | 2.82749e-06 | Conti_non_fene_vs_others |
| Slc43a2                                                                   | 49.3206 | -4.58098 | 0.645576 | -7.09596 | 1.28452e-12 | 2.31728e-11 | Conti_non_fene_vs_others |
| Myo18a                                                                    | 59.9508 | -4.18307 | 0.510697 | -8.19091 | 2.59257e-16 | 6.15393e-15 | Conti_non_fene_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                          |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|--------------------------|
| Flot2                                                                     | 10.225  | -3.47489 | 0.955911  | -3.63516 | 0.000277804 | 0.00162669  | Conti_non_fene_vs_others |
| Acsf2                                                                     | 15.6094 | -3.10736 | 0.709813  | -4.37772 | 1.19927e-05 | 9.51617e-05 | Conti_non_fene_vs_others |
| Ppp1r9b                                                                   | 21.4489 | -3.3069  | 0.644082  | -5.13429 | 2.83205e-07 | 2.9768e-06  | Conti_non_fene_vs_others |
| Abi3                                                                      | 28.2767 | -4.33456 | 0.782321  | -5.54064 | 3.01374e-08 | 3.6122e-07  | Conti_non_fene_vs_others |
| Hoxb5                                                                     | 13.7972 | -4.23463 | 1.05593   | -4.01032 | 6.06374e-05 | 0.000421032 | Conti_non_fene_vs_others |
| Hoxb4                                                                     | 12.1332 | -4.04788 | 1.0557    | -3.83431 | 0.000125917 | 0.000815871 | Conti_non_fene_vs_others |
| Hoxb3                                                                     | 11.2729 | -3.94302 | 1.05751   | -3.72858 | 0.000192563 | 0.00118929  | Conti_non_fene_vs_others |
| Arhgap23                                                                  | 87.0551 | -3.33836 | 0.325118  | -10.2681 | 9.80793e-25 | 3.55524e-23 | Conti_non_fene_vs_others |
| Thra                                                                      | 31.7336 | -4.51808 | 0.78197   | -5.77782 | 7.56742e-09 | 9.74469e-08 | Conti_non_fene_vs_others |
| Igfbp4                                                                    | 150.222 | -7.09331 | 0.864279  | -8.2072  | 2.26411e-16 | 5.38088e-15 | Conti_non_fene_vs_others |
| Tmem106a                                                                  | 33.4619 | -3.99639 | 0.643942  | -6.20613 | 5.43065e-10 | 7.87709e-09 | Conti_non_fene_vs_others |
| Cd300lg                                                                   | 145.988 | -6.4694  | 0.708211  | -9.13485 | 6.54955e-20 | 1.9274e-18  | Conti_non_fene_vs_others |
| Hdac5                                                                     | 10.0798 | -3.45506 | 0.955686  | -3.61527 | 0.000300038 | 0.00174367  | Conti_non_fene_vs_others |
| Mapt                                                                      | 12.5789 | -4.10163 | 1.05751   | -3.87856 | 0.000105077 | 0.000692406 | Conti_non_fene_vs_others |
| Tanc2                                                                     | 40.0671 | -5.47348 | 0.955073  | -5.73096 | 9.9864e-09  | 1.26579e-07 | Conti_non_fene_vs_others |
| Gh                                                                        | 74.9303 | -6.67497 | 1.06717   | -6.25483 | 3.97953e-10 | 5.89573e-09 | Conti_non_fene_vs_others |
| Tex2                                                                      | 21.4649 | -4.87134 | 1.05632   | -4.61163 | 3.99527e-06 | 3.47913e-05 | Conti_non_fene_vs_others |
| Axin2                                                                     | 24.0788 | 5.27437  | 0.240034  | 21.9734  | 5.169e-107  | 8.4238e-105 | Conti_non_fene_vs_others |
| Fam20a                                                                    | 18.6586 | -3.09413 | 0.646138  | -4.78865 | 1.67909e-06 | 1.57155e-05 | Conti_non_fene_vs_others |
| Ttyh2                                                                     | 21.9937 | 5.31335  | 0.250144  | 21.2412  | 3.9761e-100 | 5.88608e-98 | Conti_non_fene_vs_others |
| Jpt1                                                                      | 18.2979 | -4.31971 | 0.955446  | -4.52115 | 6.15058e-06 | 5.15686e-05 | Conti_non_fene_vs_others |
| Rnf157                                                                    | 18.5964 | -4.66441 | 1.05605   | -4.41685 | 1.0015e-05  | 8.03229e-05 | Conti_non_fene_vs_others |
| C1qtnf1                                                                   | 12.0407 | -4.03702 | 1.05686   | -3.81983 | 0.000133541 | 0.000857823 | Conti_non_fene_vs_others |
| Mafig                                                                     | 21.2841 | -3.30027 | 0.644116  | -5.12372 | 2.99559e-07 | 3.1368e-06  | Conti_non_fene_vs_others |
| Notum                                                                     | 18.556  | 8.76537  | 0.590948  | 14.8327  | 8.99914e-50 | 6.66108e-48 | Conti_non_fene_vs_others |
| Kidins220                                                                 | 32.207  | -4.85251 | 0.864253  | -5.61468 | 1.96923e-08 | 2.41247e-07 | Conti_non_fene_vs_others |
| Rnf144a                                                                   | 55.8445 | -5.65636 | 0.863872  | -6.54769 | 5.84352e-11 | 9.22829e-10 | Conti_non_fene_vs_others |
| Pxdn                                                                      | 31.4508 | -5.42219 | 1.05593   | -5.13501 | 2.82123e-07 | 2.96929e-06 | Conti_non_fene_vs_others |
| Prkar2b                                                                   | 10.6662 | 4.78474  | 0.411428  | 11.6296  | 2.9154e-31  | 1.31791e-29 | Conti_non_fene_vs_others |
| Hdac9                                                                     | 15.4053 | -3.74213 | 0.868028  | -4.31107 | 1.62467e-05 | 0.000125828 | Conti_non_fene_vs_others |
| Ahr                                                                       | 40.316  | -3.38714 | 0.482103  | -7.02577 | 2.12888e-12 | 3.79461e-11 | Conti_non_fene_vs_others |
| Etv1                                                                      | 11.1864 | -3.93026 | 1.0564    | -3.72045 | 0.000198869 | 0.00121969  | Conti_non_fene_vs_others |
| Arl4a                                                                     | 132.018 | 3.29575  | 0.0906378 | 36.3617  | 1.714e-289  | 7.73e-287   | Conti_non_fene_vs_others |
| Lrrn3                                                                     | 28.1344 | 8.7394   | 0.476255  | 18.3503  | 3.28586e-75 | 3.62061e-73 | Conti_non_fene_vs_others |
| Stxbp6                                                                    | 51.9783 | 3.81395  | 0.16397   | 23.26    | 1.127e-119  | 2.0052e-117 | Conti_non_fene_vs_others |
| Klhdc2                                                                    | 10.8476 | -3.55062 | 0.955628  | -3.71548 | 0.000202815 | 0.00123997  | Conti_non_fene_vs_others |
| Map4k5                                                                    | 50.41   | -3.03486 | 0.386678  | -7.84855 | 4.20886e-15 | 9.25424e-14 | Conti_non_fene_vs_others |
| Slc38a6                                                                   | 36.875  | -3.87622 | 0.590472  | -6.56461 | 5.21707e-11 | 8.27266e-10 | Conti_non_fene_vs_others |
| Sgpp1                                                                     | 52.3649 | -3.4872  | 0.436015  | -7.99789 | 1.26566e-15 | 2.84086e-14 | Conti_non_fene_vs_others |
| Sipa1l1                                                                   | 19.8991 | -3.80476 | 0.782247  | -4.86388 | 1.15106e-06 | 1.10672e-05 | Conti_non_fene_vs_others |
| Flvcr2                                                                    | 18.3411 | 6.24796  | 0.317921  | 19.6525  | 5.49835e-86 | 6.83523e-84 | Conti_non_fene_vs_others |
| Ift43                                                                     | 21.6874 | -3.04641 | 0.589791  | -5.16524 | 2.40128e-07 | 2.55587e-06 | Conti_non_fene_vs_others |
| Ccdc88c                                                                   | 12.9453 | -4.14125 | 1.05616   | -3.92103 | 8.81698e-05 | 0.000590631 | Conti_non_fene_vs_others |
| Lgmn                                                                      | 61.7393 | -6.39577 | 1.05579   | -6.05781 | 1.3799e-09  | 1.91694e-08 | Conti_non_fene_vs_others |
| Serpina3g                                                                 | 17.433  | -4.23871 | 0.956919  | -4.42954 | 9.44348e-06 | 7.6339e-05  | Conti_non_fene_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |          |          |             |             |                          |
|---------------------------------------------------------------------------|---------|----------|----------|----------|-------------|-------------|--------------------------|
| Degs2                                                                     | 38.4642 | 8.23988  | 0.35039  | 23.5163  | 2.7786e-122 | 4.9893e-120 | Conti_non_fene_vs_others |
| Traf3                                                                     | 17.2509 | -4.55645 | 1.05588  | -4.31529 | 1.59395e-05 | 0.000123646 | Conti_non_fene_vs_others |
| Exoc3l4                                                                   | 17.1861 | -4.54986 | 1.0555   | -4.31061 | 1.62807e-05 | 0.00012604  | Conti_non_fene_vs_others |
| Tnfaip2                                                                   | 34.1191 | -4.92726 | 0.864405 | -5.70017 | 1.19688e-08 | 1.49942e-07 | Conti_non_fene_vs_others |
| Ckb                                                                       | 11.9929 | -3.69179 | 0.955503 | -3.86372 | 0.000111674 | 0.000731156 | Conti_non_fene_vs_others |
| Pacs2                                                                     | 10.4226 | -3.47929 | 0.955677 | -3.64065 | 0.000271948 | 0.00159718  | Conti_non_fene_vs_others |
| Net1                                                                      | 49.0786 | 4.81088  | 0.166976 | 28.8117  | 1.5292e-182 | 4.4262e-180 | Conti_non_fene_vs_others |
| Chrm3                                                                     | 188.064 | -7.4195  | 0.86447  | -8.58272 | 9.26563e-18 | 2.41193e-16 | Conti_non_fene_vs_others |
| Ripor2                                                                    | 12.0259 | -3.71588 | 0.95848  | -3.87685 | 0.000105818 | 0.000696342 | Conti_non_fene_vs_others |
| Mboat1                                                                    | 12.1309 | 6.78606  | 0.440444 | 15.4073  | 1.46137e-53 | 1.17109e-51 | Conti_non_fene_vs_others |
| Foxq1                                                                     | 121.039 | 8.59369  | 0.21594  | 39.7967  | 0           | 0           | Conti_non_fene_vs_others |
| 1700018A04Rik                                                             | 12.1926 | 9.54291  | 0.912299 | 10.4603  | 1.31447e-25 | 4.89279e-24 | Conti_non_fene_vs_others |
| Foxf2                                                                     | 45.724  | 9.5814   | 0.479181 | 19.9954  | 6.04202e-89 | 7.97094e-87 | Conti_non_fene_vs_others |
| Foxc1                                                                     | 62.0793 | 4.99536  | 0.14701  | 33.9796  | 4.4569e-253 | 1.8007e-250 | Conti_non_fene_vs_others |
| Bmp6                                                                      | 90.8972 | -6.36186 | 0.863895 | -7.36416 | 1.78265e-13 | 3.43647e-12 | Conti_non_fene_vs_others |
| Edn1                                                                      | 77.2945 | 4.76471  | 0.26176  | 18.2026  | 4.92092e-74 | 5.33137e-72 | Conti_non_fene_vs_others |
| Phactr1                                                                   | 23.4862 | -3.16683 | 0.589891 | -5.3685  | 7.93939e-08 | 9.04633e-07 | Conti_non_fene_vs_others |
| Dtnbp1                                                                    | 10.8817 | -3.89131 | 1.05599  | -3.68499 | 0.000228714 | 0.00137491  | Conti_non_fene_vs_others |
| Myliip                                                                    | 69.5912 | -3.44043 | 0.373782 | -9.20436 | 3.43723e-20 | 1.02393e-18 | Conti_non_fene_vs_others |
| Gmpr                                                                      | 13.7269 | -3.2621  | 0.78267  | -4.16792 | 3.07397e-05 | 0.000225552 | Conti_non_fene_vs_others |
| Id4                                                                       | 23.3732 | -4.99398 | 1.05537  | -4.73195 | 2.22368e-06 | 2.03127e-05 | Conti_non_fene_vs_others |
| Ctsl                                                                      | 166.877 | -3.19326 | 0.224144 | -14.2465 | 4.71507e-46 | 3.1208e-44  | Conti_non_fene_vs_others |
| A830082K12Rik                                                             | 10.1015 | -3.7838  | 1.05711  | -3.57939 | 0.000344403 | 0.00197254  | Conti_non_fene_vs_others |
| Mef2c                                                                     | 239.003 | -3.14293 | 0.184361 | -17.0477 | 3.63356e-65 | 3.40414e-63 | Conti_non_fene_vs_others |
| Edil3                                                                     | 42.6755 | -5.86262 | 1.05578  | -5.55285 | 2.81043e-08 | 3.37897e-07 | Conti_non_fene_vs_others |
| Rasgrf2                                                                   | 29.8941 | -4.74746 | 0.864388 | -5.49228 | 3.96771e-08 | 4.68896e-07 | Conti_non_fene_vs_others |
| F2r                                                                       | 67.6426 | -5.63534 | 0.78182  | -7.20798 | 5.67892e-13 | 1.06304e-11 | Conti_non_fene_vs_others |
| Iqgap2                                                                    | 35.6573 | -5.60358 | 1.05558  | -5.30853 | 1.1051e-07  | 1.23452e-06 | Conti_non_fene_vs_others |
| Hexb                                                                      | 23.8167 | -5.02132 | 1.05521  | -4.75862 | 1.9492e-06  | 1.80175e-05 | Conti_non_fene_vs_others |
| Map1b                                                                     | 22.0159 | -4.58604 | 0.955505 | -4.7996  | 1.58982e-06 | 1.49304e-05 | Conti_non_fene_vs_others |
| Ocln                                                                      | 66.673  | 10.4636  | 0.523383 | 19.9921  | 6.44641e-89 | 8.44697e-87 | Conti_non_fene_vs_others |
| Pik3r1                                                                    | 37.927  | -4.19575 | 0.643938 | -6.51576 | 7.2321e-11  | 1.13841e-09 | Conti_non_fene_vs_others |
| Adamts6                                                                   | 12.0269 | -3.68938 | 0.955606 | -3.86077 | 0.000113029 | 0.000739035 | Conti_non_fene_vs_others |
| Rgs7bp                                                                    | 21.7482 | -4.5845  | 0.956723 | -4.79189 | 1.65221e-06 | 1.54714e-05 | Conti_non_fene_vs_others |
| Zswim6                                                                    | 144.285 | -3.3895  | 0.258598 | -13.1072 | 2.995e-39   | 1.71333e-37 | Conti_non_fene_vs_others |
| Elovl7                                                                    | 80.2973 | 8.14037  | 0.234308 | 34.7421  | 1.8224e-264 | 7.8539e-262 | Conti_non_fene_vs_others |
| Plpp1                                                                     | 674.129 | -4.94776 | 0.196716 | -25.1517 | 1.3527e-139 | 2.7326e-137 | Conti_non_fene_vs_others |
| Esm1                                                                      | 148.628 | -6.21297 | 0.646603 | -9.60863 | 7.35213e-22 | 2.38827e-20 | Conti_non_fene_vs_others |
| Parp8                                                                     | 19.162  | -4.7073  | 1.05687  | -4.45399 | 8.42872e-06 | 6.87088e-05 | Conti_non_fene_vs_others |
| Dnase1l3                                                                  | 238.181 | -8.34346 | 1.05513  | -7.90755 | 2.62508e-15 | 5.81145e-14 | Conti_non_fene_vs_others |
| Il3ra                                                                     | 11.2267 | -3.9367  | 1.05601  | -3.72791 | 0.000193076 | 0.00119138  | Conti_non_fene_vs_others |
| Lrrc3b                                                                    | 23.2378 | -4.98581 | 1.05679  | -4.71789 | 2.38308e-06 | 2.16262e-05 | Conti_non_fene_vs_others |
| Rarb                                                                      | 61.1005 | -6.38074 | 1.05512  | -6.04742 | 1.47187e-09 | 2.03886e-08 | Conti_non_fene_vs_others |
| Gng2                                                                      | 19.979  | -4.76746 | 1.05528  | -4.51773 | 6.25051e-06 | 5.23385e-05 | Conti_non_fene_vs_others |
| Camk2g                                                                    | 12.8699 | -4.13199 | 1.05563  | -3.91423 | 9.06947e-05 | 0.000606288 | Conti_non_fene_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |          |          |             |             |                          |
|---------------------------------------------------------------------------|---------|----------|----------|----------|-------------|-------------|--------------------------|
| Zfp503                                                                    | 36.3815 | -5.63202 | 1.0552   | -5.3374  | 9.42864e-08 | 1.06308e-06 | Conti_non_fene_vs_others |
| Lrmda                                                                     | 424.236 | -5.73067 | 0.324457 | -17.6623 | 8.17886e-70 | 8.30821e-68 | Conti_non_fene_vs_others |
| Zcchc24                                                                   | 24.2118 | -4.4163  | 0.864998 | -5.10557 | 3.29804e-07 | 3.42943e-06 | Conti_non_fene_vs_others |
| Wnt5a                                                                     | 25.7377 | 10.6729  | 0.890079 | 11.991   | 3.96293e-33 | 1.89761e-31 | Conti_non_fene_vs_others |
| Stab1                                                                     | 135.117 | -4.09777 | 0.332599 | -12.3205 | 7.02925e-35 | 3.54073e-33 | Conti_non_fene_vs_others |
| Sh3bp5                                                                    | 151.612 | -5.09612 | 0.435877 | -11.6917 | 1.4062e-31  | 6.46219e-30 | Conti_non_fene_vs_others |
| Samd4                                                                     | 24.2627 | -5.04899 | 1.05569  | -4.78264 | 1.73004e-06 | 1.61534e-05 | Conti_non_fene_vs_others |
| Peli2                                                                     | 21.3482 | -3.03612 | 0.591265 | -5.13497 | 2.82196e-07 | 2.96929e-06 | Conti_non_fene_vs_others |
| Osgep                                                                     | 10.3453 | -3.14153 | 0.864785 | -3.63273 | 0.000280436 | 0.00164156  | Conti_non_fene_vs_others |
| Slc7a7                                                                    | 26.7484 | -3.36464 | 0.590203 | -5.70083 | 1.19227e-08 | 1.49559e-07 | Conti_non_fene_vs_others |
| Mmp14                                                                     | 22.0226 | -4.5914  | 0.956068 | -4.80237 | 1.56795e-06 | 1.47481e-05 | Conti_non_fene_vs_others |
| Phf11d                                                                    | 15.774  | -3.13255 | 0.710269 | -4.41037 | 1.03196e-05 | 8.2663e-05  | Conti_non_fene_vs_others |
| Tnfrsf19                                                                  | 49.4213 | 11.5551  | 0.881059 | 13.115   | 2.70267e-39 | 1.55068e-37 | Conti_non_fene_vs_others |
| Fam124a                                                                   | 55.2615 | -6.23596 | 1.05519  | -5.90978 | 3.42558e-09 | 4.59421e-08 | Conti_non_fene_vs_others |
| Wdfy2                                                                     | 28.1354 | -4.64043 | 0.864172 | -5.3698  | 7.88261e-08 | 8.98691e-07 | Conti_non_fene_vs_others |
| Ctsb                                                                      | 103.018 | -5.96042 | 0.708319 | -8.41488 | 3.93304e-17 | 9.7912e-16  | Conti_non_fene_vs_others |
| Gata4                                                                     | 100.074 | -7.09252 | 1.05612  | -6.71565 | 1.87226e-11 | 3.07441e-10 | Conti_non_fene_vs_others |
| Xkr6                                                                      | 15.4817 | -4.39964 | 1.05601  | -4.16627 | 3.09618e-05 | 0.00022701  | Conti_non_fene_vs_others |
| Msra                                                                      | 10.2814 | -3.10935 | 0.865325 | -3.59328 | 0.00032654  | 0.00188134  | Conti_non_fene_vs_others |
| Clu                                                                       | 15.4286 | -4.39484 | 1.05725  | -4.15685 | 3.22672e-05 | 0.000235868 | Conti_non_fene_vs_others |
| Nefl                                                                      | 10.3735 | 9.8679   | 1.10412  | 8.93732  | 3.98713e-19 | 1.12715e-17 | Conti_non_fene_vs_others |
| Slc25a37                                                                  | 14.3211 | -3.62255 | 0.865908 | -4.18353 | 2.87016e-05 | 0.000212365 | Conti_non_fene_vs_others |
| Pcdh17                                                                    | 158.752 | -7.75805 | 1.05534  | -7.35121 | 1.96426e-13 | 3.77156e-12 | Conti_non_fene_vs_others |
| Dach1                                                                     | 105.732 | 3.16644  | 0.158655 | 19.958   | 1.27848e-88 | 1.64196e-86 | Conti_non_fene_vs_others |
| Ednrb                                                                     | 99.3643 | -7.08234 | 1.05599  | -6.70684 | 1.98879e-11 | 3.263e-10   | Conti_non_fene_vs_others |
| Rap2a                                                                     | 18.0834 | -3.03491 | 0.644813 | -4.70665 | 2.51816e-06 | 2.26633e-05 | Conti_non_fene_vs_others |
| Zic5                                                                      | 17.3391 | 10.5944  | 1.08808  | 9.7368   | 2.10056e-22 | 6.97539e-21 | Conti_non_fene_vs_others |
| Zic2                                                                      | 27.5621 | 11.2958  | 1.07876  | 10.4711  | 1.17283e-25 | 4.37398e-24 | Conti_non_fene_vs_others |
| Ggact                                                                     | 20.2079 | 4.21165  | 0.239186 | 17.6082  | 2.12985e-69 | 2.11816e-67 | Conti_non_fene_vs_others |
| Ccdc152                                                                   | 22.1182 | 3.27526  | 0.257352 | 12.7267  | 4.19997e-37 | 2.2688e-35  | Conti_non_fene_vs_others |
| Oxct1                                                                     | 13.6728 | -4.22023 | 1.05588  | -3.99689 | 6.41803e-05 | 0.000443567 | Conti_non_fene_vs_others |
| Npr3                                                                      | 65.3842 | -6.17933 | 0.956253 | -6.46203 | 1.03309e-10 | 1.60021e-09 | Conti_non_fene_vs_others |
| Ncald                                                                     | 18.0404 | -4.61974 | 1.05532  | -4.37757 | 1.20012e-05 | 9.51898e-05 | Conti_non_fene_vs_others |
| Cthrc1                                                                    | 11.38   | 5.9492   | 0.40339  | 14.748   | 3.16955e-49 | 2.28502e-47 | Conti_non_fene_vs_others |
| Zfp2                                                                      | 41.978  | -5.83886 | 1.05683  | -5.52486 | 3.29753e-08 | 3.9329e-07  | Conti_non_fene_vs_others |
| Sntb1                                                                     | 118.458 | -7.33572 | 1.05652  | -6.94329 | 3.83083e-12 | 6.65692e-11 | Conti_non_fene_vs_others |
| Trib1                                                                     | 13.9682 | -3.92468 | 0.955619 | -4.10696 | 4.00905e-05 | 0.00028774  | Conti_non_fene_vs_others |
| Fam49b                                                                    | 15.5497 | -3.40747 | 0.782902 | -4.35236 | 1.34679e-05 | 0.000106043 | Conti_non_fene_vs_others |
| Tg                                                                        | 31.5745 | -5.42833 | 1.06732  | -5.08594 | 3.65814e-07 | 3.77754e-06 | Conti_non_fene_vs_others |
| Khdrbs3                                                                   | 15.4131 | -4.39366 | 1.05626  | -4.15965 | 3.18739e-05 | 0.000233345 | Conti_non_fene_vs_others |
| Gpihbp1                                                                   | 298.965 | -6.75549 | 0.546008 | -12.3725 | 3.68206e-35 | 1.87418e-33 | Conti_non_fene_vs_others |
| Kctd17                                                                    | 16.5081 | -4.16583 | 0.955502 | -4.35983 | 1.30161e-05 | 0.00010261  | Conti_non_fene_vs_others |
| Lgals1                                                                    | 27.8625 | -5.24762 | 1.05797  | -4.96009 | 7.04588e-07 | 6.98573e-06 | Conti_non_fene_vs_others |
| Cbx6                                                                      | 15.014  | -4.02701 | 0.95536  | -4.21517 | 2.49591e-05 | 0.000186453 | Conti_non_fene_vs_others |
| Tcf20                                                                     | 23.4673 | -3.45778 | 0.644127 | -5.36816 | 7.95423e-08 | 9.05792e-07 | Conti_non_fene_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |          |          |             |             |                          |
|---------------------------------------------------------------------------|---------|----------|----------|----------|-------------|-------------|--------------------------|
| Bik                                                                       | 23.3069 | -4.03939 | 0.782121 | -5.16466 | 2.40877e-07 | 2.56244e-06 | Conti_non_fene_vs_others |
| Atxn10                                                                    | 19.6279 | -3.80448 | 0.782152 | -4.86412 | 1.1497e-06  | 1.10596e-05 | Conti_non_fene_vs_others |
| Slc2a13                                                                   | 22.4809 | -4.62548 | 0.955372 | -4.84155 | 1.28833e-06 | 1.22956e-05 | Conti_non_fene_vs_others |
| Slc48a1                                                                   | 13.0154 | -3.17618 | 0.785032 | -4.04592 | 5.21174e-05 | 0.000366465 | Conti_non_fene_vs_others |
| Csad                                                                      | 13.0203 | -3.13551 | 0.782887 | -4.00505 | 6.20032e-05 | 0.000429439 | Conti_non_fene_vs_others |
| Litaf                                                                     | 14.686  | -4.32408 | 1.05584  | -4.0954  | 4.21445e-05 | 0.000301145 | Conti_non_fene_vs_others |
| Snx29                                                                     | 36.3731 | -4.41892 | 0.709158 | -6.23122 | 4.62807e-10 | 6.78398e-09 | Conti_non_fene_vs_others |
| Tbx1                                                                      | 28.8496 | 9.06599  | 0.512219 | 17.6994  | 4.23601e-70 | 4.3465e-68  | Conti_non_fene_vs_others |
| Cldn5                                                                     | 1104.81 | 3.38209  | 0.04082  | 82.8538  | 0           | 0           | Conti_non_fene_vs_others |
| Abcc5                                                                     | 17.8177 | -3.00768 | 0.645084 | -4.66247 | 3.12444e-06 | 2.76551e-05 | Conti_non_fene_vs_others |
| Vps8                                                                      | 18.7689 | -3.10516 | 0.644739 | -4.81615 | 1.46354e-06 | 1.38518e-05 | Conti_non_fene_vs_others |
| Masp1                                                                     | 27.4816 | -5.22775 | 1.05534  | -4.95362 | 7.28461e-07 | 7.21135e-06 | Conti_non_fene_vs_others |
| Mb21d2                                                                    | 38.0086 | -4.48529 | 0.710005 | -6.31727 | 2.66222e-10 | 4.0022e-09  | Conti_non_fene_vs_others |
| Gm46565                                                                   | 12.736  | -4.11739 | 1.0578   | -3.89242 | 9.92491e-05 | 0.000657132 | Conti_non_fene_vs_others |
| Acap2                                                                     | 73.1718 | -3.52949 | 0.373876 | -9.44028 | 3.71797e-21 | 1.16107e-19 | Conti_non_fene_vs_others |
| Apod                                                                      | 26.2199 | 6.65076  | 0.502163 | 13.2442  | 4.87342e-40 | 2.82965e-38 | Conti_non_fene_vs_others |
| Nrros                                                                     | 19.0832 | -3.12702 | 0.644763 | -4.84988 | 1.23538e-06 | 1.18251e-05 | Conti_non_fene_vs_others |
| Tfrc                                                                      | 175.575 | 9.51309  | 0.236588 | 40.2095  | 0           | 0           | Conti_non_fene_vs_others |
| Itgb5                                                                     | 17.7659 | -4.599   | 1.05642  | -4.35336 | 1.34066e-05 | 0.000105603 | Conti_non_fene_vs_others |
| Ccdc80                                                                    | 23.7866 | -4.70516 | 0.955814 | -4.92268 | 8.53679e-07 | 8.36976e-06 | Conti_non_fene_vs_others |
| Gm609                                                                     | 14.6198 | 7.9234   | 0.694848 | 11.4031  | 4.03619e-30 | 1.74329e-28 | Conti_non_fene_vs_others |
| Robo1                                                                     | 25.7483 | -5.13387 | 1.05852  | -4.85006 | 1.23425e-06 | 1.18202e-05 | Conti_non_fene_vs_others |
| Mir99ahg                                                                  | 91.3607 | -6.96082 | 1.05534  | -6.59583 | 4.22869e-11 | 6.74955e-10 | Conti_non_fene_vs_others |
| Bace2                                                                     | 35.3587 | -5.59137 | 1.05549  | -5.2974  | 1.17464e-07 | 1.30843e-06 | Conti_non_fene_vs_others |
| Gm49797                                                                   | 13.9184 | -3.92229 | 0.955743 | -4.10391 | 4.06217e-05 | 0.000291122 | Conti_non_fene_vs_others |
| Mpc1                                                                      | 23.8446 | -3.78632 | 0.708635 | -5.34313 | 9.13575e-08 | 1.03366e-06 | Conti_non_fene_vs_others |
| Prkn                                                                      | 27.7451 | -4.61947 | 0.865121 | -5.33968 | 9.31103e-08 | 1.05227e-06 | Conti_non_fene_vs_others |
| Airm                                                                      | 52.4061 | -3.33784 | 0.418362 | -7.97834 | 1.48309e-15 | 3.31737e-14 | Conti_non_fene_vs_others |
| 9530082P21Rik                                                             | 13.4055 | -3.21191 | 0.782795 | -4.10312 | 4.07607e-05 | 0.00029201  | Conti_non_fene_vs_others |
| Mapk8ip3                                                                  | 10.1719 | -3.09925 | 0.865299 | -3.58171 | 0.000341349 | 0.00195851  | Conti_non_fene_vs_others |
| Fkbp5                                                                     | 39.4531 | -5.74968 | 1.05572  | -5.44622 | 5.1451e-08  | 6.00355e-07 | Conti_non_fene_vs_others |
| Abcg1                                                                     | 26.5375 | -3.12407 | 0.54646  | -5.71693 | 1.08463e-08 | 1.36793e-07 | Conti_non_fene_vs_others |
| Cd320                                                                     | 26.1444 | 3.16695  | 0.2057   | 15.3959  | 1.74254e-53 | 1.39066e-51 | Conti_non_fene_vs_others |
| Slc39a7                                                                   | 10.1564 | -3.0757  | 0.865486 | -3.55373 | 0.000379815 | 0.0021487   | Conti_non_fene_vs_others |
| Ehmt2                                                                     | 12.6116 | -3.11215 | 0.78368  | -3.9712  | 7.15108e-05 | 0.000488829 | Conti_non_fene_vs_others |
| H2-Q6                                                                     | 22.602  | -4.31652 | 0.864511 | -4.99302 | 5.94431e-07 | 5.9483e-06  | Conti_non_fene_vs_others |
| H2-Q7                                                                     | 52.2036 | -5.26183 | 0.781724 | -6.73106 | 1.68437e-11 | 2.77961e-10 | Conti_non_fene_vs_others |
| Slc29a1                                                                   | 84.5895 | -3.20798 | 0.316095 | -10.1488 | 3.35438e-24 | 1.18707e-22 | Conti_non_fene_vs_others |
| Rftn1                                                                     | 33.6411 | -4.29918 | 0.708812 | -6.06533 | 1.31686e-09 | 1.83593e-08 | Conti_non_fene_vs_others |
| Plcl2                                                                     | 12.1453 | -4.04937 | 1.05589  | -3.83503 | 0.00012555  | 0.00081377  | Conti_non_fene_vs_others |
| Sema6b                                                                    | 10.0346 | -3.7737  | 1.05596  | -3.57372 | 0.000351946 | 0.0020098   | Conti_non_fene_vs_others |
| Tnfaip8l1                                                                 | 11.2917 | -3.24043 | 0.868448 | -3.73129 | 0.0001905   | 0.00117805  | Conti_non_fene_vs_others |
| Safb2                                                                     | 16.83   | -3.56489 | 0.782571 | -4.55536 | 5.22951e-06 | 4.45588e-05 | Conti_non_fene_vs_others |
| Rab31                                                                     | 34.4449 | -3.53326 | 0.546065 | -6.4704  | 9.77426e-11 | 1.51642e-09 | Conti_non_fene_vs_others |
| Lbh                                                                       | 19.9517 | -3.19008 | 0.645254 | -4.94391 | 7.65702e-07 | 7.55304e-06 | Conti_non_fene_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                          |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|--------------------------|
| Ehd3                                                                      | 490.333 | -8.51621 | 0.781739  | -10.8939 | 1.23201e-27 | 4.95692e-26 | Conti_non_fene_vs_others |
| Ltbp1                                                                     | 33.5281 | -4.30023 | 0.70883   | -6.06666 | 1.30602e-09 | 1.82344e-08 | Conti_non_fene_vs_others |
| Plekhh2                                                                   | 22.1885 | 4.84694  | 0.242518  | 19.9859  | 7.30942e-89 | 9.51353e-87 | Conti_non_fene_vs_others |
| Prkce                                                                     | 185.097 | -3.83259 | 0.260185  | -14.7303 | 4.12127e-49 | 2.91693e-47 | Conti_non_fene_vs_others |
| Jcad                                                                      | 337.829 | 3.0661   | 0.0590481 | 51.9254  | 0           | 0           | Conti_non_fene_vs_others |
| Greb1l                                                                    | 14.1963 | -3.27881 | 0.783361  | -4.18557 | 2.84454e-05 | 0.000210711 | Conti_non_fene_vs_others |
| Osbp11a                                                                   | 63.4514 | 3.1639   | 0.137197  | 23.061   | 1.1404e-117 | 2.0105e-115 | Conti_non_fene_vs_others |
| Celf4                                                                     | 10.6698 | -3.86319 | 1.05689   | -3.65524 | 0.000256938 | 0.00152333  | Conti_non_fene_vs_others |
| Cystm1                                                                    | 12.2796 | 3.7887   | 0.30841   | 12.2846  | 1.09566e-34 | 5.50469e-33 | Conti_non_fene_vs_others |
| Pcdh12                                                                    | 38.1494 | -3.30899 | 0.482284  | -6.86107 | 6.83445e-12 | 1.16468e-10 | Conti_non_fene_vs_others |
| Fgf1                                                                      | 18.6924 | -4.67179 | 1.05595   | -4.42427 | 9.67684e-06 | 7.79331e-05 | Conti_non_fene_vs_others |
| Dpysl3                                                                    | 36.1431 | -5.62262 | 1.05624   | -5.32323 | 1.01939e-07 | 1.14205e-06 | Conti_non_fene_vs_others |
| Sncaip                                                                    | 26.616  | -3.94955 | 0.709212  | -5.56893 | 2.56301e-08 | 3.08724e-07 | Conti_non_fene_vs_others |
| Snx24                                                                     | 50.1813 | -3.71744 | 0.485355  | -7.65921 | 1.87073e-14 | 3.92631e-13 | Conti_non_fene_vs_others |
| Slc12a2                                                                   | 10.5736 | -3.15413 | 0.865326  | -3.64502 | 0.000267375 | 0.00157344  | Conti_non_fene_vs_others |
| Chsy3                                                                     | 14.9141 | -4.34741 | 1.05623   | -4.11598 | 3.85542e-05 | 0.000277639 | Conti_non_fene_vs_others |
| Gm4951                                                                    | 34.0523 | -4.02392 | 0.644005  | -6.24828 | 4.14994e-10 | 6.12946e-09 | Conti_non_fene_vs_others |
| Ablim3                                                                    | 10.6449 | -3.85946 | 1.06514   | -3.62344 | 0.000290715 | 0.00169406  | Conti_non_fene_vs_others |
| Apccd1                                                                    | 79.1589 | 6.37864  | 0.159475  | 39.9978  | 0           | 0           | Conti_non_fene_vs_others |
| Piezo2                                                                    | 81.0076 | -6.19362 | 0.86449   | -7.16448 | 7.80803e-13 | 1.44211e-11 | Conti_non_fene_vs_others |
| Fech                                                                      | 10.2858 | -3.46277 | 0.95552   | -3.62396 | 0.000290126 | 0.00169165  | Conti_non_fene_vs_others |
| Rbfa                                                                      | 13.0191 | -3.49482 | 0.865379  | -4.03849 | 5.37965e-05 | 0.000377588 | Conti_non_fene_vs_others |
| Mbp                                                                       | 64.2754 | 8.57484  | 0.322081  | 26.6232  | 3.6539e-156 | 8.5373e-154 | Conti_non_fene_vs_others |
| Ndufs8                                                                    | 21.5811 | -3.04492 | 0.590131  | -5.15974 | 2.47296e-07 | 2.62353e-06 | Conti_non_fene_vs_others |
| Unc93b1                                                                   | 18.8783 | -3.7156  | 0.782188  | -4.75026 | 2.03152e-06 | 1.87249e-05 | Conti_non_fene_vs_others |
| Cdc42ep2                                                                  | 37.9663 | -4.47368 | 0.708703  | -6.31249 | 2.74579e-10 | 4.11826e-09 | Conti_non_fene_vs_others |
| Pola2                                                                     | 14.5931 | -4.31399 | 1.05608   | -4.08492 | 4.40915e-05 | 0.000314479 | Conti_non_fene_vs_others |
| Prdx5                                                                     | 17.5339 | -3.59272 | 0.782354  | -4.5922  | 4.38607e-06 | 3.78882e-05 | Conti_non_fene_vs_others |
| Fkbp2                                                                     | 14.4611 | -3.98737 | 0.955327  | -4.17383 | 2.99525e-05 | 0.000220214 | Conti_non_fene_vs_others |
| Cox8a                                                                     | 94.5811 | -4.00008 | 0.385996  | -10.363  | 3.65216e-25 | 1.34395e-23 | Conti_non_fene_vs_others |
| Spindoc                                                                   | 12.7518 | -3.10197 | 0.782918  | -3.96207 | 7.43042e-05 | 0.000505608 | Conti_non_fene_vs_others |
| Slc22a8                                                                   | 83.7937 | 9.74978  | 0.376644  | 25.8859  | 9.5924e-148 | 2.1139e-145 | Conti_non_fene_vs_others |
| Gda                                                                       | 12.3745 | -3.73789 | 0.957271  | -3.90474 | 9.43272e-05 | 0.000628189 | Conti_non_fene_vs_others |
| Abhd17b                                                                   | 35.8785 | -3.1876  | 0.482407  | -6.60771 | 3.90318e-11 | 6.26609e-10 | Conti_non_fene_vs_others |
| Cemip2                                                                    | 182.969 | -3.97551 | 0.274996  | -14.4566 | 2.27761e-47 | 1.54439e-45 | Conti_non_fene_vs_others |
| Tmem252                                                                   | 24.3107 | 3.37374  | 0.213068  | 15.8341  | 1.81002e-56 | 1.50007e-54 | Conti_non_fene_vs_others |
| Dock8                                                                     | 16.5988 | -4.50028 | 1.05557   | -4.26335 | 2.01384e-05 | 0.000153516 | Conti_non_fene_vs_others |
| Slc1a1                                                                    | 36.1213 | 3.89991  | 0.192744  | 20.2336  | 4.95518e-91 | 6.67332e-89 | Conti_non_fene_vs_others |
| 4430402118Rik                                                             | 10.2985 | 3.28443  | 0.320404  | 10.2509  | 1.17234e-24 | 4.23374e-23 | Conti_non_fene_vs_others |
| Asah2                                                                     | 30.4151 | -3.13033 | 0.51223   | -6.11118 | 9.88956e-10 | 1.39381e-08 | Conti_non_fene_vs_others |
| Cpeb3                                                                     | 13.5837 | -3.87684 | 0.955311  | -4.0582  | 4.94534e-05 | 0.000350018 | Conti_non_fene_vs_others |
| Pdlim1                                                                    | 30.8055 | -5.39273 | 1.05586   | -5.10745 | 3.26527e-07 | 3.39718e-06 | Conti_non_fene_vs_others |
| Fbxw4                                                                     | 18.7811 | -3.73223 | 0.782143  | -4.7718  | 1.8259e-06  | 1.69664e-05 | Conti_non_fene_vs_others |
| Atp5md                                                                    | 31.7877 | -5.43849 | 1.05508   | -5.15459 | 2.54188e-07 | 2.6937e-06  | Conti_non_fene_vs_others |
| Afap1l2                                                                   | 39.7208 | 3.57651  | 0.181927  | 19.6591  | 4.83317e-86 | 6.04707e-84 | Conti_non_fene_vs_others |



| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                          |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|--------------------------|
| Slc38a5                                                                   | 55.4999 | 12.3155  | 1.07206   | 11.4877  | 1.52089e-30 | 6.73395e-29 | Conti_non_fene_vs_others |
| Tspan7                                                                    | 158.312 | -7.75419 | 1.05579   | -7.34443 | 2.06631e-13 | 3.9636e-12  | Conti_non_fene_vs_others |
| Atp6ap2                                                                   | 19.4965 | -3.45909 | 0.708895  | -4.87955 | 1.06327e-06 | 1.02638e-05 | Conti_non_fene_vs_others |
| Maoa                                                                      | 98.9648 | 4.22406  | 0.11914   | 35.4545  | 2.4696e-275 | 1.0885e-272 | Conti_non_fene_vs_others |
| Maob                                                                      | 15.4096 | 8.33168  | 0.564097  | 14.7699  | 2.28901e-49 | 1.66257e-47 | Conti_non_fene_vs_others |
| Chst7                                                                     | 12.1852 | -4.05505 | 1.05599   | -3.84003 | 0.000123017 | 0.000799756 | Conti_non_fene_vs_others |
| Lamp2                                                                     | 136.742 | -4.38355 | 0.361796  | -12.1161 | 8.68099e-34 | 4.27286e-32 | Conti_non_fene_vs_others |
| 6030498E09Rik                                                             | 13.6112 | -4.21366 | 1.05714   | -3.9859  | 6.72261e-05 | 0.000463296 | Conti_non_fene_vs_others |
| Zic3                                                                      | 37.232  | 11.7573  | 1.07783   | 10.9082  | 1.05289e-27 | 4.25389e-26 | Conti_non_fene_vs_others |
| Bgn                                                                       | 44.9194 | -4.43424 | 0.645529  | -6.86916 | 6.45832e-12 | 1.10155e-10 | Conti_non_fene_vs_others |
| F8                                                                        | 178.457 | -7.92692 | 1.05527   | -7.51172 | 5.83555e-14 | 1.17152e-12 | Conti_non_fene_vs_others |
| Tmem47                                                                    | 14.8202 | -4.33744 | 1.0554    | -4.10978 | 3.96041e-05 | 0.000284671 | Conti_non_fene_vs_others |
| Dmd                                                                       | 40.6439 | -4.01977 | 0.5903    | -6.8097  | 9.77993e-12 | 1.64637e-10 | Conti_non_fene_vs_others |
| Pgk1                                                                      | 18.2853 | -3.37167 | 0.708922  | -4.75606 | 1.9741e-06  | 1.82303e-05 | Conti_non_fene_vs_others |
| Gm5127                                                                    | 13.3107 | 6.7814   | 0.47561   | 14.2583  | 3.97907e-46 | 2.65176e-44 | Conti_non_fene_vs_others |
| Itm2a                                                                     | 1241.16 | 5.67222  | 0.0634414 | 89.4088  | 0           | 0           | Conti_non_fene_vs_others |
| Pcdh19                                                                    | 36.9571 | 4.34997  | 0.203661  | 21.3588  | 3.2269e-101 | 4.851e-99   | Conti_non_fene_vs_others |
| Tmem164                                                                   | 72.5814 | -3.61912 | 0.386086  | -9.37388 | 6.99153e-21 | 2.15217e-19 | Conti_non_fene_vs_others |
| Iqsec2                                                                    | 25.9431 | -3.61071 | 0.644603  | -5.60145 | 2.12571e-08 | 2.59597e-07 | Conti_non_fene_vs_others |
| Sh3kbp1                                                                   | 15.4774 | -3.75669 | 0.866507  | -4.33544 | 1.45468e-05 | 0.000113661 | Conti_non_fene_vs_others |
| Bmx                                                                       | 17.3106 | 5.29433  | 0.297462  | 17.7984  | 7.27674e-71 | 7.50627e-69 | Conti_non_fene_vs_others |
| Pir                                                                       | 35.0386 | 4.20776  | 0.189356  | 22.2214  | 2.1333e-109 | 3.5664e-107 | Conti_non_fene_vs_others |
| Gm47283                                                                   | 15.2147 | -3.70583 | 0.864409  | -4.28713 | 1.80996e-05 | 0.000138957 | Conti_non_fene_vs_others |
| Gm16070                                                                   | 18.0563 | -7.06668 | 0.969798  | -7.28676 | 3.17502e-13 | 1.12919e-12 | Sinusoida_vs_others      |
| Crispld1                                                                  | 54.5923 | -8.9585  | 1.06442   | -8.41629 | 3.88582e-17 | 1.61294e-16 | Sinusoida_vs_others      |
| Tmem182                                                                   | 12.3572 | -6.81371 | 1.07218   | -6.35502 | 2.08397e-10 | 6.49503e-10 | Sinusoida_vs_others      |
| Slc40a1                                                                   | 208.334 | 3.77262  | 0.0907286 | 41.5814  | 0           | 0           | Sinusoida_vs_others      |
| Myo1b                                                                     | 128.371 | -3.89383 | 0.1343    | -28.9935 | 7.9506e-185 | 2.382e-183  | Sinusoida_vs_others      |
| Stk17b                                                                    | 10.5504 | -3.77655 | 0.440715  | -8.56913 | 1.04266e-17 | 4.42113e-17 | Sinusoida_vs_others      |
| Plcl1                                                                     | 19.7663 | -4.74103 | 0.438657  | -10.8081 | 3.15233e-27 | 1.76633e-26 | Sinusoida_vs_others      |
| Adam23                                                                    | 1280.65 | 12.3498  | 0.590195  | 20.9249  | 3.17972e-97 | 4.81417e-96 | Sinusoida_vs_others      |
| Map2                                                                      | 18.1276 | -5.90457 | 0.655958  | -9.00144 | 2.22784e-19 | 9.99731e-19 | Sinusoida_vs_others      |
| Fn1                                                                       | 25.3482 | -5.37878 | 0.474132  | -11.3445 | 7.90083e-30 | 4.72864e-29 | Sinusoida_vs_others      |
| Igfbp5                                                                    | 2324.78 | -7.16684 | 0.497982  | -14.3918 | 5.82851e-47 | 4.90674e-46 | Sinusoida_vs_others      |
| Epha4                                                                     | 90.4934 | -4.42207 | 0.184108  | -24.0189 | 1.7638e-127 | 3.476e-126  | Sinusoida_vs_others      |
| Sgpp2                                                                     | 11.7974 | -6.74677 | 1.07912   | -6.2521  | 4.04971e-10 | 1.23906e-09 | Sinusoida_vs_others      |
| Serpine2                                                                  | 33.5458 | -7.96522 | 0.968462  | -8.22461 | 1.95834e-16 | 7.94215e-16 | Sinusoida_vs_others      |
| Col4a3                                                                    | 86.5945 | -3.85437 | 0.159266  | -24.2008 | 2.1834e-129 | 4.3807e-128 | Sinusoida_vs_others      |
| Arl4c                                                                     | 24.9558 | 3.14756  | 0.2099    | 14.9955  | 7.8551e-51  | 7.0074e-50  | Sinusoida_vs_others      |
| Gpc1                                                                      | 25.7841 | 6.69708  | 0.600312  | 11.156   | 6.69339e-29 | 3.89067e-28 | Sinusoida_vs_others      |
| Rnf152                                                                    | 30.3527 | -3.81139 | 0.263758  | -14.4503 | 2.496e-47   | 2.11501e-46 | Sinusoida_vs_others      |
| Tnfrsf11a                                                                 | 48.5731 | -3.24324 | 0.181811  | -17.8385 | 3.54996e-71 | 4.13161e-70 | Sinusoida_vs_others      |
| Cxcr4                                                                     | 18.7911 | -5.95596 | 0.66376   | -8.97305 | 2.88412e-19 | 1.29088e-18 | Sinusoida_vs_others      |
| Cd55b                                                                     | 16.1131 | 7.74581  | 1.07074   | 7.23405  | 4.6881e-13  | 1.65445e-12 | Sinusoida_vs_others      |
| Gm15675                                                                   | 287.578 | 10.458   | 0.6461    | 16.1863  | 6.30332e-59 | 6.29886e-58 | Sinusoida_vs_others      |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                     |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|---------------------|
| Cd55                                                                      | 1073.38 | 8.3366   | 0.162032  | 51.4505  | 0           | 0           | Sinusoida_vs_others |
| Gm16083                                                                   | 143.771 | 4.52908  | 0.135561  | 33.4098  | 9.8813e-245 | 3.9195e-243 | Sinusoida_vs_others |
| Gm19461                                                                   | 17.6203 | 5.91813  | 0.559212  | 10.583   | 3.57375e-26 | 1.94908e-25 | Sinusoida_vs_others |
| Prep                                                                      | 52.9611 | 3.2208   | 0.157622  | 20.4337  | 8.3868e-93  | 1.22447e-91 | Sinusoida_vs_others |
| Cfh                                                                       | 197.636 | 4.56327  | 0.113324  | 40.2674  | 0           | 0           | Sinusoida_vs_others |
| Pla2g4a                                                                   | 16.5777 | -6.06223 | 0.722255  | -8.39348 | 4.71961e-17 | 1.95277e-16 | Sinusoida_vs_others |
| Npl                                                                       | 100.573 | 6.34255  | 0.270394  | 23.4567  | 1.1292e-121 | 2.1154e-120 | Sinusoida_vs_others |
| Dnm3                                                                      | 291.666 | -4.62064 | 0.2614    | -17.6765 | 6.3593e-70  | 7.2653e-69  | Sinusoida_vs_others |
| Dnm3os                                                                    | 20.6409 | 3.98478  | 0.291692  | 13.6609  | 1.73829e-42 | 1.35891e-41 | Sinusoida_vs_others |
| Fmo2                                                                      | 55.2997 | -4.08422 | 0.59895   | -6.81897 | 9.16974e-12 | 3.04268e-11 | Sinusoida_vs_others |
| Sele                                                                      | 39.692  | 5.72815  | 0.377346  | 15.1801  | 4.79164e-52 | 4.33926e-51 | Sinusoida_vs_others |
| Selp                                                                      | 56.9051 | 5.58449  | 0.48999   | 11.3972  | 4.3198e-30  | 2.60343e-29 | Sinusoida_vs_others |
| Pbx1                                                                      | 4729.82 | -3.35882 | 0.0389535 | -86.2263 | 0           | 0           | Sinusoida_vs_others |
| Fcgr2b                                                                    | 1704.2  | 13.0251  | 0.645367  | 20.1825  | 1.39629e-90 | 1.99e-89    | Sinusoida_vs_others |
| Pcp4l1                                                                    | 197.841 | -6.19068 | 0.218916  | -28.2787 | 6.3124e-176 | 1.7653e-174 | Sinusoida_vs_others |
| Cd84                                                                      | 171.323 | 7.38106  | 0.293037  | 25.1881  | 5.4026e-140 | 1.1815e-138 | Sinusoida_vs_others |
| Ackr1                                                                     | 18.5671 | 5.81002  | 0.531626  | 10.9288  | 8.39915e-28 | 4.7681e-27  | Sinusoida_vs_others |
| Enah                                                                      | 32.6725 | -7.92782 | 0.965023  | -8.21516 | 2.11877e-16 | 8.5749e-16  | Sinusoida_vs_others |
| 1700047M11Rik                                                             | 48.0189 | 9.31819  | 1.06576   | 8.74326  | 2.26488e-18 | 9.83978e-18 | Sinusoida_vs_others |
| Susd4                                                                     | 11.495  | 3.36396  | 0.369882  | 9.09468  | 9.48623e-20 | 4.30535e-19 | Sinusoida_vs_others |
| Dusp10                                                                    | 62.7112 | 4.74885  | 0.212352  | 22.3631  | 9.0124e-111 | 1.557e-109  | Sinusoida_vs_others |
| C130074G19Rik                                                             | 128.282 | -3.05248 | 0.106891  | -28.557  | 2.3018e-179 | 6.5913e-178 | Sinusoida_vs_others |
| Tgfb2                                                                     | 48.3056 | -3.36917 | 0.219056  | -15.3804 | 2.21574e-53 | 2.04709e-52 | Sinusoida_vs_others |
| G0s2                                                                      | 17.2333 | -6.12462 | 0.722286  | -8.47949 | 2.26185e-17 | 9.48731e-17 | Sinusoida_vs_others |
| Cd34                                                                      | 566.932 | -4.88283 | 0.0858687 | -56.8639 | 0           | 0           | Sinusoida_vs_others |
| Camk1d                                                                    | 1261.28 | 3.16467  | 0.0324636 | 97.4836  | 0           | 0           | Sinusoida_vs_others |
| Proser2                                                                   | 33.2075 | -7.07754 | 0.719174  | -9.84121 | 7.48039e-23 | 3.75808e-22 | Sinusoida_vs_others |
| Itih5                                                                     | 136.887 | -8.57855 | 0.593599  | -14.4518 | 2.44359e-47 | 2.07172e-46 | Sinusoida_vs_others |
| Itga8                                                                     | 477.013 | 5.94651  | 0.132551  | 44.8621  | 0           | 0           | Sinusoida_vs_others |
| St8sia6                                                                   | 16.5127 | -6.64647 | 0.884903  | -7.51096 | 5.86973e-14 | 2.15002e-13 | Sinusoida_vs_others |
| Mrc1                                                                      | 2355.44 | 5.61794  | 0.0504544 | 111.347  | 0           | 0           | Sinusoida_vs_others |
| Slc39a12                                                                  | 12.1089 | 3.14241  | 0.320372  | 9.80864  | 1.03355e-22 | 5.16742e-22 | Sinusoida_vs_others |
| Nebi                                                                      | 62.7325 | -4.80815 | 0.577624  | -8.32401 | 8.50349e-17 | 3.48224e-16 | Sinusoida_vs_others |
| Adamtsl2                                                                  | 15.0596 | -4.20359 | 0.423956  | -9.91515 | 3.57714e-23 | 1.81176e-22 | Sinusoida_vs_others |
| Olfm1                                                                     | 135.601 | 4.35075  | 0.128871  | 33.7605  | 7.4953e-250 | 3.035e-248  | Sinusoida_vs_others |
| Ass1                                                                      | 25.1565 | -4.49059 | 0.356303  | -12.6033 | 2.02507e-36 | 1.40696e-35 | Sinusoida_vs_others |
| St6galnac4                                                                | 46.9189 | -3.0682  | 0.178903  | -17.15   | 6.28474e-66 | 6.83367e-65 | Sinusoida_vs_others |
| Zeb2                                                                      | 883.316 | 5.31896  | 0.0708452 | 75.0786  | 0           | 0           | Sinusoida_vs_others |
| Galnt13                                                                   | 12.2025 | 5.38772  | 0.640639  | 8.40992  | 4.10305e-17 | 1.70084e-16 | Sinusoida_vs_others |
| Ly75                                                                      | 12.3132 | -6.80856 | 1.07047   | -6.36033 | 2.0132e-10  | 6.27949e-10 | Sinusoida_vs_others |
| Dpp4                                                                      | 893.657 | 9.09166  | 0.229066  | 39.6901  | 0           | 0           | Sinusoida_vs_others |
| Gm13561                                                                   | 19.4325 | 6.84634  | 0.72386   | 9.4581   | 3.13604e-21 | 1.49486e-20 | Sinusoida_vs_others |
| Fign                                                                      | 100.471 | 4.47239  | 0.156743  | 28.5333  | 4.5239e-179 | 1.2907e-177 | Sinusoida_vs_others |
| Cobll1                                                                    | 37.9799 | -3.01921 | 0.196041  | -15.4009 | 1.614e-53   | 1.49648e-52 | Sinusoida_vs_others |
| B3galt1                                                                   | 984.847 | 6.41561  | 0.0926912 | 69.2149  | 0           | 0           | Sinusoida_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                     |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|---------------------|
| Rapgef4                                                                   | 560.456 | -5.90239 | 0.121342  | -48.6426 | 0           | 0           | Sinusoida_vs_others |
| Rapgef4os1                                                                | 42.8003 | -6.30397 | 0.486423  | -12.9599 | 2.06608e-38 | 1.48867e-37 | Sinusoida_vs_others |
| Gpr155                                                                    | 131.596 | 4.06705  | 0.123345  | 32.9729  | 1.9842e-238 | 7.5992e-237 | Sinusoida_vs_others |
| Hoxd3os1                                                                  | 25.2138 | -7.84649 | 1.06785   | -7.34795 | 2.01271e-13 | 7.21431e-13 | Sinusoida_vs_others |
| Hoxd8                                                                     | 31.8402 | -8.18096 | 1.06567   | -7.67682 | 1.63082e-14 | 6.08974e-14 | Sinusoida_vs_others |
| Hoxd4                                                                     | 15.5975 | -7.14923 | 1.06941   | -6.68524 | 2.30554e-11 | 7.50446e-11 | Sinusoida_vs_others |
| Ccdc141                                                                   | 20.3314 | -6.65624 | 0.796869  | -8.353   | 6.65533e-17 | 2.73694e-16 | Sinusoida_vs_others |
| Tfpi                                                                      | 532.14  | 3.26779  | 0.0532118 | 61.4109  | 0           | 0           | Sinusoida_vs_others |
| Aplnr                                                                     | 198.028 | -10.5272 | 0.962768  | -10.9343 | 7.90119e-28 | 4.48869e-27 | Sinusoida_vs_others |
| Cd82                                                                      | 27.658  | 3.78535  | 0.236024  | 16.038   | 6.93816e-58 | 6.83659e-57 | Sinusoida_vs_others |
| Mpped2                                                                    | 41.7826 | -8.57331 | 1.06719   | -8.03357 | 9.46779e-16 | 3.73073e-15 | Sinusoida_vs_others |
| Fmn1                                                                      | 175.47  | 10.319   | 0.789899  | 13.0637  | 5.30894e-39 | 3.86464e-38 | Sinusoida_vs_others |
| 3110099E03Rik                                                             | 23.3871 | -7.7346  | 1.06832   | -7.23998 | 4.48752e-13 | 1.58547e-12 | Sinusoida_vs_others |
| Thbs1                                                                     | 10.9437 | -3.72306 | 0.436432  | -8.53068 | 1.4549e-17  | 6.14904e-17 | Sinusoida_vs_others |
| Bub1b                                                                     | 11.5471 | 3.56754  | 0.357164  | 9.98852  | 1.71119e-23 | 8.74663e-23 | Sinusoida_vs_others |
| Ehd4                                                                      | 1035.04 | -3.71965 | 0.0823281 | -45.1809 | 0           | 0           | Sinusoida_vs_others |
| Frmd5                                                                     | 14.2236 | -3.04198 | 0.330137  | -9.21429 | 3.13342e-20 | 1.44061e-19 | Sinusoida_vs_others |
| Sord                                                                      | 63.2562 | 3.92409  | 0.163678  | 23.9744  | 5.1467e-127 | 1.0092e-125 | Sinusoida_vs_others |
| Slc28a2                                                                   | 23.2018 | -7.13843 | 0.882679  | -8.08724 | 6.10331e-16 | 2.4265e-15  | Sinusoida_vs_others |
| Gatm                                                                      | 1151.19 | 5.86878  | 0.074112  | 79.188   | 0           | 0           | Sinusoida_vs_others |
| Hdc                                                                       | 80.1352 | 4.20139  | 0.157067  | 26.749   | 1.2695e-157 | 3.1333e-156 | Sinusoida_vs_others |
| Mal                                                                       | 88.6486 | -3.98365 | 0.170433  | -23.3737 | 7.9149e-121 | 1.4774e-119 | Sinusoida_vs_others |
| Mall                                                                      | 16.9092 | -4.16573 | 0.397314  | -10.4847 | 1.01552e-25 | 5.48849e-25 | Sinusoida_vs_others |
| Morrbid                                                                   | 250.799 | 4.13358  | 0.0874004 | 47.2947  | 0           | 0           | Sinusoida_vs_others |
| Il1a                                                                      | 189.224 | 10.4282  | 0.788685  | 13.2223  | 6.52262e-40 | 4.82953e-39 | Sinusoida_vs_others |
| Prnp                                                                      | 34.1906 | -3.99234 | 0.262754  | -15.1942 | 3.86294e-52 | 3.50232e-51 | Sinusoida_vs_others |
| Bmp2                                                                      | 1469.34 | 6.03731  | 0.0694004 | 86.9923  | 0           | 0           | Sinusoida_vs_others |
| 4930545L23Rik                                                             | 10.1107 | -3.59053 | 0.426111  | -8.42628 | 3.56829e-17 | 1.48272e-16 | Sinusoida_vs_others |
| 9630028H03Rik                                                             | 17.8238 | -4.34785 | 0.410025  | -10.6039 | 2.85892e-26 | 1.56416e-25 | Sinusoida_vs_others |
| Flrt3                                                                     | 25.5727 | -3.5898  | 0.278146  | -12.9061 | 4.15607e-38 | 2.98213e-37 | Sinusoida_vs_others |
| Slc24a3                                                                   | 10.6414 | -3.29107 | 0.638236  | -5.15652 | 2.51588e-07 | 6.51013e-07 | Sinusoida_vs_others |
| Ralgapa2                                                                  | 2216.27 | 5.42594  | 0.0525798 | 103.194  | 0           | 0           | Sinusoida_vs_others |
| Acss1                                                                     | 27.6038 | -7.10237 | 0.792497  | -8.96202 | 3.18779e-19 | 1.42516e-18 | Sinusoida_vs_others |
| Tcf15                                                                     | 116.839 | -6.11425 | 0.281276  | -21.7376 | 9.0567e-105 | 1.4855e-103 | Sinusoida_vs_others |
| Tox2                                                                      | 23.4774 | 3.78208  | 0.25669   | 14.734   | 3.89882e-49 | 3.39814e-48 | Sinusoida_vs_others |
| Sdc4                                                                      | 23.9377 | 3.454    | 0.236472  | 14.6064  | 2.55789e-48 | 2.20225e-47 | Sinusoida_vs_others |
| Pltp                                                                      | 381.175 | -6.3421  | 0.16697   | -37.9834 | 0           | 0           | Sinusoida_vs_others |
| Sulf2                                                                     | 21.9619 | -6.77028 | 0.797004  | -8.49466 | 1.9852e-17  | 8.35169e-17 | Sinusoida_vs_others |
| Zbp1                                                                      | 21.5334 | -3.18499 | 0.267921  | -11.8878 | 1.36967e-32 | 8.74263e-32 | Sinusoida_vs_others |
| Cdh4                                                                      | 190.111 | 3.01362  | 0.0822536 | 36.6382  | 7.0652e-294 | 3.4011e-292 | Sinusoida_vs_others |
| Srms                                                                      | 14.5513 | -6.16378 | 0.799112  | -7.71329 | 1.22617e-14 | 4.60302e-14 | Sinusoida_vs_others |
| Pkia                                                                      | 18.618  | -6.52654 | 0.797816  | -8.18051 | 2.82648e-16 | 1.13857e-15 | Sinusoida_vs_others |
| Stmn2                                                                     | 46.7142 | -5.61042 | 0.459502  | -12.2098 | 2.75558e-34 | 1.82558e-33 | Sinusoida_vs_others |
| Hey1                                                                      | 30.9859 | -3.24054 | 0.234211  | -13.836  | 1.5458e-43  | 1.2326e-42  | Sinusoida_vs_others |
| Pag1                                                                      | 12.6118 | -4.33436 | 0.474314  | -9.13817 | 6.35187e-20 | 2.89804e-19 | Sinusoida_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                     |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|---------------------|
| Nlgn1                                                                     | 12.6417 | -5.10296 | 0.635363  | -8.03157 | 9.62356e-16 | 3.79019e-15 | Sinusoida_vs_others |
| Tnfr                                                                      | 265.432 | 6.69731  | 0.187875  | 35.6477  | 2.5616e-278 | 1.1479e-276 | Sinusoida_vs_others |
| Egfr                                                                      | 77.515  | 6.98428  | 0.45316   | 15.4124  | 1.35065e-53 | 1.25455e-52 | Sinusoida_vs_others |
| Spry1                                                                     | 103.949 | -3.04601 | 0.121491  | -25.0719 | 1.0084e-138 | 2.1808e-137 | Sinusoida_vs_others |
| Pabpc4l                                                                   | 40.6103 | 3.65959  | 0.208123  | 17.5837  | 3.2818e-69  | 3.72473e-68 | Sinusoida_vs_others |
| P2ry1                                                                     | 67.1369 | 3.4019   | 0.144678  | 23.5135  | 2.9677e-122 | 5.5799e-121 | Sinusoida_vs_others |
| Arhgef26                                                                  | 30.5614 | -8.12216 | 1.06567   | -7.62163 | 2.50495e-14 | 9.27587e-14 | Sinusoida_vs_others |
| Ppm1l                                                                     | 63.1784 | -3.23868 | 0.167996  | -19.2783 | 8.16489e-83 | 1.07499e-81 | Sinusoida_vs_others |
| B3galnt1                                                                  | 17.9089 | -7.05564 | 0.969812  | -7.27527 | 3.45722e-13 | 1.22731e-12 | Sinusoida_vs_others |
| Gucy1b1                                                                   | 11.9657 | 3.18201  | 0.335312  | 9.4897   | 2.31708e-21 | 1.11095e-20 | Sinusoida_vs_others |
| Cd1d1                                                                     | 30.5553 | -3.65269 | 0.25189   | -14.5012 | 1.19134e-47 | 1.0117e-46  | Sinusoida_vs_others |
| Lmna                                                                      | 111.875 | -3.50674 | 0.126319  | -27.7609 | 1.2854e-169 | 3.4698e-168 | Sinusoida_vs_others |
| S100a6                                                                    | 373.71  | -4.07956 | 0.796015  | -5.12498 | 2.97566e-07 | 7.66162e-07 | Sinusoida_vs_others |
| Igfbp3                                                                    | 42.6024 | 6.00203  | 0.37403   | 16.0469  | 6.00937e-58 | 5.92891e-57 | Sinusoida_vs_others |
| Inka2                                                                     | 10.1047 | -4.33568 | 0.533311  | -8.12974 | 4.30229e-16 | 1.71705e-15 | Sinusoida_vs_others |
| Dennd2d                                                                   | 19.6828 | 6.8669   | 0.72454   | 9.47761  | 2.60176e-21 | 1.24361e-20 | Sinusoida_vs_others |
| Vcam1                                                                     | 181.916 | 4.24133  | 0.157516  | 26.9263  | 1.0798e-159 | 2.7036e-158 | Sinusoida_vs_others |
| Frrs1                                                                     | 63.6117 | 6.78618  | 0.392538  | 17.288   | 5.79771e-67 | 6.38898e-66 | Sinusoida_vs_others |
| Palmd                                                                     | 199.047 | -5.95939 | 0.201952  | -29.5089 | 2.2103e-191 | 6.9289e-190 | Sinusoida_vs_others |
| Plppr5                                                                    | 32.3511 | 6.29146  | 0.471125  | 13.3541  | 1.12067e-40 | 8.47535e-40 | Sinusoida_vs_others |
| Lef1                                                                      | 73.4531 | -5.92398 | 0.33438   | -17.7163 | 3.1393e-70  | 3.61846e-69 | Sinusoida_vs_others |
| Dkk2                                                                      | 126.283 | -4.30345 | 1.16366   | -3.69822 | 0.000217119 | 0.000434882 | Sinusoida_vs_others |
| Gm30648                                                                   | 62.2908 | 5.00308  | 0.223347  | 22.4005  | 3.8953e-111 | 6.7373e-110 | Sinusoida_vs_others |
| Slc39a8                                                                   | 267.336 | 4.30753  | 0.142442  | 30.2406  | 6.9319e-201 | 2.2884e-199 | Sinusoida_vs_others |
| Emcn                                                                      | 4240.49 | -3.63694 | 0.0258626 | -140.625 | 0           | 0           | Sinusoida_vs_others |
| Adh6b                                                                     | 10.445  | 5.15485  | 0.642361  | 8.02485  | 1.01648e-15 | 3.99727e-15 | Sinusoida_vs_others |
| C1ca3a1                                                                   | 31.1959 | 4.13505  | 0.252293  | 16.3899  | 2.25982e-60 | 2.2936e-59  | Sinusoida_vs_others |
| Ssx2ip                                                                    | 56.5073 | 3.18355  | 0.141955  | 22.4265  | 2.1684e-111 | 3.7715e-110 | Sinusoida_vs_others |
| Penk                                                                      | 10.9852 | -6.64351 | 1.1029    | -6.02365 | 1.70527e-09 | 5.02563e-09 | Sinusoida_vs_others |
| Klhl32                                                                    | 12.0686 | 3.03918  | 0.323526  | 9.39394  | 5.77943e-21 | 2.73144e-20 | Sinusoida_vs_others |
| Cga                                                                       | 60.5012 | -9.1047  | 1.07216   | -8.49195 | 2.03192e-17 | 8.53902e-17 | Sinusoida_vs_others |
| Aqp7                                                                      | 42.8596 | -8.31927 | 0.968867  | -8.58659 | 8.95882e-18 | 3.80811e-17 | Sinusoida_vs_others |
| Cntfr                                                                     | 52.1108 | 7.98711  | 0.650747  | 12.2738  | 1.25301e-34 | 8.36904e-34 | Sinusoida_vs_others |
| 4930578G10Rik                                                             | 12.2971 | 6.75913  | 0.883108  | 7.6538   | 1.95124e-14 | 7.26007e-14 | Sinusoida_vs_others |
| Msmg                                                                      | 25.4975 | -4.99733 | 0.416616  | -11.995  | 3.77212e-33 | 2.43979e-32 | Sinusoida_vs_others |
| Hrct1                                                                     | 28.219  | -5.8679  | 0.521287  | -11.2566 | 2.14955e-29 | 1.2694e-28  | Sinusoida_vs_others |
| Spaar                                                                     | 27.8667 | -7.40437 | 0.87527   | -8.45953 | 2.68458e-17 | 1.12151e-16 | Sinusoida_vs_others |
| Reck                                                                      | 22.6163 | -3.71364 | 0.298419  | -12.4444 | 1.49987e-35 | 1.02198e-34 | Sinusoida_vs_others |
| Col15a1                                                                   | 233.532 | -8.76494 | 0.483657  | -18.1222 | 2.12847e-73 | 2.54581e-72 | Sinusoida_vs_others |
| Cttnal1                                                                   | 49.406  | 5.39857  | 0.285303  | 18.9222  | 7.48307e-80 | 9.56861e-79 | Sinusoida_vs_others |
| Susd1                                                                     | 47.8983 | 4.04368  | 0.201663  | 20.0517  | 1.9511e-89  | 2.75047e-88 | Sinusoida_vs_others |
| Col27a1                                                                   | 45.3399 | 4.77538  | 0.24701   | 19.3328  | 2.84706e-83 | 3.75797e-82 | Sinusoida_vs_others |
| Ptprd                                                                     | 16.7941 | 4.13715  | 0.348375  | 11.8756  | 1.5857e-32  | 1.0105e-31  | Sinusoida_vs_others |
| Lurap1l                                                                   | 73.1957 | -4.41461 | 0.203949  | -21.6457 | 6.6694e-104 | 1.0859e-102 | Sinusoida_vs_others |
| Adamts1                                                                   | 42.6963 | -5.55524 | 0.455407  | -12.1984 | 3.16957e-34 | 2.0954e-33  | Sinusoida_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |          |          |             |             |                     |
|---------------------------------------------------------------------------|---------|----------|----------|----------|-------------|-------------|---------------------|
| Gm12648                                                                   | 59.3143 | 7.91176  | 0.604192 | 13.0948  | 3.52753e-39 | 2.57268e-38 | Sinusoida_vs_others |
| Kank4                                                                     | 19.5416 | -4.38891 | 0.397502 | -11.0412 | 2.41667e-28 | 1.38608e-27 | Sinusoida_vs_others |
| Dock7                                                                     | 171.002 | 5.38364  | 0.153019 | 35.1828  | 3.6615e-271 | 1.6128e-269 | Sinusoida_vs_others |
| Rab3b                                                                     | 48.7201 | 4.36962  | 0.215896 | 20.2395  | 4.39966e-91 | 6.3051e-90  | Sinusoida_vs_others |
| Ptch2                                                                     | 49.4353 | 4.11389  | 0.19302  | 21.3133  | 8.5542e-101 | 1.3462e-99  | Sinusoida_vs_others |
| Gm12840                                                                   | 107.368 | 6.59196  | 0.284713 | 23.153   | 1.3562e-118 | 2.4837e-117 | Sinusoida_vs_others |
| Slc2a1                                                                    | 38.5331 | -5.49596 | 0.395379 | -13.9005 | 6.29283e-44 | 5.04107e-43 | Sinusoida_vs_others |
| Rhbdl2                                                                    | 62.7842 | -8.86932 | 0.962826 | -9.21175 | 3.20844e-20 | 1.4738e-19  | Sinusoida_vs_others |
| Ptpru                                                                     | 261.783 | -4.94917 | 0.127067 | -38.9494 | 0           | 0           | Sinusoida_vs_others |
| Grrp1                                                                     | 136.332 | -6.44594 | 0.287038 | -22.4567 | 1.0994e-111 | 1.9186e-110 | Sinusoida_vs_others |
| Alpl                                                                      | 44.0714 | -6.05815 | 0.450894 | -13.4359 | 3.72615e-41 | 2.84428e-40 | Sinusoida_vs_others |
| Mfap2                                                                     | 34.3699 | -8.28733 | 1.06622  | -7.77261 | 7.68854e-15 | 2.90803e-14 | Sinusoida_vs_others |
| Fblim1                                                                    | 18.2021 | -5.64388 | 0.601095 | -9.38933 | 6.03829e-21 | 2.85118e-20 | Sinusoida_vs_others |
| Tmem51                                                                    | 102.755 | 3.29805  | 0.111265 | 29.6414  | 4.3751e-193 | 1.3855e-191 | Sinusoida_vs_others |
| Tmem51os1                                                                 | 13.4274 | 3.15406  | 0.293314 | 10.7532  | 5.72531e-27 | 3.18621e-26 | Sinusoida_vs_others |
| Tnfrsf1b                                                                  | 12.7354 | -4.08075 | 0.442052 | -9.23137 | 2.67198e-20 | 1.23101e-19 | Sinusoida_vs_others |
| Zfp979                                                                    | 47.6974 | -5.92291 | 0.406009 | -14.5881 | 3.3437e-48  | 2.87562e-47 | Sinusoida_vs_others |
| Rbp7                                                                      | 379.586 | -10.3161 | 0.652462 | -15.8109 | 2.61498e-56 | 2.52079e-55 | Sinusoida_vs_others |
| Ctnnbip1                                                                  | 109.511 | -4.94202 | 0.196129 | -25.1978 | 4.233e-140  | 9.2703e-139 | Sinusoida_vs_others |
| Clstn1                                                                    | 123.336 | -6.54438 | 0.31092  | -21.0485 | 2.36213e-98 | 3.61859e-97 | Sinusoida_vs_others |
| Smim1                                                                     | 18.6948 | 3.18977  | 0.251454 | 12.6853  | 7.13325e-37 | 5.00293e-36 | Sinusoida_vs_others |
| Megf6                                                                     | 17.8524 | 3.77149  | 0.472951 | 7.97438  | 1.53148e-15 | 5.95176e-15 | Sinusoida_vs_others |
| Vwa1                                                                      | 64.8874 | -7.27339 | 0.549095 | -13.2461 | 4.75018e-40 | 3.53738e-39 | Sinusoida_vs_others |
| Cdk14                                                                     | 16.1647 | -4.43319 | 0.440615 | -10.0614 | 8.18647e-24 | 4.22334e-23 | Sinusoida_vs_others |
| Cfap69                                                                    | 17.4499 | 3.72291  | 0.302185 | 12.3199  | 7.07449e-35 | 4.74757e-34 | Sinusoida_vs_others |
| Rundc3b                                                                   | 20.0167 | -6.92347 | 0.876696 | -7.89723 | 2.85173e-15 | 1.0992e-14  | Sinusoida_vs_others |
| Abcb1a                                                                    | 60.7097 | -5.04929 | 0.274727 | -18.3793 | 1.92485e-75 | 2.3548e-74  | Sinusoida_vs_others |
| Hgf                                                                       | 316.468 | 12.0373  | 1.06429  | 11.3102  | 1.16841e-29 | 6.97144e-29 | Sinusoida_vs_others |
| Sema3c                                                                    | 51.0586 | -6.92655 | 0.550638 | -12.5791 | 2.75053e-36 | 1.90673e-35 | Sinusoida_vs_others |
| Gsap                                                                      | 54.4377 | 3.64332  | 0.170506 | 21.3677  | 2.6714e-101 | 4.2428e-100 | Sinusoida_vs_others |
| Msx1                                                                      | 15.3519 | -4.79101 | 0.503513 | -9.51518 | 1.81399e-21 | 8.72972e-21 | Sinusoida_vs_others |
| C1qtnf7                                                                   | 34.4675 | 3.4594   | 0.227524 | 15.2045  | 3.29932e-52 | 2.99481e-51 | Sinusoida_vs_others |
| Bst1                                                                      | 14.4874 | -4.54912 | 0.474652 | -9.58411 | 9.32623e-22 | 4.52743e-21 | Sinusoida_vs_others |
| Prom1                                                                     | 16.212  | -6.03012 | 0.724708 | -8.32076 | 8.74002e-17 | 3.57722e-16 | Sinusoida_vs_others |
| D5Ert615e                                                                 | 237.188 | -4.39663 | 0.118297 | -37.1659 | 2.4268e-302 | 1.2291e-300 | Sinusoida_vs_others |
| Pcdh7                                                                     | 87.5199 | -4.18222 | 0.464551 | -9.0027  | 2.20231e-19 | 9.88559e-19 | Sinusoida_vs_others |
| Uchl1                                                                     | 41.4711 | -5.72041 | 0.413762 | -13.8254 | 1.79196e-43 | 1.42669e-42 | Sinusoida_vs_others |
| Bend4                                                                     | 37.542  | 5.41684  | 0.327435 | 16.5433  | 1.79053e-61 | 1.85606e-60 | Sinusoida_vs_others |
| Lnx1                                                                      | 15.2494 | -7.11788 | 1.0809   | -6.58512 | 4.54509e-11 | 1.46167e-10 | Sinusoida_vs_others |
| Kit                                                                       | 397.683 | 4.65522  | 0.1142   | 40.7639  | 0           | 0           | Sinusoida_vs_others |
| Cxcl10                                                                    | 143.217 | 3.79049  | 0.404495 | 9.37094  | 7.18926e-21 | 3.38642e-20 | Sinusoida_vs_others |
| Rasgef1b                                                                  | 268.355 | 5.90143  | 0.143706 | 41.0661  | 0           | 0           | Sinusoida_vs_others |
| Tmem150c                                                                  | 10.4311 | -5.09593 | 0.663994 | -7.67466 | 1.65859e-14 | 6.19044e-14 | Sinusoida_vs_others |
| Hpse                                                                      | 46.8877 | 7.3519   | 0.552013 | 13.3183  | 1.81089e-40 | 1.36356e-39 | Sinusoida_vs_others |
| Gpat3                                                                     | 17.5686 | 4.35347  | 0.355495 | 12.2462  | 1.75958e-34 | 1.17273e-33 | Sinusoida_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                     |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|---------------------|
| Sparcl1                                                                   | 675.194 | -8.76751 | 0.285077  | -30.7549 | 1.0515e-207 | 3.562e-206  | Sinusoida_vs_others |
| Sez6l                                                                     | 10.0339 | -5.62146 | 0.801676  | -7.01213 | 2.3472e-12  | 8.02653e-12 | Sinusoida_vs_others |
| Cabp1                                                                     | 12.6938 | -6.55779 | 0.96917   | -6.76639 | 1.32031e-11 | 4.35316e-11 | Sinusoida_vs_others |
| Tbx3                                                                      | 29.6328 | -7.78427 | 0.96578   | -8.06009 | 7.62392e-16 | 3.01793e-15 | Sinusoida_vs_others |
| Cux2                                                                      | 47.1965 | 6.8361   | 0.464573  | 14.7148  | 5.17912e-49 | 4.50141e-48 | Sinusoida_vs_others |
| Hvcn1                                                                     | 31.6357 | 4.44254  | 0.265837  | 16.7115  | 1.08001e-62 | 1.13467e-61 | Sinusoida_vs_others |
| Hip1r                                                                     | 24.1202 | -3.81631 | 0.298001  | -12.8064 | 1.51039e-37 | 1.0768e-36  | Sinusoida_vs_others |
| Rflna                                                                     | 39.1313 | -4.85388 | 0.318937  | -15.219  | 2.64733e-52 | 2.41144e-51 | Sinusoida_vs_others |
| Hspb1                                                                     | 880.662 | -4.39076 | 0.0645058 | -68.0676 | 0           | 0           | Sinusoida_vs_others |
| Cldn15                                                                    | 68.6402 | -5.38433 | 0.283981  | -18.9602 | 3.63579e-80 | 4.66443e-79 | Sinusoida_vs_others |
| Agfg2                                                                     | 132.126 | 3.11172  | 0.0917108 | 33.9297  | 2.4326e-252 | 9.9275e-251 | Sinusoida_vs_others |
| Snx8                                                                      | 222.301 | 3.3139   | 0.0780166 | 42.4769  | 0           | 0           | Sinusoida_vs_others |
| Sdk1                                                                      | 97.9094 | -3.54897 | 0.21118   | -16.8055 | 2.22595e-63 | 2.35933e-62 | Sinusoida_vs_others |
| Fry                                                                       | 296.605 | -3.57727 | 0.0831344 | -43.0299 | 0           | 0           | Sinusoida_vs_others |
| N4bp2l1                                                                   | 73.3383 | 4.17792  | 0.171699  | 24.3328  | 8.8175e-131 | 1.7899e-129 | Sinusoida_vs_others |
| Stard13                                                                   | 68.1211 | -3.85595 | 0.182098  | -21.1751 | 1.6208e-99  | 2.52777e-98 | Sinusoida_vs_others |
| Ppp1r9a                                                                   | 91.5543 | 9.66654  | 0.872647  | 11.0773  | 1.61731e-28 | 9.3139e-28  | Sinusoida_vs_others |
| Pdk4                                                                      | 121.66  | 3.82613  | 0.123342  | 31.0206  | 2.8472e-211 | 9.7729e-210 | Sinusoida_vs_others |
| Dync1i1                                                                   | 14.9481 | -5.35175 | 0.603638  | -8.86583 | 7.59354e-19 | 3.35431e-18 | Sinusoida_vs_others |
| Tfec                                                                      | 102.717 | 7.96763  | 0.459366  | 17.3449  | 2.15707e-67 | 2.38551e-66 | Sinusoida_vs_others |
| Cav1                                                                      | 383.948 | -3.5088  | 0.0763432 | -45.9608 | 0           | 0           | Sinusoida_vs_others |
| Wnt2                                                                      | 356.481 | 8.44266  | 0.291919  | 28.9212  | 6.4616e-184 | 1.9137e-182 | Sinusoida_vs_others |
| Cped1                                                                     | 253.886 | -5.16164 | 0.137885  | -37.4344 | 1.0771e-306 | 5.5275e-305 | Sinusoida_vs_others |
| Aass                                                                      | 429.933 | 11.9017  | 0.871065  | 13.6633  | 1.68077e-42 | 1.31526e-41 | Sinusoida_vs_others |
| Cadps2                                                                    | 234.344 | 4.62909  | 0.104685  | 44.219   | 0           | 0           | Sinusoida_vs_others |
| Akr1b8                                                                    | 84.6011 | 8.42663  | 0.595047  | 14.1613  | 1.59031e-45 | 1.31181e-44 | Sinusoida_vs_others |
| Chrm2                                                                     | 23.0053 | -6.83893 | 0.796157  | -8.58993 | 8.70243e-18 | 3.70318e-17 | Sinusoida_vs_others |
| Ptn                                                                       | 71.5817 | -9.34896 | 1.0693    | -8.74309 | 2.2682e-18  | 9.85148e-18 | Sinusoida_vs_others |
| Dennd2a                                                                   | 92.1767 | 5.2169   | 0.204304  | 25.535   | 8.0617e-144 | 1.8167e-142 | Sinusoida_vs_others |
| Gimap3                                                                    | 18.752  | -5.68544 | 0.59927   | -9.48727 | 2.37166e-21 | 1.13607e-20 | Sinusoida_vs_others |
| Hoxa7                                                                     | 38.1197 | -8.14898 | 0.965462  | -8.4405  | 3.15983e-17 | 1.31616e-16 | Sinusoida_vs_others |
| Creb5                                                                     | 17.0569 | -4.17549 | 0.397409  | -10.5068 | 8.03977e-26 | 4.35576e-25 | Sinusoida_vs_others |
| Tril                                                                      | 47.137  | -5.35145 | 0.342179  | -15.6394 | 3.92685e-55 | 3.72308e-54 | Sinusoida_vs_others |
| Aqp1                                                                      | 2392.04 | 3.16652  | 0.0872995 | 36.2719  | 4.4926e-288 | 2.0852e-286 | Sinusoida_vs_others |
| Pde1c                                                                     | 231.889 | 4.05483  | 0.105898  | 38.2899  | 0           | 0           | Sinusoida_vs_others |
| Ndnf                                                                      | 11.0997 | -6.65755 | 1.0843    | -6.13997 | 8.25365e-10 | 2.47787e-09 | Sinusoida_vs_others |
| Prdm5                                                                     | 22.9434 | -5.38403 | 0.492059  | -10.9418 | 7.27063e-28 | 4.13349e-27 | Sinusoida_vs_others |
| Capg                                                                      | 14.9535 | -3.78719 | 0.375223  | -10.0932 | 5.92262e-24 | 3.07174e-23 | Sinusoida_vs_others |
| Loxl3                                                                     | 38.8853 | 3.97553  | 0.21323   | 18.6444  | 1.40318e-77 | 1.75245e-76 | Sinusoida_vs_others |
| Rtkn                                                                      | 22.9485 | 3.23405  | 0.236702  | 13.663   | 1.68988e-42 | 1.32173e-41 | Sinusoida_vs_others |
| Rab11fip5                                                                 | 14.3439 | -3.32289 | 0.334908  | -9.92181 | 3.34643e-23 | 1.69546e-22 | Sinusoida_vs_others |
| Efcc1                                                                     | 15.5507 | 5.0681   | 0.456454  | 11.1032  | 1.21018e-28 | 6.99263e-28 | Sinusoida_vs_others |
| Nup210                                                                    | 23.1018 | -6.25682 | 0.654368  | -9.56162 | 1.15932e-21 | 5.61392e-21 | Sinusoida_vs_others |
| Ssu2                                                                      | 25.4406 | -6.69211 | 0.722844  | -9.25803 | 2.08238e-20 | 9.63373e-20 | Sinusoida_vs_others |
| Timp4                                                                     | 34.4754 | -7.71319 | 0.88601   | -8.70554 | 3.16069e-18 | 1.36478e-17 | Sinusoida_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                     |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|---------------------|
| Cxcl12                                                                    | 263.864 | -7.11086 | 0.514566  | -13.8192 | 1.95348e-43 | 1.55369e-42 | Sinusoida_vs_others |
| Cacna1c                                                                   | 11.4252 | -4.04205 | 0.500796  | -8.07124 | 6.95874e-16 | 2.75743e-15 | Sinusoida_vs_others |
| Clec1b                                                                    | 159.681 | 5.52729  | 0.170083  | 32.4975  | 1.1557e-231 | 4.2887e-230 | Sinusoida_vs_others |
| Gm43914                                                                   | 11.863  | 5.83803  | 0.66276   | 8.80866  | 1.26652e-18 | 5.55519e-18 | Sinusoida_vs_others |
| Kap                                                                       | 222.544 | -10.6963 | 0.965079  | -11.0834 | 1.51074e-28 | 8.70984e-28 | Sinusoida_vs_others |
| Emp1                                                                      | 106.436 | -4.85134 | 0.19412   | -24.9914 | 7.5756e-138 | 1.627e-136  | Sinusoida_vs_others |
| Arhgdib                                                                   | 249.622 | 3.12867  | 0.069417  | 45.0706  | 0           | 0           | Sinusoida_vs_others |
| Rerg                                                                      | 100.964 | 10.101   | 0.965328  | 10.4638  | 1.26644e-25 | 6.83509e-25 | Sinusoida_vs_others |
| Slco1c1                                                                   | 49.2595 | -8.80899 | 1.0695    | -8.23653 | 1.77281e-16 | 7.20288e-16 | Sinusoida_vs_others |
| Slco1a4                                                                   | 89.4202 | -9.66927 | 1.06538   | -9.07585 | 1.12794e-19 | 5.11022e-19 | Sinusoida_vs_others |
| Kcnj8                                                                     | 39.0938 | -3.28702 | 0.200686  | -16.3789 | 2.70425e-60 | 2.73752e-59 | Sinusoida_vs_others |
| Lrmp                                                                      | 65.9303 | 3.22729  | 0.134107  | 24.065   | 5.809e-128  | 1.1521e-126 | Sinusoida_vs_others |
| Tmtc1                                                                     | 124.874 | -5.24358 | 0.201647  | -26.0037 | 4.4942e-149 | 1.0461e-147 | Sinusoida_vs_others |
| Ehd2                                                                      | 169.523 | -4.13321 | 0.122839  | -33.6475 | 3.3941e-248 | 1.3602e-246 | Sinusoida_vs_others |
| C5ar2                                                                     | 146.532 | 10.3464  | 0.871753  | 11.8686  | 1.72414e-32 | 1.09737e-31 | Sinusoida_vs_others |
| Pglyrp1                                                                   | 25.2848 | -7.84667 | 1.06637   | -7.35827 | 1.86311e-13 | 6.68579e-13 | Sinusoida_vs_others |
| Fosb                                                                      | 42.1979 | -3.21502 | 0.202956  | -15.841  | 1.62265e-56 | 1.57102e-55 | Sinusoida_vs_others |
| Bcam                                                                      | 224.288 | -3.08533 | 0.0862057 | -35.7903 | 1.5613e-280 | 7.057e-279  | Sinusoida_vs_others |
| Igsf23                                                                    | 13.5625 | 4.73343  | 0.442732  | 10.6914  | 1.11661e-26 | 6.16772e-26 | Sinusoida_vs_others |
| Spint2                                                                    | 68.6096 | 4.17696  | 0.167998  | 24.8632  | 1.8619e-136 | 3.9659e-135 | Sinusoida_vs_others |
| Chst8                                                                     | 76.62   | -3.66858 | 0.16762   | -21.8863 | 3.5076e-106 | 5.8207e-105 | Sinusoida_vs_others |
| Sult2b1                                                                   | 28.648  | -7.44285 | 0.876603  | -8.49056 | 2.05649e-17 | 8.63993e-17 | Sinusoida_vs_others |
| Lmtk3                                                                     | 41.9496 | -4.30248 | 0.263224  | -16.3453 | 4.69938e-60 | 4.74793e-59 | Sinusoida_vs_others |
| Gm2788                                                                    | 11.614  | 4.38255  | 0.428364  | 10.2309  | 1.44188e-24 | 7.59478e-24 | Sinusoida_vs_others |
| Tarsl2                                                                    | 10.0713 | -3.16198 | 0.383427  | -8.24663 | 1.62923e-16 | 6.62296e-16 | Sinusoida_vs_others |
| Synm                                                                      | 32.7523 | -5.25988 | 0.395442  | -13.3013 | 2.27574e-40 | 1.70862e-39 | Sinusoida_vs_others |
| Gm29683                                                                   | 20.5536 | 5.48169  | 0.463318  | 11.8314  | 2.68693e-32 | 1.7018e-31  | Sinusoida_vs_others |
| B130024G19Rik                                                             | 152.259 | 3.10793  | 0.0899065 | 34.5685  | 7.5097e-262 | 3.1991e-260 | Sinusoida_vs_others |
| Gm42397                                                                   | 20.6171 | 7.51268  | 0.887975  | 8.46046  | 2.66331e-17 | 1.11322e-16 | Sinusoida_vs_others |
| Sema4b                                                                    | 46.0568 | 3.0898   | 0.165668  | 18.6506  | 1.24823e-77 | 1.56019e-76 | Sinusoida_vs_others |
| Tm6sf1                                                                    | 67.418  | -3.45209 | 0.158873  | -21.7285 | 1.103e-104  | 1.8053e-103 | Sinusoida_vs_others |
| Prss23                                                                    | 177.817 | -5.52545 | 0.591064  | -9.34832 | 8.90534e-21 | 4.17705e-20 | Sinusoida_vs_others |
| Me3                                                                       | 30.9821 | -4.6525  | 0.335164  | -13.8813 | 8.2254e-44  | 6.57567e-43 | Sinusoida_vs_others |
| Dlg2                                                                      | 53.1336 | -5.24151 | 0.313801  | -16.7033 | 1.24028e-62 | 1.30129e-61 | Sinusoida_vs_others |
| Thrsp                                                                     | 349.211 | -4.02585 | 0.0848025 | -47.4733 | 0           | 0           | Sinusoida_vs_others |
| Acer3                                                                     | 466.91  | 3.99972  | 0.0667932 | 59.8821  | 0           | 0           | Sinusoida_vs_others |
| Map6                                                                      | 10.5252 | -6.5818  | 1.07518   | -6.12156 | 9.26662e-10 | 2.77303e-09 | Sinusoida_vs_others |
| Tpbgl                                                                     | 406.166 | 6.18261  | 0.129547  | 47.7248  | 0           | 0           | Sinusoida_vs_others |
| Gm10605                                                                   | 70.6923 | 5.43638  | 0.241328  | 22.5269  | 2.2623e-112 | 3.9702e-111 | Sinusoida_vs_others |
| Anapc15                                                                   | 341.319 | 4.3512   | 0.0824178 | 52.7944  | 0           | 0           | Sinusoida_vs_others |
| Cavin3                                                                    | 520.267 | -6.37515 | 0.29301   | -21.7574 | 5.879e-105  | 9.6529e-104 | Sinusoida_vs_others |
| Apbb1                                                                     | 13.6122 | -3.64627 | 0.373827  | -9.7539  | 1.77519e-22 | 8.79899e-22 | Sinusoida_vs_others |
| Lmo1                                                                      | 16.0144 | -6.89426 | 0.969418  | -7.11175 | 1.14581e-12 | 3.97151e-12 | Sinusoida_vs_others |
| Lyve1                                                                     | 480.442 | 10.7124  | 0.548902  | 19.516   | 8.02684e-85 | 1.07132e-83 | Sinusoida_vs_others |
| Dkk3                                                                      | 13.5845 | 6.91962  | 0.885977  | 7.81016  | 5.71175e-15 | 2.17463e-14 | Sinusoida_vs_others |



| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                     |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|---------------------|
| Mical2                                                                    | 78.9656 | 3.76269  | 0.144209  | 26.0919  | 4.5037e-150 | 1.0578e-148 | Sinusoida_vs_others |
| Pth                                                                       | 67.1601 | -9.25676 | 1.72729   | -5.35912 | 8.36286e-08 | 2.22699e-07 | Sinusoida_vs_others |
| 493340618Rik                                                              | 18.5437 | 6.47966  | 0.662838  | 9.77563  | 1.4326e-22  | 7.12358e-22 | Sinusoida_vs_others |
| Pde3b                                                                     | 37.001  | 4.22311  | 0.238876  | 17.6791  | 6.07182e-70 | 6.94708e-69 | Sinusoida_vs_others |
| Xylt1                                                                     | 54.8594 | -3.45436 | 0.17668   | -19.5515 | 4.00839e-85 | 5.3869e-84  | Sinusoida_vs_others |
| Gprc5b                                                                    | 23.5588 | -3.71943 | 0.29263   | -12.7103 | 5.18046e-37 | 3.64814e-36 | Sinusoida_vs_others |
| Vwa3a                                                                     | 36.1282 | -5.40811 | 0.400642  | -13.4986 | 1.59305e-41 | 1.22626e-40 | Sinusoida_vs_others |
| Prkcb                                                                     | 151.404 | 3.54808  | 0.106778  | 33.2285  | 4.1708e-242 | 1.6335e-240 | Sinusoida_vs_others |
| Nupr1                                                                     | 20.6881 | -6.38638 | 0.719337  | -8.87814 | 6.79858e-19 | 3.00914e-18 | Sinusoida_vs_others |
| Cpxm2                                                                     | 22.5733 | -7.39142 | 0.966151  | -7.65038 | 2.00385e-14 | 7.45225e-14 | Sinusoida_vs_others |
| Ebf3                                                                      | 56.8315 | -4.12508 | 0.217321  | -18.9815 | 2.42399e-80 | 3.11493e-79 | Sinusoida_vs_others |
| Ifitm1                                                                    | 12.9597 | 3.02513  | 0.493008  | 6.13607  | 8.45903e-10 | 2.5382e-09  | Sinusoida_vs_others |
| Eps8l2                                                                    | 16.678  | -3.13051 | 0.305971  | -10.2314 | 1.43463e-24 | 7.55913e-24 | Sinusoida_vs_others |
| Dusp8                                                                     | 10.8064 | -3.71243 | 0.437988  | -8.47609 | 2.32891e-17 | 9.75807e-17 | Sinusoida_vs_others |
| Stxbp2                                                                    | 11.7475 | 4.39717  | 0.431057  | 10.2009  | 1.9645e-24  | 1.03196e-23 | Sinusoida_vs_others |
| Clec4g                                                                    | 1789.19 | 14.5368  | 1.06331   | 13.6713  | 1.50677e-42 | 1.18029e-41 | Sinusoida_vs_others |
| Cd209b                                                                    | 12.5095 | 7.37633  | 1.08272   | 6.81279  | 9.5724e-12  | 3.17359e-11 | Sinusoida_vs_others |
| Mcf2l                                                                     | 279.26  | -6.82751 | 0.23019   | -29.6603 | 2.4951e-193 | 7.9175e-192 | Sinusoida_vs_others |
| Tmem255b                                                                  | 25.822  | -5.937   | 0.560179  | -10.5984 | 3.03141e-26 | 1.65678e-25 | Sinusoida_vs_others |
| Csmd1                                                                     | 115.654 | 9.71785  | 0.794627  | 12.2294  | 2.16418e-34 | 1.43746e-33 | Sinusoida_vs_others |
| Plat                                                                      | 150.693 | -4.85173 | 0.16864   | -28.7698 | 5.1213e-182 | 1.4968e-180 | Sinusoida_vs_others |
| Nrg1                                                                      | 154.107 | 6.66484  | 0.45006   | 14.8088  | 1.28522e-49 | 1.12332e-48 | Sinusoida_vs_others |
| Gm6213                                                                    | 34.9038 | -4.61656 | 0.33615   | -13.7336 | 6.38376e-43 | 5.03608e-42 | Sinusoida_vs_others |
| Msr1                                                                      | 463.388 | 9.55997  | 0.373633  | 25.5865  | 2.1548e-144 | 4.8699e-143 | Sinusoida_vs_others |
| Sorbs2                                                                    | 173.316 | -4.59556 | 0.145048  | -31.683  | 2.6643e-220 | 9.4154e-219 | Sinusoida_vs_others |
| Hpgd                                                                      | 343.327 | 9.5759   | 0.436189  | 21.9535  | 8.0104e-107 | 1.3378e-105 | Sinusoida_vs_others |
| Palld                                                                     | 1036.67 | 6.62303  | 0.192095  | 34.4779  | 1.7218e-260 | 7.2751e-259 | Sinusoida_vs_others |
| Tll1                                                                      | 86.8109 | -8.7578  | 0.789316  | -11.0954 | 1.32032e-28 | 7.61484e-28 | Sinusoida_vs_others |
| Psd3                                                                      | 2305.85 | 3.25578  | 0.0395778 | 82.2628  | 0           | 0           | Sinusoida_vs_others |
| Lpl                                                                       | 54.5931 | -6.50791 | 0.465893  | -13.9687 | 2.42065e-44 | 1.9512e-43  | Sinusoida_vs_others |
| Isyna1                                                                    | 21.4875 | -4.43155 | 0.377128  | -11.7508 | 6.99632e-32 | 4.37946e-31 | Sinusoida_vs_others |
| Plvap                                                                     | 2711.85 | -4.22379 | 0.0656276 | -64.36   | 0           | 0           | Sinusoida_vs_others |
| F2rl3                                                                     | 10.0242 | -6.21158 | 0.977468  | -6.35477 | 2.08741e-10 | 6.50315e-10 | Sinusoida_vs_others |
| Gm10638                                                                   | 18.2    | -3.15827 | 0.283763  | -11.13   | 8.96692e-29 | 5.20443e-28 | Sinusoida_vs_others |
| Tox3                                                                      | 25.6495 | -7.86982 | 1.06608   | -7.38203 | 1.55896e-13 | 5.61247e-13 | Sinusoida_vs_others |
| Irx3                                                                      | 176.143 | -10.6477 | 1.06295   | -10.0171 | 1.28169e-23 | 6.58376e-23 | Sinusoida_vs_others |
| Crnde                                                                     | 19.7308 | -7.19453 | 0.966722  | -7.44219 | 9.90305e-14 | 3.59856e-13 | Sinusoida_vs_others |
| Irx5                                                                      | 57.6412 | -8.74628 | 0.963964  | -9.07324 | 1.15525e-19 | 5.22787e-19 | Sinusoida_vs_others |
| Mt2                                                                       | 66.9562 | 3.85343  | 0.155168  | 24.8339  | 3.8566e-136 | 8.181e-135  | Sinusoida_vs_others |
| Cx3cl1                                                                    | 43.2134 | -6.32124 | 0.490376  | -12.8906 | 5.08547e-38 | 3.63893e-37 | Sinusoida_vs_others |
| Ccdc102a                                                                  | 27.0698 | -3.7209  | 0.281911  | -13.1988 | 8.91099e-40 | 6.57915e-39 | Sinusoida_vs_others |
| Mmp15                                                                     | 86.9204 | -4.47878 | 0.19295   | -23.2121 | 3.4332e-119 | 6.3175e-118 | Sinusoida_vs_others |
| Car7                                                                      | 53.4849 | -3.16073 | 0.179602  | -17.5985 | 2.52766e-69 | 2.87509e-68 | Sinusoida_vs_others |
| Rrad                                                                      | 18.0288 | -5.40436 | 0.558816  | -9.67109 | 4.00083e-22 | 1.96119e-21 | Sinusoida_vs_others |
| Agrp                                                                      | 14.7809 | -3.15951 | 0.31379   | -10.0689 | 7.58338e-24 | 3.91741e-23 | Sinusoida_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                     |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|---------------------|
| Has3                                                                      | 15.3018 | -4.78382 | 0.497302  | -9.61954 | 6.61273e-22 | 3.22223e-21 | Sinusoida_vs_others |
| Maf                                                                       | 3595.61 | 4.82602  | 0.0328581 | 146.875  | 0           | 0           | Sinusoida_vs_others |
| Plcg2                                                                     | 12.8968 | -3.2268  | 0.365784  | -8.82158 | 1.1286e-18  | 4.95863e-18 | Sinusoida_vs_others |
| Wfdc1                                                                     | 17.8004 | -5.38423 | 0.558473  | -9.64098 | 5.36726e-22 | 2.62356e-21 | Sinusoida_vs_others |
| Fendrr                                                                    | 10.4652 | -6.27663 | 0.975834  | -6.43206 | 1.25883e-10 | 3.96788e-10 | Sinusoida_vs_others |
| Foxf1                                                                     | 25.9431 | -7.59356 | 0.96625   | -7.85879 | 3.87849e-15 | 1.48832e-14 | Sinusoida_vs_others |
| Aprt                                                                      | 68.5046 | -3.32156 | 0.15474   | -21.4655 | 3.2754e-102 | 5.2613e-101 | Sinusoida_vs_others |
| Sipa1l2                                                                   | 137.649 | -4.16725 | 0.141526  | -29.4451 | 1.4549e-190 | 4.5155e-189 | Sinusoida_vs_others |
| Pard3                                                                     | 16.7053 | -4.0566  | 0.389322  | -10.4196 | 2.01704e-25 | 1.08447e-24 | Sinusoida_vs_others |
| Endod1                                                                    | 118.638 | -6.36029 | 0.298251  | -21.3253 | 6.6125e-101 | 1.0449e-99  | Sinusoida_vs_others |
| Fut4                                                                      | 16.2725 | -6.92038 | 0.967951  | -7.14952 | 8.7083e-13  | 3.03327e-12 | Sinusoida_vs_others |
| Bmper                                                                     | 53.8732 | 4.24112  | 0.201597  | 21.0376  | 2.97128e-98 | 4.53836e-97 | Sinusoida_vs_others |
| Jam3                                                                      | 296.71  | -4.48778 | 0.103521  | -43.3514 | 0           | 0           | Sinusoida_vs_others |
| Kirrel3                                                                   | 92.4866 | -4.49614 | 0.236066  | -19.0461 | 7.07387e-81 | 9.12794e-80 | Sinusoida_vs_others |
| Robo3                                                                     | 13.161  | -6.60487 | 0.971812  | -6.79645 | 1.07229e-11 | 3.55049e-11 | Sinusoida_vs_others |
| Gramd1b                                                                   | 110.32  | 3.44653  | 0.113503  | 30.3651  | 1.5881e-202 | 5.2763e-201 | Sinusoida_vs_others |
| Mir100hg                                                                  | 255.023 | 5.28752  | 0.13053   | 40.5081  | 0           | 0           | Sinusoida_vs_others |
| Fxyd2                                                                     | 22.112  | -7.06875 | 0.875774  | -8.07143 | 6.9479e-16  | 2.75383e-15 | Sinusoida_vs_others |
| Zbtb16                                                                    | 73.9395 | -8.52694 | 0.789805  | -10.7963 | 3.58539e-27 | 2.00681e-26 | Sinusoida_vs_others |
| Scamp5                                                                    | 48.7976 | 5.73566  | 0.316544  | 18.1196  | 2.23172e-73 | 2.66726e-72 | Sinusoida_vs_others |
| Sema7a                                                                    | 167.75  | -6.9281  | 0.303555  | -22.8232 | 2.6952e-115 | 4.8058e-114 | Sinusoida_vs_others |
| Megf11                                                                    | 15.4399 | 3.37636  | 0.294787  | 11.4536  | 2.25618e-30 | 1.36716e-29 | Sinusoida_vs_others |
| Rab27a                                                                    | 121.715 | 3.44109  | 0.108242  | 31.7908  | 8.6781e-222 | 3.0948e-220 | Sinusoida_vs_others |
| Myo5a                                                                     | 21.4304 | -3.17359 | 0.267886  | -11.8468 | 2.2366e-32  | 1.42005e-31 | Sinusoida_vs_others |
| Lysmd2                                                                    | 52.1721 | -5.28106 | 0.320494  | -16.4779 | 5.28929e-61 | 5.43577e-60 | Sinusoida_vs_others |
| Hmgn3                                                                     | 55.1391 | -4.85305 | 0.266142  | -18.2348 | 2.73181e-74 | 3.30046e-73 | Sinusoida_vs_others |
| Plscr1                                                                    | 172.283 | -4.2164  | 0.129029  | -32.6779 | 3.2144e-234 | 1.2102e-232 | Sinusoida_vs_others |
| Plscr2                                                                    | 620.33  | -7.88414 | 0.22068   | -35.7266 | 1.5279e-279 | 6.8863e-278 | Sinusoida_vs_others |
| Slc9a9                                                                    | 1226.6  | 8.40998  | 0.1591    | 52.8599  | 0           | 0           | Sinusoida_vs_others |
| Trpc1                                                                     | 11.7334 | -5.84724 | 0.799769  | -7.31116 | 2.64851e-13 | 9.45183e-13 | Sinusoida_vs_others |
| Foxl2                                                                     | 10.305  | -6.55209 | 1.07688   | -6.08432 | 1.16989e-09 | 3.48147e-09 | Sinusoida_vs_others |
| Ephb1                                                                     | 100.783 | -6.90938 | 0.389788  | -17.726  | 2.6424e-70  | 3.05024e-69 | Sinusoida_vs_others |
| Ackr4                                                                     | 44.512  | 5.73856  | 0.333967  | 17.183   | 3.55986e-66 | 3.88437e-65 | Sinusoida_vs_others |
| Rtp3                                                                      | 38.4001 | -5.04585 | 0.339352  | -14.8691 | 5.23257e-50 | 4.59928e-49 | Sinusoida_vs_others |
| Vipr1                                                                     | 12.293  | 6.46341  | 0.809567  | 7.98378  | 1.41914e-15 | 5.52898e-15 | Sinusoida_vs_others |
| Ackr2                                                                     | 25.469  | 4.25718  | 0.279445  | 15.2344  | 2.09015e-52 | 1.90838e-51 | Sinusoida_vs_others |
| Esr1                                                                      | 39.1304 | 4.41378  | 0.238878  | 18.4771  | 3.15434e-76 | 3.88952e-75 | Sinusoida_vs_others |
| Cnksr3                                                                    | 549.148 | 3.67432  | 0.0550027 | 66.8025  | 0           | 0           | Sinusoida_vs_others |
| Ust                                                                       | 22.5388 | 5.49049  | 0.441801  | 12.4275  | 1.85299e-35 | 1.25927e-34 | Sinusoida_vs_others |
| Plagl1                                                                    | 19.5831 | 5.87682  | 0.530268  | 11.0827  | 1.52127e-28 | 8.76732e-28 | Sinusoida_vs_others |
| Adgrg6                                                                    | 103.831 | 6.39544  | 0.388615  | 16.457   | 7.46832e-61 | 7.63478e-60 | Sinusoida_vs_others |
| Cited2                                                                    | 65.5416 | -3.14439 | 0.151611  | -20.7399 | 1.51305e-95 | 2.26652e-94 | Sinusoida_vs_others |
| Map3k5                                                                    | 106.526 | -5.27799 | 0.223191  | -23.6478 | 1.2435e-123 | 2.3783e-122 | Sinusoida_vs_others |
| Aldh8a1                                                                   | 11.4001 | 5.28177  | 0.5715    | 9.24194  | 2.42076e-20 | 1.11693e-19 | Sinusoida_vs_others |
| Enpp3                                                                     | 30.6001 | -6.95846 | 0.718186  | -9.68894 | 3.36004e-22 | 1.65333e-21 | Sinusoida_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                     |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|---------------------|
| Rspo3                                                                     | 220.459 | 8.48603  | 0.40477   | 20.9651  | 1.36742e-97 | 2.08043e-96 | Sinusoida_vs_others |
| Hey2                                                                      | 12.5996 | -6.84542 | 1.07676   | -6.3574  | 2.05203e-10 | 6.39805e-10 | Sinusoida_vs_others |
| Calhm6                                                                    | 28.1952 | 8.25362  | 0.968416  | 8.5228   | 1.55737e-17 | 6.57496e-17 | Sinusoida_vs_others |
| Dse                                                                       | 416.146 | 4.29874  | 0.0712293 | 60.3506  | 0           | 0           | Sinusoida_vs_others |
| Mettl24                                                                   | 71.9522 | -3.76355 | 0.171542  | -21.9395 | 1.0901e-106 | 1.8186e-105 | Sinusoida_vs_others |
| Ccdc162                                                                   | 10.8203 | 3.61155  | 0.361703  | 9.98484  | 1.77586e-23 | 9.06526e-23 | Sinusoida_vs_others |
| Cd24a                                                                     | 590.642 | -9.69045 | 0.417333  | -23.22   | 2.8616e-119 | 5.272e-118  | Sinusoida_vs_others |
| Prdm1                                                                     | 105.743 | -3.38992 | 0.130039  | -26.0686 | 8.2859e-150 | 1.9403e-148 | Sinusoida_vs_others |
| Sowahc                                                                    | 13.7443 | 4.13896  | 0.375278  | 11.0291  | 2.76752e-28 | 1.58556e-27 | Sinusoida_vs_others |
| Oit3                                                                      | 685.662 | 5.34838  | 0.0773991 | 69.1014  | 0           | 0           | Sinusoida_vs_others |
| Spock2                                                                    | 78.4231 | -6.53994 | 0.394975  | -16.5579 | 1.40483e-61 | 1.46015e-60 | Sinusoida_vs_others |
| Unc5b                                                                     | 72.8383 | -3.55608 | 0.160639  | -22.1371 | 1.3887e-108 | 2.347e-107  | Sinusoida_vs_others |
| H2afy2                                                                    | 24.6483 | -3.43456 | 0.25968   | -13.2261 | 6.20123e-40 | 4.60033e-39 | Sinusoida_vs_others |
| Tet1                                                                      | 18.6791 | -4.31824 | 0.387711  | -11.1378 | 8.21442e-29 | 4.76945e-28 | Sinusoida_vs_others |
| Tmem26                                                                    | 75.1286 | -8.5497  | 0.789253  | -10.8326 | 2.41091e-27 | 1.35627e-26 | Sinusoida_vs_others |
| Fam13c                                                                    | 62.0405 | -7.98539 | 0.715336  | -11.1631 | 6.17778e-29 | 3.59365e-28 | Sinusoida_vs_others |
| Bicc1                                                                     | 31.1321 | -8.14934 | 1.06707   | -7.63713 | 2.2211e-14  | 8.24441e-14 | Sinusoida_vs_others |
| Ddt                                                                       | 43.7445 | -3.18114 | 0.182792  | -17.4031 | 7.81604e-68 | 8.66845e-67 | Sinusoida_vs_others |
| Mmp11                                                                     | 14.4948 | -6.45788 | 0.881622  | -7.32499 | 2.3891e-13  | 8.53905e-13 | Sinusoida_vs_others |
| Chchd10                                                                   | 94.7485 | -4.23402 | 0.988589  | -4.28289 | 1.8448e-05  | 4.11193e-05 | Sinusoida_vs_others |
| Palm                                                                      | 150.099 | -3.79247 | 0.119246  | -31.8038 | 5.738e-222  | 2.051e-220  | Sinusoida_vs_others |
| Cfd                                                                       | 11.9144 | -6.75934 | 1.07768   | -6.27214 | 3.56129e-10 | 1.09241e-09 | Sinusoida_vs_others |
| Arhgap45                                                                  | 306.242 | 3.92193  | 0.0761902 | 51.4755  | 0           | 0           | Sinusoida_vs_others |
| Gadd45b                                                                   | 27.9348 | -3.54745 | 0.254739  | -13.9258 | 4.41296e-44 | 3.54427e-43 | Sinusoida_vs_others |
| Gm4924                                                                    | 11.0057 | 3.04952  | 0.321712  | 9.47905  | 2.56605e-21 | 1.22692e-20 | Sinusoida_vs_others |
| Chst11                                                                    | 148.304 | -4.9337  | 0.169201  | -29.1588 | 6.4642e-187 | 1.967e-185  | Sinusoida_vs_others |
| Stab2                                                                     | 4471.43 | 11.7391  | 0.256298  | 45.8023  | 0           | 0           | Sinusoida_vs_others |
| Gm16271                                                                   | 10.0354 | 6.7604   | 0.980711  | 6.89337  | 5.44868e-12 | 1.82786e-11 | Sinusoida_vs_others |
| Igf1                                                                      | 46.5768 | -6.79041 | 0.550101  | -12.3439 | 5.25214e-35 | 3.53531e-34 | Sinusoida_vs_others |
| Dram1                                                                     | 92.8774 | -6.89613 | 0.403288  | -17.0998 | 1.48985e-65 | 1.61321e-64 | Sinusoida_vs_others |
| Rmst                                                                      | 10.0954 | -6.52042 | 1.07726   | -6.05279 | 1.4236e-09  | 4.20987e-09 | Sinusoida_vs_others |
| Plxnc1                                                                    | 1423.34 | 9.76379  | 0.229444  | 42.5542  | 0           | 0           | Sinusoida_vs_others |
| Rassf9                                                                    | 98.4219 | -4.59167 | 0.184962  | -24.825  | 4.8221e-136 | 1.0215e-134 | Sinusoida_vs_others |
| Ppfia2                                                                    | 461.926 | 3.74692  | 0.0616867 | 60.7412  | 0           | 0           | Sinusoida_vs_others |
| Nav3                                                                      | 195.778 | -7.67643 | 0.363736  | -21.1044 | 7.2429e-99  | 1.12395e-97 | Sinusoida_vs_others |
| Kcnc2                                                                     | 10.5695 | -4.06916 | 0.541365  | -7.51648 | 5.6271e-14  | 2.06163e-13 | Sinusoida_vs_others |
| Lyz2                                                                      | 14.3024 | -4.05618 | 0.765826  | -5.29647 | 1.18063e-07 | 3.11146e-07 | Sinusoida_vs_others |
| Tafa2                                                                     | 17.9665 | 5.94546  | 0.559064  | 10.6347  | 2.05554e-26 | 1.13018e-25 | Sinusoida_vs_others |
| Gpr182                                                                    | 1374.9  | 4.24895  | 0.0397572 | 106.873  | 0           | 0           | Sinusoida_vs_others |
| Pik3ip1                                                                   | 29.4543 | -4.17226 | 0.296158  | -14.0879 | 4.50577e-45 | 3.69516e-44 | Sinusoida_vs_others |
| Selenom                                                                   | 439.295 | -3.22933 | 0.0610766 | -52.8735 | 0           | 0           | Sinusoida_vs_others |
| Ap1b1                                                                     | 399.575 | 3.97636  | 0.0669313 | 59.4096  | 0           | 0           | Sinusoida_vs_others |
| Emid1                                                                     | 72.5322 | -5.9071  | 0.327842  | -18.0181 | 1.40375e-72 | 1.65732e-71 | Sinusoida_vs_others |
| Ramp3                                                                     | 360.321 | -5.26948 | 0.120213  | -43.8346 | 0           | 0           | Sinusoida_vs_others |
| Igfbp3                                                                    | 2125.7  | -7.681   | 0.988591  | -7.76965 | 7.8706e-15  | 2.97544e-14 | Sinusoida_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                     |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|---------------------|
| Tns3                                                                      | 285.521 | 3.10664  | 0.0651671 | 47.6718  | 0           | 0           | Sinusoida_vs_others |
| Gm12002                                                                   | 278.093 | -9.60344 | 0.590197  | -16.2716 | 1.57059e-59 | 1.5827e-58  | Sinusoida_vs_others |
| Meis1                                                                     | 410.251 | 3.47374  | 0.0688424 | 50.4592  | 0           | 0           | Sinusoida_vs_others |
| Ccdc85a                                                                   | 342.826 | -10.7427 | 0.787604  | -13.6397 | 2.32397e-42 | 1.81039e-41 | Sinusoida_vs_others |
| Stk10                                                                     | 106.057 | -3.42731 | 0.12961   | -26.4433 | 4.3538e-154 | 1.0399e-152 | Sinusoida_vs_others |
| Lcp2                                                                      | 39.1188 | 4.20997  | 0.222584  | 18.9141  | 8.72658e-80 | 1.11404e-78 | Sinusoida_vs_others |
| Slit3                                                                     | 174.172 | -4.02886 | 0.835177  | -4.82396 | 1.40738e-06 | 3.43161e-06 | Sinusoida_vs_others |
| C1qtnf2                                                                   | 18.1192 | -3.09743 | 0.28052   | -11.0418 | 2.40293e-28 | 1.37871e-27 | Sinusoida_vs_others |
| Ebf1                                                                      | 1270.49 | -6.63876 | 0.600376  | -11.0577 | 2.0126e-28  | 1.15689e-27 | Sinusoida_vs_others |
| Gpx3                                                                      | 65.5233 | -6.92429 | 0.494036  | -14.0157 | 1.2489e-44  | 1.01405e-43 | Sinusoida_vs_others |
| Hs3st3b1                                                                  | 300.321 | 3.88612  | 0.0789045 | 49.251   | 0           | 0           | Sinusoida_vs_others |
| Usp43                                                                     | 22.5329 | -7.38994 | 0.968248  | -7.63227 | 2.30649e-14 | 8.54823e-14 | Sinusoida_vs_others |
| 9130017K11Rik                                                             | 21.7324 | -6.17074 | 0.652042  | -9.46371 | 2.97203e-21 | 1.41799e-20 | Sinusoida_vs_others |
| Arrb2                                                                     | 147.321 | 4.01343  | 0.110329  | 36.3769  | 9.871e-290  | 4.623e-288  | Sinusoida_vs_others |
| Cxcl16                                                                    | 198.568 | 3.77638  | 0.091388  | 41.3225  | 0           | 0           | Sinusoida_vs_others |
| Zmynd15                                                                   | 71.2199 | 4.66943  | 0.187823  | 24.8608  | 1.9771e-136 | 4.2054e-135 | Sinusoida_vs_others |
| Tlcd2                                                                     | 17.9923 | 3.07376  | 0.266106  | 11.5509  | 7.30838e-31 | 4.47218e-30 | Sinusoida_vs_others |
| Gm45606                                                                   | 12.8092 | 4.31374  | 0.408315  | 10.5647  | 4.34157e-26 | 2.36122e-25 | Sinusoida_vs_others |
| Slc43a2                                                                   | 470.707 | 6.44222  | 0.129761  | 49.6468  | 0           | 0           | Sinusoida_vs_others |
| Rflnb                                                                     | 630.166 | -6.2235  | 0.12853   | -48.4207 | 0           | 0           | Sinusoida_vs_others |
| Nos2                                                                      | 19.7937 | -6.91098 | 0.875752  | -7.89148 | 2.98628e-15 | 1.15049e-14 | Sinusoida_vs_others |
| Tmem132e                                                                  | 83.3724 | 10.114   | 1.06591   | 9.48859  | 2.34173e-21 | 1.12243e-20 | Sinusoida_vs_others |
| Slfn2                                                                     | 89.7005 | -4.69597 | 0.199519  | -23.5365 | 1.7262e-122 | 3.2614e-121 | Sinusoida_vs_others |
| Gm20234                                                                   | 10.5543 | -6.5863  | 1.07255   | -6.14078 | 8.21179e-10 | 2.46639e-09 | Sinusoida_vs_others |
| Al662270                                                                  | 35.2244 | 4.89548  | 0.288321  | 16.9793  | 1.16864e-64 | 1.25665e-63 | Sinusoida_vs_others |
| Car4                                                                      | 246.27  | -10.8425 | 0.961697  | -11.2743 | 1.75701e-29 | 1.04035e-28 | Sinusoida_vs_others |
| Ppm1e                                                                     | 60.0355 | -3.85553 | 0.197075  | -19.5637 | 3.15266e-85 | 4.2479e-84  | Sinusoida_vs_others |
| Hlf                                                                       | 24.9399 | -4.10159 | 0.320771  | -12.7867 | 1.9464e-37  | 1.38257e-36 | Sinusoida_vs_others |
| Itga3                                                                     | 24.0758 | -3.75247 | 0.298687  | -12.5632 | 3.36344e-36 | 2.32333e-35 | Sinusoida_vs_others |
| Plxdc1                                                                    | 45.9111 | 4.09396  | 0.215192  | 19.0247  | 1.06491e-80 | 1.36959e-79 | Sinusoida_vs_others |
| P3h4                                                                      | 15.9823 | -3.48736 | 0.329566  | -10.5817 | 3.62424e-26 | 1.97523e-25 | Sinusoida_vs_others |
| Fkbp10                                                                    | 14.8209 | -3.96591 | 0.393178  | -10.0868 | 6.31888e-24 | 3.2718e-23  | Sinusoida_vs_others |
| Tmem106a                                                                  | 307.362 | 3.88381  | 0.0737753 | 52.6438  | 0           | 0           | Sinusoida_vs_others |
| Meox1                                                                     | 119.707 | -8.64607 | 0.646215  | -13.3796 | 7.96202e-41 | 6.03321e-40 | Sinusoida_vs_others |
| Gjc1                                                                      | 95.4631 | -4.43413 | 0.184599  | -24.0203 | 1.7066e-127 | 3.3674e-126 | Sinusoida_vs_others |
| Arhgap27os1                                                               | 10.7797 | -3.09449 | 0.365774  | -8.46013 | 2.67087e-17 | 1.11608e-16 | Sinusoida_vs_others |
| Wnt9b                                                                     | 13.5539 | 6.02782  | 0.665144  | 9.06243  | 1.27579e-19 | 5.76666e-19 | Sinusoida_vs_others |
| Cyb561                                                                    | 18.8117 | -3.01557 | 0.276504  | -10.906  | 1.07851e-27 | 6.10763e-27 | Sinusoida_vs_others |
| Gh                                                                        | 516.206 | -11.9104 | 0.977625  | -12.183  | 3.82854e-34 | 2.52353e-33 | Sinusoida_vs_others |
| Sdk2                                                                      | 18.9833 | -3.75489 | 0.326672  | -11.4944 | 1.40822e-30 | 8.57335e-30 | Sinusoida_vs_others |
| Hid1                                                                      | 46.6174 | 3.36001  | 0.164593  | 20.414   | 1.25623e-92 | 1.82895e-91 | Sinusoida_vs_others |
| Unc13d                                                                    | 10.9373 | 5.2291   | 0.580092  | 9.01426  | 1.98198e-19 | 8.90431e-19 | Sinusoida_vs_others |
| St6galnac2                                                                | 20.1984 | -6.35375 | 0.719688  | -8.82847 | 1.06113e-18 | 4.66746e-18 | Sinusoida_vs_others |
| Gm11730                                                                   | 22.4429 | -7.38368 | 0.967206  | -7.63403 | 2.27532e-14 | 8.43762e-14 | Sinusoida_vs_others |
| C1qtnf1                                                                   | 119.002 | 5.28315  | 0.180722  | 29.2336  | 7.2671e-188 | 2.242e-186  | Sinusoida_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                     |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|---------------------|
| Pomc                                                                      | 175.511 | -7.12339 | 0.321594  | -22.1502 | 1.0376e-108 | 1.7575e-107 | Sinusoida_vs_others |
| Efr3b                                                                     | 106.284 | -5.4872  | 0.237809  | -23.074  | 8.4534e-118 | 1.5391e-116 | Sinusoida_vs_others |
| Fam49a                                                                    | 67.8229 | 3.08407  | 0.155497  | 19.8337  | 1.52464e-87 | 2.11477e-86 | Sinusoida_vs_others |
| Mboat2                                                                    | 14.655  | -4.42319 | 0.470486  | -9.40133 | 5.38779e-21 | 2.54867e-20 | Sinusoida_vs_others |
| Rsad2                                                                     | 903.742 | -3.16312 | 0.107154  | -29.5193 | 1.6302e-191 | 5.1208e-190 | Sinusoida_vs_others |
| Lamb1                                                                     | 48.5147 | -6.85466 | 0.550906  | -12.4425 | 1.53579e-35 | 1.04554e-34 | Sinusoida_vs_others |
| Twist1                                                                    | 40.5363 | 5.15816  | 0.2956    | 17.4498  | 3.45386e-68 | 3.85528e-67 | Sinusoida_vs_others |
| Tspan13                                                                   | 256.921 | -4.00036 | 0.0963937 | -41.5002 | 0           | 0           | Sinusoida_vs_others |
| Meox2                                                                     | 19.2454 | -7.45186 | 1.07997   | -6.90004 | 5.19893e-12 | 1.74634e-11 | Sinusoida_vs_others |
| Stxbp6                                                                    | 29.3096 | -5.9167  | 0.527363  | -11.2194 | 3.27483e-29 | 1.9288e-28  | Sinusoida_vs_others |
| Prkd1                                                                     | 372.476 | -4.0001  | 0.0822756 | -48.6183 | 0           | 0           | Sinusoida_vs_others |
| Egln3                                                                     | 23.0762 | -3.2056  | 0.265875  | -12.0568 | 1.78583e-33 | 1.16232e-32 | Sinusoida_vs_others |
| Mdga2                                                                     | 38.0875 | -7.56556 | 0.801958  | -9.43386 | 3.95271e-21 | 1.87781e-20 | Sinusoida_vs_others |
| Slc38a6                                                                   | 331.447 | 3.11976  | 0.0625815 | 49.8511  | 0           | 0           | Sinusoida_vs_others |
| Churc1                                                                    | 55.7887 | -3.36393 | 0.170686  | -19.7083 | 1.83062e-86 | 2.51008e-85 | Sinusoida_vs_others |
| Ttc9                                                                      | 11.5159 | -6.12098 | 0.880283  | -6.95342 | 3.56528e-12 | 1.20645e-11 | Sinusoida_vs_others |
| Batf                                                                      | 15.7657 | 3.03461  | 0.292747  | 10.366   | 3.54092e-25 | 1.88877e-24 | Sinusoida_vs_others |
| Esrrb                                                                     | 47.02   | 8.99353  | 0.965378  | 9.31608  | 1.2072e-20  | 5.62842e-20 | Sinusoida_vs_others |
| Lgmn                                                                      | 609.618 | 4.72622  | 0.0684544 | 69.0419  | 0           | 0           | Sinusoida_vs_others |
| Ifi27l2a                                                                  | 48.3064 | -3.30964 | 0.216311  | -15.3004 | 7.59883e-53 | 6.98724e-52 | Sinusoida_vs_others |
| Serpina3f                                                                 | 77.3056 | 7.29134  | 0.421638  | 17.2929  | 5.32263e-67 | 5.87378e-66 | Sinusoida_vs_others |
| Serpina3g                                                                 | 167.88  | 5.73044  | 0.175941  | 32.5702  | 1.0841e-232 | 4.0326e-231 | Sinusoida_vs_others |
| Gm28875                                                                   | 15.1704 | -5.37622 | 0.601519  | -8.93774 | 3.9721e-19  | 1.76918e-18 | Sinusoida_vs_others |
| Syne3                                                                     | 20.3182 | -4.6545  | 0.413963  | -11.2437 | 2.48597e-29 | 1.46696e-28 | Sinusoida_vs_others |
| Evl                                                                       | 83.865  | -4.41803 | 0.189438  | -23.3218 | 2.6629e-120 | 4.9409e-119 | Sinusoida_vs_others |
| Tnfrsf2                                                                   | 232.001 | -4.62545 | 0.12209   | -37.8855 | 0           | 0           | Sinusoida_vs_others |
| Jag2                                                                      | 66.7416 | -5.45832 | 0.297043  | -18.3755 | 2.06383e-75 | 2.52284e-74 | Sinusoida_vs_others |
| Crip1                                                                     | 587.419 | -4.35487 | 0.162108  | -26.864  | 5.7908e-159 | 1.4384e-157 | Sinusoida_vs_others |
| Akr1c14                                                                   | 15.2391 | -3.81654 | 0.373175  | -10.2272 | 1.49792e-24 | 7.8873e-24  | Sinusoida_vs_others |
| Chrm3                                                                     | 1292.94 | -8.50721 | 0.718127  | -11.8464 | 2.24676e-32 | 1.42592e-31 | Sinusoida_vs_others |
| Gm47405                                                                   | 19.1049 | -6.8526  | 0.876246  | -7.82041 | 5.26527e-15 | 2.01105e-14 | Sinusoida_vs_others |
| Edaradd                                                                   | 11.455  | 4.25617  | 0.421856  | 10.0891  | 6.17034e-24 | 3.19809e-23 | Sinusoida_vs_others |
| Elmo1                                                                     | 256.708 | -6.3583  | 0.202819  | -31.3496 | 9.8586e-216 | 3.437e-214  | Sinusoida_vs_others |
| Gm47664                                                                   | 10.0965 | -6.2239  | 0.97158   | -6.40596 | 1.49429e-10 | 4.69199e-10 | Sinusoida_vs_others |
| Prl                                                                       | 41.5735 | -8.56534 | 1.09679   | -7.80942 | 5.74497e-15 | 2.18674e-14 | Sinusoida_vs_others |
| 2610307P16Rik                                                             | 150.681 | -7.49263 | 0.388786  | -19.2719 | 9.24952e-83 | 1.21676e-81 | Sinusoida_vs_others |
| Tubb2a                                                                    | 70.3167 | -3.42224 | 0.156339  | -21.8898 | 3.2462e-106 | 5.3984e-105 | Sinusoida_vs_others |
| Bmp6                                                                      | 861.837 | 3.11803  | 0.0481162 | 64.8022  | 0           | 0           | Sinusoida_vs_others |
| Gcnt2                                                                     | 111.068 | -3.96162 | 0.14924   | -26.5453 | 2.908e-155  | 7.043e-154  | Sinusoida_vs_others |
| Nfil3                                                                     | 10.4551 | -5.38239 | 0.72694   | -7.40417 | 1.31973e-13 | 4.76778e-13 | Sinusoida_vs_others |
| Slc34a1                                                                   | 13.2783 | -6.91848 | 1.07396   | -6.44201 | 1.17902e-10 | 3.7231e-10  | Sinusoida_vs_others |
| Klhl3                                                                     | 172.369 | 3.02966  | 0.0824434 | 36.7484  | 1.2353e-295 | 6.0591e-294 | Sinusoida_vs_others |
| A830082K12Rik                                                             | 97.1564 | 3.27085  | 0.117531  | 27.8298  | 1.8927e-170 | 5.154e-169  | Sinusoida_vs_others |
| Edil3                                                                     | 294.119 | -10.8095 | 0.870622  | -12.4158 | 2.14428e-35 | 1.45405e-34 | Sinusoida_vs_others |
| Hapln1                                                                    | 61.0924 | -9.11933 | 1.06534   | -8.56005 | 1.12817e-17 | 4.77853e-17 | Sinusoida_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                     |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|---------------------|
| Cmya5                                                                     | 23.5192 | -4.22914 | 0.338166  | -12.5061 | 6.91215e-36 | 4.75142e-35 | Sinusoida_vs_others |
| Iqgap2                                                                    | 357.291 | 8.84276  | 0.332723  | 26.5769  | 1.2546e-155 | 3.0481e-154 | Sinusoida_vs_others |
| Arhgef28                                                                  | 72.6461 | -5.26514 | 0.265793  | -19.8091 | 2.48242e-87 | 3.44021e-86 | Sinusoida_vs_others |
| Rgs7bp                                                                    | 214.669 | 5.80795  | 0.158829  | 36.5672  | 9.4936e-293 | 4.5143e-291 | Sinusoida_vs_others |
| Il6st                                                                     | 1279.75 | 3.58982  | 0.0373422 | 96.133   | 0           | 0           | Sinusoida_vs_others |
| Gpx8                                                                      | 59.565  | -3.60634 | 0.179763  | -20.0617 | 1.59689e-89 | 2.25523e-88 | Sinusoida_vs_others |
| Gzmk                                                                      | 40.0093 | -4.37678 | 0.27888   | -15.6941 | 1.65887e-55 | 1.58244e-54 | Sinusoida_vs_others |
| Esm1                                                                      | 1013.14 | -5.63691 | 0.264434  | -21.3169 | 7.906e-101  | 1.248e-99   | Sinusoida_vs_others |
| Dnase1l3                                                                  | 2389.51 | 14.0884  | 0.787704  | 17.8854  | 1.53194e-71 | 1.78965e-70 | Sinusoida_vs_others |
| Lrrc3b                                                                    | 160.351 | -7.93175 | 0.439373  | -18.0524 | 7.55043e-73 | 8.96196e-72 | Sinusoida_vs_others |
| Gm48163                                                                   | 23.3846 | 3.54248  | 0.261878  | 13.5272  | 1.08043e-41 | 8.33724e-41 | Sinusoida_vs_others |
| Thrb                                                                      | 52.3429 | -5.21798 | 0.311932  | -16.7279 | 8.20164e-63 | 8.62254e-62 | Sinusoida_vs_others |
| Nid2                                                                      | 73.3757 | -3.88844 | 0.173911  | -22.3589 | 9.9024e-111 | 1.707e-109  | Sinusoida_vs_others |
| Kcnk5                                                                     | 29.4816 | -3.95611 | 0.281707  | -14.0434 | 8.46107e-45 | 6.90973e-44 | Sinusoida_vs_others |
| Cacna2d3                                                                  | 15.6525 | -6.56616 | 0.891112  | -7.36851 | 1.72548e-13 | 6.1962e-13  | Sinusoida_vs_others |
| Mustn1                                                                    | 12.5846 | -3.17984 | 0.344694  | -9.22512 | 2.83232e-20 | 1.30333e-19 | Sinusoida_vs_others |
| Sema3g                                                                    | 74.4425 | -5.04313 | 0.250266  | -20.1511 | 2.63223e-90 | 3.74118e-89 | Sinusoida_vs_others |
| Vstm4                                                                     | 64.6607 | 8.58954  | 0.716022  | 11.9962  | 3.7198e-33  | 2.40796e-32 | Sinusoida_vs_others |
| Sncg                                                                      | 91.012  | -4.05421 | 0.165432  | -24.5068 | 1.2489e-132 | 2.5687e-131 | Sinusoida_vs_others |
| Pnp2                                                                      | 20.4516 | 4.18776  | 0.307993  | 13.5969  | 4.17639e-42 | 3.24531e-41 | Sinusoida_vs_others |
| Mmp14                                                                     | 206.972 | 3.12393  | 0.0753357 | 41.4668  | 0           | 0           | Sinusoida_vs_others |
| Slc7a8                                                                    | 10.2904 | 5.35485  | 0.616924  | 8.67992  | 3.96044e-18 | 1.70301e-17 | Sinusoida_vs_others |
| Atp8a2                                                                    | 10.0785 | -3.70923 | 0.444104  | -8.35216 | 6.70246e-17 | 2.75559e-16 | Sinusoida_vs_others |
| C1qtnf9                                                                   | 29.3768 | -3.28883 | 0.28349   | -11.6012 | 4.06242e-31 | 2.49769e-30 | Sinusoida_vs_others |
| Fam124a                                                                   | 547.401 | 4.90991  | 0.0756684 | 64.8872  | 0           | 0           | Sinusoida_vs_others |
| Gata4                                                                     | 1004.71 | 13.704   | 1.06345   | 12.8864  | 5.36972e-38 | 3.83879e-37 | Sinusoida_vs_others |
| Extl3                                                                     | 65.3559 | -4.48524 | 0.221643  | -20.2364 | 4.68273e-91 | 6.70459e-90 | Sinusoida_vs_others |
| Stc1                                                                      | 63.3625 | -3.50313 | 0.200966  | -17.4315 | 4.76041e-68 | 5.29847e-67 | Sinusoida_vs_others |
| Loxl2                                                                     | 50.6012 | 3.77944  | 0.177117  | 21.3387  | 4.9676e-101 | 7.8656e-100 | Sinusoida_vs_others |
| Tnfrsf10b                                                                 | 27.6091 | -3.85822 | 0.283171  | -13.6251 | 2.84158e-42 | 2.2114e-41  | Sinusoida_vs_others |
| Bmp1                                                                      | 26.9405 | -5.79778 | 0.518633  | -11.179  | 5.16858e-29 | 3.01788e-28 | Sinusoida_vs_others |
| Rubcnl                                                                    | 12.7211 | 6.22446  | 0.731951  | 8.50392  | 1.8329e-17  | 7.72769e-17 | Sinusoida_vs_others |
| Serp2                                                                     | 31.2559 | -5.29999 | 0.409952  | -12.9283 | 3.11633e-38 | 2.24125e-37 | Sinusoida_vs_others |
| Lacc1                                                                     | 18.684  | 3.42417  | 0.269633  | 12.6994  | 5.95888e-37 | 4.18873e-36 | Sinusoida_vs_others |
| Rgcc                                                                      | 1816.45 | -10.5047 | 0.315783  | -33.2654 | 1.2222e-242 | 4.799e-241  | Sinusoida_vs_others |
| Diaph3                                                                    | 17.0726 | 5.34274  | 0.509727  | 10.4816  | 1.04968e-25 | 5.6711e-25  | Sinusoida_vs_others |
| Pcdh9                                                                     | 31.3911 | -3.33571 | 0.592719  | -5.62781 | 1.82507e-08 | 5.07293e-08 | Sinusoida_vs_others |
| Dach1                                                                     | 83.5489 | -9.2821  | 0.966904  | -9.59981 | 8.00939e-22 | 3.89547e-21 | Sinusoida_vs_others |
| 4930517O19Rik                                                             | 18.8745 | -3.61379 | 0.318587  | -11.3432 | 8.01792e-30 | 4.79687e-29 | Sinusoida_vs_others |
| Hs6st3                                                                    | 39.5963 | 6.20063  | 0.494344  | 12.5431  | 4.33471e-36 | 2.98893e-35 | Sinusoida_vs_others |
| Selenop                                                                   | 7084.73 | 3.56289  | 0.0263465 | 135.232  | 0           | 0           | Sinusoida_vs_others |
| Npr3                                                                      | 455.369 | -4.0786  | 0.281233  | -14.5026 | 1.16699e-47 | 9.91557e-47 | Sinusoida_vs_others |
| Sema5a                                                                    | 14.7451 | -6.18456 | 0.797346  | -7.75643 | 8.73524e-15 | 3.29671e-14 | Sinusoida_vs_others |
| Zfpm2                                                                     | 408.487 | 3.84334  | 0.0735538 | 52.2521  | 0           | 0           | Sinusoida_vs_others |
| Sybu                                                                      | 63.0797 | -7.04014 | 0.513679  | -13.7053 | 9.4349e-43  | 7.40552e-42 | Sinusoida_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                     |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|---------------------|
| Ccn3                                                                      | 11.864  | -5.02437 | 0.643917  | -7.80282 | 6.05385e-15 | 2.30262e-14 | Sinusoida_vs_others |
| Enpp2                                                                     | 43.1698 | -5.36798 | 0.64956   | -8.26403 | 1.4083e-16  | 5.72787e-16 | Sinusoida_vs_others |
| Sntb1                                                                     | 1138.88 | 3.30411  | 0.0745776 | 44.3044  | 0           | 0           | Sinusoida_vs_others |
| Tg                                                                        | 217.167 | -10.9502 | 1.07592   | -10.1774 | 2.50038e-24 | 1.31036e-23 | Sinusoida_vs_others |
| Khdrbs3                                                                   | 153.627 | 6.33552  | 0.22003   | 28.7939  | 2.5565e-182 | 7.4861e-181 | Sinusoida_vs_others |
| Ly6c1                                                                     | 2344.26 | -7.8642  | 0.393292  | -19.9958 | 5.98787e-89 | 8.38032e-88 | Sinusoida_vs_others |
| Apol10b                                                                   | 19.7595 | -3.28272 | 0.287149  | -11.4321 | 2.88905e-30 | 1.74725e-29 | Sinusoida_vs_others |
| Apol9b                                                                    | 18.9425 | -5.47787 | 0.557522  | -9.82538 | 8.75416e-23 | 4.38526e-22 | Sinusoida_vs_others |
| Csf2rb                                                                    | 13.313  | -4.58629 | 0.509525  | -9.00111 | 2.23455e-19 | 1.00216e-18 | Sinusoida_vs_others |
| Lgals1                                                                    | 267.26  | 3.12782  | 0.115668  | 27.0413  | 4.8399e-161 | 1.2297e-159 | Sinusoida_vs_others |
| Pdgfb                                                                     | 244.662 | -3.83732 | 0.0954129 | -40.2181 | 0           | 0           | Sinusoida_vs_others |
| Prickle1                                                                  | 1455.74 | 3.57051  | 0.0438632 | 81.4011  | 0           | 0           | Sinusoida_vs_others |
| Krt80                                                                     | 13.5255 | -6.94261 | 1.06973   | -6.49004 | 8.5815e-11  | 2.71925e-10 | Sinusoida_vs_others |
| AU021092                                                                  | 368.283 | -3.39953 | 0.067968  | -50.0166 | 0           | 0           | Sinusoida_vs_others |
| Abat                                                                      | 72.8691 | 3.88465  | 0.14993   | 25.9098  | 5.17e-148   | 1.1963e-146 | Sinusoida_vs_others |
| Emp2                                                                      | 142.146 | -9.18158 | 0.7131    | -12.8756 | 6.17691e-38 | 4.41382e-37 | Sinusoida_vs_others |
| Shisa9                                                                    | 66.402  | 4.23648  | 0.206427  | 20.5229  | 1.34352e-93 | 1.98389e-92 | Sinusoida_vs_others |
| Gm15738                                                                   | 22.5401 | -3.64615 | 0.292082  | -12.4833 | 9.20522e-36 | 6.30259e-35 | Sinusoida_vs_others |
| St6gal1                                                                   | 127.017 | 3.64259  | 0.110267  | 33.0344  | 2.6085e-239 | 1.004e-237  | Sinusoida_vs_others |
| Masp1                                                                     | 275.75  | 10.972   | 0.788399  | 13.9168  | 5.00563e-44 | 4.01613e-43 | Sinusoida_vs_others |
| Bcl6                                                                      | 28.7016 | 3.47398  | 0.233642  | 14.8688  | 5.25322e-50 | 4.61482e-49 | Sinusoida_vs_others |
| Mb21d2                                                                    | 353.015 | 3.60323  | 0.0651012 | 55.3481  | 0           | 0           | Sinusoida_vs_others |
| Gm46565                                                                   | 123.88  | 3.93456  | 0.126444  | 31.1169  | 1.4208e-212 | 4.8983e-211 | Sinusoida_vs_others |
| Tfrc                                                                      | 20.439  | -4.56162 | 0.410841  | -11.1031 | 1.21144e-28 | 6.99729e-28 | Sinusoida_vs_others |
| Itgb5                                                                     | 122.681 | -6.91036 | 0.353812  | -19.5312 | 5.96314e-85 | 7.97942e-84 | Sinusoida_vs_others |
| Sema5b                                                                    | 15.8951 | -5.02348 | 0.531753  | -9.44701 | 3.48658e-21 | 1.65991e-20 | Sinusoida_vs_others |
| Slc15a2                                                                   | 16.6449 | -7.24515 | 1.0744    | -6.74342 | 1.54703e-11 | 5.08237e-11 | Sinusoida_vs_others |
| Fstl1                                                                     | 98.7395 | -3.50599 | 0.211844  | -16.5499 | 1.60493e-61 | 1.66478e-60 | Sinusoida_vs_others |
| Gramd1c                                                                   | 39.589  | 3.23101  | 0.184647  | 17.4983  | 1.47714e-68 | 1.66074e-67 | Sinusoida_vs_others |
| Boc                                                                       | 63.6802 | -8.60124 | 0.873261  | -9.84957 | 6.88372e-23 | 3.46279e-22 | Sinusoida_vs_others |
| Cd200r1                                                                   | 19.5452 | 8.02153  | 1.07197   | 7.48299  | 7.265e-14   | 2.65165e-13 | Sinusoida_vs_others |
| Ccdc80                                                                    | 228.568 | 4.0045   | 0.0906906 | 44.1556  | 0           | 0           | Sinusoida_vs_others |
| Cd200                                                                     | 803.904 | -6.24291 | 0.368747  | -16.9301 | 2.69975e-64 | 2.89507e-63 | Sinusoida_vs_others |
| Epha6                                                                     | 23.0283 | -6.83443 | 0.836045  | -8.17472 | 2.96561e-16 | 1.19307e-15 | Sinusoida_vs_others |
| Robo1                                                                     | 257.684 | 8.71252  | 0.37617   | 23.1612  | 1.1224e-118 | 2.058e-117  | Sinusoida_vs_others |
| Robo2                                                                     | 36.3664 | -8.37036 | 1.06794   | -7.83782 | 4.58419e-15 | 1.75436e-14 | Sinusoida_vs_others |
| Itsn1                                                                     | 508.759 | 4.00763  | 0.0646865 | 61.9546  | 0           | 0           | Sinusoida_vs_others |
| Gm16046                                                                   | 13.5268 | -3.73138 | 0.385291  | -9.68457 | 3.50681e-22 | 1.72446e-21 | Sinusoida_vs_others |
| Tnfrsf12a                                                                 | 10.8432 | -3.28868 | 0.381032  | -8.63099 | 6.0825e-18  | 2.60327e-17 | Sinusoida_vs_others |
| Neur11b                                                                   | 32.1493 | -5.12942 | 0.384626  | -13.3361 | 1.4268e-40  | 1.07592e-39 | Sinusoida_vs_others |
| Def6                                                                      | 11.5715 | -4.21039 | 0.477359  | -8.82019 | 1.1427e-18  | 5.01917e-18 | Sinusoida_vs_others |
| Gm26885                                                                   | 54.231  | 3.60039  | 0.16513   | 21.8033  | 2.1586e-105 | 3.5593e-104 | Sinusoida_vs_others |
| Slc37a1                                                                   | 21.2802 | 3.50799  | 0.250839  | 13.985   | 1.92419e-44 | 1.55505e-43 | Sinusoida_vs_others |
| Angptl4                                                                   | 31.502  | -7.87235 | 0.974522  | -8.07816 | 6.57495e-16 | 2.61e-15    | Sinusoida_vs_others |
| H2-Ab1                                                                    | 37.8002 | -4.86773 | 0.766821  | -6.34794 | 2.1821e-10  | 6.78455e-10 | Sinusoida_vs_others |



| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                     |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|---------------------|
| H2-Aa                                                                     | 21.5929 | -3.40447 | 0.748623  | -4.54764 | 5.42497e-06 | 1.26504e-05 | Sinusoida_vs_others |
| H2-Eb1                                                                    | 19.093  | -3.51543 | 0.942836  | -3.72857 | 0.000192569 | 0.000387605 | Sinusoida_vs_others |
| Rcan2                                                                     | 41.0236 | -8.54466 | 1.06804   | -8.00031 | 1.24106e-15 | 4.85586e-15 | Sinusoida_vs_others |
| Clic5                                                                     | 291.145 | -8.00503 | 0.333     | -24.0391 | 1.0852e-127 | 2.1441e-126 | Sinusoida_vs_others |
| Satb1                                                                     | 11.7327 | -3.39152 | 0.386227  | -8.78117 | 1.61782e-18 | 7.06613e-18 | Sinusoida_vs_others |
| Arhgap28                                                                  | 12.4365 | -3.07646 | 0.349432  | -8.80418 | 1.31811e-18 | 5.77497e-18 | Sinusoida_vs_others |
| Ltbp1                                                                     | 221.836 | -6.99396 | 0.270351  | -25.87   | 1.4512e-147 | 3.3479e-146 | Sinusoida_vs_others |
| Gm30938                                                                   | 44.1183 | 5.34316  | 0.293362  | 18.2136  | 4.02837e-74 | 4.84808e-73 | Sinusoida_vs_others |
| Greb1l                                                                    | 130.646 | 9.6026   | 0.714799  | 13.434   | 3.82314e-41 | 2.91402e-40 | Sinusoida_vs_others |
| Gata6                                                                     | 11.9331 | -3.26436 | 0.374235  | -8.72276 | 2.71504e-18 | 1.1743e-17  | Sinusoida_vs_others |
| Cdh2                                                                      | 11.1399 | -5.47927 | 0.743675  | -7.36782 | 1.73442e-13 | 6.22684e-13 | Sinusoida_vs_others |
| Gm49980                                                                   | 20.0117 | -3.45527 | 0.297137  | -11.6285 | 2.95176e-31 | 1.81914e-30 | Sinusoida_vs_others |
| Lims2                                                                     | 513.943 | -3.23836 | 0.0575377 | -56.2824 | 0           | 0           | Sinusoida_vs_others |
| Cd14                                                                      | 13.6147 | -3.3096  | 0.343266  | -9.64149 | 5.34064e-22 | 2.61137e-21 | Sinusoida_vs_others |
| Pcdh1                                                                     | 81.9484 | -4.31485 | 0.186365  | -23.1526 | 1.3678e-118 | 2.502e-117  | Sinusoida_vs_others |
| Gnpda1                                                                    | 90.6061 | 3.48835  | 0.123676  | 28.2056  | 4.9932e-175 | 1.3864e-173 | Sinusoida_vs_others |
| Snx24                                                                     | 463.918 | 6.38696  | 0.130923  | 48.7842  | 0           | 0           | Sinusoida_vs_others |
| Cd74                                                                      | 53.1556 | -3.0213  | 0.748052  | -4.0389  | 5.37034e-05 | 0.000114608 | Sinusoida_vs_others |
| Ablim3                                                                    | 73.6617 | -5.93147 | 0.349312  | -16.9804 | 1.14673e-64 | 1.23394e-63 | Sinusoida_vs_others |
| Apcdd1                                                                    | 14.877  | -4.07496 | 0.407755  | -9.99367 | 1.62452e-23 | 8.31459e-23 | Sinusoida_vs_others |
| Piezo2                                                                    | 561.779 | -3.99984 | 0.0705139 | -56.7241 | 0           | 0           | Sinusoida_vs_others |
| Tubb6                                                                     | 28.2592 | -3.69973 | 0.272326  | -13.5857 | 4.86972e-42 | 3.78029e-41 | Sinusoida_vs_others |
| AC109619.1                                                                | 18.0066 | 7.61037  | 0.969422  | 7.85043  | 4.14627e-15 | 1.58872e-14 | Sinusoida_vs_others |
| Flrt1                                                                     | 59.4798 | 7.49867  | 0.51571   | 14.5405  | 6.71323e-48 | 5.7417e-47  | Sinusoida_vs_others |
| Fads2                                                                     | 21.9464 | 3.72152  | 0.263287  | 14.1348  | 2.31722e-45 | 1.90738e-44 | Sinusoida_vs_others |
| Gna14                                                                     | 69.5266 | 9.27365  | 0.873076  | 10.6218  | 2.35942e-26 | 1.29543e-25 | Sinusoida_vs_others |
| Gda                                                                       | 83.1715 | -5.1636  | 0.246233  | -20.9704 | 1.22189e-97 | 1.86266e-96 | Sinusoida_vs_others |
| Cemip2                                                                    | 1660.24 | 3.24802  | 0.0298558 | 108.79   | 0           | 0           | Sinusoida_vs_others |
| Trpm3                                                                     | 23.3441 | -3.22004 | 0.408622  | -7.88025 | 3.2674e-15  | 1.25661e-14 | Sinusoida_vs_others |
| Tmem252                                                                   | 17.0007 | -6.39212 | 0.797715  | -8.01304 | 1.11906e-15 | 4.39179e-15 | Sinusoida_vs_others |
| Pgm5                                                                      | 74.228  | 3.84915  | 0.147952  | 26.0163  | 3.2432e-149 | 7.5604e-148 | Sinusoida_vs_others |
| Kank1                                                                     | 25.8063 | 4.09153  | 0.274874  | 14.8851  | 4.11715e-50 | 3.62911e-49 | Sinusoida_vs_others |
| Slc1a1                                                                    | 19.2467 | -7.45496 | 1.0709    | -6.96141 | 3.36873e-12 | 1.14119e-11 | Sinusoida_vs_others |
| Slc16a12                                                                  | 22.5403 | 4.88704  | 0.370556  | 13.1884  | 1.02348e-39 | 7.54582e-39 | Sinusoida_vs_others |
| A830019P07Rik                                                             | 14.8672 | 3.9657   | 0.338814  | 11.7046  | 1.20689e-31 | 7.51842e-31 | Sinusoida_vs_others |
| Entpd1                                                                    | 220.329 | -3.36112 | 0.0871944 | -38.5474 | 0           | 0           | Sinusoida_vs_others |
| Scd1                                                                      | 15.6066 | -4.38472 | 0.437009  | -10.0335 | 1.0862e-23  | 5.58879e-23 | Sinusoida_vs_others |
| Gsto1                                                                     | 38.6332 | 3.16494  | 0.175124  | 18.0726  | 5.24148e-73 | 6.24041e-72 | Sinusoida_vs_others |
| Afap1l2                                                                   | 25.7388 | -4.44445 | 0.352348  | -12.6138 | 1.77237e-36 | 1.23471e-35 | Sinusoida_vs_others |
| Ablim1                                                                    | 355.43  | -4.94137 | 0.277818  | -17.7864 | 9.01096e-71 | 1.04405e-69 | Sinusoida_vs_others |
| Plp2                                                                      | 26.5964 | -3.09556 | 0.231412  | -13.3768 | 8.2588e-41  | 6.25504e-40 | Sinusoida_vs_others |
| Magix                                                                     | 22.7122 | -3.55658 | 0.279818  | -12.7104 | 5.17995e-37 | 3.64814e-36 | Sinusoida_vs_others |
| Lanc13                                                                    | 20.0423 | -4.88819 | 0.460025  | -10.6259 | 2.25765e-26 | 1.24043e-25 | Sinusoida_vs_others |
| Tspan7                                                                    | 1541.42 | 3.76812  | 0.0378315 | 99.6027  | 0           | 0           | Sinusoida_vs_others |
| Dipk2b                                                                    | 69.2977 | -6.85293 | 0.460674  | -14.8759 | 4.72854e-50 | 4.16096e-49 | Sinusoida_vs_others |

| Supplementary Table S2: Pseudobulk DEG results of structural cEC subtypes |         |          |           |          |             |             |                     |
|---------------------------------------------------------------------------|---------|----------|-----------|----------|-------------|-------------|---------------------|
| Slc9a7                                                                    | 23.5376 | 6.16011  | 0.5294    | 11.636   | 2.70365e-31 | 1.66888e-30 | Sinusoida_vs_others |
| Klhl13                                                                    | 61.0326 | 3.03303  | 0.149673  | 20.2644  | 2.6513e-91  | 3.81008e-90 | Sinusoida_vs_others |
| 6030498E09Rik                                                             | 136.331 | 10.5336  | 0.964087  | 10.926   | 8.65831e-28 | 4.91343e-27 | Sinusoida_vs_others |
| Tenm1                                                                     | 15.8597 | 6.56149  | 0.745172  | 8.80533  | 1.30463e-18 | 5.71749e-18 | Sinusoida_vs_others |
| Apln                                                                      | 15.6084 | -4.66432 | 0.478304  | -9.75179 | 1.81243e-22 | 8.97501e-22 | Sinusoida_vs_others |
| Mbnl3                                                                     | 43.8463 | 4.69072  | 0.243931  | 19.2297  | 2.08903e-82 | 2.73882e-81 | Sinusoida_vs_others |
| Fgf13                                                                     | 16.036  | -6.01706 | 0.735726  | -8.17839 | 2.87658e-16 | 1.15815e-15 | Sinusoida_vs_others |
| F8                                                                        | 1716.79 | 3.26056  | 0.0337983 | 96.471   | 0           | 0           | Sinusoida_vs_others |
| Dmd                                                                       | 369.186 | 3.49339  | 0.0611615 | 57.1174  | 0           | 0           | Sinusoida_vs_others |
| Ar                                                                        | 102.944 | -5.40388 | 0.249225  | -21.6828 | 2.9826e-104 | 4.8714e-103 | Sinusoida_vs_others |
| Itm2a                                                                     | 291.442 | -11.3739 | 1.06367   | -10.693  | 1.09736e-26 | 6.06356e-26 | Sinusoida_vs_others |
| Pcdh19                                                                    | 15.8952 | -7.17604 | 1.07051   | -6.70337 | 2.03664e-11 | 6.6431e-11  | Sinusoida_vs_others |
| Il13ra2                                                                   | 39.8774 | 9.04659  | 1.06685   | 8.47968  | 2.2581e-17  | 9.47415e-17 | Sinusoida_vs_others |
| Mid1                                                                      | 613.601 | 3.85739  | 0.0599783 | 64.3131  | 0           | 0           | Sinusoida_vs_others |
| G530011O06Rik                                                             | 10.7939 | 5.00693  | 0.550838  | 9.08965  | 9.93545e-20 | 4.50529e-19 | Sinusoida_vs_others |
| Csprs                                                                     | 26.006  | 4.24632  | 0.281213  | 15.1     | 1.61823e-51 | 1.45697e-50 | Sinusoida_vs_others |

## Supplementary Table S3

| Supplementary Table S3: ORA results of structural cEC subtypes                   |                   |               |          |                  |             |
|----------------------------------------------------------------------------------|-------------------|---------------|----------|------------------|-------------|
| Term                                                                             | group             | cluster_label | LFC      | Adjusted P-value | -log10adj-P |
| NABA_MATRISOME                                                                   | Conti Fene EC     | Fene ECs      | Positive | 2.23575e-06      | 5.65058     |
| NABA_CORE_MATRISOME                                                              | Conti Fene EC     | Fene ECs      | Positive | 0.00022199       | 3.65367     |
| NABA_ECM_GLYCOPROTEINS                                                           | Conti Fene EC     | Fene ECs      | Positive | 0.000883284      | 3.0539      |
| GOBP_CELL_CELL_ADHESION_VIA_PLASMA_MEMBRANE_ADHESION_MOLECULES                   | Conti Fene EC     | Fene ECs      | Positive | 0.0025626        | 2.59132     |
| ELVIDGE_HYPOXIA_BY_DMOG_UP                                                       | Conti Fene EC     | Fene ECs      | Positive | 0.0116527        | 1.93357     |
| GOBP_CORONARY_VASCULATURE_DEVELOPMENT                                            | Conti Fene EC     | Fene ECs      | Positive | 0.0137672        | 1.86115     |
| NABA_MATRISOME_ASSOCIATED                                                        | Conti Fene EC     | Fene ECs      | Positive | 0.0191333        | 1.71821     |
| RAFFEL_VEGFA_TARGETS_UP                                                          | Conti Fene EC     | Fene ECs      | Positive | 0.0204911        | 1.68844     |
| GOBP_HOMOPHILIC_CELL_ADHESION_VIA_PLASMA_MEMBRANE_ADHESION_MOLECULES             | Conti Fene EC     | Fene ECs      | Positive | 0.0272854        | 1.56407     |
| ELVIDGE_HYPOXIA_UP                                                               | Conti Fene EC     | Fene ECs      | Positive | 0.0411348        | 1.38579     |
| NABA_MATRISOME                                                                   | Conti Fene EC     | Fene ECs      | Negative | 0.000189382      | 3.72266     |
| NABA_MATRISOME_ASSOCIATED                                                        | Conti Fene EC     | Fene ECs      | Negative | 0.000754114      | 3.12256     |
| FULCHER_INFLAMMATORY_RESPONSE_LECTIN_VS_LPS_DN                                   | Conti Fene EC     | Fene ECs      | Negative | 0.000754114      | 3.12256     |
| PETROVA_ENDOTHELIUM_LYMPHATIC_VS_BLOOD_DN                                        | Conti Fene EC     | Fene ECs      | Negative | 0.00339857       | 2.4687      |
| REACTOME_GLYCOSAMINOGLYCAN_METABOLISM                                            | Conti Fene EC     | Fene ECs      | Negative | 0.00339857       | 2.4687      |
| PETROVA_PROX1_TARGETS_DN                                                         | Conti Fene EC     | Fene ECs      | Negative | 0.00339857       | 2.4687      |
| GOBP_HETEROPHILIC_CELL_CELL_ADHESION_VIA_PLASMA_MEMBRANE_CELL_ADHESION_MOLECULES | Conti Fene EC     | Fene ECs      | Negative | 0.0062723        | 2.20257     |
| NABA_ECM_AFFILIATED                                                              | Conti Fene EC     | Fene ECs      | Negative | 0.0069041        | 2.16089     |
| GOBP_AMINOGLYCAN_METABOLIC_PROCESS                                               | Conti Fene EC     | Fene ECs      | Negative | 0.00708916       | 2.1494      |
| FULCHER_INFLAMMATORY_RESPONSE_LECTIN_VS_LPS_UP                                   | Conti Fene EC     | Fene ECs      | Negative | 0.012586         | 1.90011     |
| NABA_MATRISOME                                                                   | Sinusoida EC      | Sinus ECs     | Positive | 0.00146014       | 2.83561     |
| PETROVA_PROX1_TARGETS_DN                                                         | Sinusoida EC      | Sinus ECs     | Positive | 0.00146014       | 2.83561     |
| NABA_MATRISOME_ASSOCIATED                                                        | Sinusoida EC      | Sinus ECs     | Positive | 0.00146014       | 2.83561     |
| FULCHER_INFLAMMATORY_RESPONSE_LECTIN_VS_LPS_DN                                   | Sinusoida EC      | Sinus ECs     | Positive | 0.00146014       | 2.83561     |
| REACTOME_GLYCOSAMINOGLYCAN_METABOLISM                                            | Sinusoida EC      | Sinus ECs     | Positive | 0.00146014       | 2.83561     |
| PETROVA_ENDOTHELIUM_LYMPHATIC_VS_BLOOD_DN                                        | Sinusoida EC      | Sinus ECs     | Positive | 0.00146014       | 2.83561     |
| NABA_ECM_AFFILIATED                                                              | Sinusoida EC      | Sinus ECs     | Positive | 0.00318439       | 2.49697     |
| GOBP_HETEROPHILIC_CELL_CELL_ADHESION_VIA_PLASMA_MEMBRANE_CELL_ADHESION_MOLECULES | Sinusoida EC      | Sinus ECs     | Positive | 0.00318439       | 2.49697     |
| REACTOME_METABOLISM_OF_CARBOHYDRATES                                             | Sinusoida EC      | Sinus ECs     | Positive | 0.00593005       | 2.22694     |
| GOBP_LEUKOCYTE_CELL_CELL_ADHESION                                                | Sinusoida EC      | Sinus ECs     | Positive | 0.0134391        | 1.87163     |
| NABA_MATRISOME                                                                   | Sinusoida EC      | Sinus ECs     | Negative | 1.69413e-07      | 6.77105     |
| NABA_CORE_MATRISOME                                                              | Sinusoida EC      | Sinus ECs     | Negative | 5.73626e-05      | 4.24137     |
| NABA_ECM_GLYCOPROTEINS                                                           | Sinusoida EC      | Sinus ECs     | Negative | 0.000305657      | 3.51477     |
| ELVIDGE_HYPOXIA_UP                                                               | Sinusoida EC      | Sinus ECs     | Negative | 0.00109529       | 2.96047     |
| GOMF_CELL_ADHESION_MOLECULE_BINDING                                              | Sinusoida EC      | Sinus ECs     | Negative | 0.00109529       | 2.96047     |
| OHGUCHI_LIVER_HNF4A_TARGETS_UP                                                   | Sinusoida EC      | Sinus ECs     | Negative | 0.00109529       | 2.96047     |
| ELVIDGE_HYPOXIA_BY_DMOG_UP                                                       | Sinusoida EC      | Sinus ECs     | Negative | 0.00109529       | 2.96047     |
| ELVIDGE_HIF1A_AND_HIF2A_TARGETS_DN                                               | Sinusoida EC      | Sinus ECs     | Negative | 0.00215728       | 2.66609     |
| GOBP_CELL_CELL_ADHESION_VIA_PLASMA_MEMBRANE_ADHESION_MOLECULES                   | Sinusoida EC      | Sinus ECs     | Negative | 0.00286659       | 2.54263     |
| PETROVA_ENDOTHELIUM_LYMPHATIC_VS_BLOOD_DN                                        | Sinusoida EC      | Sinus ECs     | Negative | 0.00286659       | 2.54263     |
| REACTOME_SLC_MEDIATED_TRANSMEMBRANE_TRANSPORT                                    | Conti non Fene EC | nonFene ECs   | Positive | 2.67057e-06      | 5.5734      |
| GOMF_ORGANIC_ACID_TRANSMEMBRANE_TRANSPORTER_ACTIVITY                             | Conti non Fene EC | nonFene ECs   | Positive | 3.65422e-06      | 5.43721     |

| Supplementary Table S3: ORA results of structural cEC subtypes |                   |             |          |             |         |
|----------------------------------------------------------------|-------------------|-------------|----------|-------------|---------|
| GOBP_ORGANIC_ACID_TRANSMEMBRANE_TRANSPORT                      | Conti non Fene EC | nonFene ECs | Positive | 0.000126292 | 3.89862 |
| GOMF_SECONDARY_ACTIVE_TRANSMEMBRANE_TRANSPORTER_ACTIVITY       | Conti non Fene EC | nonFene ECs | Positive | 0.000210961 | 3.6758  |
| REACTOME_AMINO_ACID_TRANSPORT_ACROSS_THE_PLASMA_MEMBRANE       | Conti non Fene EC | nonFene ECs | Positive | 0.0015798   | 2.8014  |
| GOMF_MONOCARBOXYLIC_ACID_TRANSMEMBRANE_TRANSPORTER_ACTIVITY    | Conti non Fene EC | nonFene ECs | Positive | 0.00176422  | 2.75345 |
| GOBP_NEUTRAL_AMINO_ACID_TRANSPORT                              | Conti non Fene EC | nonFene ECs | Positive | 0.00176422  | 2.75345 |
| GOMF_L_AMINO_ACID_TRANSMEMBRANE_TRANSPORTER_ACTIVITY           | Conti non Fene EC | nonFene ECs | Positive | 0.00265749  | 2.57553 |
| PID_HIF1_TFPATHWAY                                             | Conti non Fene EC | nonFene ECs | Positive | 0.00265749  | 2.57553 |
| GOBP_AMINO_ACID_TRANSMEMBRANE_TRANSPORT                        | Conti non Fene EC | nonFene ECs | Positive | 0.00329781  | 2.48177 |
| GOBP_MUCOPOLYSACCHARIDE_METABOLIC_PROCESS                      | Conti non Fene EC | nonFene ECs | Negative | 0.00206325  | 2.68545 |
| RUTELLA_RESPONSE_TO_HGF_VS_CSF2RB_AND_IL4_UP                   | Conti non Fene EC | nonFene ECs | Negative | 0.00517201  | 2.28634 |
| GOBP_AMINOGLYCAN_METABOLIC_PROCESS                             | Conti non Fene EC | nonFene ECs | Negative | 0.00517201  | 2.28634 |
| REACTOME_GLYCOSAMINOGLYCAN_METABOLISM                          | Conti non Fene EC | nonFene ECs | Negative | 0.00584038  | 2.23356 |
| PETROVA_ENDOTHELIUM_LYMPHATIC_VS_BLOOD_UP                      | Conti non Fene EC | nonFene ECs | Negative | 0.00584038  | 2.23356 |
| GOBP_HYALURONAN_CATABOLIC_PROCESS                              | Conti non Fene EC | nonFene ECs | Negative | 0.0153098   | 1.81503 |
| FULCHER_INFLAMMATORY_RESPONSE_LECTIN_VS_LPS_DN                 | Conti non Fene EC | nonFene ECs | Negative | 0.016531    | 1.7817  |
| GOBP_AMINOGLYCAN_BIOSYNTHETIC_PROCESS                          | Conti non Fene EC | nonFene ECs | Negative | 0.0167876   | 1.77501 |
| RUTELLA_RESPONSE_TO_HGF_VS_CSF2RB_AND_IL4_DN                   | Conti non Fene EC | nonFene ECs | Negative | 0.022837    | 1.64136 |
| GOBP_LEUKOCYTE_CHEMOTAXIS                                      | Conti non Fene EC | nonFene ECs | Negative | 0.0335432   | 1.4744  |

## Supplementary Table S4

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |                |             |             |                 |
|-------------------------------------------------------------------------------|---------|----------------|-------------|-------------|-----------------|
| names                                                                         | scores  | logfoldchanges | pvals       | pvals_adj   | group           |
| Tmsb4x                                                                        | 26.14   | 1.74328        | 1.2804e-150 | 8.7953e-148 | Common EC1_high |
| Rps8                                                                          | 26.0656 | 1.56332        | 8.9534e-150 | 6.0221e-147 | Common EC1_high |
| Rps24                                                                         | 25.7615 | 1.64992        | 2.3944e-146 | 1.4305e-143 | Common EC1_high |
| Rps29                                                                         | 25.56   | 1.53046        | 4.2514e-144 | 2.3264e-141 | Common EC1_high |
| Tpt1                                                                          | 25.2956 | 1.40298        | 3.5712e-141 | 1.7738e-138 | Common EC1_high |
| Rpl37a                                                                        | 23.7857 | 1.39091        | 4.6931e-125 | 1.4029e-122 | Common EC1_high |
| Rps12                                                                         | 23.6912 | 1.39396        | 4.4389e-124 | 1.2795e-121 | Common EC1_high |
| Rplp1                                                                         | 23.5657 | 1.31359        | 8.6641e-123 | 2.4114e-120 | Common EC1_high |
| Rpl13                                                                         | 23.4129 | 1.39456        | 3.1545e-121 | 8.4169e-119 | Common EC1_high |
| Rpl27a                                                                        | 23.0559 | 1.39512        | 1.2825e-117 | 3.1367e-115 | Common EC1_high |
| Rpl41                                                                         | 22.9522 | 1.33779        | 1.402e-116  | 3.2101e-114 | Common EC1_high |
| Fau                                                                           | 22.3521 | 1.39934        | 1.153e-110  | 2.2698e-108 | Common EC1_high |
| Rps3a1                                                                        | 22.0676 | 1.3785         | 6.4807e-108 | 1.2164e-105 | Common EC1_high |
| Rpl23                                                                         | 22.0499 | 1.26955        | 9.5761e-108 | 1.7871e-105 | Common EC1_high |
| Rps14                                                                         | 21.3803 | 1.18025        | 2.0376e-101 | 3.3057e-99  | Common EC1_high |
| Rpl35a                                                                        | 21.3603 | 1.22634        | 3.1273e-101 | 4.9251e-99  | Common EC1_high |
| Rpl9                                                                          | 21.0169 | 1.39564        | 4.5936e-98  | 6.7718e-96  | Common EC1_high |
| Rps27                                                                         | 20.2688 | 1.27167        | 2.4272e-91  | 3.0610e-89  | Common EC1_high |
| Rps20                                                                         | 20.2558 | 1.19787        | 3.1593e-91  | 3.9381e-89  | Common EC1_high |
| Rps27a                                                                        | 19.8885 | 1.24278        | 5.1225e-88  | 5.8233e-86  | Common EC1_high |
| Rpl38                                                                         | 19.7779 | 1.36838        | 4.6193e-87  | 5.1074e-85  | Common EC1_high |
| Rpl30                                                                         | 19.7084 | 1.24591        | 1.8247e-86  | 1.9970e-84  | Common EC1_high |
| Rpl26                                                                         | 19.6622 | 1.12258        | 4.5506e-86  | 4.9136e-84  | Common EC1_high |
| Rps4x                                                                         | 19.4838 | 1.27913        | 1.506e-84   | 1.5484e-82  | Common EC1_high |
| Rps23                                                                         | 19.0617 | 1.11055        | 5.2555e-81  | 4.8617e-79  | Common EC1_high |
| Rps21                                                                         | 18.8277 | 1.11407        | 4.4810e-79  | 3.9206e-77  | Common EC1_high |
| Rps10                                                                         | 18.7181 | 1.16171        | 3.5248e-78  | 2.9712e-76  | Common EC1_high |
| Rps16                                                                         | 18.6094 | 1.08765        | 2.6973e-77  | 2.2329e-75  | Common EC1_high |
| Myl6                                                                          | 18.481  | 1.10931        | 2.9382e-76  | 2.3365e-74  | Common EC1_high |
| Rps15a                                                                        | 17.4982 | 1.04647        | 1.4773e-68  | 9.5390e-67  | Common EC1_high |
| Rpl34                                                                         | 16.7363 | 1.05437        | 7.1326e-63  | 3.9978e-61  | Common EC1_high |
| Spock2                                                                        | 7.68455 | 3.17066        | 1.5353e-14  | 1.4321e-13  | Common EC1_high |
| Slco1a4                                                                       | 6.98577 | 2.791          | 2.8329e-12  | 2.3451e-11  | Common EC1_high |
| Ptn                                                                           | 6.83799 | 2.95742        | 8.0310e-12  | 6.5064e-11  | Common EC1_high |
| Slco1c1                                                                       | 6.25083 | 2.83862        | 4.0828e-10  | 2.9856e-09  | Common EC1_high |
| Itm2a                                                                         | 5.99271 | 1.97516        | 2.0637e-09  | 1.4522e-08  | Common EC1_high |
| Cldn5                                                                         | 4.67974 | 1.17402        | 2.8723e-06  | 1.6447e-05  | Common EC1_high |
| Abcb1a                                                                        | 4.54945 | 2.20355        | 5.3787e-06  | 3.0268e-05  | Common EC1_high |
| Pglyrp1                                                                       | 4.51679 | 2.91496        | 6.2784e-06  | 3.5160e-05  | Common EC1_high |
| Cxcl12                                                                        | 4.4943  | 1.90698        | 6.9799e-06  | 3.8974e-05  | Common EC1_high |
| Slc2a1                                                                        | 3.55679 | 2.20599        | 0.000375408 | 0.00180277  | Common EC1_high |
| Pltp                                                                          | 3.53947 | 1.22851        | 0.000400927 | 0.0019199   | Common EC1_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                       |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|-----------------------|
| Fn1                                                                           | 3.46227 | 2.47322 | 0.000535645 | 0.00253159  | Common EC1_high       |
| Malat1                                                                        | 24.0174 | 2.00582 | 1.829e-127  | 4.3102e-125 | Common EC2_high       |
| mt-Nd2                                                                        | 21.3229 | 1.83331 | 6.9625e-101 | 1.06533e-98 | Common EC2_high       |
| mt-Atp6                                                                       | 19.7422 | 1.54453 | 9.3661e-87  | 1.16302e-84 | Common EC2_high       |
| mt-Co2                                                                        | 19.284  | 1.49678 | 7.32479e-83 | 8.18273e-81 | Common EC2_high       |
| mt-Co3                                                                        | 18.8344 | 1.45348 | 3.94466e-79 | 4.13485e-77 | Common EC2_high       |
| mt-Nd4                                                                        | 18.6824 | 1.57524 | 6.88244e-78 | 6.87924e-76 | Common EC2_high       |
| mt-Cytb                                                                       | 17.6852 | 1.39129 | 5.45283e-70 | 4.64497e-68 | Common EC2_high       |
| mt-Nd1                                                                        | 17.0824 | 1.34356 | 2.00646e-65 | 1.53868e-63 | Common EC2_high       |
| mt-Co1                                                                        | 15.1879 | 1.28373 | 4.25328e-52 | 2.43039e-50 | Common EC2_high       |
| Meis2                                                                         | 14.97   | 1.19657 | 1.15294e-50 | 6.27701e-49 | Common EC2_high       |
| Gm42418                                                                       | 11.8743 | 1.04516 | 1.61044e-32 | 5.10235e-31 | Common EC2_high       |
| Prkg1                                                                         | 11.3584 | 1.09916 | 6.73515e-30 | 1.93628e-28 | Common EC2_high       |
| Lrmda                                                                         | 10.8403 | 1.18631 | 2.21647e-27 | 5.72185e-26 | Common EC2_high       |
| mt-Nd5                                                                        | 8.44719 | 1.94748 | 2.98405e-17 | 4.61177e-16 | Common EC2_high       |
| Psd3                                                                          | 8.38936 | 1.24401 | 4.88787e-17 | 7.44363e-16 | Common EC2_high       |
| Pard3b                                                                        | 7.61968 | 1.05172 | 2.54306e-14 | 3.27625e-13 | Common EC2_high       |
| Cga                                                                           | 7.2399  | 3.68549 | 4.49025e-13 | 5.29853e-12 | Common EC2_high       |
| mt-Nd3                                                                        | 7.19024 | 1.40591 | 6.46774e-13 | 7.53015e-12 | Common EC2_high       |
| Gh                                                                            | 6.29418 | 2.73991 | 3.09031e-10 | 2.96583e-09 | Common EC2_high       |
| Ralgapa2                                                                      | 6.06339 | 1.17148 | 1.33285e-09 | 1.21591e-08 | Common EC2_high       |
| Pomc                                                                          | 5.70739 | 2.42704 | 1.14723e-08 | 9.62388e-08 | Common EC2_high       |
| mt-Nd4l                                                                       | 5.36003 | 2.05611 | 8.32082e-08 | 6.49197e-07 | Common EC2_high       |
| Slc9a9                                                                        | 5.00893 | 1.09603 | 5.47337e-07 | 3.94613e-06 | Common EC2_high       |
| Palld                                                                         | 4.92358 | 1.06275 | 8.49763e-07 | 6.00714e-06 | Common EC2_high       |
| Auts2                                                                         | 4.83928 | 1.11211 | 1.30311e-06 | 9.07288e-06 | Common EC2_high       |
| AY036118                                                                      | 4.55993 | 1.3018  | 5.11711e-06 | 3.34289e-05 | Common EC2_high       |
| Gm26917                                                                       | 4.2457  | 1.36214 | 2.17916e-05 | 0.000133347 | Common EC2_high       |
| Plvap                                                                         | 51.6723 | 3.5519  | 0           | 0           | Specific Thyroid_high |
| Cd24a                                                                         | 48.2063 | 3.9792  | 0           | 0           | Specific Thyroid_high |
| Plscr2                                                                        | 46.7291 | 3.45282 | 0           | 0           | Specific Thyroid_high |
| Ly6a                                                                          | 45.9488 | 2.76038 | 0           | 0           | Specific Thyroid_high |
| Emcn                                                                          | 44.9581 | 2.62009 | 0           | 0           | Specific Thyroid_high |
| Ehd4                                                                          | 44.2812 | 2.80979 | 0           | 0           | Specific Thyroid_high |
| Cd81                                                                          | 44.2403 | 1.91641 | 0           | 0           | Specific Thyroid_high |
| Crip1                                                                         | 44.0463 | 3.56281 | 0           | 0           | Specific Thyroid_high |
| Ppia                                                                          | 43.875  | 1.68867 | 0           | 0           | Specific Thyroid_high |
| Ly6c1                                                                         | 43.5831 | 3.14099 | 0           | 0           | Specific Thyroid_high |
| Sparcl1                                                                       | 43.1376 | 3.82037 | 0           | 0           | Specific Thyroid_high |
| Slc9a3r2                                                                      | 42.7637 | 2.21299 | 0           | 0           | Specific Thyroid_high |
| Ubb                                                                           | 42.7588 | 1.88801 | 0           | 0           | Specific Thyroid_high |
| Calm1                                                                         | 42.641  | 1.71203 | 0           | 0           | Specific Thyroid_high |
| Hspb1                                                                         | 41.7638 | 2.7172  | 0           | 0           | Specific Thyroid_high |
| Crip2                                                                         | 41.5969 | 2.03054 | 0           | 0           | Specific Thyroid_high |
| Igfbp7                                                                        | 41.3104 | 2.27834 | 0           | 0           | Specific Thyroid_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                       |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|-----------------------|
| Cd200                                                                         | 40.6843 | 2.61009 | 0           | 0           | Specific Thyroid_high |
| Itm2b                                                                         | 40.6231 | 1.4365  | 0           | 0           | Specific Thyroid_high |
| AW112010                                                                      | 40.5025 | 2.85573 | 0           | 0           | Specific Thyroid_high |
| Rgcc                                                                          | 39.657  | 2.92808 | 0           | 0           | Specific Thyroid_high |
| Gnas                                                                          | 39.5504 | 1.29638 | 0           | 0           | Specific Thyroid_high |
| Cd34                                                                          | 39.4443 | 2.48911 | 0           | 0           | Specific Thyroid_high |
| Cst3                                                                          | 39.2131 | 2.05845 | 0           | 0           | Specific Thyroid_high |
| Igfbp3                                                                        | 38.8027 | 3.13909 | 0           | 0           | Specific Thyroid_high |
| Sox18                                                                         | 38.5836 | 2.06128 | 0           | 0           | Specific Thyroid_high |
| Rdx                                                                           | 38.4879 | 2.04613 | 0           | 0           | Specific Thyroid_high |
| Cavin3                                                                        | 37.9721 | 2.4829  | 0           | 0           | Specific Thyroid_high |
| Fxyd5                                                                         | 37.6687 | 2.37072 | 0           | 1.7999e-307 | Specific Thyroid_high |
| Ptma                                                                          | 36.9603 | 1.27349 | 4.9785e-299 | 5.0228e-296 | Specific Thyroid_high |
| Esm1                                                                          | 36.9194 | 3.27982 | 2.2605e-298 | 2.2115e-295 | Specific Thyroid_high |
| H3f3a                                                                         | 36.7173 | 1.555   | 3.8627e-295 | 3.6679e-292 | Specific Thyroid_high |
| Emp2                                                                          | 35.9181 | 4.45391 | 1.5946e-282 | 1.4301e-279 | Specific Thyroid_high |
| Rbp7                                                                          | 35.8974 | 4.45664 | 3.3554e-282 | 2.9279e-279 | Specific Thyroid_high |
| Srgn                                                                          | 35.7995 | 1.63342 | 1.1254e-280 | 9.5614e-278 | Specific Thyroid_high |
| Ednrb                                                                         | 35.3155 | 2.44299 | 3.4006e-273 | 2.7447e-270 | Specific Thyroid_high |
| Kctd12b                                                                       | 35.2013 | 2.47475 | 1.9116e-271 | 1.5053e-268 | Specific Thyroid_high |
| Pcp4l1                                                                        | 34.8853 | 3.17239 | 1.2426e-266 | 9.5516e-264 | Specific Thyroid_high |
| Rps11                                                                         | 34.8838 | 1.5135  | 1.3102e-266 | 9.8368e-264 | Specific Thyroid_high |
| Sparc                                                                         | 34.7189 | 1.41587 | 4.092e-264  | 3.0025e-261 | Specific Thyroid_high |
| Podxl                                                                         | 34.7106 | 1.77175 | 5.4553e-264 | 3.9139e-261 | Specific Thyroid_high |
| Atox1                                                                         | 34.6921 | 1.74773 | 1.0365e-263 | 7.2748e-261 | Specific Thyroid_high |
| Selenom                                                                       | 34.3961 | 2.0636  | 2.8842e-259 | 1.9399e-256 | Specific Thyroid_high |
| Rpl21                                                                         | 34.3719 | 1.48908 | 6.6327e-259 | 4.3701e-256 | Specific Thyroid_high |
| Tm4sf1                                                                        | 34.2648 | 1.8043  | 2.626e-257  | 1.6956e-254 | Specific Thyroid_high |
| Rpl10                                                                         | 33.9735 | 1.56056 | 5.4903e-253 | 3.4087e-250 | Specific Thyroid_high |
| Eif1                                                                          | 33.9277 | 1.46534 | 2.6042e-252 | 1.5864e-249 | Specific Thyroid_high |
| Dynl1                                                                         | 33.8987 | 1.67801 | 6.9589e-252 | 4.1605e-249 | Specific Thyroid_high |
| Tmsb4x                                                                        | 33.8693 | 1.38943 | 1.8881e-251 | 1.1083e-248 | Specific Thyroid_high |
| Rtl8a                                                                         | 33.4693 | 2.78855 | 1.3507e-245 | 7.6502e-243 | Specific Thyroid_high |
| Rpl19                                                                         | 33.4668 | 1.43266 | 1.4644e-245 | 8.1513e-243 | Specific Thyroid_high |
| Ly6e                                                                          | 33.4578 | 1.96006 | 1.9848e-245 | 1.0861e-242 | Specific Thyroid_high |
| Flt1                                                                          | 33.2783 | 1.26361 | 7.9598e-243 | 4.2831e-240 | Specific Thyroid_high |
| Rpl29                                                                         | 33.1681 | 1.52508 | 3.1053e-241 | 1.6435e-238 | Specific Thyroid_high |
| Jam3                                                                          | 33.1176 | 2.48046 | 1.6613e-240 | 8.651e-238  | Specific Thyroid_high |
| Rpl18                                                                         | 33.0252 | 1.54484 | 3.5288e-239 | 1.8084e-236 | Specific Thyroid_high |
| Ramp3                                                                         | 32.9473 | 2.27824 | 4.6195e-238 | 2.3303e-235 | Specific Thyroid_high |
| Tsc22d1                                                                       | 32.8744 | 1.88366 | 5.1055e-237 | 2.5358e-234 | Specific Thyroid_high |
| Rpl15                                                                         | 32.7778 | 1.52183 | 1.2188e-235 | 5.8728e-233 | Specific Thyroid_high |
| Plcb1                                                                         | 32.4522 | 1.94224 | 5.0421e-231 | 2.3939e-228 | Specific Thyroid_high |
| Fth1                                                                          | 32.1142 | 1.41045 | 2.7962e-226 | 1.2897e-223 | Specific Thyroid_high |
| Ppib                                                                          | 32.1088 | 1.67118 | 3.324e-226  | 1.5115e-223 | Specific Thyroid_high |



| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                       |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|-----------------------|
| Rps7                                                                          | 32.0671 | 1.49133 | 1.2697e-225 | 5.6935e-223 | Specific Thyroid_high |
| Rpl6                                                                          | 32.0302 | 1.42769 | 4.1464e-225 | 1.8338e-222 | Specific Thyroid_high |
| Mfge8                                                                         | 31.8835 | 1.92048 | 4.5263e-223 | 1.9484e-220 | Specific Thyroid_high |
| Actg1                                                                         | 31.8663 | 1.58798 | 7.8239e-223 | 3.3236e-220 | Specific Thyroid_high |
| Plpp3                                                                         | 31.6682 | 1.37441 | 4.2657e-220 | 1.7656e-217 | Specific Thyroid_high |
| Tspo                                                                          | 31.5139 | 1.79007 | 5.6023e-218 | 2.2895e-215 | Specific Thyroid_high |
| Rps10                                                                         | 31.3811 | 1.37019 | 3.6637e-216 | 1.4785e-213 | Specific Thyroid_high |
| Txn1                                                                          | 31.3627 | 1.52143 | 6.5268e-216 | 2.6015e-213 | Specific Thyroid_high |
| Col4a1                                                                        | 31.2159 | 1.35162 | 6.4841e-214 | 2.5529e-211 | Specific Thyroid_high |
| Fau                                                                           | 31.0527 | 1.3248  | 1.0502e-211 | 4.0851e-209 | Specific Thyroid_high |
| Map1lc3a                                                                      | 30.8548 | 2.41113 | 4.8241e-209 | 1.8541e-206 | Specific Thyroid_high |
| Thrsp                                                                         | 30.7363 | 2.09643 | 1.8666e-207 | 7.0898e-205 | Specific Thyroid_high |
| Gapdh                                                                         | 30.7346 | 1.67999 | 1.9633e-207 | 7.3704e-205 | Specific Thyroid_high |
| Bcam                                                                          | 30.7222 | 2.42455 | 2.8778e-207 | 1.0679e-204 | Specific Thyroid_high |
| Id3                                                                           | 30.6887 | 1.38898 | 8.0578e-207 | 2.923e-204  | Specific Thyroid_high |
| Acvrl1                                                                        | 30.5866 | 2.20116 | 1.8468e-205 | 6.6249e-203 | Specific Thyroid_high |
| B3gnt2                                                                        | 30.5572 | 1.98284 | 4.5378e-205 | 1.6099e-202 | Specific Thyroid_high |
| Col4a2                                                                        | 30.4416 | 1.5099  | 1.5471e-203 | 5.429e-201  | Specific Thyroid_high |
| Pfn1                                                                          | 30.4057 | 1.37932 | 4.6229e-203 | 1.6048e-200 | Specific Thyroid_high |
| Mgl1                                                                          | 30.4038 | 1.50917 | 4.8915e-203 | 1.68e-200   | Specific Thyroid_high |
| Myl12a                                                                        | 30.2294 | 1.50545 | 9.7314e-201 | 3.239e-198  | Specific Thyroid_high |
| H2-D1                                                                         | 30.2154 | 1.36786 | 1.4868e-200 | 4.8982e-198 | Specific Thyroid_high |
| Ifitm3                                                                        | 30.1994 | 1.39569 | 2.411e-200  | 7.8625e-198 | Specific Thyroid_high |
| Rpl36                                                                         | 30.1239 | 1.32109 | 2.3546e-199 | 7.602e-197  | Specific Thyroid_high |
| Rpl27a                                                                        | 30.1206 | 1.25065 | 2.6046e-199 | 8.3258e-197 | Specific Thyroid_high |
| Rpl9                                                                          | 30.1032 | 1.3948  | 4.3971e-199 | 1.3918e-196 | Specific Thyroid_high |
| Cav1                                                                          | 30.101  | 2.12563 | 4.7007e-199 | 1.4734e-196 | Specific Thyroid_high |
| Tmem59                                                                        | 30.0394 | 1.45739 | 3.0045e-198 | 9.3271e-196 | Specific Thyroid_high |
| Ebf1                                                                          | 29.7605 | 2.0709  | 1.2698e-194 | 3.9044e-192 | Specific Thyroid_high |
| BC028528                                                                      | 29.6942 | 2.14399 | 9.1289e-194 | 2.7804e-191 | Specific Thyroid_high |
| Rps27a                                                                        | 29.6853 | 1.32447 | 1.1902e-193 | 3.591e-191  | Specific Thyroid_high |
| Hsp90ab1                                                                      | 29.6    | 1.19052 | 1.4919e-192 | 4.4599e-190 | Specific Thyroid_high |
| Gnai2                                                                         | 29.4944 | 1.20872 | 3.394e-191  | 1.0053e-188 | Specific Thyroid_high |
| Rflnb                                                                         | 29.3886 | 1.95075 | 7.6705e-190 | 2.2513e-187 | Specific Thyroid_high |
| Cox8a                                                                         | 29.314  | 1.47228 | 6.8746e-189 | 1.9817e-186 | Specific Thyroid_high |
| Plscr1                                                                        | 29.1398 | 2.56271 | 1.124e-186  | 3.2113e-184 | Specific Thyroid_high |
| Actb                                                                          | 29.1341 | 1.04452 | 1.3274e-186 | 3.7592e-184 | Specific Thyroid_high |
| Cald1                                                                         | 28.9839 | 1.37587 | 1.0509e-184 | 2.9502e-182 | Specific Thyroid_high |
| Rps21                                                                         | 28.9666 | 1.27654 | 1.7342e-184 | 4.8266e-182 | Specific Thyroid_high |
| Rpl32                                                                         | 28.9582 | 1.33119 | 2.2129e-184 | 6.1064e-182 | Specific Thyroid_high |
| Oaz1                                                                          | 28.9393 | 1.41911 | 3.8269e-184 | 1.047e-181  | Specific Thyroid_high |
| Rps8                                                                          | 28.9093 | 1.17112 | 9.1232e-184 | 2.4752e-181 | Specific Thyroid_high |
| Ndufa4                                                                        | 28.8684 | 1.35328 | 2.9741e-183 | 8.0016e-181 | Specific Thyroid_high |
| Selenok                                                                       | 28.863  | 1.43497 | 3.4801e-183 | 9.2855e-181 | Specific Thyroid_high |
| Mef2c                                                                         | 28.8357 | 1.23892 | 7.6614e-183 | 2.0274e-180 | Specific Thyroid_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                       |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|-----------------------|
| Rps5                                                                          | 28.6603 | 1.33176 | 1.1944e-180 | 3.135e-178  | Specific Thyroid_high |
| Selenow                                                                       | 28.6332 | 1.48078 | 2.5954e-180 | 6.7576e-178 | Specific Thyroid_high |
| Myl12b                                                                        | 28.6048 | 1.40871 | 5.8502e-180 | 1.511e-177  | Specific Thyroid_high |
| Pltp                                                                          | 28.5241 | 2.03447 | 5.8839e-179 | 1.5076e-176 | Specific Thyroid_high |
| Lims2                                                                         | 28.4267 | 1.6888  | 9.447e-178  | 2.4015e-175 | Specific Thyroid_high |
| Sumo2                                                                         | 28.2771 | 1.33453 | 6.6136e-176 | 1.6299e-173 | Specific Thyroid_high |
| Myl6                                                                          | 28.0254 | 1.1935  | 7.9713e-173 | 1.9497e-170 | Specific Thyroid_high |
| Atp5j                                                                         | 27.988  | 1.38318 | 2.2732e-172 | 5.5181e-170 | Specific Thyroid_high |
| Cfl1                                                                          | 27.9671 | 1.29373 | 4.0806e-172 | 9.7586e-170 | Specific Thyroid_high |
| Tg                                                                            | 27.8911 | 4.92054 | 3.4188e-171 | 8.0567e-169 | Specific Thyroid_high |
| Id1                                                                           | 27.8669 | 1.76061 | 6.723e-171  | 1.5729e-168 | Specific Thyroid_high |
| Rps16                                                                         | 27.8459 | 1.2061  | 1.2069e-170 | 2.8033e-168 | Specific Thyroid_high |
| Atp5b                                                                         | 27.8355 | 1.43732 | 1.6123e-170 | 3.718e-168  | Specific Thyroid_high |
| Lama3                                                                         | 27.7873 | 2.22848 | 6.1855e-170 | 1.4163e-167 | Specific Thyroid_high |
| Rpl35                                                                         | 27.7438 | 1.34591 | 2.0714e-169 | 4.6767e-167 | Specific Thyroid_high |
| Col13a1                                                                       | 27.598  | 1.63416 | 1.1767e-167 | 2.62e-165   | Specific Thyroid_high |
| Rpl37                                                                         | 27.5914 | 1.21802 | 1.4118e-167 | 3.122e-165  | Specific Thyroid_high |
| Rpl18a                                                                        | 27.5862 | 1.27252 | 1.6284e-167 | 3.5763e-165 | Specific Thyroid_high |
| Selenof                                                                       | 27.483  | 1.38378 | 2.8025e-166 | 6.0319e-164 | Specific Thyroid_high |
| Rpl7a                                                                         | 27.4523 | 1.29606 | 6.5272e-166 | 1.3956e-163 | Specific Thyroid_high |
| Clu                                                                           | 27.4502 | 3.95042 | 6.9132e-166 | 1.4684e-163 | Specific Thyroid_high |
| Rpl24                                                                         | 27.4428 | 1.21439 | 8.4726e-166 | 1.7878e-163 | Specific Thyroid_high |
| Prdx1                                                                         | 27.2656 | 1.18481 | 1.0861e-163 | 2.2623e-161 | Specific Thyroid_high |
| Piezo2                                                                        | 27.2348 | 1.87901 | 2.5182e-163 | 5.2115e-161 | Specific Thyroid_high |
| Ces2e                                                                         | 27.2202 | 2.80871 | 3.7471e-163 | 7.7054e-161 | Specific Thyroid_high |
| Rabac1                                                                        | 27.1548 | 1.33773 | 2.2205e-162 | 4.5372e-160 | Specific Thyroid_high |
| Rapgef4                                                                       | 27.0944 | 1.74994 | 1.146e-161  | 2.327e-159  | Specific Thyroid_high |
| Car4                                                                          | 27.0268 | 2.87008 | 7.1598e-161 | 1.4447e-158 | Specific Thyroid_high |
| Rps24                                                                         | 26.9526 | 1.16774 | 5.3208e-160 | 1.067e-157  | Specific Thyroid_high |
| Rps4x                                                                         | 26.9191 | 1.21318 | 1.3141e-159 | 2.6027e-157 | Specific Thyroid_high |
| Tagln2                                                                        | 26.9025 | 1.29114 | 2.0516e-159 | 4.0388e-157 | Specific Thyroid_high |
| Hspa8                                                                         | 26.8366 | 1.19517 | 1.2098e-158 | 2.3672e-156 | Specific Thyroid_high |
| Clic5                                                                         | 26.7733 | 1.82265 | 6.6062e-158 | 1.2848e-155 | Specific Thyroid_high |
| Cox5b                                                                         | 26.7567 | 1.45305 | 1.0331e-157 | 1.9973e-155 | Specific Thyroid_high |
| Cox5a                                                                         | 26.7372 | 1.45799 | 1.7397e-157 | 3.3432e-155 | Specific Thyroid_high |
| Klf13                                                                         | 26.5168 | 1.40546 | 6.2005e-155 | 1.1639e-152 | Specific Thyroid_high |
| Tubb4b                                                                        | 26.5057 | 1.83599 | 8.3386e-155 | 1.5472e-152 | Specific Thyroid_high |
| Arpc3                                                                         | 26.5037 | 1.25457 | 8.7813e-155 | 1.62e-152   | Specific Thyroid_high |
| Rpl17                                                                         | 26.4745 | 1.20331 | 1.9062e-154 | 3.4769e-152 | Specific Thyroid_high |
| Btf3                                                                          | 26.4652 | 1.2556  | 2.4363e-154 | 4.4188e-152 | Specific Thyroid_high |
| Ramp2                                                                         | 26.4547 | 1.23275 | 3.2184e-154 | 5.8049e-152 | Specific Thyroid_high |
| Tmem176b                                                                      | 26.2652 | 1.68379 | 4.7876e-152 | 8.587e-150  | Specific Thyroid_high |
| Elmo1                                                                         | 26.2562 | 1.9489  | 6.0704e-152 | 1.0828e-149 | Specific Thyroid_high |
| Rpl11                                                                         | 26.232  | 1.15519 | 1.1484e-151 | 2.0371e-149 | Specific Thyroid_high |
| Rpl28                                                                         | 26.2284 | 1.13311 | 1.2609e-151 | 2.2246e-149 | Specific Thyroid_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                       |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|-----------------------|
| Psmc1                                                                         | 26.228  | 1.41125 | 1.2726e-151 | 2.2329e-149 | Specific Thyroid_high |
| Cd300lg                                                                       | 26.1838 | 1.28127 | 4.0663e-151 | 7.0962e-149 | Specific Thyroid_high |
| Rps20                                                                         | 26.0804 | 1.14504 | 6.0853e-150 | 1.0506e-147 | Specific Thyroid_high |
| Anxa2                                                                         | 26.0092 | 1.39984 | 3.8983e-149 | 6.6241e-147 | Specific Thyroid_high |
| Rhoa                                                                          | 25.9781 | 1.08754 | 8.7631e-149 | 1.4812e-146 | Specific Thyroid_high |
| Gng5                                                                          | 25.9759 | 1.18066 | 9.2666e-149 | 1.5582e-146 | Specific Thyroid_high |
| Rps2                                                                          | 25.9412 | 1.22674 | 2.2875e-148 | 3.8265e-146 | Specific Thyroid_high |
| Psmc7                                                                         | 25.9398 | 1.34284 | 2.3704e-148 | 3.9447e-146 | Specific Thyroid_high |
| Meox1                                                                         | 25.8811 | 2.54681 | 1.0878e-147 | 1.7827e-145 | Specific Thyroid_high |
| S100a13                                                                       | 25.8534 | 1.20593 | 2.2301e-147 | 3.618e-145  | Specific Thyroid_high |
| Uqcrb                                                                         | 25.8242 | 1.24215 | 4.7435e-147 | 7.6572e-145 | Specific Thyroid_high |
| Psmc2                                                                         | 25.7726 | 1.6404  | 1.8011e-146 | 2.893e-144  | Specific Thyroid_high |
| H2-T23                                                                        | 25.7273 | 1.41264 | 5.7926e-146 | 9.2581e-144 | Specific Thyroid_high |
| Rps3                                                                          | 25.72   | 1.17134 | 6.9887e-146 | 1.1115e-143 | Specific Thyroid_high |
| Gm12002                                                                       | 25.667  | 2.0797  | 2.7308e-145 | 4.3217e-143 | Specific Thyroid_high |
| C1stn1                                                                        | 25.6274 | 2.47815 | 7.5608e-145 | 1.1907e-142 | Specific Thyroid_high |
| Rpl23                                                                         | 25.6269 | 1.13805 | 7.6616e-145 | 1.2007e-142 | Specific Thyroid_high |
| Rpl39                                                                         | 25.6062 | 1.18654 | 1.3028e-144 | 2.0221e-142 | Specific Thyroid_high |
| Rps19                                                                         | 25.5334 | 1.20278 | 8.3837e-144 | 1.2951e-141 | Specific Thyroid_high |
| Laptm4a                                                                       | 25.5005 | 1.15743 | 1.9463e-143 | 2.9921e-141 | Specific Thyroid_high |
| Esam                                                                          | 25.4869 | 1.1526  | 2.7519e-143 | 4.2107e-141 | Specific Thyroid_high |
| Rtl8b                                                                         | 25.4725 | 2.63724 | 3.9809e-143 | 6.0625e-141 | Specific Thyroid_high |
| Rpl8                                                                          | 25.4308 | 1.10875 | 1.1523e-142 | 1.7466e-140 | Specific Thyroid_high |
| Nme2                                                                          | 25.4296 | 1.28122 | 1.1866e-142 | 1.7902e-140 | Specific Thyroid_high |
| Cox7a2                                                                        | 25.3786 | 1.26607 | 4.3408e-142 | 6.488e-140  | Specific Thyroid_high |
| Arpc1b                                                                        | 25.3285 | 1.34953 | 1.5494e-141 | 2.3051e-139 | Specific Thyroid_high |
| Slc25a4                                                                       | 25.1965 | 1.48963 | 4.3777e-140 | 6.4536e-138 | Specific Thyroid_high |
| Ifngr1                                                                        | 25.1671 | 1.71763 | 9.1762e-140 | 1.3405e-137 | Specific Thyroid_high |
| Elob                                                                          | 25.0978 | 1.18736 | 5.2537e-139 | 7.6061e-137 | Specific Thyroid_high |
| Cox4i1                                                                        | 25.0741 | 1.16209 | 9.5282e-139 | 1.3733e-136 | Specific Thyroid_high |
| Pdgfb                                                                         | 25.0123 | 1.69046 | 4.4907e-138 | 6.4437e-136 | Specific Thyroid_high |
| Rpl35a                                                                        | 24.9838 | 1.08738 | 9.1774e-138 | 1.3053e-135 | Specific Thyroid_high |
| Rps13                                                                         | 24.935  | 1.18423 | 3.1076e-137 | 4.4004e-135 | Specific Thyroid_high |
| Rpl27                                                                         | 24.8885 | 1.11155 | 9.9005e-137 | 1.3897e-134 | Specific Thyroid_high |
| Sh3bgrl3                                                                      | 24.8382 | 1.30423 | 3.4689e-136 | 4.8482e-134 | Specific Thyroid_high |
| Eef1a1                                                                        | 24.8043 | 1.05279 | 8.0647e-136 | 1.1223e-133 | Specific Thyroid_high |
| Aldoa                                                                         | 24.7852 | 1.50929 | 1.295e-135  | 1.7868e-133 | Specific Thyroid_high |
| Rpl13                                                                         | 24.6934 | 1.0878  | 1.2594e-134 | 1.7085e-132 | Specific Thyroid_high |
| Rps25                                                                         | 24.6751 | 1.10714 | 1.979e-134  | 2.6733e-132 | Specific Thyroid_high |
| Tspan13                                                                       | 24.6003 | 1.74974 | 1.2552e-133 | 1.6885e-131 | Specific Thyroid_high |
| Ackr3                                                                         | 24.5317 | 3.26554 | 6.7836e-133 | 9.05e-131   | Specific Thyroid_high |
| Rpl34                                                                         | 24.526  | 1.17632 | 7.8067e-133 | 1.0372e-130 | Specific Thyroid_high |
| Smpdl3a                                                                       | 24.4962 | 1.8123  | 1.6217e-132 | 2.137e-130  | Specific Thyroid_high |
| Smco4                                                                         | 24.2474 | 1.3792  | 7.0382e-130 | 9.1625e-128 | Specific Thyroid_high |
| Chchd2                                                                        | 24.2469 | 1.02152 | 7.1234e-130 | 9.2361e-128 | Specific Thyroid_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                       |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|-----------------------|
| Rpl7                                                                          | 24.1193 | 1.12655 | 1.5695e-128 | 2.0268e-126 | Specific Thyroid_high |
| Rps26                                                                         | 24.1135 | 1.09794 | 1.8067e-128 | 2.3239e-126 | Specific Thyroid_high |
| Lmna                                                                          | 24.0849 | 2.60437 | 3.6016e-128 | 4.6142e-126 | Specific Thyroid_high |
| Cox6c                                                                         | 23.9136 | 1.1596  | 2.2134e-126 | 2.7806e-124 | Specific Thyroid_high |
| Atp5j2                                                                        | 23.8627 | 1.22136 | 7.4704e-126 | 9.2762e-124 | Specific Thyroid_high |
| Lrrfip1                                                                       | 23.858  | 1.67552 | 8.3609e-126 | 1.0342e-123 | Specific Thyroid_high |
| Ivns1abp                                                                      | 23.8527 | 1.52263 | 9.4959e-126 | 1.1701e-123 | Specific Thyroid_high |
| Rpl10a                                                                        | 23.7834 | 1.17769 | 4.9616e-125 | 6.0676e-123 | Specific Thyroid_high |
| Ost4                                                                          | 23.6623 | 1.46449 | 8.8236e-124 | 1.075e-121  | Specific Thyroid_high |
| Sorbs2                                                                        | 23.6332 | 1.88536 | 1.7574e-123 | 2.117e-121  | Specific Thyroid_high |
| Eif5a                                                                         | 23.6091 | 1.37474 | 3.1053e-123 | 3.7131e-121 | Specific Thyroid_high |
| Rpl14                                                                         | 23.5932 | 1.07824 | 4.5265e-123 | 5.3925e-121 | Specific Thyroid_high |
| Psmb8                                                                         | 23.5018 | 1.46011 | 3.9109e-122 | 4.642e-120  | Specific Thyroid_high |
| Hint1                                                                         | 23.4674 | 1.26365 | 8.7809e-122 | 1.0384e-119 | Specific Thyroid_high |
| Sema7a                                                                        | 23.4485 | 2.00167 | 1.3684e-121 | 1.6065e-119 | Specific Thyroid_high |
| Rps15a                                                                        | 23.1978 | 1.10509 | 4.7878e-119 | 5.6005e-117 | Specific Thyroid_high |
| Psmb3                                                                         | 23.1957 | 1.3138  | 5.0358e-119 | 5.8694e-117 | Specific Thyroid_high |
| Rplp2                                                                         | 23.1252 | 1.06796 | 2.5857e-118 | 2.9921e-116 | Specific Thyroid_high |
| Gabarap                                                                       | 23.1101 | 1.16692 | 3.6616e-118 | 4.222e-116  | Specific Thyroid_high |
| Plpp1                                                                         | 23.06   | 1.18648 | 1.1673e-117 | 1.327e-115  | Specific Thyroid_high |
| Tspan12                                                                       | 23.0158 | 1.35649 | 3.236e-117  | 3.653e-115  | Specific Thyroid_high |
| Dad1                                                                          | 23.0043 | 1.30027 | 4.2243e-117 | 4.7519e-115 | Specific Thyroid_high |
| Rplp0                                                                         | 22.9874 | 1.10464 | 6.2296e-117 | 6.9834e-115 | Specific Thyroid_high |
| Tle5                                                                          | 22.9813 | 1.2433  | 7.1687e-117 | 8.0084e-115 | Specific Thyroid_high |
| Mcf2l                                                                         | 22.9063 | 1.67032 | 4.0177e-116 | 4.4728e-114 | Specific Thyroid_high |
| Rpl30                                                                         | 22.8748 | 1.10223 | 8.2734e-116 | 9.1789e-114 | Specific Thyroid_high |
| Eno1                                                                          | 22.8746 | 2.47058 | 8.315e-116  | 9.1935e-114 | Specific Thyroid_high |
| Timp3                                                                         | 22.8709 | 1.16014 | 9.0649e-116 | 9.9884e-114 | Specific Thyroid_high |
| Krtcap2                                                                       | 22.8361 | 1.32507 | 2.0072e-115 | 2.2042e-113 | Specific Thyroid_high |
| Uba52                                                                         | 22.8268 | 1.94061 | 2.4862e-115 | 2.7209e-113 | Specific Thyroid_high |
| Slc25a5                                                                       | 22.7932 | 1.41148 | 5.352e-115  | 5.8179e-113 | Specific Thyroid_high |
| Ndufc2                                                                        | 22.7904 | 1.3062  | 5.7107e-115 | 6.1869e-113 | Specific Thyroid_high |
| Gm10076                                                                       | 22.7879 | 1.66886 | 6.0406e-115 | 6.5225e-113 | Specific Thyroid_high |
| Endod1                                                                        | 22.7555 | 2.32299 | 1.2647e-114 | 1.3611e-112 | Specific Thyroid_high |
| Gnb2                                                                          | 22.7134 | 1.01906 | 3.3014e-114 | 3.5293e-112 | Specific Thyroid_high |
| Scarb1                                                                        | 22.6959 | 1.33788 | 4.916e-114  | 5.238e-112  | Specific Thyroid_high |
| Ywhaq                                                                         | 22.6673 | 1.12631 | 9.408e-114  | 9.9261e-112 | Specific Thyroid_high |
| Edf1                                                                          | 22.6448 | 1.3276  | 1.5684e-113 | 1.6494e-111 | Specific Thyroid_high |
| Anxa3                                                                         | 22.6394 | 1.28003 | 1.7733e-113 | 1.8588e-111 | Specific Thyroid_high |
| Rpl23a                                                                        | 22.6207 | 1.03173 | 2.711e-113  | 2.8325e-111 | Specific Thyroid_high |
| Atp5e                                                                         | 22.474  | 1.12836 | 7.4606e-112 | 7.7448e-110 | Specific Thyroid_high |
| Park7                                                                         | 22.4696 | 1.46958 | 8.2257e-112 | 8.5118e-110 | Specific Thyroid_high |
| Plekho1                                                                       | 22.4063 | 1.31177 | 3.4189e-111 | 3.5153e-109 | Specific Thyroid_high |
| H3f3b                                                                         | 22.387  | 1.0297  | 5.2635e-111 | 5.3606e-109 | Specific Thyroid_high |
| Mgst3                                                                         | 22.3487 | 2.41537 | 1.244e-110  | 1.255e-108  | Specific Thyroid_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                       |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|-----------------------|
| Rps3a1                                                                        | 22.2866 | 1.01641 | 4.989e-110  | 5.0022e-108 | Specific Thyroid_high |
| Rpl36a1                                                                       | 22.2835 | 1.238   | 5.3455e-110 | 5.343e-108  | Specific Thyroid_high |
| Rpl41                                                                         | 22.2124 | 1.03846 | 2.6068e-109 | 2.5976e-107 | Specific Thyroid_high |
| Bri3                                                                          | 22.2123 | 1.28288 | 2.6153e-109 | 2.598e-107  | Specific Thyroid_high |
| Ehd2                                                                          | 22.1761 | 1.8397  | 5.8381e-109 | 5.7524e-107 | Specific Thyroid_high |
| Naca                                                                          | 22.1679 | 1.01183 | 7.0069e-109 | 6.8759e-107 | Specific Thyroid_high |
| Ndufs5                                                                        | 22.1023 | 1.34994 | 3.0041e-108 | 2.9213e-106 | Specific Thyroid_high |
| Jun                                                                           | 22.0966 | 1.2874  | 3.4092e-108 | 3.3053e-106 | Specific Thyroid_high |
| Itih5                                                                         | 22.0095 | 2.58488 | 2.3371e-107 | 2.2456e-105 | Specific Thyroid_high |
| B4galt4                                                                       | 21.9108 | 1.9579  | 2.0513e-106 | 1.9652e-104 | Specific Thyroid_high |
| Ar                                                                            | 21.8762 | 2.62292 | 4.3785e-106 | 4.1822e-104 | Specific Thyroid_high |
| Lysmd2                                                                        | 21.8712 | 4.08574 | 4.881e-106  | 4.6484e-104 | Specific Thyroid_high |
| Pσμα3                                                                         | 21.7961 | 1.19989 | 2.5247e-105 | 2.3833e-103 | Specific Thyroid_high |
| S100a11                                                                       | 21.7458 | 1.37585 | 7.5682e-105 | 7.0618e-103 | Specific Thyroid_high |
| Gas6                                                                          | 21.7441 | 1.17226 | 7.8572e-105 | 7.3104e-103 | Specific Thyroid_high |
| Rhoc                                                                          | 21.6957 | 1.18681 | 2.2533e-104 | 2.0844e-102 | Specific Thyroid_high |
| Rsad2                                                                         | 21.6693 | 1.44625 | 3.997e-104  | 3.6764e-102 | Specific Thyroid_high |
| Psmb1                                                                         | 21.659  | 1.25777 | 4.9984e-104 | 4.5715e-102 | Specific Thyroid_high |
| Lmcd1                                                                         | 21.6547 | 1.8428  | 5.4867e-104 | 5.0039e-102 | Specific Thyroid_high |
| Thbd                                                                          | 21.6482 | 1.56741 | 6.3162e-104 | 5.7442e-102 | Specific Thyroid_high |
| Gabarapl2                                                                     | 21.5676 | 1.32464 | 3.6216e-103 | 3.2752e-101 | Specific Thyroid_high |
| Ndufb9                                                                        | 21.5179 | 1.26244 | 1.0593e-102 | 9.5259e-101 | Specific Thyroid_high |
| Sem1                                                                          | 21.4632 | 1.02736 | 3.4397e-102 | 3.0848e-100 | Specific Thyroid_high |
| Rpl3                                                                          | 21.3348 | 1.06126 | 5.3937e-101 | 4.8104e-99  | Specific Thyroid_high |
| Pttg1                                                                         | 21.2743 | 1.55018 | 1.9627e-100 | 1.74078e-98 | Specific Thyroid_high |
| Myc11                                                                         | 21.2409 | 1.14123 | 3.9995e-100 | 3.52796e-98 | Specific Thyroid_high |
| Cox7c                                                                         | 21.206  | 1.07369 | 8.4031e-100 | 7.39218e-98 | Specific Thyroid_high |
| Fkbp3                                                                         | 21.1686 | 1.70481 | 1.8601e-99  | 1.62748e-97 | Specific Thyroid_high |
| Impdh1                                                                        | 21.1589 | 1.83136 | 2.2863e-99  | 1.99396e-97 | Specific Thyroid_high |
| Rpsa                                                                          | 21.1588 | 1.0113  | 2.2913e-99  | 1.99396e-97 | Specific Thyroid_high |
| Atp5l                                                                         | 21.1468 | 1.04888 | 2.954e-99   | 2.5637e-97  | Specific Thyroid_high |
| Klf4                                                                          | 21.1013 | 1.46755 | 7.7336e-99  | 6.67592e-97 | Specific Thyroid_high |
| Ubc                                                                           | 21.0836 | 1.02502 | 1.12368e-98 | 9.64839e-97 | Specific Thyroid_high |
| Atp5d                                                                         | 21.0623 | 1.25767 | 1.76228e-98 | 1.50915e-96 | Specific Thyroid_high |
| S100a6                                                                        | 21.0604 | 1.63501 | 1.83691e-98 | 1.5689e-96  | Specific Thyroid_high |
| Ldha                                                                          | 20.9782 | 1.24209 | 1.03749e-97 | 8.79141e-96 | Specific Thyroid_high |
| Ndufa13                                                                       | 20.8971 | 1.22176 | 5.69594e-97 | 4.78889e-95 | Specific Thyroid_high |
| Ctla2a                                                                        | 20.8928 | 1.22873 | 6.22179e-97 | 5.21742e-95 | Specific Thyroid_high |
| Chmp2a                                                                        | 20.8581 | 1.18078 | 1.28558e-96 | 1.06971e-94 | Specific Thyroid_high |
| Btl9                                                                          | 20.8557 | 1.17263 | 1.35401e-96 | 1.12376e-94 | Specific Thyroid_high |
| Clec14a                                                                       | 20.8104 | 1.11042 | 3.48124e-96 | 2.86714e-94 | Specific Thyroid_high |
| Atp5g1                                                                        | 20.7648 | 1.42239 | 9.00911e-96 | 7.38221e-94 | Specific Thyroid_high |
| Rnasek                                                                        | 20.7435 | 1.1783  | 1.40351e-95 | 1.14715e-93 | Specific Thyroid_high |
| Ndufb11                                                                       | 20.6557 | 1.22873 | 8.67108e-95 | 7.05153e-93 | Specific Thyroid_high |
| D8Ert738e                                                                     | 20.6383 | 1.18055 | 1.24452e-94 | 1.007e-92   | Specific Thyroid_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                       |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|-----------------------|
| Prss23                                                                        | 20.6047 | 1.99964 | 2.49115e-94 | 2.01067e-92 | Specific Thyroid_high |
| Cox6b1                                                                        | 20.571  | 1.05528 | 4.98843e-94 | 4.01624e-92 | Specific Thyroid_high |
| Eef2                                                                          | 20.5623 | 1.01301 | 5.97655e-94 | 4.79982e-92 | Specific Thyroid_high |
| Taldo1                                                                        | 20.5558 | 1.31735 | 6.83309e-94 | 5.4741e-92  | Specific Thyroid_high |
| Psmb5                                                                         | 20.4953 | 1.40065 | 2.36891e-93 | 1.87912e-91 | Specific Thyroid_high |
| Ahr                                                                           | 20.4221 | 1.50298 | 1.06282e-92 | 8.38949e-91 | Specific Thyroid_high |
| Tmem176a                                                                      | 20.4037 | 1.36803 | 1.55013e-92 | 1.21767e-90 | Specific Thyroid_high |
| Cltb                                                                          | 20.397  | 1.68503 | 1.77898e-92 | 1.39404e-90 | Specific Thyroid_high |
| Arl6ip5                                                                       | 20.3642 | 1.38756 | 3.47233e-92 | 2.71439e-90 | Specific Thyroid_high |
| Fez2                                                                          | 20.3484 | 1.3437  | 4.79463e-92 | 3.739e-90   | Specific Thyroid_high |
| Snrpb                                                                         | 20.3354 | 1.10338 | 6.25778e-92 | 4.86825e-90 | Specific Thyroid_high |
| Mrfap1                                                                        | 20.2921 | 1.14159 | 1.51017e-91 | 1.16641e-89 | Specific Thyroid_high |
| Tmem88                                                                        | 20.1953 | 1.34666 | 1.07751e-90 | 8.24348e-89 | Specific Thyroid_high |
| Gstm1                                                                         | 20.178  | 1.60523 | 1.52656e-90 | 1.16513e-88 | Specific Thyroid_high |
| Icam2                                                                         | 20.1611 | 1.11003 | 2.15121e-90 | 1.63416e-88 | Specific Thyroid_high |
| Epha4                                                                         | 20.1492 | 2.42114 | 2.73211e-90 | 2.06572e-88 | Specific Thyroid_high |
| Spcs1                                                                         | 20.0798 | 1.37298 | 1.10939e-89 | 8.34889e-88 | Specific Thyroid_high |
| Nedd8                                                                         | 19.9942 | 1.08348 | 6.1855e-89  | 4.63339e-87 | Specific Thyroid_high |
| Sncg                                                                          | 19.9465 | 2.40771 | 1.60869e-88 | 1.19394e-86 | Specific Thyroid_high |
| Tuba1a                                                                        | 19.9047 | 1.26726 | 3.70377e-88 | 2.74258e-86 | Specific Thyroid_high |
| Serpinh1                                                                      | 19.9037 | 1.0988  | 3.7769e-88  | 2.79033e-86 | Specific Thyroid_high |
| Col15a1                                                                       | 19.8854 | 1.60011 | 5.43939e-88 | 4.00024e-86 | Specific Thyroid_high |
| Cd151                                                                         | 19.8787 | 1.26861 | 6.22073e-88 | 4.56446e-86 | Specific Thyroid_high |
| Prdm1                                                                         | 19.787  | 2.25395 | 3.84989e-87 | 2.81207e-85 | Specific Thyroid_high |
| Clec1a                                                                        | 19.5658 | 1.21886 | 3.02842e-85 | 2.18242e-83 | Specific Thyroid_high |
| Oaz2                                                                          | 19.4966 | 1.1595  | 1.17388e-84 | 8.42196e-83 | Specific Thyroid_high |
| Rnf7                                                                          | 19.4821 | 1.30838 | 1.55806e-84 | 1.11534e-82 | Specific Thyroid_high |
| Gngt2                                                                         | 19.4697 | 1.17057 | 1.98307e-84 | 1.41645e-82 | Specific Thyroid_high |
| Eef1b2                                                                        | 19.4331 | 1.0428  | 4.05122e-84 | 2.88728e-82 | Specific Thyroid_high |
| 1810037117Rik                                                                 | 19.427  | 1.04122 | 4.56503e-84 | 3.2463e-82  | Specific Thyroid_high |
| Fry                                                                           | 19.4096 | 1.25519 | 6.39959e-84 | 4.54089e-82 | Specific Thyroid_high |
| Hlx                                                                           | 19.325  | 1.70801 | 3.31079e-83 | 2.33893e-81 | Specific Thyroid_high |
| Tsc22d3                                                                       | 19.3148 | 1.3771  | 4.03283e-83 | 2.84279e-81 | Specific Thyroid_high |
| Enpp2                                                                         | 19.3096 | 5.50885 | 4.46334e-83 | 3.13258e-81 | Specific Thyroid_high |
| Ndufa7                                                                        | 19.3032 | 1.01591 | 5.04339e-83 | 3.53201e-81 | Specific Thyroid_high |
| Tmem50a                                                                       | 19.2677 | 1.02094 | 1.00315e-82 | 6.96486e-81 | Specific Thyroid_high |
| Ran                                                                           | 19.221  | 1.16923 | 2.46884e-82 | 1.70313e-80 | Specific Thyroid_high |
| Atp6v0c                                                                       | 19.2066 | 1.00648 | 3.25921e-82 | 2.24358e-80 | Specific Thyroid_high |
| Aldh2                                                                         | 19.1812 | 1.16403 | 5.31263e-82 | 3.64932e-80 | Specific Thyroid_high |
| Palmd                                                                         | 19.1807 | 1.37161 | 5.36024e-82 | 3.67421e-80 | Specific Thyroid_high |
| Cox6a1                                                                        | 19.1256 | 1.09283 | 1.5458e-81  | 1.05733e-79 | Specific Thyroid_high |
| Ier5                                                                          | 19.1096 | 1.32218 | 2.10112e-81 | 1.43111e-79 | Specific Thyroid_high |
| Dnaja1                                                                        | 19.0966 | 1.03045 | 2.69678e-81 | 1.83296e-79 | Specific Thyroid_high |
| Mapk3                                                                         | 19.0562 | 1.07894 | 5.83117e-81 | 3.93848e-79 | Specific Thyroid_high |
| Prdx4                                                                         | 19.0259 | 1.48807 | 1.04081e-80 | 7.00054e-79 | Specific Thyroid_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                       |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|-----------------------|
| Smim14                                                                        | 18.9769 | 1.34656 | 2.64664e-80 | 1.77276e-78 | Specific Thyroid_high |
| Mmp15                                                                         | 18.8669 | 2.11187 | 2.1352e-79  | 1.40971e-77 | Specific Thyroid_high |
| Trim47                                                                        | 18.8569 | 1.47792 | 2.57759e-79 | 1.69831e-77 | Specific Thyroid_high |
| Eva1b                                                                         | 18.7872 | 1.07726 | 9.60921e-79 | 6.29276e-77 | Specific Thyroid_high |
| Gpx1                                                                          | 18.7832 | 1.14891 | 1.03689e-78 | 6.77654e-77 | Specific Thyroid_high |
| Fmo2                                                                          | 18.7554 | 3.68129 | 1.7474e-78  | 1.13969e-76 | Specific Thyroid_high |
| Prkd1                                                                         | 18.6284 | 1.28097 | 1.89237e-77 | 1.22435e-75 | Specific Thyroid_high |
| Vps28                                                                         | 18.6107 | 1.39792 | 2.6333e-77  | 1.70032e-75 | Specific Thyroid_high |
| Iqgap1                                                                        | 18.5973 | 1.09136 | 3.3806e-77  | 2.17416e-75 | Specific Thyroid_high |
| Uqcrq                                                                         | 18.5794 | 1.05184 | 4.71675e-77 | 3.02744e-75 | Specific Thyroid_high |
| Ablim1                                                                        | 18.5542 | 1.10482 | 7.54754e-77 | 4.80616e-75 | Specific Thyroid_high |
| Vdac2                                                                         | 18.5219 | 1.10866 | 1.37498e-76 | 8.73846e-75 | Specific Thyroid_high |
| Lpcat1                                                                        | 18.4885 | 1.35016 | 2.55805e-76 | 1.61934e-74 | Specific Thyroid_high |
| Sybu                                                                          | 18.4853 | 3.11444 | 2.71206e-76 | 1.71348e-74 | Specific Thyroid_high |
| Psmb6                                                                         | 18.477  | 1.20153 | 3.16355e-76 | 1.99483e-74 | Specific Thyroid_high |
| Alyref                                                                        | 18.471  | 1.57058 | 3.53238e-76 | 2.22306e-74 | Specific Thyroid_high |
| Sec61b                                                                        | 18.39   | 1.13337 | 1.57872e-75 | 9.8777e-74  | Specific Thyroid_high |
| Psmb10                                                                        | 18.3787 | 1.14088 | 1.94722e-75 | 1.21597e-73 | Specific Thyroid_high |
| Rras                                                                          | 18.3675 | 1.11053 | 2.39038e-75 | 1.48983e-73 | Specific Thyroid_high |
| Sub1                                                                          | 18.351  | 1.03045 | 3.2422e-75  | 2.0091e-73  | Specific Thyroid_high |
| Ifi27                                                                         | 18.3239 | 1.07384 | 5.33364e-75 | 3.29879e-73 | Specific Thyroid_high |
| Gna11                                                                         | 18.2783 | 1.13192 | 1.232e-74   | 7.56181e-73 | Specific Thyroid_high |
| Ntf3                                                                          | 18.2357 | 1.56956 | 2.68916e-74 | 1.6412e-72  | Specific Thyroid_high |
| Psmb2                                                                         | 18.2294 | 1.0999  | 3.01731e-74 | 1.838e-72   | Specific Thyroid_high |
| S100a1                                                                        | 18.2057 | 1.10361 | 4.64846e-74 | 2.82628e-72 | Specific Thyroid_high |
| Tmem234                                                                       | 18.1517 | 1.04552 | 1.2449e-73  | 7.54061e-72 | Specific Thyroid_high |
| Eef1d                                                                         | 18.1499 | 1.15815 | 1.28754e-73 | 7.76978e-72 | Specific Thyroid_high |
| Atp5c1                                                                        | 18.1279 | 1.10209 | 1.92055e-73 | 1.15465e-71 | Specific Thyroid_high |
| Cav2                                                                          | 18.1257 | 1.05942 | 1.99758e-73 | 1.19874e-71 | Specific Thyroid_high |
| Higd2a                                                                        | 18.1172 | 1.39677 | 2.33312e-73 | 1.3949e-71  | Specific Thyroid_high |
| Rheb                                                                          | 18.1126 | 1.12314 | 2.53325e-73 | 1.51175e-71 | Specific Thyroid_high |
| Grc10                                                                         | 18.0913 | 1.07    | 3.72842e-73 | 2.22088e-71 | Specific Thyroid_high |
| Bvht                                                                          | 18.0554 | 1.26394 | 7.16055e-73 | 4.2418e-71  | Specific Thyroid_high |
| Snrpg                                                                         | 18.0111 | 1.0428  | 1.595e-72   | 9.414e-71   | Specific Thyroid_high |
| Eif4a1                                                                        | 17.9172 | 1.08985 | 8.65168e-72 | 5.08778e-70 | Specific Thyroid_high |
| Ccdc85a                                                                       | 17.8522 | 1.22101 | 2.78006e-71 | 1.62598e-69 | Specific Thyroid_high |
| Eif3f                                                                         | 17.8266 | 1.00914 | 4.39684e-71 | 2.56695e-69 | Specific Thyroid_high |
| Efna1                                                                         | 17.8233 | 1.22254 | 4.65968e-71 | 2.71548e-69 | Specific Thyroid_high |
| Mrpl33                                                                        | 17.7768 | 1.2927  | 1.06965e-70 | 6.21109e-69 | Specific Thyroid_high |
| Tcf15                                                                         | 17.7575 | 1.99676 | 1.50908e-70 | 8.7313e-69  | Specific Thyroid_high |
| Ecsr                                                                          | 17.7432 | 1.06629 | 1.94657e-70 | 1.12424e-68 | Specific Thyroid_high |
| Ssr4                                                                          | 17.723  | 1.26289 | 2.7865e-70  | 1.60647e-68 | Specific Thyroid_high |
| Ndufa11                                                                       | 17.7202 | 1.18203 | 2.92838e-70 | 1.68226e-68 | Specific Thyroid_high |
| Rpl22l1                                                                       | 17.6667 | 1.12284 | 7.57255e-70 | 4.31943e-68 | Specific Thyroid_high |
| Dbi                                                                           | 17.6552 | 1.05711 | 9.28175e-70 | 5.28503e-68 | Specific Thyroid_high |



| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                       |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|-----------------------|
| Mlec                                                                          | 17.5785 | 2.94561 | 3.60318e-69 | 2.03728e-67 | Specific Thyroid_high |
| Grrp1                                                                         | 17.5765 | 1.51932 | 3.7285e-69  | 2.10445e-67 | Specific Thyroid_high |
| Scand1                                                                        | 17.5707 | 1.16472 | 4.13304e-69 | 2.32871e-67 | Specific Thyroid_high |
| Syne2                                                                         | 17.5361 | 1.22833 | 7.59462e-69 | 4.25681e-67 | Specific Thyroid_high |
| Efr3b                                                                         | 17.5255 | 1.79549 | 9.15793e-69 | 5.12416e-67 | Specific Thyroid_high |
| Ndufb7                                                                        | 17.5249 | 1.0099  | 9.25241e-69 | 5.16806e-67 | Specific Thyroid_high |
| Prdx2                                                                         | 17.5129 | 1.05865 | 1.1415e-68  | 6.35404e-67 | Specific Thyroid_high |
| Dok4                                                                          | 17.4829 | 1.86079 | 1.93531e-68 | 1.06806e-66 | Specific Thyroid_high |
| Rnf220                                                                        | 17.4207 | 1.46528 | 5.74482e-68 | 3.14892e-66 | Specific Thyroid_high |
| Ndufa8                                                                        | 17.366  | 1.05139 | 1.49179e-67 | 8.13554e-66 | Specific Thyroid_high |
| Ywhah                                                                         | 17.3585 | 1.02844 | 1.70123e-67 | 9.26207e-66 | Specific Thyroid_high |
| Pσμα2                                                                         | 17.2578 | 1.05643 | 9.78437e-67 | 5.30014e-65 | Specific Thyroid_high |
| Hras                                                                          | 17.253  | 1.17531 | 1.06208e-66 | 5.72439e-65 | Specific Thyroid_high |
| Snu13                                                                         | 17.1997 | 1.08205 | 2.66945e-66 | 1.43399e-64 | Specific Thyroid_high |
| Diaph2                                                                        | 17.1852 | 1.24122 | 3.42991e-66 | 1.83639e-64 | Specific Thyroid_high |
| Jup                                                                           | 17.1561 | 1.02159 | 5.65938e-66 | 3.02005e-64 | Specific Thyroid_high |
| Tmem14c                                                                       | 17.1315 | 1.11067 | 8.63685e-66 | 4.58619e-64 | Specific Thyroid_high |
| Pσμα1                                                                         | 17.1121 | 1.21672 | 1.20626e-65 | 6.37385e-64 | Specific Thyroid_high |
| Ndufb4                                                                        | 17.1056 | 1.1127  | 1.34792e-65 | 7.11073e-64 | Specific Thyroid_high |
| Polr2e                                                                        | 17.0351 | 1.41646 | 4.51222e-65 | 2.37646e-63 | Specific Thyroid_high |
| Ndufb10                                                                       | 16.9909 | 1.19817 | 9.59384e-65 | 5.02005e-63 | Specific Thyroid_high |
| Rai14                                                                         | 16.8659 | 1.13459 | 8.02245e-64 | 4.15738e-62 | Specific Thyroid_high |
| Mrps24                                                                        | 16.8179 | 1.27344 | 1.80457e-63 | 9.32167e-62 | Specific Thyroid_high |
| Hprt                                                                          | 16.8083 | 1.1039  | 2.12299e-63 | 1.09316e-61 | Specific Thyroid_high |
| Mdh2                                                                          | 16.8002 | 1.29415 | 2.43348e-63 | 1.25103e-61 | Specific Thyroid_high |
| Alox12                                                                        | 16.7779 | 2.30589 | 3.54334e-63 | 1.81582e-61 | Specific Thyroid_high |
| Psmb9                                                                         | 16.7378 | 1.18149 | 6.95309e-63 | 3.55191e-61 | Specific Thyroid_high |
| Stc1                                                                          | 16.7362 | 3.38997 | 7.13936e-63 | 3.6413e-61  | Specific Thyroid_high |
| Cope                                                                          | 16.7257 | 1.33313 | 8.51237e-63 | 4.3279e-61  | Specific Thyroid_high |
| Tmco1                                                                         | 16.7226 | 1.06637 | 8.975e-63   | 4.55594e-61 | Specific Thyroid_high |
| Ccdc28b                                                                       | 16.7103 | 1.76991 | 1.10222e-62 | 5.57763e-61 | Specific Thyroid_high |
| Dpm3                                                                          | 16.7022 | 1.21074 | 1.26331e-62 | 6.38277e-61 | Specific Thyroid_high |
| Tomm6                                                                         | 16.6872 | 1.13047 | 1.62468e-62 | 8.1702e-61  | Specific Thyroid_high |
| Ciao2b                                                                        | 16.6859 | 1.57598 | 1.66052e-62 | 8.33744e-61 | Specific Thyroid_high |
| Ucp2                                                                          | 16.6777 | 1.17203 | 1.90464e-62 | 9.54834e-61 | Specific Thyroid_high |
| Pop5                                                                          | 16.6519 | 1.50203 | 2.93352e-62 | 1.46156e-60 | Specific Thyroid_high |
| Lipe                                                                          | 16.6486 | 2.00767 | 3.09655e-62 | 1.5404e-60  | Specific Thyroid_high |
| Psenen                                                                        | 16.6287 | 1.11516 | 4.31931e-62 | 2.14537e-60 | Specific Thyroid_high |
| Nav2                                                                          | 16.5839 | 1.9925  | 9.11361e-62 | 4.50586e-60 | Specific Thyroid_high |
| Nop10                                                                         | 16.4424 | 1.1939  | 9.50216e-61 | 4.64814e-59 | Specific Thyroid_high |
| Eif3k                                                                         | 16.3952 | 1.03802 | 2.07083e-60 | 1.00992e-58 | Specific Thyroid_high |
| Rhbdl2                                                                        | 16.3406 | 2.53605 | 5.07516e-60 | 2.46393e-58 | Specific Thyroid_high |
| Psmc7                                                                         | 16.3372 | 1.14176 | 5.36832e-60 | 2.60234e-58 | Specific Thyroid_high |
| Polr1d                                                                        | 16.3193 | 1.10654 | 7.19644e-60 | 3.48332e-58 | Specific Thyroid_high |
| Tbxa2r                                                                        | 16.3128 | 1.14162 | 8.00194e-60 | 3.8674e-58  | Specific Thyroid_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                       |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|-----------------------|
| Srsf7                                                                         | 16.2623 | 1.0091  | 1.82903e-59 | 8.80031e-58 | Specific Thyroid_high |
| Ypel3                                                                         | 16.197  | 1.38227 | 5.29574e-59 | 2.52919e-57 | Specific Thyroid_high |
| Taf10                                                                         | 16.1343 | 1.32511 | 1.46423e-58 | 6.9621e-57  | Specific Thyroid_high |
| Tmed2                                                                         | 16.0811 | 1.00794 | 3.46056e-58 | 1.643e-56   | Specific Thyroid_high |
| Dipk2b                                                                        | 16.0779 | 2.11864 | 3.64309e-58 | 1.72712e-56 | Specific Thyroid_high |
| Rer1                                                                          | 16.0639 | 1.19698 | 4.56811e-58 | 2.15616e-56 | Specific Thyroid_high |
| Dctn3                                                                         | 16.056  | 1.23647 | 5.18957e-58 | 2.44591e-56 | Specific Thyroid_high |
| Psmb4                                                                         | 16.0259 | 1.00719 | 8.42677e-58 | 3.95434e-56 | Specific Thyroid_high |
| Evl                                                                           | 16.0201 | 1.89033 | 9.25633e-58 | 4.33102e-56 | Specific Thyroid_high |
| C130074G19Rik                                                                 | 15.9699 | 1.53441 | 2.07002e-57 | 9.65759e-56 | Specific Thyroid_high |
| Vamp8                                                                         | 15.9628 | 1.23152 | 2.31966e-57 | 1.08067e-55 | Specific Thyroid_high |
| Fut8                                                                          | 15.9604 | 1.18514 | 2.41192e-57 | 1.12203e-55 | Specific Thyroid_high |
| Cfap20                                                                        | 15.8853 | 1.58741 | 8.00632e-57 | 3.69263e-55 | Specific Thyroid_high |
| Manf                                                                          | 15.875  | 1.03484 | 9.44045e-57 | 4.34167e-55 | Specific Thyroid_high |
| Card19                                                                        | 15.874  | 1.66414 | 9.59541e-57 | 4.40665e-55 | Specific Thyroid_high |
| 2026-03-02 00:00:00                                                           | 15.8394 | 1.04879 | 1.66329e-56 | 7.62772e-55 | Specific Thyroid_high |
| Tnfaip2                                                                       | 15.8284 | 1.12057 | 1.98349e-56 | 9.08324e-55 | Specific Thyroid_high |
| Pmepa1                                                                        | 15.8009 | 1.32962 | 3.06704e-56 | 1.40056e-54 | Specific Thyroid_high |
| Ints9                                                                         | 15.7563 | 1.67738 | 6.21967e-56 | 2.82422e-54 | Specific Thyroid_high |
| Jag2                                                                          | 15.7436 | 1.96689 | 7.60129e-56 | 3.44674e-54 | Specific Thyroid_high |
| Ctsz                                                                          | 15.7344 | 1.08291 | 8.78915e-56 | 3.97977e-54 | Specific Thyroid_high |
| BC031181                                                                      | 15.7069 | 1.24056 | 1.35601e-55 | 6.1315e-54  | Specific Thyroid_high |
| 2026-09-04 00:00:00                                                           | 15.6943 | 1.1222  | 1.65416e-55 | 7.46918e-54 | Specific Thyroid_high |
| Irf2bpl                                                                       | 15.6315 | 1.26667 | 4.44031e-55 | 1.98828e-53 | Specific Thyroid_high |
| Pik3r3                                                                        | 15.5944 | 1.18711 | 7.95282e-55 | 3.55127e-53 | Specific Thyroid_high |
| Nxpe4                                                                         | 15.5699 | 1.03042 | 1.16568e-54 | 5.18376e-53 | Specific Thyroid_high |
| Ndufs7                                                                        | 15.5203 | 1.16791 | 2.52829e-54 | 1.11663e-52 | Specific Thyroid_high |
| Ebf3                                                                          | 15.5139 | 2.6283  | 2.79184e-54 | 1.23134e-52 | Specific Thyroid_high |
| Pdpd1                                                                         | 15.4588 | 1.31864 | 6.58262e-54 | 2.87967e-52 | Specific Thyroid_high |
| Pnkd                                                                          | 15.4514 | 1.14569 | 7.38381e-54 | 3.22144e-52 | Specific Thyroid_high |
| Slc50a1                                                                       | 15.4344 | 1.03283 | 9.61279e-54 | 4.18825e-52 | Specific Thyroid_high |
| Trir                                                                          | 15.4134 | 1.01195 | 1.32936e-53 | 5.78415e-52 | Specific Thyroid_high |
| Polr2c                                                                        | 15.3125 | 1.45632 | 6.30784e-53 | 2.72257e-51 | Specific Thyroid_high |
| Hmg20b                                                                        | 15.3069 | 1.08122 | 6.87915e-53 | 2.9652e-51  | Specific Thyroid_high |
| Proser2                                                                       | 15.2865 | 4.09195 | 9.40257e-53 | 4.03673e-51 | Specific Thyroid_high |
| Yipf4                                                                         | 15.1958 | 1.16444 | 3.77201e-52 | 1.60659e-50 | Specific Thyroid_high |
| Eln                                                                           | 15.1949 | 2.81932 | 3.82457e-52 | 1.62683e-50 | Specific Thyroid_high |
| Pcdh1                                                                         | 15.1858 | 1.69199 | 4.39066e-52 | 1.86516e-50 | Specific Thyroid_high |
| Atp5md                                                                        | 15.1556 | 1.05595 | 6.95803e-52 | 2.95191e-50 | Specific Thyroid_high |
| Sdhib                                                                         | 15.1354 | 1.36502 | 9.46779e-52 | 4.00088e-50 | Specific Thyroid_high |
| Ifi35                                                                         | 15.0823 | 1.12605 | 2.11858e-51 | 8.8714e-50  | Specific Thyroid_high |
| Scn1b                                                                         | 15.0725 | 1.36336 | 2.45785e-51 | 1.02521e-49 | Specific Thyroid_high |
| Hcfc1r1                                                                       | 15.0503 | 1.27671 | 3.43566e-51 | 1.42754e-49 | Specific Thyroid_high |
| Mrps14                                                                        | 15.0147 | 1.16194 | 5.88211e-51 | 2.43466e-49 | Specific Thyroid_high |
| Ncoa7                                                                         | 14.9999 | 1.12219 | 7.35301e-51 | 3.0357e-49  | Specific Thyroid_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                       |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|-----------------------|
| Pebp1                                                                         | 14.9932 | 1.03274 | 8.13285e-51 | 3.35337e-49 | Specific Thyroid_high |
| Syf2                                                                          | 14.8949 | 1.01204 | 3.55745e-50 | 1.44468e-48 | Specific Thyroid_high |
| Unc119b                                                                       | 14.8843 | 2.47612 | 4.16607e-50 | 1.68972e-48 | Specific Thyroid_high |
| Mfsd6                                                                         | 14.7847 | 2.39596 | 1.83795e-49 | 7.38037e-48 | Specific Thyroid_high |
| Ctnnbip1                                                                      | 14.7232 | 1.26636 | 4.57193e-49 | 1.82679e-47 | Specific Thyroid_high |
| 0610012G03Rik                                                                 | 14.714  | 1.21909 | 5.23969e-49 | 2.09102e-47 | Specific Thyroid_high |
| Tmtc1                                                                         | 14.7133 | 1.39266 | 5.29406e-49 | 2.11011e-47 | Specific Thyroid_high |
| Slc35b1                                                                       | 14.6971 | 1.50719 | 6.72794e-49 | 2.67173e-47 | Specific Thyroid_high |
| Gm13889                                                                       | 14.6815 | 1.40902 | 8.4701e-49  | 3.35942e-47 | Specific Thyroid_high |
| Cox7b                                                                         | 14.6444 | 1.03308 | 1.4636e-48  | 5.79074e-47 | Specific Thyroid_high |
| Aig1                                                                          | 14.6287 | 1.12913 | 1.84391e-48 | 7.27758e-47 | Specific Thyroid_high |
| 4930523C07Rik                                                                 | 14.6008 | 1.23056 | 2.77403e-48 | 1.09352e-46 | Specific Thyroid_high |
| Mdh1                                                                          | 14.5884 | 1.53635 | 3.33169e-48 | 1.31015e-46 | Specific Thyroid_high |
| Map3k5                                                                        | 14.5627 | 1.58956 | 4.84706e-48 | 1.90142e-46 | Specific Thyroid_high |
| Cdkn1a                                                                        | 14.5339 | 1.30543 | 7.39153e-48 | 2.8732e-46  | Specific Thyroid_high |
| Psmc3                                                                         | 14.5253 | 1.05593 | 8.37765e-48 | 3.25087e-46 | Specific Thyroid_high |
| Tap2                                                                          | 14.5112 | 1.13254 | 1.02975e-47 | 3.98625e-46 | Specific Thyroid_high |
| Ndufa1                                                                        | 14.5019 | 1.09757 | 1.17812e-47 | 4.54427e-46 | Specific Thyroid_high |
| U2af1                                                                         | 14.4407 | 1.11998 | 2.86748e-47 | 1.10079e-45 | Specific Thyroid_high |
| Elf3i                                                                         | 14.436  | 1.28328 | 3.06917e-47 | 1.17682e-45 | Specific Thyroid_high |
| Abhd17a                                                                       | 14.4244 | 1.06397 | 3.63333e-47 | 1.39148e-45 | Specific Thyroid_high |
| Tmem160                                                                       | 14.372  | 1.14461 | 7.76064e-47 | 2.95811e-45 | Specific Thyroid_high |
| Ginm1                                                                         | 14.364  | 1.27049 | 8.70034e-47 | 3.30849e-45 | Specific Thyroid_high |
| Ndufv3                                                                        | 14.3503 | 1.12561 | 1.06139e-46 | 4.02665e-45 | Specific Thyroid_high |
| Tubb2a                                                                        | 14.2753 | 1.8768  | 3.11959e-46 | 1.17112e-44 | Specific Thyroid_high |
| Cep85l                                                                        | 14.2734 | 1.14575 | 3.20445e-46 | 1.20157e-44 | Specific Thyroid_high |
| Iscu                                                                          | 14.2424 | 1.12054 | 5.00004e-46 | 1.87269e-44 | Specific Thyroid_high |
| Mfap2                                                                         | 14.2092 | 3.45883 | 8.03221e-46 | 3.00487e-44 | Specific Thyroid_high |
| Rex1bd                                                                        | 14.1958 | 1.15768 | 9.72797e-46 | 3.63504e-44 | Specific Thyroid_high |
| Ddrgk1                                                                        | 14.18   | 1.01915 | 1.21899e-45 | 4.53924e-44 | Specific Thyroid_high |
| Sf3b6                                                                         | 14.1661 | 1.03933 | 1.48478e-45 | 5.49725e-44 | Specific Thyroid_high |
| Rtraf                                                                         | 14.1483 | 1.05747 | 1.91436e-45 | 7.07151e-44 | Specific Thyroid_high |
| Sos1                                                                          | 14.1456 | 1.1775  | 1.98912e-45 | 7.33927e-44 | Specific Thyroid_high |
| Aurkaip1                                                                      | 14.1383 | 1.09845 | 2.20597e-45 | 8.13012e-44 | Specific Thyroid_high |
| St8sia4                                                                       | 14.1358 | 1.23904 | 2.28393e-45 | 8.40783e-44 | Specific Thyroid_high |
| Mrpl17                                                                        | 14.0255 | 1.13908 | 1.08854e-44 | 3.97103e-43 | Specific Thyroid_high |
| Cetn3                                                                         | 13.9659 | 1.01477 | 2.51619e-44 | 9.12753e-43 | Specific Thyroid_high |
| Inka1                                                                         | 13.9342 | 1.65576 | 3.9275e-44  | 1.41834e-42 | Specific Thyroid_high |
| Polr2f                                                                        | 13.9284 | 1.07205 | 4.2561e-44  | 1.53357e-42 | Specific Thyroid_high |
| Aplnr                                                                         | 13.8915 | 1.36967 | 7.13384e-44 | 2.56762e-42 | Specific Thyroid_high |
| Chst2                                                                         | 13.8903 | 1.04964 | 7.2516e-44  | 2.6071e-42  | Specific Thyroid_high |
| Gcnt2                                                                         | 13.8504 | 1.44937 | 1.2643e-43  | 4.52025e-42 | Specific Thyroid_high |
| Colgalt2                                                                      | 13.8133 | 1.15405 | 2.11798e-43 | 7.55568e-42 | Specific Thyroid_high |
| Snapc5                                                                        | 13.798  | 1.2549  | 2.61982e-43 | 9.31509e-42 | Specific Thyroid_high |
| Slco2b1                                                                       | 13.7827 | 2.12696 | 3.23865e-43 | 1.14901e-41 | Specific Thyroid_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                       |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|-----------------------|
| Cx3cl1                                                                        | 13.648  | 2.7371  | 2.07406e-42 | 7.24687e-41 | Specific Thyroid_high |
| Gemin7                                                                        | 13.5953 | 1.18678 | 4.26691e-42 | 1.48126e-40 | Specific Thyroid_high |
| Higd1a                                                                        | 13.5867 | 1.23687 | 4.80202e-42 | 1.66345e-40 | Specific Thyroid_high |
| Glnp                                                                          | 13.5708 | 1.06375 | 5.96626e-42 | 2.06232e-40 | Specific Thyroid_high |
| Foxf1                                                                         | 13.5271 | 4.36934 | 1.08258e-41 | 3.72611e-40 | Specific Thyroid_high |
| Enpp6                                                                         | 13.5108 | 1.67208 | 1.35026e-41 | 4.64251e-40 | Specific Thyroid_high |
| 0610010K14Rik                                                                 | 13.5012 | 1.27361 | 1.53893e-41 | 5.27436e-40 | Specific Thyroid_high |
| Sap18                                                                         | 13.4623 | 1.19213 | 2.60682e-41 | 8.90593e-40 | Specific Thyroid_high |
| Pfdn2                                                                         | 13.4542 | 1.14275 | 2.90774e-41 | 9.9235e-40  | Specific Thyroid_high |
| Elovl1                                                                        | 13.4198 | 1.38068 | 4.62769e-41 | 1.57268e-39 | Specific Thyroid_high |
| Med21                                                                         | 13.4147 | 1.29954 | 4.95642e-41 | 1.68263e-39 | Specific Thyroid_high |
| Sort1                                                                         | 13.3904 | 1.52881 | 6.88489e-41 | 2.33241e-39 | Specific Thyroid_high |
| Srsf9                                                                         | 13.3521 | 1.14958 | 1.15186e-40 | 3.89811e-39 | Specific Thyroid_high |
| Emp1                                                                          | 13.3363 | 1.41938 | 1.42314e-40 | 4.79105e-39 | Specific Thyroid_high |
| Ppp1r11                                                                       | 13.3213 | 1.04463 | 1.74151e-40 | 5.85672e-39 | Specific Thyroid_high |
| Lamb1                                                                         | 13.3133 | 2.50391 | 1.9371e-40  | 6.50772e-39 | Specific Thyroid_high |
| Ier2                                                                          | 13.2814 | 1.13857 | 2.96892e-40 | 9.94311e-39 | Specific Thyroid_high |
| Ndufab1                                                                       | 13.129  | 1.08728 | 2.24686e-39 | 7.45528e-38 | Specific Thyroid_high |
| Mpc1                                                                          | 13.1151 | 1.07682 | 2.69723e-39 | 8.91301e-38 | Specific Thyroid_high |
| Cycs                                                                          | 13.0925 | 1.18549 | 3.63527e-39 | 1.1976e-37  | Specific Thyroid_high |
| Sipa1l2                                                                       | 12.9981 | 1.1619  | 1.25404e-38 | 4.08958e-37 | Specific Thyroid_high |
| Ndufa12                                                                       | 12.9943 | 1.04327 | 1.31781e-38 | 4.28887e-37 | Specific Thyroid_high |
| Anapc11                                                                       | 12.9844 | 1.05559 | 1.50076e-38 | 4.87935e-37 | Specific Thyroid_high |
| Rnf187                                                                        | 12.9828 | 1.02936 | 1.53161e-38 | 4.97466e-37 | Specific Thyroid_high |
| Mrps21                                                                        | 12.9376 | 1.13302 | 2.75956e-38 | 8.90924e-37 | Specific Thyroid_high |
| Rrp1                                                                          | 12.9312 | 1.06912 | 3.00103e-38 | 9.66948e-37 | Specific Thyroid_high |
| Uqcrc1                                                                        | 12.8873 | 1.11726 | 5.30992e-38 | 1.70408e-36 | Specific Thyroid_high |
| Nt5c                                                                          | 12.8309 | 1.55193 | 1.10034e-37 | 3.4965e-36  | Specific Thyroid_high |
| Cenpx                                                                         | 12.8194 | 1.34269 | 1.27604e-37 | 4.05083e-36 | Specific Thyroid_high |
| Timm13                                                                        | 12.8086 | 1.02678 | 1.46753e-37 | 4.64047e-36 | Specific Thyroid_high |
| Tmem208                                                                       | 12.7788 | 1.16887 | 2.15321e-37 | 6.78208e-36 | Specific Thyroid_high |
| Cyc1                                                                          | 12.722  | 1.2301  | 4.46343e-37 | 1.39769e-35 | Specific Thyroid_high |
| Gps2                                                                          | 12.6616 | 1.14683 | 9.64613e-37 | 3.00894e-35 | Specific Thyroid_high |
| Spry1                                                                         | 12.6599 | 1.475   | 9.86898e-37 | 3.07548e-35 | Specific Thyroid_high |
| Snrpd1                                                                        | 12.5856 | 1.00038 | 2.53548e-36 | 7.84832e-35 | Specific Thyroid_high |
| Spr                                                                           | 12.567  | 1.30215 | 3.20568e-36 | 9.8944e-35  | Specific Thyroid_high |
| Pmp22                                                                         | 12.5635 | 1.1756  | 3.35149e-36 | 1.03346e-34 | Specific Thyroid_high |
| Guk1                                                                          | 12.5023 | 1.34777 | 7.24832e-36 | 2.21812e-34 | Specific Thyroid_high |
| Tmem255b                                                                      | 12.436  | 3.85276 | 1.66632e-35 | 5.07041e-34 | Specific Thyroid_high |
| Psmc4                                                                         | 12.3709 | 1.20744 | 3.75822e-35 | 1.13715e-33 | Specific Thyroid_high |
| Pdcl3                                                                         | 12.3077 | 1.04027 | 8.23607e-35 | 2.47581e-33 | Specific Thyroid_high |
| Isg15                                                                         | 12.2896 | 1.27456 | 1.02993e-34 | 3.09028e-33 | Specific Thyroid_high |
| Eepd1                                                                         | 12.2885 | 1.3519  | 1.04451e-34 | 3.13111e-33 | Specific Thyroid_high |
| Tm2d2                                                                         | 12.2673 | 1.29873 | 1.35784e-34 | 4.0553e-33  | Specific Thyroid_high |
| Ankrd33b                                                                      | 12.2076 | 1.68002 | 2.82987e-34 | 8.35887e-33 | Specific Thyroid_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                       |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|-----------------------|
| Lrrc3b                                                                        | 12.2061 | 1.17752 | 2.88495e-34 | 8.51377e-33 | Specific Thyroid_high |
| Fam174a                                                                       | 12.1994 | 1.10218 | 3.12972e-34 | 9.21926e-33 | Specific Thyroid_high |
| Acss1                                                                         | 12.1961 | 3.50178 | 3.25953e-34 | 9.58413e-33 | Specific Thyroid_high |
| Adam12                                                                        | 12.1953 | 1.17634 | 3.29433e-34 | 9.67766e-33 | Specific Thyroid_high |
| Ckb                                                                           | 12.1933 | 1.60592 | 3.37411e-34 | 9.90301e-33 | Specific Thyroid_high |
| Rnh1                                                                          | 12.1125 | 1.2345  | 9.06545e-34 | 2.63674e-32 | Specific Thyroid_high |
| Polr2j                                                                        | 12.1049 | 1.07337 | 9.95103e-34 | 2.88651e-32 | Specific Thyroid_high |
| Bicc1                                                                         | 12.0812 | 3.27457 | 1.3275e-33  | 3.8438e-32  | Specific Thyroid_high |
| Tril                                                                          | 12.0758 | 2.09661 | 1.41768e-33 | 4.0939e-32  | Specific Thyroid_high |
| Gata2                                                                         | 12.0599 | 1.23718 | 1.72048e-33 | 4.94178e-32 | Specific Thyroid_high |
| Gpx8                                                                          | 12.0508 | 1.93463 | 1.91994e-33 | 5.49513e-32 | Specific Thyroid_high |
| Abrac1                                                                        | 12.0296 | 1.14688 | 2.48449e-33 | 7.09838e-32 | Specific Thyroid_high |
| Fkbp4                                                                         | 12.0165 | 1.29937 | 2.91171e-33 | 8.29697e-32 | Specific Thyroid_high |
| Rcan2                                                                         | 11.9823 | 2.96265 | 4.40038e-33 | 1.25058e-31 | Specific Thyroid_high |
| Wdr83os                                                                       | 11.9607 | 1.01984 | 5.70895e-33 | 1.61963e-31 | Specific Thyroid_high |
| Tmem128                                                                       | 11.8795 | 1.09729 | 1.51246e-32 | 4.2646e-31  | Specific Thyroid_high |
| Ufc1                                                                          | 11.869  | 1.02342 | 1.71429e-32 | 4.82528e-31 | Specific Thyroid_high |
| Slc48a1                                                                       | 11.8609 | 1.48942 | 1.88977e-32 | 5.31458e-31 | Specific Thyroid_high |
| Socs2                                                                         | 11.8484 | 1.25893 | 2.19263e-32 | 6.16092e-31 | Specific Thyroid_high |
| Nudc                                                                          | 11.8449 | 1.01496 | 2.28718e-32 | 6.42101e-31 | Specific Thyroid_high |
| 1810058I24Rik                                                                 | 11.793  | 1.08767 | 4.24028e-32 | 1.18938e-30 | Specific Thyroid_high |
| Znrd1                                                                         | 11.7807 | 1.18837 | 4.90809e-32 | 1.37312e-30 | Specific Thyroid_high |
| Ndufs8                                                                        | 11.7799 | 1.0312  | 4.95414e-32 | 1.3848e-30  | Specific Thyroid_high |
| Ndufb6                                                                        | 11.7362 | 1.09612 | 8.31645e-32 | 2.32063e-30 | Specific Thyroid_high |
| Pgls                                                                          | 11.7305 | 1.03552 | 8.89285e-32 | 2.47932e-30 | Specific Thyroid_high |
| Cited2                                                                        | 11.7238 | 1.69328 | 9.62547e-32 | 2.67895e-30 | Specific Thyroid_high |
| Mrpl57                                                                        | 11.7097 | 1.27605 | 1.13664e-31 | 3.16077e-30 | Specific Thyroid_high |
| Sra1                                                                          | 11.6469 | 1.53005 | 2.37833e-31 | 6.55716e-30 | Specific Thyroid_high |
| Ddt                                                                           | 11.6216 | 2.09254 | 3.20049e-31 | 8.80134e-30 | Specific Thyroid_high |
| Mpped2                                                                        | 11.614  | 2.26277 | 3.49729e-31 | 9.59304e-30 | Specific Thyroid_high |
| Mrpl27                                                                        | 11.6099 | 1.28615 | 3.67052e-31 | 1.00596e-29 | Specific Thyroid_high |
| Hspe1                                                                         | 11.6079 | 1.15814 | 3.75835e-31 | 1.02916e-29 | Specific Thyroid_high |
| Banf1                                                                         | 11.5698 | 1.07154 | 5.86387e-31 | 1.59759e-29 | Specific Thyroid_high |
| Zfp979                                                                        | 11.5423 | 1.9151  | 8.07575e-31 | 2.18913e-29 | Specific Thyroid_high |
| H2afj                                                                         | 11.514  | 1.02586 | 1.12169e-30 | 3.0279e-29  | Specific Thyroid_high |
| Trib2                                                                         | 11.5014 | 1.13252 | 1.29831e-30 | 3.49882e-29 | Specific Thyroid_high |
| Ssr2                                                                          | 11.4577 | 1.02687 | 2.15247e-30 | 5.78621e-29 | Specific Thyroid_high |
| Gulp1                                                                         | 11.448  | 1.06913 | 2.40737e-30 | 6.46068e-29 | Specific Thyroid_high |
| Ssu2                                                                          | 11.4453 | 4.51456 | 2.48142e-30 | 6.65387e-29 | Specific Thyroid_high |
| Ptpre                                                                         | 11.4446 | 1.20373 | 2.50284e-30 | 6.70573e-29 | Specific Thyroid_high |
| Lsm6                                                                          | 11.415  | 1.14379 | 3.51769e-30 | 9.40915e-29 | Specific Thyroid_high |
| Gjc1                                                                          | 11.3428 | 1.11501 | 8.05396e-30 | 2.1401e-28  | Specific Thyroid_high |
| Wdfy1                                                                         | 11.2401 | 1.06664 | 2.58954e-29 | 6.83033e-28 | Specific Thyroid_high |
| Vwa1                                                                          | 11.2148 | 1.26716 | 3.45066e-29 | 9.07203e-28 | Specific Thyroid_high |
| Atg4a                                                                         | 11.2096 | 1.2644  | 3.65784e-29 | 9.60889e-28 | Specific Thyroid_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                       |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|-----------------------|
| Mif                                                                           | 11.2062 | 1.24362 | 3.80276e-29 | 9.96528e-28 | Specific Thyroid_high |
| Ndufb2                                                                        | 11.1742 | 1.04845 | 5.45562e-29 | 1.4285e-27  | Specific Thyroid_high |
| Psmc5                                                                         | 11.1407 | 1.00527 | 7.94672e-29 | 2.07741e-27 | Specific Thyroid_high |
| Psmc2                                                                         | 11.1194 | 1.11186 | 1.00978e-28 | 2.6312e-27  | Specific Thyroid_high |
| Irf7                                                                          | 11.0544 | 1.2319  | 2.08614e-28 | 5.39671e-27 | Specific Thyroid_high |
| Ccdc59                                                                        | 11.0434 | 1.01812 | 2.35797e-28 | 6.09017e-27 | Specific Thyroid_high |
| Mrpl23                                                                        | 10.9963 | 1.09614 | 3.98208e-28 | 1.02114e-26 | Specific Thyroid_high |
| Fmc1                                                                          | 10.9933 | 1.68063 | 4.1161e-28  | 1.053e-26   | Specific Thyroid_high |
| Tm2d1                                                                         | 10.9446 | 1.03733 | 7.05027e-28 | 1.78945e-26 | Specific Thyroid_high |
| Idnk                                                                          | 10.9274 | 1.1018  | 8.52542e-28 | 2.16046e-26 | Specific Thyroid_high |
| Ccrl2                                                                         | 10.9068 | 1.14415 | 1.06962e-27 | 2.70845e-26 | Specific Thyroid_high |
| Trappc4                                                                       | 10.8903 | 1.07726 | 1.28183e-27 | 3.23818e-26 | Specific Thyroid_high |
| Unc50                                                                         | 10.8836 | 1.09487 | 1.38025e-27 | 3.48408e-26 | Specific Thyroid_high |
| Tnfrsf10b                                                                     | 10.8822 | 2.81732 | 1.40133e-27 | 3.53453e-26 | Specific Thyroid_high |
| Nxpe2                                                                         | 10.8797 | 1.19261 | 1.44008e-27 | 3.62943e-26 | Specific Thyroid_high |
| Stmn1                                                                         | 10.848  | 1.8101  | 2.0383e-27  | 5.12911e-26 | Specific Thyroid_high |
| Mrpl43                                                                        | 10.8421 | 1.32701 | 2.17328e-27 | 5.45601e-26 | Specific Thyroid_high |
| Mrpl42                                                                        | 10.8366 | 1.08064 | 2.30842e-27 | 5.79079e-26 | Specific Thyroid_high |
| Bag5                                                                          | 10.8102 | 1.0188  | 3.0796e-27  | 7.69543e-26 | Specific Thyroid_high |
| Depp1                                                                         | 10.7669 | 1.76398 | 4.93195e-27 | 1.22672e-25 | Specific Thyroid_high |
| Emc4                                                                          | 10.7424 | 1.37066 | 6.43506e-27 | 1.59567e-25 | Specific Thyroid_high |
| Ssna1                                                                         | 10.6953 | 1.23416 | 1.07087e-26 | 2.64118e-25 | Specific Thyroid_high |
| Ripor2                                                                        | 10.6802 | 1.55867 | 1.26051e-26 | 3.1018e-25  | Specific Thyroid_high |
| Cpxm2                                                                         | 10.6472 | 5.03708 | 1.79635e-26 | 4.3969e-25  | Specific Thyroid_high |
| Smox                                                                          | 10.6066 | 1.64063 | 2.77591e-26 | 6.73836e-25 | Specific Thyroid_high |
| Nfu1                                                                          | 10.5956 | 1.19818 | 3.12164e-26 | 7.56622e-25 | Specific Thyroid_high |
| Adh5                                                                          | 10.592  | 1.26712 | 3.24702e-26 | 7.86421e-25 | Specific Thyroid_high |
| Slfn2                                                                         | 10.4657 | 1.39722 | 1.24162e-25 | 2.95181e-24 | Specific Thyroid_high |
| Ube2a                                                                         | 10.4566 | 1.18471 | 1.36732e-25 | 3.24349e-24 | Specific Thyroid_high |
| Ceacam1                                                                       | 10.4534 | 1.18235 | 1.41372e-25 | 3.3511e-24  | Specific Thyroid_high |
| Ier5l                                                                         | 10.4444 | 1.24849 | 1.55428e-25 | 3.67619e-24 | Specific Thyroid_high |
| Svbp                                                                          | 10.4241 | 1.09098 | 1.92434e-25 | 4.54146e-24 | Specific Thyroid_high |
| Pfdn6                                                                         | 10.3515 | 1.0465  | 4.11863e-25 | 9.67758e-24 | Specific Thyroid_high |
| Uqcrrf1                                                                       | 10.3349 | 1.15655 | 4.89918e-25 | 1.14782e-23 | Specific Thyroid_high |
| Ndufv1                                                                        | 10.3023 | 1.23357 | 6.87702e-25 | 1.60307e-23 | Specific Thyroid_high |
| Papss2                                                                        | 10.2792 | 1.70673 | 8.74592e-25 | 2.03284e-23 | Specific Thyroid_high |
| Tox3                                                                          | 10.2421 | 3.43625 | 1.28436e-24 | 2.97245e-23 | Specific Thyroid_high |
| Mrpl36                                                                        | 10.2356 | 1.15999 | 1.373e-24   | 3.17078e-23 | Specific Thyroid_high |
| Lurap1l                                                                       | 10.2078 | 1.37158 | 1.83031e-24 | 4.2088e-23  | Specific Thyroid_high |
| Ephb1                                                                         | 10.1944 | 1.15449 | 2.10134e-24 | 4.82174e-23 | Specific Thyroid_high |
| Nrarp                                                                         | 10.1703 | 1.44852 | 2.68929e-24 | 6.15772e-23 | Specific Thyroid_high |
| Mrpl4                                                                         | 10.1318 | 1.11806 | 3.99142e-24 | 9.09406e-23 | Specific Thyroid_high |
| Alpl                                                                          | 10.105  | 1.92566 | 5.24726e-24 | 1.1905e-22  | Specific Thyroid_high |
| Hmgn3                                                                         | 10.1042 | 1.45036 | 5.29152e-24 | 1.1997e-22  | Specific Thyroid_high |
| Ergic3                                                                        | 10.0943 | 1.04102 | 5.85622e-24 | 1.32401e-22 | Specific Thyroid_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                       |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|-----------------------|
| Mrpl18                                                                        | 10.0592 | 1.13874 | 8.36812e-24 | 1.88531e-22 | Specific Thyroid_high |
| Ace                                                                           | 10.0268 | 3.63991 | 1.1627e-23  | 2.60318e-22 | Specific Thyroid_high |
| Fam89b                                                                        | 10.019  | 1.35165 | 1.25791e-23 | 2.81438e-22 | Specific Thyroid_high |
| Mrps16                                                                        | 9.96869 | 1.05884 | 2.08961e-23 | 4.64941e-22 | Specific Thyroid_high |
| Ptprr                                                                         | 9.95364 | 1.82142 | 2.43135e-23 | 5.39864e-22 | Specific Thyroid_high |
| Bmp1                                                                          | 9.95144 | 2.54883 | 2.4857e-23  | 5.51552e-22 | Specific Thyroid_high |
| Slc12a2                                                                       | 9.89794 | 1.40147 | 4.24958e-23 | 9.34589e-22 | Specific Thyroid_high |
| Gne                                                                           | 9.85613 | 1.48304 | 6.44905e-23 | 1.41158e-21 | Specific Thyroid_high |
| Cactin                                                                        | 9.85047 | 1.48676 | 6.82243e-23 | 1.49128e-21 | Specific Thyroid_high |
| Adrm1                                                                         | 9.83379 | 1.27835 | 8.05327e-23 | 1.75913e-21 | Specific Thyroid_high |
| Mrpl53                                                                        | 9.80818 | 1.00429 | 1.03824e-22 | 2.25874e-21 | Specific Thyroid_high |
| Bambi                                                                         | 9.77984 | 1.27596 | 1.37431e-22 | 2.98585e-21 | Specific Thyroid_high |
| Ebp                                                                           | 9.75962 | 1.1877  | 1.67791e-22 | 3.6381e-21  | Specific Thyroid_high |
| Mrpl34                                                                        | 9.74166 | 1.15543 | 2.00246e-22 | 4.33308e-21 | Specific Thyroid_high |
| Mtx2                                                                          | 9.73846 | 1.23454 | 2.06663e-22 | 4.46894e-21 | Specific Thyroid_high |
| Lxn                                                                           | 9.73082 | 1.23473 | 2.22781e-22 | 4.80781e-21 | Specific Thyroid_high |
| Erh                                                                           | 9.68745 | 1.41891 | 3.40917e-22 | 7.31329e-21 | Specific Thyroid_high |
| Nr1h2                                                                         | 9.66299 | 1.1082  | 4.33036e-22 | 9.25864e-21 | Specific Thyroid_high |
| Cacybp                                                                        | 9.65293 | 1.04073 | 4.77728e-22 | 1.01872e-20 | Specific Thyroid_high |
| Gzmk                                                                          | 9.64912 | 2.43068 | 4.95813e-22 | 1.05659e-20 | Specific Thyroid_high |
| Cdk2ap1                                                                       | 9.61451 | 1.10234 | 6.94366e-22 | 1.47194e-20 | Specific Thyroid_high |
| Hmgn5                                                                         | 9.57392 | 1.76489 | 1.0293e-21  | 2.16628e-20 | Specific Thyroid_high |
| Anxa6                                                                         | 9.55993 | 1.2832  | 1.17838e-21 | 2.4752e-20  | Specific Thyroid_high |
| Nr4a1                                                                         | 9.55015 | 1.6943  | 1.29514e-21 | 2.71692e-20 | Specific Thyroid_high |
| Aprt                                                                          | 9.50549 | 1.1884  | 1.99108e-21 | 4.14456e-20 | Specific Thyroid_high |
| Ccdc124                                                                       | 9.49966 | 1.01792 | 2.10571e-21 | 4.38033e-20 | Specific Thyroid_high |
| Lsm7                                                                          | 9.4704  | 1.10153 | 2.78766e-21 | 5.78032e-20 | Specific Thyroid_high |
| Extl3                                                                         | 9.40622 | 1.20133 | 5.14286e-21 | 1.05824e-19 | Specific Thyroid_high |
| Ramac                                                                         | 9.38408 | 1.05305 | 6.34697e-21 | 1.3002e-19  | Specific Thyroid_high |
| Cops6                                                                         | 9.31558 | 1.02156 | 1.21292e-20 | 2.47061e-19 | Specific Thyroid_high |
| Gch1                                                                          | 9.29732 | 1.07175 | 1.44032e-20 | 2.92641e-19 | Specific Thyroid_high |
| Gstp1                                                                         | 9.25245 | 2.18744 | 2.19407e-20 | 4.42998e-19 | Specific Thyroid_high |
| Fkbp2                                                                         | 9.21206 | 1.06187 | 3.1992e-20  | 6.41529e-19 | Specific Thyroid_high |
| Olfr1396                                                                      | 9.21056 | 1.70712 | 3.24426e-20 | 6.50161e-19 | Specific Thyroid_high |
| Map2                                                                          | 9.20833 | 4.33393 | 3.31238e-20 | 6.63401e-19 | Specific Thyroid_high |
| Rgs12                                                                         | 9.19466 | 1.04195 | 3.76168e-20 | 7.51521e-19 | Specific Thyroid_high |
| Serpine2                                                                      | 9.18993 | 2.49813 | 3.9311e-20  | 7.84883e-19 | Specific Thyroid_high |
| Gm26532                                                                       | 9.18966 | 1.15831 | 3.94083e-20 | 7.86338e-19 | Specific Thyroid_high |
| Gm11808                                                                       | 9.16157 | 1.3111  | 5.11485e-20 | 1.01683e-18 | Specific Thyroid_high |
| Mea1                                                                          | 9.09602 | 1.50989 | 9.37006e-20 | 1.84571e-18 | Specific Thyroid_high |
| Tmem179b                                                                      | 9.09263 | 1.08078 | 9.66722e-20 | 1.90309e-18 | Specific Thyroid_high |
| Tspan17                                                                       | 9.08372 | 1.2754  | 1.04929e-19 | 2.0606e-18  | Specific Thyroid_high |
| Endou                                                                         | 9.08051 | 1.50893 | 1.08066e-19 | 2.11962e-18 | Specific Thyroid_high |
| Oxct1                                                                         | 9.0442  | 1.09385 | 1.50765e-19 | 2.94106e-18 | Specific Thyroid_high |
| Rad23a                                                                        | 9.0359  | 1.01379 | 1.62655e-19 | 3.16916e-18 | Specific Thyroid_high |



| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                       |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|-----------------------|
| Cyb561                                                                        | 9.03429 | 3.33315 | 1.65067e-19 | 3.21424e-18 | Specific Thyroid_high |
| Enah                                                                          | 9.01919 | 2.15016 | 1.8948e-19  | 3.68072e-18 | Specific Thyroid_high |
| Arl3                                                                          | 8.97892 | 1.00347 | 2.7345e-19  | 5.2896e-18  | Specific Thyroid_high |
| Bex3                                                                          | 8.92885 | 1.33938 | 4.30444e-19 | 8.28182e-18 | Specific Thyroid_high |
| Dnajc21                                                                       | 8.91756 | 1.08893 | 4.76653e-19 | 9.15452e-18 | Specific Thyroid_high |
| Fosl2                                                                         | 8.91613 | 1.30555 | 4.8286e-19  | 9.26401e-18 | Specific Thyroid_high |
| Prdx6                                                                         | 8.91612 | 1.11011 | 4.82928e-19 | 9.26401e-18 | Specific Thyroid_high |
| Stard3nl                                                                      | 8.88929 | 1.10742 | 6.15006e-19 | 1.17419e-17 | Specific Thyroid_high |
| Psmg4                                                                         | 8.84057 | 1.26061 | 9.52283e-19 | 1.80425e-17 | Specific Thyroid_high |
| Chrm2                                                                         | 8.83863 | 4.3515  | 9.69042e-19 | 1.83385e-17 | Specific Thyroid_high |
| Naxe                                                                          | 8.79824 | 1.00135 | 1.38976e-18 | 2.61776e-17 | Specific Thyroid_high |
| Rapgef4os1                                                                    | 8.79806 | 1.40787 | 1.39195e-18 | 2.62036e-17 | Specific Thyroid_high |
| Timm8b                                                                        | 8.78111 | 1.06977 | 1.61868e-18 | 3.04186e-17 | Specific Thyroid_high |
| Smim12                                                                        | 8.75459 | 1.14379 | 2.04853e-18 | 3.82072e-17 | Specific Thyroid_high |
| Trip10                                                                        | 8.71465 | 1.28515 | 2.91665e-18 | 5.42107e-17 | Specific Thyroid_high |
| Hacd4                                                                         | 8.71116 | 1.28932 | 3.00779e-18 | 5.58725e-17 | Specific Thyroid_high |
| Tspan3                                                                        | 8.69353 | 1.09943 | 3.51353e-18 | 6.51547e-17 | Specific Thyroid_high |
| Mlf1                                                                          | 8.6888  | 3.10676 | 3.663e-18   | 6.78485e-17 | Specific Thyroid_high |
| Dlg2                                                                          | 8.64414 | 2.36458 | 5.42145e-18 | 9.99609e-17 | Specific Thyroid_high |
| Arhgef28                                                                      | 8.62618 | 1.0896  | 6.34353e-18 | 1.16696e-16 | Specific Thyroid_high |
| Magix                                                                         | 8.60579 | 2.75592 | 7.57926e-18 | 1.38953e-16 | Specific Thyroid_high |
| Dpy30                                                                         | 8.6027  | 1.00461 | 7.78625e-18 | 1.42667e-16 | Specific Thyroid_high |
| Kcnk5                                                                         | 8.58851 | 2.60836 | 8.81022e-18 | 1.61246e-16 | Specific Thyroid_high |
| Phax                                                                          | 8.5762  | 1.09505 | 9.80616e-18 | 1.79169e-16 | Specific Thyroid_high |
| Rnf152                                                                        | 8.57106 | 2.18214 | 1.02539e-17 | 1.87137e-16 | Specific Thyroid_high |
| Trmt112                                                                       | 8.56504 | 1.07187 | 1.08035e-17 | 1.97057e-16 | Specific Thyroid_high |
| Vkorc1                                                                        | 8.55123 | 1.08216 | 1.21782e-17 | 2.21381e-16 | Specific Thyroid_high |
| Emid1                                                                         | 8.49664 | 1.28966 | 1.95155e-17 | 3.50812e-16 | Specific Thyroid_high |
| Saysd1                                                                        | 8.49445 | 1.14534 | 1.98877e-17 | 3.57304e-16 | Specific Thyroid_high |
| Mrps7                                                                         | 8.39968 | 1.19318 | 4.47684e-17 | 7.94147e-16 | Specific Thyroid_high |
| Plekhl1                                                                       | 8.3908  | 1.2262  | 4.82836e-17 | 8.55563e-16 | Specific Thyroid_high |
| Enpp3                                                                         | 8.37924 | 2.23122 | 5.3272e-17  | 9.43437e-16 | Specific Thyroid_high |
| Tgfb2                                                                         | 8.31666 | 2.06858 | 9.04793e-17 | 1.58929e-15 | Specific Thyroid_high |
| Gde1                                                                          | 8.28226 | 1.17855 | 1.20862e-16 | 2.11034e-15 | Specific Thyroid_high |
| Mien1                                                                         | 8.2791  | 1.15175 | 1.2411e-16  | 2.16589e-15 | Specific Thyroid_high |
| Prdm16                                                                        | 8.26511 | 1.68483 | 1.39565e-16 | 2.42773e-15 | Specific Thyroid_high |
| Dipk1a                                                                        | 8.23544 | 1.83597 | 1.78893e-16 | 3.09681e-15 | Specific Thyroid_high |
| Ddx39                                                                         | 8.22545 | 1.49917 | 1.94464e-16 | 3.36275e-15 | Specific Thyroid_high |
| Ebna1bp2                                                                      | 8.20791 | 1.04319 | 2.25064e-16 | 3.87943e-15 | Specific Thyroid_high |
| Fam13c                                                                        | 8.20435 | 1.05062 | 2.31833e-16 | 3.99185e-15 | Specific Thyroid_high |
| Znhit1                                                                        | 8.19358 | 1.00623 | 2.53577e-16 | 4.35464e-15 | Specific Thyroid_high |
| Rab9                                                                          | 8.17029 | 1.02436 | 3.07638e-16 | 5.26342e-15 | Specific Thyroid_high |
| Nuak1                                                                         | 8.16203 | 1.05837 | 3.29445e-16 | 5.62461e-15 | Specific Thyroid_high |
| Ndufaf3                                                                       | 8.16058 | 1.29813 | 3.33421e-16 | 5.68949e-15 | Specific Thyroid_high |
| Smim19                                                                        | 8.15013 | 1.28528 | 3.63535e-16 | 6.18374e-15 | Specific Thyroid_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                       |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|-----------------------|
| Hagh                                                                          | 8.14536 | 1.21878 | 3.78154e-16 | 6.42225e-15 | Specific Thyroid_high |
| Pam16                                                                         | 8.12502 | 1.11887 | 4.47296e-16 | 7.58851e-15 | Specific Thyroid_high |
| Fdx1                                                                          | 8.11453 | 1.27175 | 4.87683e-16 | 8.26935e-15 | Specific Thyroid_high |
| Traf5                                                                         | 8.07547 | 1.32443 | 6.72183e-16 | 1.13323e-14 | Specific Thyroid_high |
| Anxa1                                                                         | 8.05102 | 1.69151 | 8.21077e-16 | 1.3785e-14  | Specific Thyroid_high |
| Synm                                                                          | 8.04801 | 1.45468 | 8.41501e-16 | 1.41205e-14 | Specific Thyroid_high |
| Gadd45gip1                                                                    | 7.97576 | 1.23156 | 1.51449e-15 | 2.52558e-14 | Specific Thyroid_high |
| Txn14a                                                                        | 7.97328 | 1.14965 | 1.54521e-15 | 2.57416e-14 | Specific Thyroid_high |
| Synpo                                                                         | 7.96495 | 1.21799 | 1.65286e-15 | 2.75207e-14 | Specific Thyroid_high |
| Mrps18a                                                                       | 7.91772 | 1.05805 | 2.419e-15   | 3.99884e-14 | Specific Thyroid_high |
| Golm1                                                                         | 7.91137 | 1.50547 | 2.54573e-15 | 4.20189e-14 | Specific Thyroid_high |
| Chrac1                                                                        | 7.90679 | 1.02094 | 2.64104e-15 | 4.3503e-14  | Specific Thyroid_high |
| Emc6                                                                          | 7.90035 | 1.02066 | 2.7813e-15  | 4.57667e-14 | Specific Thyroid_high |
| Ppid                                                                          | 7.89168 | 1.06753 | 2.98136e-15 | 4.90088e-14 | Specific Thyroid_high |
| Crispld1                                                                      | 7.8802  | 1.23473 | 3.26853e-15 | 5.36474e-14 | Specific Thyroid_high |
| Tubb6                                                                         | 7.86397 | 2.1835  | 3.72142e-15 | 6.10187e-14 | Specific Thyroid_high |
| Spryd3                                                                        | 7.79181 | 1.07773 | 6.60576e-15 | 1.07116e-13 | Specific Thyroid_high |
| Ypel5                                                                         | 7.78802 | 1.02725 | 6.80658e-15 | 1.10316e-13 | Specific Thyroid_high |
| Hdac9                                                                         | 7.77302 | 1.11444 | 7.66348e-15 | 1.23956e-13 | Specific Thyroid_high |
| Elof1                                                                         | 7.76338 | 1.22938 | 8.26948e-15 | 1.33157e-13 | Specific Thyroid_high |
| Rnf125                                                                        | 7.75478 | 1.11617 | 8.8496e-15  | 1.42215e-13 | Specific Thyroid_high |
| Fbln2                                                                         | 7.75127 | 1.88637 | 9.09793e-15 | 1.45987e-13 | Specific Thyroid_high |
| Nid2                                                                          | 7.74201 | 1.04963 | 9.78599e-15 | 1.5695e-13  | Specific Thyroid_high |
| Atp8b1                                                                        | 7.68302 | 1.60737 | 1.55378e-14 | 2.46747e-13 | Specific Thyroid_high |
| Bcl7c                                                                         | 7.67994 | 1.03677 | 1.59166e-14 | 2.5264e-13  | Specific Thyroid_high |
| Churc1                                                                        | 7.65727 | 1.14159 | 1.89926e-14 | 3.00577e-13 | Specific Thyroid_high |
| Ass1                                                                          | 7.65512 | 2.06202 | 1.93127e-14 | 3.05493e-13 | Specific Thyroid_high |
| Emd                                                                           | 7.63591 | 1.10881 | 2.24237e-14 | 3.53318e-13 | Specific Thyroid_high |
| 1700123O20Rik                                                                 | 7.63203 | 1.1621  | 2.31088e-14 | 3.63757e-13 | Specific Thyroid_high |
| Ahsa1                                                                         | 7.60246 | 1.0589  | 2.90562e-14 | 4.556e-13   | Specific Thyroid_high |
| Afap1                                                                         | 7.58603 | 1.23311 | 3.29847e-14 | 5.15696e-13 | Specific Thyroid_high |
| Hilpda                                                                        | 7.58183 | 1.67266 | 3.40722e-14 | 5.32439e-13 | Specific Thyroid_high |
| Nudt9                                                                         | 7.58012 | 1.05319 | 3.45241e-14 | 5.39241e-13 | Specific Thyroid_high |
| St6galnac2                                                                    | 7.55774 | 2.09218 | 4.10124e-14 | 6.38421e-13 | Specific Thyroid_high |
| Psmid10                                                                       | 7.53456 | 1.25375 | 4.89984e-14 | 7.6017e-13  | Specific Thyroid_high |
| Mrps15                                                                        | 7.524   | 1.051   | 5.31251e-14 | 8.22217e-13 | Specific Thyroid_high |
| Cbr1                                                                          | 7.51498 | 1.31209 | 5.69179e-14 | 8.79653e-13 | Specific Thyroid_high |
| Gm32688                                                                       | 7.50443 | 1.04073 | 6.16942e-14 | 9.51647e-13 | Specific Thyroid_high |
| Gadd45b                                                                       | 7.50016 | 2.00823 | 6.37395e-14 | 9.82726e-13 | Specific Thyroid_high |
| Usp1                                                                          | 7.49172 | 1.0026  | 6.79753e-14 | 1.04653e-12 | Specific Thyroid_high |
| Sdhd                                                                          | 7.48636 | 1.05368 | 7.08101e-14 | 1.08862e-12 | Specific Thyroid_high |
| Hey1                                                                          | 7.48205 | 2.29137 | 7.31724e-14 | 1.12333e-12 | Specific Thyroid_high |
| Gps1                                                                          | 7.43142 | 1.00754 | 1.07442e-13 | 1.64163e-12 | Specific Thyroid_high |
| Timeless                                                                      | 7.41302 | 1.39155 | 1.23453e-13 | 1.8827e-12  | Specific Thyroid_high |
| Ube2l6                                                                        | 7.38794 | 1.37252 | 1.49124e-13 | 2.2667e-12  | Specific Thyroid_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                       |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|-----------------------|
| Med31                                                                         | 7.36158 | 1.08658 | 1.81746e-13 | 2.75348e-12 | Specific Thyroid_high |
| Eci1                                                                          | 7.35255 | 1.10193 | 1.94456e-13 | 2.94053e-12 | Specific Thyroid_high |
| Epb4114a                                                                      | 7.3052  | 1.52615 | 2.7686e-13  | 4.15935e-12 | Specific Thyroid_high |
| Wscd1                                                                         | 7.25448 | 1.53437 | 4.03194e-13 | 6.02644e-12 | Specific Thyroid_high |
| Mlx                                                                           | 7.18761 | 1.26991 | 6.59353e-13 | 9.78272e-12 | Specific Thyroid_high |
| Tmed4                                                                         | 7.16799 | 1.0105  | 7.61085e-13 | 1.12766e-11 | Specific Thyroid_high |
| Lrp3                                                                          | 7.15158 | 1.81175 | 8.57816e-13 | 1.26807e-11 | Specific Thyroid_high |
| Hey2                                                                          | 7.11535 | 4.18478 | 1.11628e-12 | 1.64337e-11 | Specific Thyroid_high |
| Foxp2                                                                         | 7.11376 | 3.6558  | 1.12926e-12 | 1.66173e-11 | Specific Thyroid_high |
| Pold4                                                                         | 7.08309 | 1.01465 | 1.40976e-12 | 2.06882e-11 | Specific Thyroid_high |
| Sdhaf4                                                                        | 7.07907 | 1.03378 | 1.4513e-12  | 2.12881e-11 | Specific Thyroid_high |
| Fdps                                                                          | 7.07778 | 1.57753 | 1.46478e-12 | 2.14664e-11 | Specific Thyroid_high |
| Anxa4                                                                         | 7.07317 | 1.15102 | 1.51433e-12 | 2.21724e-11 | Specific Thyroid_high |
| Alg5                                                                          | 7.04903 | 1.03768 | 1.80164e-12 | 2.62956e-11 | Specific Thyroid_high |
| Castor1                                                                       | 7.04723 | 1.33585 | 1.8252e-12  | 2.66275e-11 | Specific Thyroid_high |
| Naa10                                                                         | 7.02658 | 1.25366 | 2.11655e-12 | 3.07667e-11 | Specific Thyroid_high |
| Cops7a                                                                        | 7.02086 | 1.02045 | 2.20509e-12 | 3.20393e-11 | Specific Thyroid_high |
| Jdp2                                                                          | 6.99635 | 1.09649 | 2.62713e-12 | 3.80004e-11 | Specific Thyroid_high |
| Fes                                                                           | 6.99518 | 1.04391 | 2.6492e-12  | 3.83025e-11 | Specific Thyroid_high |
| Dohh                                                                          | 6.99425 | 1.29199 | 2.66689e-12 | 3.85237e-11 | Specific Thyroid_high |
| Dpm2                                                                          | 6.99216 | 1.08115 | 2.70693e-12 | 3.90847e-11 | Specific Thyroid_high |
| Bloc1s4                                                                       | 6.98999 | 1.18792 | 2.74899e-12 | 3.96742e-11 | Specific Thyroid_high |
| Fam57b                                                                        | 6.98893 | 1.73131 | 2.7698e-12  | 3.99388e-11 | Specific Thyroid_high |
| Slc25a17                                                                      | 6.97772 | 1.13508 | 3.00011e-12 | 4.31249e-11 | Specific Thyroid_high |
| Pkn3                                                                          | 6.96549 | 1.91694 | 3.27271e-12 | 4.6918e-11  | Specific Thyroid_high |
| Tob1                                                                          | 6.9479  | 1.25495 | 3.70774e-12 | 5.30134e-11 | Specific Thyroid_high |
| Pfdn4                                                                         | 6.94563 | 1.00099 | 3.76764e-12 | 5.38222e-11 | Specific Thyroid_high |
| Mdga2                                                                         | 6.93569 | 3.26936 | 4.04229e-12 | 5.75674e-11 | Specific Thyroid_high |
| Gt(ROSA)26Sor                                                                 | 6.93046 | 1.07958 | 4.19468e-12 | 5.9685e-11  | Specific Thyroid_high |
| Cox20                                                                         | 6.91089 | 1.00985 | 4.81636e-12 | 6.83199e-11 | Specific Thyroid_high |
| Mgst1                                                                         | 6.90995 | 1.48062 | 4.84832e-12 | 6.8743e-11  | Specific Thyroid_high |
| Ppm1l                                                                         | 6.89684 | 1.13922 | 5.31701e-12 | 7.52564e-11 | Specific Thyroid_high |
| Msx1                                                                          | 6.89503 | 3.01764 | 5.38549e-12 | 7.61255e-11 | Specific Thyroid_high |
| Stmn2                                                                         | 6.88622 | 2.38413 | 5.72952e-12 | 8.09176e-11 | Specific Thyroid_high |
| Mrpl55                                                                        | 6.88089 | 1.1331  | 5.94793e-12 | 8.39073e-11 | Specific Thyroid_high |
| Tmem238                                                                       | 6.85426 | 1.5563  | 7.16836e-12 | 1.00753e-10 | Specific Thyroid_high |
| Gm49980                                                                       | 6.82254 | 2.47457 | 8.94459e-12 | 1.25446e-10 | Specific Thyroid_high |
| St6galnac4                                                                    | 6.82142 | 1.18686 | 9.01465e-12 | 1.26373e-10 | Specific Thyroid_high |
| Disp1                                                                         | 6.79921 | 1.70852 | 1.05191e-11 | 1.4689e-10  | Specific Thyroid_high |
| Mrpl35                                                                        | 6.76728 | 1.29027 | 1.3123e-11  | 1.82698e-10 | Specific Thyroid_high |
| Akr1c14                                                                       | 6.76373 | 2.6414  | 1.34482e-11 | 1.87145e-10 | Specific Thyroid_high |
| Pfkfb                                                                         | 6.75781 | 1.08027 | 1.40097e-11 | 1.94707e-10 | Specific Thyroid_high |
| C1qtnf2                                                                       | 6.73127 | 2.54813 | 1.68193e-11 | 2.32752e-10 | Specific Thyroid_high |
| Tpgs2                                                                         | 6.73079 | 1.2843  | 1.68742e-11 | 2.33412e-10 | Specific Thyroid_high |
| Timm17b                                                                       | 6.71999 | 1.162   | 1.8174e-11  | 2.51069e-10 | Specific Thyroid_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                       |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|-----------------------|
| Me3                                                                           | 6.71062 | 1.4866  | 1.93797e-11 | 2.67496e-10 | Specific Thyroid_high |
| Rbis                                                                          | 6.70553 | 1.0219  | 2.00677e-11 | 2.76756e-10 | Specific Thyroid_high |
| Cxcr4                                                                         | 6.69649 | 3.34162 | 2.13482e-11 | 2.93788e-10 | Specific Thyroid_high |
| Plp2                                                                          | 6.68832 | 1.78174 | 2.25748e-11 | 3.10271e-10 | Specific Thyroid_high |
| Nr4a2                                                                         | 6.67676 | 1.64194 | 2.44275e-11 | 3.35164e-10 | Specific Thyroid_high |
| Isca2                                                                         | 6.67331 | 1.17951 | 2.50099e-11 | 3.43009e-10 | Specific Thyroid_high |
| Msrb1                                                                         | 6.66043 | 1.1891  | 2.73027e-11 | 3.7382e-10  | Specific Thyroid_high |
| Mif4gd                                                                        | 6.65775 | 1.06781 | 2.78058e-11 | 3.80547e-10 | Specific Thyroid_high |
| Sh3bp4                                                                        | 6.64537 | 1.42951 | 3.0245e-11  | 4.13404e-10 | Specific Thyroid_high |
| Dda1                                                                          | 6.63898 | 1.08218 | 3.15854e-11 | 4.30996e-10 | Specific Thyroid_high |
| Mall                                                                          | 6.62634 | 2.55818 | 3.44102e-11 | 4.68749e-10 | Specific Thyroid_high |
| Gm12185                                                                       | 6.62404 | 1.19158 | 3.49511e-11 | 4.75916e-10 | Specific Thyroid_high |
| Fut4                                                                          | 6.60397 | 2.81198 | 4.00293e-11 | 5.43459e-10 | Specific Thyroid_high |
| Gmpr2                                                                         | 6.57445 | 1.18123 | 4.88321e-11 | 6.57441e-10 | Specific Thyroid_high |
| Dusp23                                                                        | 6.56121 | 1.06171 | 5.33728e-11 | 7.16483e-10 | Specific Thyroid_high |
| Exosc4                                                                        | 6.52113 | 1.06164 | 6.97796e-11 | 9.30923e-10 | Specific Thyroid_high |
| Creb3                                                                         | 6.5064  | 1.02411 | 7.69751e-11 | 1.0248e-09  | Specific Thyroid_high |
| Mrpl38                                                                        | 6.48653 | 1.26346 | 8.78339e-11 | 1.16504e-09 | Specific Thyroid_high |
| Tsen15                                                                        | 6.47729 | 1.17159 | 9.33863e-11 | 1.23666e-09 | Specific Thyroid_high |
| Tbcc                                                                          | 6.46884 | 1.35722 | 9.8759e-11  | 1.3046e-09  | Specific Thyroid_high |
| Snhg3                                                                         | 6.46077 | 1.17158 | 1.04171e-10 | 1.37497e-09 | Specific Thyroid_high |
| 2310009A05Rik                                                                 | 6.45704 | 1.0197  | 1.06768e-10 | 1.40751e-09 | Specific Thyroid_high |
| Mrpl32                                                                        | 6.43807 | 1.02713 | 1.21004e-10 | 1.59129e-09 | Specific Thyroid_high |
| Sh3d21                                                                        | 6.41051 | 1.23241 | 1.45032e-10 | 1.90185e-09 | Specific Thyroid_high |
| Prpf40b                                                                       | 6.40958 | 1.11509 | 1.45922e-10 | 1.91275e-09 | Specific Thyroid_high |
| Uchl1                                                                         | 6.39376 | 1.5668  | 1.61855e-10 | 2.11558e-09 | Specific Thyroid_high |
| Myo5a                                                                         | 6.3886  | 2.36896 | 1.67411e-10 | 2.18643e-09 | Specific Thyroid_high |
| U2af1l4                                                                       | 6.37868 | 1.10057 | 1.78624e-10 | 2.32536e-09 | Specific Thyroid_high |
| Ppp1r35                                                                       | 6.36796 | 1.26694 | 1.91564e-10 | 2.4918e-09  | Specific Thyroid_high |
| Dnase1l1                                                                      | 6.32479 | 1.07691 | 2.53577e-10 | 3.27338e-09 | Specific Thyroid_high |
| 4930453N24Rik                                                                 | 6.26321 | 1.01441 | 3.77142e-10 | 4.8356e-09  | Specific Thyroid_high |
| S1pr4                                                                         | 6.24046 | 1.68955 | 4.36298e-10 | 5.58078e-09 | Specific Thyroid_high |
| Insig1                                                                        | 6.23825 | 1.13695 | 4.4249e-10  | 5.6555e-09  | Specific Thyroid_high |
| Ino80b                                                                        | 6.2142  | 1.20717 | 5.15875e-10 | 6.56227e-09 | Specific Thyroid_high |
| Gnpda2                                                                        | 6.17191 | 1.02592 | 6.74708e-10 | 8.53564e-09 | Specific Thyroid_high |
| 1110008P14Rik                                                                 | 6.15755 | 1.45469 | 7.3877e-10  | 9.3278e-09  | Specific Thyroid_high |
| Taf12                                                                         | 6.13535 | 1.06424 | 8.49713e-10 | 1.06785e-08 | Specific Thyroid_high |
| Cmya5                                                                         | 6.09898 | 2.16137 | 1.06746e-09 | 1.33164e-08 | Specific Thyroid_high |
| H2-Ke6                                                                        | 6.09085 | 1.12872 | 1.12312e-09 | 1.39891e-08 | Specific Thyroid_high |
| Prdx3                                                                         | 6.06928 | 1.19984 | 1.28482e-09 | 1.59601e-08 | Specific Thyroid_high |
| Rrad                                                                          | 6.02971 | 2.27985 | 1.64254e-09 | 2.02171e-08 | Specific Thyroid_high |
| Commd4                                                                        | 6.02271 | 1.01585 | 1.71526e-09 | 2.10961e-08 | Specific Thyroid_high |
| Serp2                                                                         | 6.0221  | 1.54589 | 1.72174e-09 | 2.11596e-08 | Specific Thyroid_high |
| Prickle3                                                                      | 5.99829 | 1.30459 | 1.9941e-09  | 2.44603e-08 | Specific Thyroid_high |
| Nmb                                                                           | 5.99294 | 1.75593 | 2.06082e-09 | 2.52307e-08 | Specific Thyroid_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                       |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|-----------------------|
| Nagpa                                                                         | 5.91821 | 1.25592 | 3.25464e-09 | 3.92514e-08 | Specific Thyroid_high |
| Fh1                                                                           | 5.91076 | 1.15627 | 3.40539e-09 | 4.10082e-08 | Specific Thyroid_high |
| Rab3a                                                                         | 5.89268 | 1.78719 | 3.79989e-09 | 4.55718e-08 | Specific Thyroid_high |
| Asna1                                                                         | 5.88752 | 1.1644  | 3.92041e-09 | 4.69474e-08 | Specific Thyroid_high |
| Ethe1                                                                         | 5.87925 | 1.18402 | 4.12127e-09 | 4.9298e-08  | Specific Thyroid_high |
| Snai2                                                                         | 5.84678 | 1.00997 | 5.01178e-09 | 5.96628e-08 | Specific Thyroid_high |
| Praf2                                                                         | 5.82877 | 1.39351 | 5.58364e-09 | 6.62262e-08 | Specific Thyroid_high |
| Ccdc102a                                                                      | 5.82324 | 1.48098 | 5.77183e-09 | 6.83829e-08 | Specific Thyroid_high |
| Lsm3                                                                          | 5.79177 | 1.14153 | 6.96493e-09 | 8.19674e-08 | Specific Thyroid_high |
| Yif1a                                                                         | 5.78409 | 1.01146 | 7.29078e-09 | 8.56249e-08 | Specific Thyroid_high |
| Tpgs1                                                                         | 5.74193 | 1.04041 | 9.36057e-09 | 1.09376e-07 | Specific Thyroid_high |
| Syt15                                                                         | 5.69033 | 1.86017 | 1.26792e-08 | 1.47036e-07 | Specific Thyroid_high |
| Hoxd8                                                                         | 5.65104 | 1.42193 | 1.59475e-08 | 1.83881e-07 | Specific Thyroid_high |
| Fam241a                                                                       | 5.63465 | 1.0262  | 1.75411e-08 | 2.01822e-07 | Specific Thyroid_high |
| Hoxd3os1                                                                      | 5.63212 | 1.61789 | 1.78007e-08 | 2.04737e-07 | Specific Thyroid_high |
| 0610009B22Rik                                                                 | 5.60841 | 1.34078 | 2.04199e-08 | 2.34194e-07 | Specific Thyroid_high |
| Pigyl                                                                         | 5.56994 | 1.22505 | 2.54825e-08 | 2.8999e-07  | Specific Thyroid_high |
| Gas2                                                                          | 5.56324 | 2.29429 | 2.64805e-08 | 3.01135e-07 | Specific Thyroid_high |
| Fendrr                                                                        | 5.5546  | 2.87771 | 2.78244e-08 | 3.15861e-07 | Specific Thyroid_high |
| C1galt1c1                                                                     | 5.53435 | 1.01407 | 3.12377e-08 | 3.53738e-07 | Specific Thyroid_high |
| Trappc1                                                                       | 5.46164 | 1.08759 | 4.7175e-08  | 5.26276e-07 | Specific Thyroid_high |
| Rusc1                                                                         | 5.43041 | 1.0858  | 5.62257e-08 | 6.24439e-07 | Specific Thyroid_high |
| Rce1                                                                          | 5.39138 | 1.06925 | 6.99187e-08 | 7.73586e-07 | Specific Thyroid_high |
| Sh3bgrl2                                                                      | 5.38214 | 2.01616 | 7.36059e-08 | 8.13267e-07 | Specific Thyroid_high |
| Dhrs1                                                                         | 5.35577 | 1.19205 | 8.5192e-08  | 9.36474e-07 | Specific Thyroid_high |
| Gm15478                                                                       | 5.35526 | 1.68174 | 8.54355e-08 | 9.38511e-07 | Specific Thyroid_high |
| Map6                                                                          | 5.29636 | 3.39164 | 1.18137e-07 | 1.28726e-06 | Specific Thyroid_high |
| Tmem150c                                                                      | 5.26031 | 3.55026 | 1.43809e-07 | 1.55645e-06 | Specific Thyroid_high |
| Gm28875                                                                       | 5.2475  | 2.27673 | 1.54178e-07 | 1.66477e-06 | Specific Thyroid_high |
| Atp1b2                                                                        | 5.24615 | 3.61373 | 1.55307e-07 | 1.67639e-06 | Specific Thyroid_high |
| Nudt14                                                                        | 5.23918 | 1.28918 | 1.61287e-07 | 1.73803e-06 | Specific Thyroid_high |
| Sez6l                                                                         | 5.19135 | 4.47223 | 2.08781e-07 | 2.2416e-06  | Specific Thyroid_high |
| Zfp637                                                                        | 5.18997 | 1.02164 | 2.10329e-07 | 2.25747e-06 | Specific Thyroid_high |
| Tent5a                                                                        | 5.16783 | 2.73082 | 2.3683e-07  | 2.536e-06   | Specific Thyroid_high |
| Prmt2                                                                         | 5.15796 | 1.18606 | 2.49652e-07 | 2.66623e-06 | Specific Thyroid_high |
| 9630028H03Rik                                                                 | 5.15516 | 1.48374 | 2.53417e-07 | 2.70376e-06 | Specific Thyroid_high |
| Bola1                                                                         | 5.13812 | 1.23438 | 2.77493e-07 | 2.95379e-06 | Specific Thyroid_high |
| Rnf5                                                                          | 5.11444 | 1.29051 | 3.14669e-07 | 3.33998e-06 | Specific Thyroid_high |
| Mkrn1                                                                         | 5.1114  | 1.13376 | 3.19783e-07 | 3.39054e-06 | Specific Thyroid_high |
| Ebpl                                                                          | 5.09564 | 1.42973 | 3.4757e-07  | 3.6767e-06  | Specific Thyroid_high |
| Zfp511                                                                        | 5.09023 | 1.12032 | 3.57624e-07 | 3.78058e-06 | Specific Thyroid_high |
| AI504432                                                                      | 5.07004 | 5.13209 | 3.97729e-07 | 4.19082e-06 | Specific Thyroid_high |
| Nxt1                                                                          | 4.9919  | 1.12017 | 5.9787e-07  | 6.22252e-06 | Specific Thyroid_high |
| Sfxn3                                                                         | 4.9717  | 1.01325 | 6.63676e-07 | 6.883e-06   | Specific Thyroid_high |
| Exosc5                                                                        | 4.95145 | 1.13321 | 7.36631e-07 | 7.6176e-06  | Specific Thyroid_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                       |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|-----------------------|
| Polr2d                                                                        | 4.93279 | 1.00073 | 8.10634e-07 | 8.35078e-06 | Specific Thyroid_high |
| Mfsd10                                                                        | 4.91671 | 1.08247 | 8.80128e-07 | 9.04934e-06 | Specific Thyroid_high |
| Dync1i1                                                                       | 4.90523 | 2.79183 | 9.3316e-07  | 9.57936e-06 | Specific Thyroid_high |
| Mpv17l2                                                                       | 4.90107 | 1.63608 | 9.53137e-07 | 9.78132e-06 | Specific Thyroid_high |
| Aebp1                                                                         | 4.88992 | 1.89195 | 1.00876e-06 | 1.03292e-05 | Specific Thyroid_high |
| Gm11730                                                                       | 4.88495 | 1.61596 | 1.03456e-06 | 1.05899e-05 | Specific Thyroid_high |
| Eef1akmt2                                                                     | 4.87824 | 1.50134 | 1.07039e-06 | 1.09428e-05 | Specific Thyroid_high |
| Rnf126                                                                        | 4.87763 | 1.10635 | 1.07367e-06 | 1.09729e-05 | Specific Thyroid_high |
| Siva1                                                                         | 4.82327 | 1.13717 | 1.41223e-06 | 1.4279e-05  | Specific Thyroid_high |
| Cabp1                                                                         | 4.82153 | 2.23871 | 1.42465e-06 | 1.43959e-05 | Specific Thyroid_high |
| St6galnac6                                                                    | 4.81283 | 1.32592 | 1.48811e-06 | 1.50277e-05 | Specific Thyroid_high |
| Gipc3                                                                         | 4.80514 | 1.05619 | 1.54641e-06 | 1.56067e-05 | Specific Thyroid_high |
| Mid1ip1                                                                       | 4.80046 | 1.20991 | 1.58303e-06 | 1.59713e-05 | Specific Thyroid_high |
| Pop7                                                                          | 4.78322 | 1.00013 | 1.72507e-06 | 1.7361e-05  | Specific Thyroid_high |
| Pcdh20                                                                        | 4.77616 | 5.79024 | 1.78674e-06 | 1.79592e-05 | Specific Thyroid_high |
| Rtp3                                                                          | 4.77109 | 1.00955 | 1.83233e-06 | 1.84002e-05 | Specific Thyroid_high |
| 1110012L19Rik                                                                 | 4.74904 | 1.40101 | 2.04383e-06 | 2.04604e-05 | Specific Thyroid_high |
| Acadvl                                                                        | 4.74651 | 1.01165 | 2.06952e-06 | 2.06984e-05 | Specific Thyroid_high |
| Nop16                                                                         | 4.683   | 1.49535 | 2.82705e-06 | 2.80231e-05 | Specific Thyroid_high |
| Tnfrsf1b                                                                      | 4.67274 | 2.41211 | 2.9721e-06  | 2.93977e-05 | Specific Thyroid_high |
| Cipc                                                                          | 4.66976 | 1.07728 | 3.01548e-06 | 2.98085e-05 | Specific Thyroid_high |
| Med7                                                                          | 4.66324 | 1.04976 | 3.11273e-06 | 3.07323e-05 | Specific Thyroid_high |
| Sdf2l1                                                                        | 4.63567 | 1.11476 | 3.5579e-06  | 3.49564e-05 | Specific Thyroid_high |
| Gm10638                                                                       | 4.62431 | 1.79455 | 3.75839e-06 | 3.68702e-05 | Specific Thyroid_high |
| Creld1                                                                        | 4.60854 | 1.26461 | 4.05511e-06 | 3.96725e-05 | Specific Thyroid_high |
| Zfp524                                                                        | 4.54455 | 1.24938 | 5.5054e-06  | 5.32161e-05 | Specific Thyroid_high |
| Sertad3                                                                       | 4.53147 | 1.10648 | 5.85736e-06 | 5.6483e-05  | Specific Thyroid_high |
| Mustn1                                                                        | 4.52607 | 2.33901 | 6.00895e-06 | 5.78411e-05 | Specific Thyroid_high |
| Bloc1s1                                                                       | 4.50147 | 1.35563 | 6.74856e-06 | 6.48058e-05 | Specific Thyroid_high |
| Cebpzoz                                                                       | 4.48767 | 1.00252 | 7.20056e-06 | 6.89413e-05 | Specific Thyroid_high |
| Alkbh7                                                                        | 4.48089 | 1.33243 | 7.43337e-06 | 7.1086e-05  | Specific Thyroid_high |
| Lactb                                                                         | 4.4742  | 1.08964 | 7.66981e-06 | 7.32603e-05 | Specific Thyroid_high |
| Thap11                                                                        | 4.4584  | 1.12717 | 8.25749e-06 | 7.8734e-05  | Specific Thyroid_high |
| Cnpy4                                                                         | 4.42312 | 1.17859 | 9.72847e-06 | 9.20796e-05 | Specific Thyroid_high |
| Ttc39c                                                                        | 4.35186 | 1.5302  | 1.34985e-05 | 0.000126063 | Specific Thyroid_high |
| Cbr3                                                                          | 4.34622 | 1.64969 | 1.38501e-05 | 0.000129197 | Specific Thyroid_high |
| Agrp                                                                          | 4.33578 | 1.58258 | 1.45241e-05 | 0.00013521  | Specific Thyroid_high |
| Eef1akmt1                                                                     | 4.32758 | 1.40715 | 1.50755e-05 | 0.000140223 | Specific Thyroid_high |
| Tmem136                                                                       | 4.31186 | 3.30946 | 1.61885e-05 | 0.000150272 | Specific Thyroid_high |
| Cdk5                                                                          | 4.30387 | 1.22512 | 1.67838e-05 | 0.000155574 | Specific Thyroid_high |
| Fbxl2                                                                         | 4.24311 | 1.51986 | 2.20447e-05 | 0.000202076 | Specific Thyroid_high |
| Ptrhd1                                                                        | 4.24179 | 1.0041  | 2.21747e-05 | 0.000203152 | Specific Thyroid_high |
| Map1a                                                                         | 4.23615 | 5.14927 | 2.27381e-05 | 0.00020802  | Specific Thyroid_high |
| Gpr150                                                                        | 4.23226 | 3.27866 | 2.31349e-05 | 0.00021153  | Specific Thyroid_high |
| Lin37                                                                         | 4.1964  | 1.22109 | 2.71189e-05 | 0.000245936 | Specific Thyroid_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                       |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|-----------------------|
| 1500011B03Rik                                                                 | 4.16869 | 1.55407 | 3.06356e-05 | 0.000275814 | Specific Thyroid_high |
| Itgb4                                                                         | 4.12908 | 2.78697 | 3.64219e-05 | 0.000325639 | Specific Thyroid_high |
| Nudt7                                                                         | 4.10513 | 1.44532 | 4.04079e-05 | 0.000359682 | Specific Thyroid_high |
| Mrps31                                                                        | 4.08476 | 1.05961 | 4.41231e-05 | 0.000391135 | Specific Thyroid_high |
| Plod2                                                                         | 4.03941 | 1.1774  | 5.35865e-05 | 0.000471272 | Specific Thyroid_high |
| Cdpf1                                                                         | 3.99201 | 1.15443 | 6.55143e-05 | 0.000571194 | Specific Thyroid_high |
| Tmed1                                                                         | 3.98606 | 1.33803 | 6.71788e-05 | 0.000585231 | Specific Thyroid_high |
| Sez6l2                                                                        | 3.97513 | 2.9846  | 7.03414e-05 | 0.000611463 | Specific Thyroid_high |
| Lhfp                                                                          | 3.92602 | 1.281   | 8.63646e-05 | 0.000743541 | Specific Thyroid_high |
| Glis2                                                                         | 3.88092 | 1.17215 | 0.000104061 | 0.000888554 | Specific Thyroid_high |
| Pir                                                                           | 3.8784  | 1.02982 | 0.000105144 | 0.000897085 | Specific Thyroid_high |
| Nfkbib                                                                        | 3.86062 | 1.0778  | 0.000113099 | 0.000961656 | Specific Thyroid_high |
| Pcsk5                                                                         | 3.85504 | 1.96756 | 0.000115709 | 0.000983067 | Specific Thyroid_high |
| Psme2b                                                                        | 3.85073 | 1.08501 | 0.000117764 | 0.00100001  | Specific Thyroid_high |
| Eid2                                                                          | 3.84694 | 1.03037 | 0.000119602 | 0.00101481  | Specific Thyroid_high |
| Wdr18                                                                         | 3.83192 | 1.13453 | 0.000127148 | 0.00107404  | Specific Thyroid_high |
| Thbs1                                                                         | 3.83032 | 2.56653 | 0.000127975 | 0.00108017  | Specific Thyroid_high |
| Gm16046                                                                       | 3.81849 | 1.55466 | 0.000134272 | 0.00113067  | Specific Thyroid_high |
| 2310039H08Rik                                                                 | 3.81247 | 1.08388 | 0.000137583 | 0.00115584  | Specific Thyroid_high |
| Mcub                                                                          | 3.81083 | 3.41516 | 0.0001385   | 0.00116324  | Specific Thyroid_high |
| Sap30                                                                         | 3.80744 | 1.29061 | 0.000140414 | 0.00117839  | Specific Thyroid_high |
| Hip1r                                                                         | 3.80343 | 1.05352 | 0.000142703 | 0.00119667  | Specific Thyroid_high |
| Lsm10                                                                         | 3.7974  | 1.06263 | 0.000146219 | 0.00122551  | Specific Thyroid_high |
| H2afy2                                                                        | 3.79545 | 1.10545 | 0.000147375 | 0.00123489  | Specific Thyroid_high |
| Fam131a                                                                       | 3.78754 | 1.48082 | 0.000152147 | 0.00127289  | Specific Thyroid_high |
| Znrd2                                                                         | 3.78202 | 1.07499 | 0.000155561 | 0.00130044  | Specific Thyroid_high |
| Ten1                                                                          | 3.7782  | 1.03965 | 0.000157963 | 0.00131877  | Specific Thyroid_high |
| Prorsd1                                                                       | 3.77021 | 1.05281 | 0.000163111 | 0.00135793  | Specific Thyroid_high |
| Ogfod3                                                                        | 3.76947 | 1.23081 | 0.000163595 | 0.00136161  | Specific Thyroid_high |
| Ss18l2                                                                        | 3.73335 | 1.22966 | 0.00018895  | 0.00156497  | Specific Thyroid_high |
| Mex3d                                                                         | 3.69823 | 1.20663 | 0.000217111 | 0.0017863   | Specific Thyroid_high |
| Zrsr1                                                                         | 3.68359 | 1.00964 | 0.000229971 | 0.00188298  | Specific Thyroid_high |
| 4930545L23Rik                                                                 | 3.68255 | 2.02197 | 0.000230913 | 0.00189022  | Specific Thyroid_high |
| Atp13a2                                                                       | 3.65924 | 1.20414 | 0.000252968 | 0.00205979  | Specific Thyroid_high |
| Fgf13                                                                         | 3.63485 | 3.08995 | 0.000278138 | 0.00224885  | Specific Thyroid_high |
| Ccdc112                                                                       | 3.60493 | 1.82026 | 0.000312234 | 0.00250447  | Specific Thyroid_high |
| Gm11713                                                                       | 3.59992 | 1.37412 | 0.00031831  | 0.00254814  | Specific Thyroid_high |
| Tmem251                                                                       | 3.5982  | 1.30031 | 0.000320422 | 0.00256314  | Specific Thyroid_high |
| Gnptg                                                                         | 3.58231 | 1.13092 | 0.000340573 | 0.00271625  | Specific Thyroid_high |
| Plcd1                                                                         | 3.57508 | 1.19761 | 0.000350116 | 0.00278754  | Specific Thyroid_high |
| Dynlt1f                                                                       | 3.56014 | 1.53807 | 0.000370656 | 0.00293876  | Specific Thyroid_high |
| Ccn3                                                                          | 3.55525 | 2.47404 | 0.000377624 | 0.00299254  | Specific Thyroid_high |
| Polr2h                                                                        | 3.5163  | 1.01303 | 0.00043761  | 0.00344507  | Specific Thyroid_high |
| Shf                                                                           | 3.48128 | 1.01537 | 0.000499026 | 0.00389909  | Specific Thyroid_high |
| Syne3                                                                         | 3.47106 | 1.16552 | 0.000518412 | 0.00404469  | Specific Thyroid_high |



| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                        |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|------------------------|
| Ctnbp2                                                                        | 3.45804 | 1.6958  | 0.000544123 | 0.0042371   | Specific Thyroid_high  |
| Snai1                                                                         | 3.45741 | 1.04494 | 0.000545399 | 0.00424601  | Specific Thyroid_high  |
| Pafah1b3                                                                      | 3.44007 | 2.18377 | 0.000581557 | 0.00451011  | Specific Thyroid_high  |
| Mad2l2                                                                        | 3.43283 | 1.02483 | 0.00059732  | 0.00462569  | Specific Thyroid_high  |
| Al467606                                                                      | 3.43171 | 1.97618 | 0.000599782 | 0.00464252  | Specific Thyroid_high  |
| Abhd8                                                                         | 3.37709 | 1.02469 | 0.000732567 | 0.00560183  | Specific Thyroid_high  |
| Gmn                                                                           | 3.36855 | 1.22481 | 0.000755635 | 0.00577003  | Specific Thyroid_high  |
| Apol10b                                                                       | 3.36708 | 1.14478 | 0.000759674 | 0.00579538  | Specific Thyroid_high  |
| Eps8l2                                                                        | 3.352   | 1.51766 | 0.000802312 | 0.00609904  | Specific Thyroid_high  |
| Tmem41a                                                                       | 3.34634 | 1.15618 | 0.000818872 | 0.00621761  | Specific Thyroid_high  |
| Cby1                                                                          | 3.32868 | 1.03244 | 0.000872577 | 0.006599    | Specific Thyroid_high  |
| Aplp1                                                                         | 3.31902 | 1.90519 | 0.00090334  | 0.00681888  | Specific Thyroid_high  |
| Hmgb3                                                                         | 3.31302 | 1.15957 | 0.000922941 | 0.00696195  | Specific Thyroid_high  |
| Tubg1                                                                         | 3.29248 | 1.16135 | 0.000993096 | 0.00745111  | Specific Thyroid_high  |
| Znhit3                                                                        | 3.28904 | 1.2178  | 0.0010053   | 0.00753563  | Specific Thyroid_high  |
| Arl6                                                                          | 3.28519 | 1.20831 | 0.00101912  | 0.00763572  | Specific Thyroid_high  |
| Gm49267                                                                       | 3.27388 | 1.34829 | 0.0010608   | 0.00793144  | Specific Thyroid_high  |
| Zfp87                                                                         | 3.26329 | 1.14561 | 0.00110127  | 0.00820895  | Specific Thyroid_high  |
| Cyp1a1                                                                        | 3.26171 | 2.47537 | 0.00110743  | 0.00824949  | Specific Thyroid_high  |
| Usp43                                                                         | 3.25001 | 1.02004 | 0.00115402  | 0.00858862  | Specific Thyroid_high  |
| Zdhhc12                                                                       | 3.22008 | 1.2127  | 0.00128157  | 0.00948541  | Specific Thyroid_high  |
| Nrm                                                                           | 3.20404 | 1.81299 | 0.00135512  | 0.00998174  | Specific Thyroid_high  |
| Pbx1                                                                          | 53.2268 | 4.36677 | 0           | 0           | Specific Adrenal1_high |
| Chrm3                                                                         | 46.6003 | 3.9824  | 0           | 0           | Specific Adrenal1_high |
| Igfbp5                                                                        | 45.8882 | 4.90758 | 0           | 0           | Specific Adrenal1_high |
| Limch1                                                                        | 44.6147 | 2.81023 | 0           | 0           | Specific Adrenal1_high |
| AU021092                                                                      | 42.7118 | 3.57055 | 0           | 0           | Specific Adrenal1_high |
| Edil3                                                                         | 42.2601 | 4.85977 | 0           | 0           | Specific Adrenal1_high |
| Ptprg                                                                         | 41.7993 | 2.14791 | 0           | 0           | Specific Adrenal1_high |
| Ptpru                                                                         | 40.6041 | 3.28771 | 0           | 0           | Specific Adrenal1_high |
| Rsad2                                                                         | 40.0393 | 2.84833 | 0           | 0           | Specific Adrenal1_high |
| Timp3                                                                         | 39.6512 | 1.94125 | 0           | 0           | Specific Adrenal1_high |
| Hipk2                                                                         | 39.5487 | 2.4356  | 0           | 0           | Specific Adrenal1_high |
| Npr3                                                                          | 39.5179 | 4.54333 | 0           | 0           | Specific Adrenal1_high |
| Inpp4b                                                                        | 39.3677 | 2.87784 | 0           | 0           | Specific Adrenal1_high |
| Fam117b                                                                       | 38.5078 | 2.26441 | 0           | 0           | Specific Adrenal1_high |
| Ifi44                                                                         | 38.2073 | 2.71152 | 0           | 0           | Specific Adrenal1_high |
| Rhob                                                                          | 37.0783 | 2.13292 | 6.2789e-301 | 1.1924e-297 | Specific Adrenal1_high |
| Tgfb2                                                                         | 36.7244 | 2.09366 | 2.9844e-295 | 5.3529e-292 | Specific Adrenal1_high |
| Insr                                                                          | 36.1331 | 2.42454 | 6.851e-286  | 1.1641e-282 | Specific Adrenal1_high |
| Cd9                                                                           | 35.1315 | 2.18047 | 2.2243e-270 | 3.5906e-267 | Specific Adrenal1_high |
| Dnm3                                                                          | 34.97   | 2.72823 | 6.4307e-268 | 9.8865e-265 | Specific Adrenal1_high |
| Meis2                                                                         | 34.7831 | 1.83357 | 4.3727e-265 | 6.4169e-262 | Specific Adrenal1_high |
| Rapgef4                                                                       | 34.2822 | 2.25323 | 1.4466e-257 | 2.0306e-254 | Specific Adrenal1_high |
| Emcn                                                                          | 33.651  | 2.27129 | 3.0098e-248 | 4.0488e-245 | Specific Adrenal1_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                        |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|------------------------|
| Rgcc                                                                          | 33.3217 | 2.53214 | 1.8721e-243 | 2.4176e-240 | Specific Adrenal1_high |
| Plpp1                                                                         | 33.2677 | 1.51945 | 1.1313e-242 | 1.4048e-239 | Specific Adrenal1_high |
| Nav3                                                                          | 33.106  | 3.25022 | 2.4333e-240 | 2.9096e-237 | Specific Adrenal1_high |
| Pcdh17                                                                        | 33.0355 | 1.98019 | 2.5116e-239 | 2.896e-236  | Specific Adrenal1_high |
| Ramp3                                                                         | 32.9881 | 2.23317 | 1.2042e-238 | 1.3406e-235 | Specific Adrenal1_high |
| Gimap4                                                                        | 32.9576 | 1.70731 | 3.2963e-238 | 3.5474e-235 | Specific Adrenal1_high |
| Irx3                                                                          | 32.2374 | 2.77117 | 5.2784e-228 | 5.4972e-225 | Specific Adrenal1_high |
| Tshz2                                                                         | 31.6806 | 1.63981 | 2.878e-220  | 2.9036e-217 | Specific Adrenal1_high |
| Prkd1                                                                         | 31.4858 | 2.30471 | 1.3591e-217 | 1.3296e-214 | Specific Adrenal1_high |
| D5Ert615e                                                                     | 31.4283 | 4.34272 | 8.3e-217    | 7.8813e-214 | Specific Adrenal1_high |
| Ebf1                                                                          | 31.3289 | 2.2458  | 1.8861e-215 | 1.7398e-212 | Specific Adrenal1_high |
| Fabp4                                                                         | 31.2044 | 2.01268 | 9.2888e-214 | 8.3303e-211 | Specific Adrenal1_high |
| Jup                                                                           | 31.0916 | 1.82541 | 3.1265e-212 | 2.728e-209  | Specific Adrenal1_high |
| Ly6e                                                                          | 30.8819 | 1.88355 | 2.0888e-209 | 1.7747e-206 | Specific Adrenal1_high |
| Gimap5                                                                        | 30.8024 | 2.18086 | 2.4346e-208 | 2.0154e-205 | Specific Adrenal1_high |
| Pdia5                                                                         | 30.6417 | 2.47402 | 3.4076e-206 | 2.7503e-203 | Specific Adrenal1_high |
| Ltbp1                                                                         | 30.0085 | 2.306   | 7.6121e-198 | 5.5854e-195 | Specific Adrenal1_high |
| Gimap6                                                                        | 29.7911 | 1.46589 | 5.0881e-195 | 3.6504e-192 | Specific Adrenal1_high |
| Tcim                                                                          | 29.7457 | 1.58018 | 1.9691e-194 | 1.382e-191  | Specific Adrenal1_high |
| Arhgap26                                                                      | 29.3434 | 1.63911 | 2.9053e-189 | 1.9957e-186 | Specific Adrenal1_high |
| Fkbp5                                                                         | 29.2957 | 2.62868 | 1.1777e-188 | 7.9215e-186 | Specific Adrenal1_high |
| Zfhx3                                                                         | 29.008  | 1.66107 | 5.2198e-185 | 3.4392e-182 | Specific Adrenal1_high |
| Ednrb                                                                         | 28.9602 | 2.02359 | 2.0903e-184 | 1.3497e-181 | Specific Adrenal1_high |
| Cped1                                                                         | 28.928  | 2.16754 | 5.3103e-184 | 3.3616e-181 | Specific Adrenal1_high |
| Dram1                                                                         | 28.624  | 3.1999  | 3.3792e-180 | 2.098e-177  | Specific Adrenal1_high |
| Tmem176a                                                                      | 28.5345 | 1.8619  | 4.3681e-179 | 2.6608e-176 | Specific Adrenal1_high |
| Igfbp3                                                                        | 28.4307 | 2.31524 | 8.4533e-178 | 5.054e-175  | Specific Adrenal1_high |
| Piezo2                                                                        | 28.3855 | 1.96805 | 3.0506e-177 | 1.7907e-174 | Specific Adrenal1_high |
| Tmem176b                                                                      | 28.0915 | 1.72052 | 1.2454e-173 | 7.0538e-171 | Specific Adrenal1_high |
| Cdc14a                                                                        | 28.0689 | 1.93319 | 2.3516e-173 | 1.309e-170  | Specific Adrenal1_high |
| Exoc3l2                                                                       | 27.9214 | 1.3869  | 1.4662e-171 | 8.0233e-169 | Specific Adrenal1_high |
| Tek                                                                           | 27.8728 | 1.27737 | 5.6955e-171 | 3.0647e-168 | Specific Adrenal1_high |
| Slit3                                                                         | 27.8321 | 3.16838 | 1.7738e-170 | 9.3881e-168 | Specific Adrenal1_high |
| Dysf                                                                          | 27.8156 | 1.38936 | 2.8098e-170 | 1.4631e-167 | Specific Adrenal1_high |
| Entpd1                                                                        | 27.7969 | 2.13359 | 4.7246e-170 | 2.4212e-167 | Specific Adrenal1_high |
| Tnfrsf2                                                                       | 27.7159 | 2.01757 | 4.4923e-169 | 2.2661e-166 | Specific Adrenal1_high |
| Btg1                                                                          | 27.5763 | 1.84845 | 2.1403e-167 | 1.047e-164  | Specific Adrenal1_high |
| S100a10                                                                       | 27.381  | 1.45356 | 4.6189e-165 | 2.2257e-162 | Specific Adrenal1_high |
| S100a6                                                                        | 27.3711 | 2.06794 | 6.051e-165  | 2.8729e-162 | Specific Adrenal1_high |
| Itgb5                                                                         | 27.1632 | 2.68543 | 1.7689e-162 | 8.2766e-160 | Specific Adrenal1_high |
| Lmo2                                                                          | 27.0871 | 1.61217 | 1.3958e-161 | 6.4378e-159 | Specific Adrenal1_high |
| Flt1                                                                          | 26.7445 | 1.1128  | 1.4301e-157 | 6.5032e-155 | Specific Adrenal1_high |
| Cd200                                                                         | 26.7322 | 1.84824 | 1.9912e-157 | 8.9285e-155 | Specific Adrenal1_high |
| Etl4                                                                          | 26.6825 | 1.569   | 7.5108e-157 | 3.3217e-154 | Specific Adrenal1_high |
| Klf12                                                                         | 26.6565 | 1.68582 | 1.5046e-156 | 6.4768e-154 | Specific Adrenal1_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                        |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|------------------------|
| Tanc2                                                                         | 26.4183 | 1.86405 | 8.4528e-154 | 3.5908e-151 | Specific Adrenal1_high |
| Palm                                                                          | 26.3466 | 2.23847 | 5.6155e-153 | 2.3545e-150 | Specific Adrenal1_high |
| Mcf2l                                                                         | 26.034  | 1.85249 | 2.0444e-149 | 8.462e-147  | Specific Adrenal1_high |
| Tspan15                                                                       | 25.9709 | 1.64898 | 1.0556e-148 | 4.314e-146  | Specific Adrenal1_high |
| H2-D1                                                                         | 25.8872 | 1.25639 | 9.2725e-148 | 3.7421e-145 | Specific Adrenal1_high |
| Plvap                                                                         | 25.7844 | 2.32473 | 1.3251e-146 | 5.2818e-144 | Specific Adrenal1_high |
| Thrsp                                                                         | 25.7268 | 1.70845 | 5.8614e-146 | 2.3077e-143 | Specific Adrenal1_high |
| Chst8                                                                         | 25.7149 | 4.23306 | 7.9568e-146 | 3.095e-143  | Specific Adrenal1_high |
| Tbxa2r                                                                        | 24.9757 | 1.64857 | 1.1221e-137 | 4.2619e-135 | Specific Adrenal1_high |
| F2r                                                                           | 24.9266 | 1.47195 | 3.8304e-137 | 1.4214e-134 | Specific Adrenal1_high |
| Ehd4                                                                          | 24.9226 | 1.71302 | 4.2342e-137 | 1.5534e-134 | Specific Adrenal1_high |
| Esm1                                                                          | 24.8236 | 2.05082 | 4.9918e-136 | 1.8108e-133 | Specific Adrenal1_high |
| Samd12                                                                        | 24.7774 | 1.56022 | 1.571e-135  | 5.6354e-133 | Specific Adrenal1_high |
| Kalrn                                                                         | 24.6674 | 1.74717 | 2.3953e-134 | 8.498e-132  | Specific Adrenal1_high |
| Chn2                                                                          | 24.6471 | 2.08656 | 3.9553e-134 | 1.3731e-131 | Specific Adrenal1_high |
| Cd34                                                                          | 24.5902 | 1.60374 | 1.6071e-133 | 5.5198e-131 | Specific Adrenal1_high |
| Laptn4a                                                                       | 24.411  | 1.15299 | 1.3079e-131 | 4.4449e-129 | Specific Adrenal1_high |
| Akap13                                                                        | 24.306  | 1.43355 | 1.6933e-130 | 5.6947e-128 | Specific Adrenal1_high |
| Cavin3                                                                        | 24.2921 | 1.5769  | 2.3744e-130 | 7.9029e-128 | Specific Adrenal1_high |
| Chst11                                                                        | 24.1847 | 2.06762 | 3.2275e-129 | 1.0633e-126 | Specific Adrenal1_high |
| Apbb2                                                                         | 24.1572 | 1.07487 | 6.2753e-129 | 2.0464e-126 | Specific Adrenal1_high |
| Ccdc85a                                                                       | 24.0503 | 1.74228 | 8.2848e-128 | 2.6748e-125 | Specific Adrenal1_high |
| Eogt                                                                          | 23.9155 | 1.6847  | 2.115e-126  | 6.6943e-124 | Specific Adrenal1_high |
| Inpp5d                                                                        | 23.8453 | 1.62926 | 1.1343e-125 | 3.4877e-123 | Specific Adrenal1_high |
| Btnl9                                                                         | 23.8007 | 1.35702 | 3.2814e-125 | 9.9008e-123 | Specific Adrenal1_high |
| Plpp3                                                                         | 23.7784 | 1.16476 | 5.5856e-125 | 1.6697e-122 | Specific Adrenal1_high |
| Svil                                                                          | 23.6799 | 1.6041  | 5.806e-124  | 1.7041e-121 | Specific Adrenal1_high |
| Gm12002                                                                       | 23.5507 | 1.94189 | 1.2342e-122 | 3.5263e-120 | Specific Adrenal1_high |
| Lrrc3b                                                                        | 23.5055 | 2.23278 | 3.5846e-122 | 1.0152e-119 | Specific Adrenal1_high |
| Airn                                                                          | 23.4893 | 1.67953 | 5.2454e-122 | 1.4726e-119 | Specific Adrenal1_high |
| Dock6                                                                         | 23.3512 | 1.38828 | 1.3416e-120 | 3.7338e-118 | Specific Adrenal1_high |
| Tmem26                                                                        | 23.3413 | 3.2553  | 1.6903e-120 | 4.6642e-118 | Specific Adrenal1_high |
| 2610307P16Rik                                                                 | 23.2617 | 2.29345 | 1.0823e-119 | 2.9363e-117 | Specific Adrenal1_high |
| Mettl24                                                                       | 22.9724 | 4.09227 | 8.8032e-117 | 2.3296e-114 | Specific Adrenal1_high |
| Cyp20a1                                                                       | 22.8254 | 1.85445 | 2.5687e-115 | 6.6879e-113 | Specific Adrenal1_high |
| Podxl                                                                         | 22.6328 | 1.23891 | 2.0615e-113 | 5.3244e-111 | Specific Adrenal1_high |
| Ldb2                                                                          | 22.5714 | 1.18116 | 8.2788e-113 | 2.1213e-110 | Specific Adrenal1_high |
| H2-Q7                                                                         | 22.5467 | 1.35117 | 1.4457e-112 | 3.6753e-110 | Specific Adrenal1_high |
| Vamp5                                                                         | 22.5395 | 1.07238 | 1.7016e-112 | 4.2918e-110 | Specific Adrenal1_high |
| Efnb2                                                                         | 22.3833 | 1.40045 | 5.7252e-111 | 1.4329e-108 | Specific Adrenal1_high |
| Pmp22                                                                         | 22.2707 | 1.86961 | 7.1095e-110 | 1.7656e-107 | Specific Adrenal1_high |
| Aig1                                                                          | 22.2197 | 1.67015 | 2.2148e-109 | 5.4584e-107 | Specific Adrenal1_high |
| Chd9                                                                          | 22.0714 | 1.4856  | 5.9562e-108 | 1.4458e-105 | Specific Adrenal1_high |
| Adamts6                                                                       | 21.9944 | 3.25294 | 3.2596e-107 | 7.8534e-105 | Specific Adrenal1_high |
| Gimap1                                                                        | 21.8782 | 1.3482  | 4.1864e-106 | 1.0012e-103 | Specific Adrenal1_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                        |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|------------------------|
| Il10rb                                                                        | 21.7777 | 1.43054 | 3.7745e-105 | 8.9603e-103 | Specific Adrenal1_high |
| Rcsd1                                                                         | 21.6532 | 1.5863  | 5.6703e-104 | 1.2983e-101 | Specific Adrenal1_high |
| Gng2                                                                          | 21.4475 | 1.95567 | 4.8186e-102 | 1.0879e-99  | Specific Adrenal1_high |
| Atp1a1                                                                        | 21.3492 | 1.23162 | 3.9678e-101 | 8.8345e-99  | Specific Adrenal1_high |
| Irx5                                                                          | 21.3286 | 3.17792 | 6.1672e-101 | 1.36376e-98 | Specific Adrenal1_high |
| Apobec3                                                                       | 21.2137 | 1.70842 | 7.1402e-100 | 1.56818e-97 | Specific Adrenal1_high |
| Slc44a2                                                                       | 21.1551 | 1.42394 | 2.4754e-99  | 5.3999e-97  | Specific Adrenal1_high |
| Myo1e                                                                         | 21.0537 | 1.55124 | 2.11658e-98 | 4.58616e-96 | Specific Adrenal1_high |
| Lims2                                                                         | 21.0413 | 1.26127 | 2.74674e-98 | 5.91191e-96 | Specific Adrenal1_high |
| Col15a1                                                                       | 21.0139 | 1.6298  | 4.89741e-98 | 1.04711e-95 | Specific Adrenal1_high |
| Boc                                                                           | 20.9736 | 3.04913 | 1.14349e-97 | 2.42878e-95 | Specific Adrenal1_high |
| Fam167b                                                                       | 20.9568 | 1.1367  | 1.62624e-97 | 3.43158e-95 | Specific Adrenal1_high |
| Kank3                                                                         | 20.9472 | 1.10855 | 1.99068e-97 | 4.17331e-95 | Specific Adrenal1_high |
| Tnfsf10                                                                       | 20.9324 | 1.17118 | 2.71315e-97 | 5.65123e-95 | Specific Adrenal1_high |
| Malat1                                                                        | 20.877  | 1.16397 | 8.66363e-97 | 1.79298e-94 | Specific Adrenal1_high |
| Ly6c1                                                                         | 20.7287 | 1.95286 | 1.9095e-95  | 3.92664e-93 | Specific Adrenal1_high |
| Selenom                                                                       | 20.6836 | 1.21827 | 4.86811e-95 | 9.94728e-93 | Specific Adrenal1_high |
| Micall1                                                                       | 20.6051 | 1.75113 | 2.4679e-94  | 5.01108e-92 | Specific Adrenal1_high |
| Mfge8                                                                         | 20.5862 | 1.18989 | 3.6464e-94  | 7.35775e-92 | Specific Adrenal1_high |
| Rarb                                                                          | 20.4299 | 1.36041 | 9.06437e-93 | 1.81766e-90 | Specific Adrenal1_high |
| Ephb1                                                                         | 20.3981 | 2.38779 | 1.73727e-92 | 3.44097e-90 | Specific Adrenal1_high |
| Sdk1                                                                          | 20.3972 | 4.13101 | 1.77024e-92 | 3.48488e-90 | Specific Adrenal1_high |
| 9530026P05Rik                                                                 | 20.3773 | 1.20154 | 2.66004e-92 | 5.20482e-90 | Specific Adrenal1_high |
| Mtdh                                                                          | 20.3544 | 1.09463 | 4.24706e-92 | 8.26002e-90 | Specific Adrenal1_high |
| Ankrd28                                                                       | 20.347  | 1.43075 | 4.93347e-92 | 9.53756e-90 | Specific Adrenal1_high |
| Il15                                                                          | 20.31   | 1.88867 | 1.04945e-91 | 2.01676e-89 | Specific Adrenal1_high |
| Tsc22d1                                                                       | 20.3059 | 1.2038  | 1.14072e-91 | 2.17918e-89 | Specific Adrenal1_high |
| Ifitm3                                                                        | 20.2321 | 1.07596 | 5.1091e-91  | 9.58996e-89 | Specific Adrenal1_high |
| Asph                                                                          | 20.1334 | 2.35739 | 3.7597e-90  | 6.97597e-88 | Specific Adrenal1_high |
| Myo1b                                                                         | 20.0317 | 1.65415 | 2.91252e-89 | 5.37318e-87 | Specific Adrenal1_high |
| Tll1                                                                          | 19.9676 | 3.31493 | 1.05296e-88 | 1.93153e-86 | Specific Adrenal1_high |
| Fgf1                                                                          | 19.931  | 1.983   | 2.18933e-88 | 3.99337e-86 | Specific Adrenal1_high |
| Grb10                                                                         | 19.9133 | 1.23197 | 3.12158e-88 | 5.66181e-86 | Specific Adrenal1_high |
| Mpz1                                                                          | 19.8793 | 1.31356 | 6.15043e-88 | 1.10931e-85 | Specific Adrenal1_high |
| Nfat5                                                                         | 19.7281 | 1.03919 | 1.23801e-86 | 2.19611e-84 | Specific Adrenal1_high |
| Ly6a                                                                          | 19.642  | 1.55409 | 6.77018e-86 | 1.1944e-83  | Specific Adrenal1_high |
| Deptor                                                                        | 19.6159 | 2.54249 | 1.13073e-85 | 1.97327e-83 | Specific Adrenal1_high |
| Trim30a                                                                       | 19.561  | 1.15452 | 3.32761e-85 | 5.7759e-83  | Specific Adrenal1_high |
| Spred1                                                                        | 19.5552 | 1.20778 | 3.7224e-85  | 6.42661e-83 | Specific Adrenal1_high |
| Sipa1l2                                                                       | 19.5218 | 1.72519 | 7.17048e-85 | 1.23138e-82 | Specific Adrenal1_high |
| Asap2                                                                         | 19.517  | 1.41975 | 7.87643e-85 | 1.34545e-82 | Specific Adrenal1_high |
| Eva1b                                                                         | 19.5092 | 1.0948  | 9.17414e-85 | 1.55888e-82 | Specific Adrenal1_high |
| Sox4                                                                          | 19.423  | 1.40971 | 4.93764e-84 | 8.21709e-82 | Specific Adrenal1_high |
| Fstl1                                                                         | 19.3274 | 1.99888 | 3.15975e-83 | 5.23142e-81 | Specific Adrenal1_high |
| Clic5                                                                         | 19.3265 | 1.27171 | 3.21587e-83 | 5.29717e-81 | Specific Adrenal1_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                        |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|------------------------|
| Cldn15                                                                        | 19.2972 | 2.55329 | 5.66432e-83 | 9.28287e-81 | Specific Adrenal1_high |
| Icam2                                                                         | 19.2823 | 1.04127 | 7.56424e-83 | 1.23339e-80 | Specific Adrenal1_high |
| Resf1                                                                         | 19.237  | 1.4767  | 1.81267e-82 | 2.9408e-80  | Specific Adrenal1_high |
| Lmtk3                                                                         | 19.2009 | 4.02802 | 3.63834e-82 | 5.84396e-80 | Specific Adrenal1_high |
| Cd81                                                                          | 19.0869 | 1.12986 | 3.24461e-81 | 5.18576e-79 | Specific Adrenal1_high |
| Colgalt2                                                                      | 19.0629 | 1.55434 | 5.13178e-81 | 8.16155e-79 | Specific Adrenal1_high |
| Shisa5                                                                        | 19.0355 | 1.03742 | 8.67479e-81 | 1.36617e-78 | Specific Adrenal1_high |
| Nisch                                                                         | 18.9481 | 1.09476 | 4.57658e-80 | 7.13792e-78 | Specific Adrenal1_high |
| Myo1c                                                                         | 18.9469 | 1.10087 | 4.67991e-80 | 7.26398e-78 | Specific Adrenal1_high |
| Maml3                                                                         | 18.9153 | 1.11513 | 8.5301e-80  | 1.3114e-77  | Specific Adrenal1_high |
| Tspan12                                                                       | 18.8097 | 1.10622 | 6.29043e-79 | 9.62495e-77 | Specific Adrenal1_high |
| Zbtb16                                                                        | 18.7883 | 3.2245  | 9.41283e-79 | 1.43346e-76 | Specific Adrenal1_high |
| Tspo                                                                          | 18.7591 | 1.05724 | 1.63246e-78 | 2.47437e-76 | Specific Adrenal1_high |
| Plscr2                                                                        | 18.7288 | 1.13984 | 2.88303e-78 | 4.32924e-76 | Specific Adrenal1_high |
| Emp1                                                                          | 18.7221 | 1.83827 | 3.27138e-78 | 4.86711e-76 | Specific Adrenal1_high |
| Rai14                                                                         | 18.7115 | 1.23117 | 3.98928e-78 | 5.90797e-76 | Specific Adrenal1_high |
| Abcg2                                                                         | 18.4638 | 1.04302 | 4.03578e-76 | 5.84284e-74 | Specific Adrenal1_high |
| Efna1                                                                         | 18.3473 | 1.16076 | 3.46927e-75 | 4.97802e-73 | Specific Adrenal1_high |
| Grrp1                                                                         | 18.3458 | 1.44504 | 3.56825e-75 | 5.09738e-73 | Specific Adrenal1_high |
| Arhgef3                                                                       | 18.3412 | 1.02075 | 3.88159e-75 | 5.52058e-73 | Specific Adrenal1_high |
| Ppfbp1                                                                        | 18.2176 | 1.06076 | 3.74188e-74 | 5.2754e-72  | Specific Adrenal1_high |
| Col4a3                                                                        | 18.2021 | 2.25828 | 4.9623e-74  | 6.96556e-72 | Specific Adrenal1_high |
| Pde8a                                                                         | 18.2006 | 1.17859 | 5.10324e-74 | 7.13239e-72 | Specific Adrenal1_high |
| Oasl2                                                                         | 18.15   | 1.50411 | 1.28402e-73 | 1.77916e-71 | Specific Adrenal1_high |
| Emid1                                                                         | 17.778  | 2.30443 | 1.04613e-70 | 1.41315e-68 | Specific Adrenal1_high |
| Ctnna3                                                                        | 17.7702 | 2.25144 | 1.20247e-70 | 1.61758e-68 | Specific Adrenal1_high |
| Mapt                                                                          | 17.7182 | 2.26776 | 3.03296e-70 | 4.06303e-68 | Specific Adrenal1_high |
| Ccrl2                                                                         | 17.6511 | 1.71477 | 9.9714e-70  | 1.3248e-67  | Specific Adrenal1_high |
| Cyba                                                                          | 17.635  | 1.03775 | 1.32584e-69 | 1.75429e-67 | Specific Adrenal1_high |
| Egr1                                                                          | 17.5816 | 2.17946 | 3.40664e-69 | 4.48911e-67 | Specific Adrenal1_high |
| Plat                                                                          | 17.5011 | 1.64587 | 1.4063e-68  | 1.8234e-66  | Specific Adrenal1_high |
| Lrg1                                                                          | 17.4731 | 2.42546 | 2.29836e-68 | 2.95628e-66 | Specific Adrenal1_high |
| Pip4k2a                                                                       | 17.4102 | 1.00288 | 6.90046e-68 | 8.84052e-66 | Specific Adrenal1_high |
| Upp1                                                                          | 17.0551 | 1.39946 | 3.20604e-65 | 3.99641e-63 | Specific Adrenal1_high |
| Ano6                                                                          | 17.0337 | 1.33709 | 4.61833e-65 | 5.71275e-63 | Specific Adrenal1_high |
| Tbxas1                                                                        | 17.0286 | 2.78223 | 5.04055e-65 | 6.21123e-63 | Specific Adrenal1_high |
| Map1b                                                                         | 17.0113 | 1.62169 | 6.77437e-65 | 8.31598e-63 | Specific Adrenal1_high |
| Psmb8                                                                         | 16.9796 | 1.01008 | 1.16242e-64 | 1.41618e-62 | Specific Adrenal1_high |
| Bach2                                                                         | 16.9251 | 1.47054 | 2.93974e-64 | 3.50673e-62 | Specific Adrenal1_high |
| Slfn2                                                                         | 16.925  | 1.96439 | 2.94354e-64 | 3.50673e-62 | Specific Adrenal1_high |
| Map3k5                                                                        | 16.907  | 1.73964 | 3.99702e-64 | 4.74425e-62 | Specific Adrenal1_high |
| Sh2d3c                                                                        | 16.9063 | 1.14004 | 4.04601e-64 | 4.78481e-62 | Specific Adrenal1_high |
| Aplnr                                                                         | 16.6358 | 1.35846 | 3.83745e-62 | 4.45655e-60 | Specific Adrenal1_high |
| Rflnb                                                                         | 16.5974 | 1.0677  | 7.27328e-62 | 8.41641e-60 | Specific Adrenal1_high |
| Jam3                                                                          | 16.5663 | 1.06757 | 1.22075e-61 | 1.39759e-59 | Specific Adrenal1_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                        |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|------------------------|
| Plaur                                                                         | 16.5576 | 2.32241 | 1.41028e-61 | 1.60886e-59 | Specific Adrenal1_high |
| Cmpk2                                                                         | 16.5288 | 1.73417 | 2.27782e-61 | 2.58941e-59 | Specific Adrenal1_high |
| Mxra8                                                                         | 16.527  | 1.54104 | 2.3454e-61  | 2.64759e-59 | Specific Adrenal1_high |
| Pnp                                                                           | 16.5238 | 1.14308 | 2.47118e-61 | 2.77522e-59 | Specific Adrenal1_high |
| Ier2                                                                          | 16.4956 | 1.28869 | 3.94923e-61 | 4.4118e-59  | Specific Adrenal1_high |
| Thrb                                                                          | 16.4576 | 3.22503 | 7.39913e-61 | 8.20896e-59 | Specific Adrenal1_high |
| Enpep                                                                         | 16.3485 | 1.13562 | 4.45638e-60 | 4.91039e-58 | Specific Adrenal1_high |
| Saraf                                                                         | 16.3218 | 1.0851  | 6.9022e-60  | 7.55381e-58 | Specific Adrenal1_high |
| Helz2                                                                         | 16.314  | 1.59986 | 7.84851e-60 | 8.56045e-58 | Specific Adrenal1_high |
| Nectin2                                                                       | 16.2721 | 1.24837 | 1.55704e-59 | 1.69255e-57 | Specific Adrenal1_high |
| Tbl1xr1                                                                       | 16.2267 | 1.53303 | 3.26464e-59 | 3.5133e-57  | Specific Adrenal1_high |
| Kif13a                                                                        | 16.1829 | 1.12307 | 6.66223e-59 | 7.14585e-57 | Specific Adrenal1_high |
| Nid2                                                                          | 16.1657 | 1.96337 | 8.80552e-59 | 9.38238e-57 | Specific Adrenal1_high |
| 4833403J16Rik                                                                 | 16.1234 | 1.90174 | 1.74654e-58 | 1.85484e-56 | Specific Adrenal1_high |
| Tnfrsf11a                                                                     | 15.9974 | 2.9178  | 1.33304e-57 | 1.39731e-55 | Specific Adrenal1_high |
| Arap2                                                                         | 15.9592 | 1.12287 | 2.45818e-57 | 2.56007e-55 | Specific Adrenal1_high |
| Irf7                                                                          | 15.9589 | 1.51153 | 2.4702e-57  | 2.56433e-55 | Specific Adrenal1_high |
| Il33                                                                          | 15.83   | 2.91699 | 1.93325e-56 | 1.96893e-54 | Specific Adrenal1_high |
| Gimap8                                                                        | 15.7958 | 1.04941 | 3.3262e-56  | 3.35583e-54 | Specific Adrenal1_high |
| Stk10                                                                         | 15.7521 | 1.45523 | 6.64068e-56 | 6.61711e-54 | Specific Adrenal1_high |
| Ccnd3                                                                         | 15.7269 | 1.21313 | 9.89741e-56 | 9.83194e-54 | Specific Adrenal1_high |
| Emp3                                                                          | 15.6189 | 1.64544 | 5.4088e-55  | 5.25974e-53 | Specific Adrenal1_high |
| Ncoa7                                                                         | 15.5839 | 1.09341 | 9.37085e-55 | 9.05802e-53 | Specific Adrenal1_high |
| Grasp                                                                         | 15.5127 | 1.02309 | 2.8489e-54  | 2.7374e-52  | Specific Adrenal1_high |
| Gcnt2                                                                         | 15.5123 | 1.5844  | 2.86366e-54 | 2.74342e-52 | Specific Adrenal1_high |
| Bcl2l1                                                                        | 15.4562 | 1.07112 | 6.85635e-54 | 6.5105e-52  | Specific Adrenal1_high |
| 2410006H16Rik                                                                 | 15.4497 | 1.54209 | 7.58279e-54 | 7.17919e-52 | Specific Adrenal1_high |
| Prex1                                                                         | 15.4128 | 1.39243 | 1.34346e-53 | 1.26454e-51 | Specific Adrenal1_high |
| Brd2                                                                          | 15.3385 | 1.02378 | 4.23143e-53 | 3.92562e-51 | Specific Adrenal1_high |
| Slco3a1                                                                       | 15.2841 | 1.04754 | 9.76616e-53 | 8.98292e-51 | Specific Adrenal1_high |
| Ifit3                                                                         | 15.2472 | 1.67293 | 1.7185e-52  | 1.57619e-50 | Specific Adrenal1_high |
| Sema7a                                                                        | 15.2193 | 1.21882 | 2.63415e-52 | 2.38886e-50 | Specific Adrenal1_high |
| Hapln1                                                                        | 15.2078 | 3.64809 | 3.13936e-52 | 2.83906e-50 | Specific Adrenal1_high |
| Thsd7a                                                                        | 15.161  | 2.4197  | 6.40433e-52 | 5.75944e-50 | Specific Adrenal1_high |
| Herc6                                                                         | 15.1122 | 1.17233 | 1.34498e-51 | 1.19293e-49 | Specific Adrenal1_high |
| Sult2b1                                                                       | 15.0072 | 4.49058 | 6.58824e-51 | 5.74868e-49 | Specific Adrenal1_high |
| Bik                                                                           | 14.8715 | 1.12767 | 5.04605e-50 | 4.33276e-48 | Specific Adrenal1_high |
| Tusc3                                                                         | 14.8687 | 1.2715  | 5.26169e-50 | 4.50594e-48 | Specific Adrenal1_high |
| Isg15                                                                         | 14.8036 | 1.32631 | 1.38862e-49 | 1.16749e-47 | Specific Adrenal1_high |
| Plgrkt                                                                        | 14.7394 | 1.18084 | 3.59881e-49 | 2.98683e-47 | Specific Adrenal1_high |
| Smad5                                                                         | 14.7288 | 1.26271 | 4.20896e-49 | 3.48427e-47 | Specific Adrenal1_high |
| Notch4                                                                        | 14.683  | 1.10985 | 8.28458e-49 | 6.80579e-47 | Specific Adrenal1_high |
| Btg2                                                                          | 14.6427 | 1.17434 | 1.49889e-48 | 1.21894e-46 | Specific Adrenal1_high |
| Wdfy1                                                                         | 14.6208 | 1.24091 | 2.06934e-48 | 1.67441e-46 | Specific Adrenal1_high |
| Fam110a                                                                       | 14.5612 | 1.97143 | 4.9584e-48  | 4.00205e-46 | Specific Adrenal1_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                        |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|------------------------|
| Cebpb                                                                         | 14.4325 | 1.94521 | 3.23109e-47 | 2.56304e-45 | Specific Adrenal1_high |
| Dchs1                                                                         | 14.3417 | 1.39388 | 1.20006e-46 | 9.44971e-45 | Specific Adrenal1_high |
| Tm6sf1                                                                        | 14.2996 | 1.55373 | 2.19907e-46 | 1.71906e-44 | Specific Adrenal1_high |
| Zdhhc14                                                                       | 14.206  | 1.21434 | 8.40664e-46 | 6.49302e-44 | Specific Adrenal1_high |
| Itrip                                                                         | 14.1512 | 2.19507 | 1.83561e-45 | 1.40101e-43 | Specific Adrenal1_high |
| Hoxa7                                                                         | 14.1243 | 2.63558 | 2.68928e-45 | 2.03811e-43 | Specific Adrenal1_high |
| Trafd1                                                                        | 14.1001 | 1.24067 | 3.79062e-45 | 2.83945e-43 | Specific Adrenal1_high |
| Pola2                                                                         | 14.0936 | 1.40257 | 4.16016e-45 | 3.10904e-43 | Specific Adrenal1_high |
| BC052040                                                                      | 14.0877 | 1.82513 | 4.52074e-45 | 3.37072e-43 | Specific Adrenal1_high |
| Car7                                                                          | 14.0552 | 2.42396 | 7.15828e-45 | 5.31276e-43 | Specific Adrenal1_high |
| Endod1                                                                        | 14.0524 | 1.22296 | 7.45008e-45 | 5.51665e-43 | Specific Adrenal1_high |
| Caskin2                                                                       | 14.0285 | 1.04756 | 1.04372e-44 | 7.67573e-43 | Specific Adrenal1_high |
| Arhgap27                                                                      | 14.0105 | 1.49094 | 1.34443e-44 | 9.81447e-43 | Specific Adrenal1_high |
| Ptpn1                                                                         | 14.0006 | 1.15807 | 1.54525e-44 | 1.12361e-42 | Specific Adrenal1_high |
| Gda                                                                           | 13.9884 | 1.78409 | 1.83401e-44 | 1.3276e-42  | Specific Adrenal1_high |
| Inpp5k                                                                        | 13.9769 | 1.17821 | 2.15555e-44 | 1.55687e-42 | Specific Adrenal1_high |
| Dll4                                                                          | 13.943  | 1.02045 | 3.47011e-44 | 2.49516e-42 | Specific Adrenal1_high |
| Rbfox3                                                                        | 13.9427 | 2.75893 | 3.48655e-44 | 2.50141e-42 | Specific Adrenal1_high |
| Tnxb                                                                          | 13.806  | 3.18547 | 2.34432e-43 | 1.65254e-41 | Specific Adrenal1_high |
| Rflna                                                                         | 13.7859 | 2.45936 | 3.09799e-43 | 2.17905e-41 | Specific Adrenal1_high |
| Phlda1                                                                        | 13.7761 | 2.31376 | 3.55073e-43 | 2.48667e-41 | Specific Adrenal1_high |
| Gm35533                                                                       | 13.7586 | 2.14977 | 4.51937e-43 | 3.15136e-41 | Specific Adrenal1_high |
| Cdc42ep4                                                                      | 13.747  | 1.49501 | 5.30695e-43 | 3.68462e-41 | Specific Adrenal1_high |
| Sema4c                                                                        | 13.5529 | 1.21808 | 7.61455e-42 | 5.10033e-40 | Specific Adrenal1_high |
| Smtn                                                                          | 13.5286 | 1.06897 | 1.06027e-41 | 7.05791e-40 | Specific Adrenal1_high |
| Cirbp                                                                         | 13.517  | 1.34605 | 1.24192e-41 | 8.21626e-40 | Specific Adrenal1_high |
| Gjc1                                                                          | 13.3786 | 1.17905 | 8.06363e-41 | 5.18632e-39 | Specific Adrenal1_high |
| Fcer1g                                                                        | 13.286  | 1.61219 | 2.79134e-40 | 1.781e-38   | Specific Adrenal1_high |
| Gimap9                                                                        | 13.2485 | 1.27784 | 4.60485e-40 | 2.92077e-38 | Specific Adrenal1_high |
| Sema3g                                                                        | 13.2482 | 1.87244 | 4.62324e-40 | 2.92669e-38 | Specific Adrenal1_high |
| Lamb2                                                                         | 13.2154 | 1.0019  | 7.1483e-40  | 4.49869e-38 | Specific Adrenal1_high |
| Csf1                                                                          | 13.152  | 1.23494 | 1.65642e-39 | 1.02251e-37 | Specific Adrenal1_high |
| Nin                                                                           | 13.0554 | 1.04077 | 5.91828e-39 | 3.58483e-37 | Specific Adrenal1_high |
| Man1c1                                                                        | 13.0351 | 1.00582 | 7.7314e-39  | 4.63956e-37 | Specific Adrenal1_high |
| Smad3                                                                         | 13.0188 | 1.29518 | 9.56249e-39 | 5.71713e-37 | Specific Adrenal1_high |
| Spry1                                                                         | 12.9967 | 1.34747 | 1.27701e-38 | 7.60672e-37 | Specific Adrenal1_high |
| Calml4                                                                        | 12.9153 | 1.47241 | 3.68847e-38 | 2.17549e-36 | Specific Adrenal1_high |
| Galnt10                                                                       | 12.9153 | 1.11299 | 3.69264e-38 | 2.17549e-36 | Specific Adrenal1_high |
| Anxa6                                                                         | 12.9084 | 1.56172 | 4.03676e-38 | 2.35679e-36 | Specific Adrenal1_high |
| Ripor2                                                                        | 12.8047 | 1.75731 | 1.54271e-37 | 8.86236e-36 | Specific Adrenal1_high |
| Hoxb7                                                                         | 12.6571 | 2.81099 | 1.02138e-36 | 5.75483e-35 | Specific Adrenal1_high |
| Mylk                                                                          | 12.5943 | 1.93313 | 2.27034e-36 | 1.26594e-34 | Specific Adrenal1_high |
| Hbegf                                                                         | 12.3862 | 1.11736 | 3.10539e-35 | 1.67096e-33 | Specific Adrenal1_high |
| Col4a4                                                                        | 12.2864 | 2.29538 | 1.07166e-34 | 5.62577e-33 | Specific Adrenal1_high |
| Lbp                                                                           | 12.2174 | 1.16125 | 2.51073e-34 | 1.29902e-32 | Specific Adrenal1_high |



| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                        |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|------------------------|
| Chchd10                                                                       | 12.1877 | 1.98141 | 3.61379e-34 | 1.85782e-32 | Specific Adrenal1_high |
| Ifit1                                                                         | 12.1746 | 1.49191 | 4.24406e-34 | 2.17491e-32 | Specific Adrenal1_high |
| Lrpap1                                                                        | 12.1654 | 1.04041 | 4.75036e-34 | 2.43051e-32 | Specific Adrenal1_high |
| Ninj1                                                                         | 12.0579 | 1.17424 | 1.76333e-33 | 8.85369e-32 | Specific Adrenal1_high |
| Mark4                                                                         | 11.9263 | 1.01922 | 8.63145e-33 | 4.2415e-31  | Specific Adrenal1_high |
| Palb1                                                                         | 11.9008 | 1.32759 | 1.17283e-32 | 5.72843e-31 | Specific Adrenal1_high |
| Maco1                                                                         | 11.8897 | 1.07913 | 1.33897e-32 | 6.52014e-31 | Specific Adrenal1_high |
| Nup210                                                                        | 11.87   | 3.94521 | 1.69378e-32 | 8.18618e-31 | Specific Adrenal1_high |
| Mknk2                                                                         | 11.8574 | 1.03063 | 1.97122e-32 | 9.49864e-31 | Specific Adrenal1_high |
| Kcnj8                                                                         | 11.8497 | 2.76269 | 2.15897e-32 | 1.03569e-30 | Specific Adrenal1_high |
| Ncor2                                                                         | 11.8148 | 1.30415 | 3.27177e-32 | 1.56488e-30 | Specific Adrenal1_high |
| Flrt3                                                                         | 11.7972 | 3.69107 | 4.03508e-32 | 1.92426e-30 | Specific Adrenal1_high |
| Dkk2                                                                          | 11.7884 | 1.8029  | 4.47741e-32 | 2.12891e-30 | Specific Adrenal1_high |
| Anapc16                                                                       | 11.7768 | 1.09312 | 5.13805e-32 | 2.43586e-30 | Specific Adrenal1_high |
| Phf11d                                                                        | 11.7562 | 1.11583 | 6.56557e-32 | 3.09897e-30 | Specific Adrenal1_high |
| Plekha5                                                                       | 11.5792 | 1.1961  | 5.2563e-31  | 2.39351e-29 | Specific Adrenal1_high |
| Gm30382                                                                       | 11.5413 | 2.36831 | 8.16652e-31 | 3.69784e-29 | Specific Adrenal1_high |
| Acyp2                                                                         | 11.5113 | 1.06728 | 1.15715e-30 | 5.19592e-29 | Specific Adrenal1_high |
| Gchfr                                                                         | 11.4208 | 1.29107 | 3.29261e-30 | 1.44236e-28 | Specific Adrenal1_high |
| Agrrn                                                                         | 11.4095 | 1.09944 | 3.74814e-30 | 1.63525e-28 | Specific Adrenal1_high |
| Lurap1l                                                                       | 11.3931 | 1.44037 | 4.52754e-30 | 1.96204e-28 | Specific Adrenal1_high |
| Nceh1                                                                         | 11.3889 | 1.26086 | 4.75142e-30 | 2.05354e-28 | Specific Adrenal1_high |
| Ppm1l                                                                         | 11.19   | 1.84619 | 4.56505e-29 | 1.8751e-27  | Specific Adrenal1_high |
| Litaf                                                                         | 11.1371 | 1.14488 | 8.27729e-29 | 3.37841e-27 | Specific Adrenal1_high |
| Hoxb6                                                                         | 11.0594 | 2.53579 | 1.97432e-28 | 8.01772e-27 | Specific Adrenal1_high |
| Mal                                                                           | 11.054  | 1.37965 | 2.09748e-28 | 8.47387e-27 | Specific Adrenal1_high |
| Junos                                                                         | 10.9809 | 1.64517 | 4.72183e-28 | 1.85456e-26 | Specific Adrenal1_high |
| Rph3al                                                                        | 10.9624 | 1.87976 | 5.79416e-28 | 2.26197e-26 | Specific Adrenal1_high |
| N4bp3                                                                         | 10.948  | 1.42517 | 6.79548e-28 | 2.64647e-26 | Specific Adrenal1_high |
| Mfng                                                                          | 10.9323 | 1.10673 | 8.0808e-28  | 3.12816e-26 | Specific Adrenal1_high |
| Xylt1                                                                         | 10.8964 | 1.69601 | 1.19935e-27 | 4.58235e-26 | Specific Adrenal1_high |
| Arhgef26                                                                      | 10.862  | 2.38192 | 1.749e-27   | 6.612e-26   | Specific Adrenal1_high |
| Tle3                                                                          | 10.8289 | 1.3959  | 2.51106e-27 | 9.44867e-26 | Specific Adrenal1_high |
| Unc5b                                                                         | 10.8029 | 1.35915 | 3.3339e-27  | 1.24722e-25 | Specific Adrenal1_high |
| Bambi                                                                         | 10.7754 | 1.1718  | 4.49805e-27 | 1.67111e-25 | Specific Adrenal1_high |
| Ppm1e                                                                         | 10.6718 | 1.72771 | 1.37956e-26 | 5.03268e-25 | Specific Adrenal1_high |
| Crispld1                                                                      | 10.6696 | 1.68464 | 1.41184e-26 | 5.13881e-25 | Specific Adrenal1_high |
| Lrrc8b                                                                        | 10.6691 | 1.26545 | 1.41996e-26 | 5.16256e-25 | Specific Adrenal1_high |
| Tspan3                                                                        | 10.554  | 1.16665 | 4.86636e-26 | 1.7322e-24  | Specific Adrenal1_high |
| Stom                                                                          | 10.5215 | 1.09653 | 6.87945e-26 | 2.43801e-24 | Specific Adrenal1_high |
| Rassf9                                                                        | 10.4867 | 1.12754 | 9.94136e-26 | 3.51156e-24 | Specific Adrenal1_high |
| Synpo                                                                         | 10.4307 | 1.46614 | 1.79614e-25 | 6.24876e-24 | Specific Adrenal1_high |
| Galnt15                                                                       | 10.417  | 1.05171 | 2.07367e-25 | 7.1833e-24  | Specific Adrenal1_high |
| Gpx8                                                                          | 10.414  | 1.50022 | 2.14052e-25 | 7.40695e-24 | Specific Adrenal1_high |
| Ifi213                                                                        | 10.3886 | 2.08327 | 2.7943e-25  | 9.60746e-24 | Specific Adrenal1_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                        |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|------------------------|
| Cplane1                                                                       | 10.2005 | 1.07549 | 1.97162e-24 | 6.52858e-23 | Specific Adrenal1_high |
| Ifi206                                                                        | 10.16   | 2.53515 | 2.99158e-24 | 9.80539e-23 | Specific Adrenal1_high |
| C430049B03Rik                                                                 | 10.1208 | 1.3501  | 4.46875e-24 | 1.43842e-22 | Specific Adrenal1_high |
| Cmklr1                                                                        | 10.1173 | 3.75961 | 4.63236e-24 | 1.48812e-22 | Specific Adrenal1_high |
| Rftn2                                                                         | 10.1038 | 1.6783  | 5.3113e-24  | 1.69946e-22 | Specific Adrenal1_high |
| Arl3                                                                          | 10.1037 | 1.00687 | 5.32193e-24 | 1.70117e-22 | Specific Adrenal1_high |
| Tap1                                                                          | 10.0988 | 1.06874 | 5.59285e-24 | 1.78424e-22 | Specific Adrenal1_high |
| Sulf2                                                                         | 10.0971 | 2.66597 | 5.6889e-24  | 1.81309e-22 | Specific Adrenal1_high |
| Nck2                                                                          | 10.0838 | 1.31381 | 6.51229e-24 | 2.07142e-22 | Specific Adrenal1_high |
| 9530082P21Rik                                                                 | 10.0466 | 1.08151 | 9.50423e-24 | 3.00827e-22 | Specific Adrenal1_high |
| Neo1                                                                          | 10.0153 | 1.60124 | 1.30601e-23 | 4.09762e-22 | Specific Adrenal1_high |
| Nuak1                                                                         | 9.99589 | 1.21777 | 1.58854e-23 | 4.94084e-22 | Specific Adrenal1_high |
| Itgav                                                                         | 9.99407 | 1.1498  | 1.61803e-23 | 5.02772e-22 | Specific Adrenal1_high |
| H2-Ab1                                                                        | 9.96682 | 2.60886 | 2.1293e-23  | 6.5784e-22  | Specific Adrenal1_high |
| Amn1                                                                          | 9.93052 | 1.41466 | 3.06646e-23 | 9.42862e-22 | Specific Adrenal1_high |
| Jkamp                                                                         | 9.92641 | 1.16507 | 3.19538e-23 | 9.8157e-22  | Specific Adrenal1_high |
| Gm6213                                                                        | 9.91778 | 2.87711 | 3.48433e-23 | 1.06627e-21 | Specific Adrenal1_high |
| Tes                                                                           | 9.8732  | 1.71261 | 5.44008e-23 | 1.65535e-21 | Specific Adrenal1_high |
| Rps6ka5                                                                       | 9.85618 | 1.435   | 6.44563e-23 | 1.95213e-21 | Specific Adrenal1_high |
| Stard13                                                                       | 9.85288 | 1.09499 | 6.66066e-23 | 2.01159e-21 | Specific Adrenal1_high |
| Zfas1                                                                         | 9.84313 | 1.22023 | 7.33933e-23 | 2.21242e-21 | Specific Adrenal1_high |
| Slfn3                                                                         | 9.82779 | 1.71386 | 8.5477e-23  | 2.57188e-21 | Specific Adrenal1_high |
| Mmp28                                                                         | 9.7996  | 1.79677 | 1.13037e-22 | 3.38534e-21 | Specific Adrenal1_high |
| Trerf1                                                                        | 9.79495 | 1.0261  | 1.18356e-22 | 3.53807e-21 | Specific Adrenal1_high |
| Atp9a                                                                         | 9.79461 | 1.0822  | 1.18758e-22 | 3.54681e-21 | Specific Adrenal1_high |
| Procr                                                                         | 9.75484 | 1.78781 | 1.75877e-22 | 5.19981e-21 | Specific Adrenal1_high |
| Extl3                                                                         | 9.67429 | 1.18469 | 3.87777e-22 | 1.12686e-20 | Specific Adrenal1_high |
| Zc3h12c                                                                       | 9.62973 | 1.27555 | 5.989e-22   | 1.72638e-20 | Specific Adrenal1_high |
| Gfod2                                                                         | 9.599   | 1.03334 | 8.07249e-22 | 2.31046e-20 | Specific Adrenal1_high |
| Churc1                                                                        | 9.58908 | 1.2349  | 8.88728e-22 | 2.53391e-20 | Specific Adrenal1_high |
| Dusp16                                                                        | 9.5849  | 1.05838 | 9.25491e-22 | 2.63487e-20 | Specific Adrenal1_high |
| Lpar4                                                                         | 9.52733 | 1.45786 | 1.61379e-21 | 4.54634e-20 | Specific Adrenal1_high |
| Prdm5                                                                         | 9.51344 | 2.37583 | 1.84465e-21 | 5.18767e-20 | Specific Adrenal1_high |
| Cdk6                                                                          | 9.42355 | 1.42624 | 4.36108e-21 | 1.19624e-19 | Specific Adrenal1_high |
| Prdm1                                                                         | 9.36463 | 1.04771 | 7.63137e-21 | 2.07564e-19 | Specific Adrenal1_high |
| Crlf2                                                                         | 9.35125 | 1.01085 | 8.66206e-21 | 2.34609e-19 | Specific Adrenal1_high |
| Pik3ip1                                                                       | 9.31433 | 2.0693  | 1.2273e-20  | 3.30471e-19 | Specific Adrenal1_high |
| Ifit3b                                                                        | 9.30722 | 1.5866  | 1.31222e-20 | 3.5216e-19  | Specific Adrenal1_high |
| Tead2                                                                         | 9.19307 | 1.36182 | 3.81782e-20 | 9.97236e-19 | Specific Adrenal1_high |
| Spryd3                                                                        | 9.19272 | 1.06046 | 3.8302e-20  | 9.99661e-19 | Specific Adrenal1_high |
| Cyth2                                                                         | 9.19178 | 1.06031 | 3.86406e-20 | 1.00768e-18 | Specific Adrenal1_high |
| Neur11b                                                                       | 9.17824 | 1.8728  | 4.38188e-20 | 1.13813e-18 | Specific Adrenal1_high |
| 4930599N23Rik                                                                 | 9.13126 | 1.46307 | 6.77059e-20 | 1.74731e-18 | Specific Adrenal1_high |
| Itgb3                                                                         | 9.12713 | 1.94156 | 7.03379e-20 | 1.81089e-18 | Specific Adrenal1_high |
| Icam1                                                                         | 9.10438 | 1.01857 | 8.67592e-20 | 2.22657e-18 | Specific Adrenal1_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                        |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|------------------------|
| Slc12a2                                                                       | 9.10275 | 1.16182 | 8.80733e-20 | 2.25849e-18 | Specific Adrenal1_high |
| Cd1d1                                                                         | 9.0499  | 1.93789 | 1.431e-19   | 3.62921e-18 | Specific Adrenal1_high |
| Hint3                                                                         | 9.02641 | 1.06318 | 1.77397e-19 | 4.48144e-18 | Specific Adrenal1_high |
| Gm47405                                                                       | 8.96221 | 2.89708 | 3.18248e-19 | 7.93409e-18 | Specific Adrenal1_high |
| Etfbkmt                                                                       | 8.95739 | 2.30709 | 3.32451e-19 | 8.26902e-18 | Specific Adrenal1_high |
| E130307A14Rik                                                                 | 8.91524 | 1.08528 | 4.86756e-19 | 1.20606e-17 | Specific Adrenal1_high |
| Igf1                                                                          | 8.88775 | 1.87168 | 6.23574e-19 | 1.53329e-17 | Specific Adrenal1_high |
| Sema6b                                                                        | 8.79897 | 1.10137 | 1.38077e-18 | 3.33419e-17 | Specific Adrenal1_high |
| Rtp3                                                                          | 8.79169 | 1.604   | 1.47332e-18 | 3.55236e-17 | Specific Adrenal1_high |
| Crnde                                                                         | 8.7676  | 2.45751 | 1.8251e-18  | 4.38418e-17 | Specific Adrenal1_high |
| Bmyc                                                                          | 8.72653 | 1.36825 | 2.62605e-18 | 6.23396e-17 | Specific Adrenal1_high |
| Gtf2ird1                                                                      | 8.71833 | 1.14119 | 2.82329e-18 | 6.69728e-17 | Specific Adrenal1_high |
| Nsg1                                                                          | 8.61281 | 1.5194  | 7.12904e-18 | 1.65465e-16 | Specific Adrenal1_high |
| Pf4                                                                           | 8.59929 | 1.94733 | 8.02127e-18 | 1.85506e-16 | Specific Adrenal1_high |
| Igf2bp2                                                                       | 8.56486 | 2.67097 | 1.0821e-17  | 2.48122e-16 | Specific Adrenal1_high |
| Epha2                                                                         | 8.56466 | 1.31774 | 1.08394e-17 | 2.48368e-16 | Specific Adrenal1_high |
| Arhgef40                                                                      | 8.51015 | 1.05901 | 1.73706e-17 | 3.93827e-16 | Specific Adrenal1_high |
| Gm4876                                                                        | 8.48351 | 1.83582 | 2.18498e-17 | 4.92955e-16 | Specific Adrenal1_high |
| Ddit4                                                                         | 8.46349 | 1.4519  | 2.59488e-17 | 5.81372e-16 | Specific Adrenal1_high |
| Snai2                                                                         | 8.45966 | 1.24163 | 2.68165e-17 | 6.00397e-16 | Specific Adrenal1_high |
| Ccnjl                                                                         | 8.43978 | 1.07569 | 3.17939e-17 | 7.07419e-16 | Specific Adrenal1_high |
| Bex3                                                                          | 8.3124  | 1.03262 | 9.37861e-17 | 2.02805e-15 | Specific Adrenal1_high |
| Idh2                                                                          | 8.15884 | 1.02106 | 3.3825e-16  | 7.09578e-15 | Specific Adrenal1_high |
| Zbp1                                                                          | 8.12352 | 2.47807 | 4.52854e-16 | 9.42642e-15 | Specific Adrenal1_high |
| Atg101                                                                        | 8.10922 | 1.06925 | 5.09465e-16 | 1.05775e-14 | Specific Adrenal1_high |
| Ammecr1                                                                       | 8.09932 | 1.15837 | 5.5266e-16  | 1.14449e-14 | Specific Adrenal1_high |
| Egln3                                                                         | 8.05446 | 2.85186 | 7.98279e-16 | 1.64051e-14 | Specific Adrenal1_high |
| Enho                                                                          | 8.0419  | 1.12226 | 8.84541e-16 | 1.80629e-14 | Specific Adrenal1_high |
| Hgsnat                                                                        | 7.95687 | 1.11083 | 1.76447e-15 | 3.54929e-14 | Specific Adrenal1_high |
| Dgka                                                                          | 7.94154 | 1.06216 | 1.99679e-15 | 3.99668e-14 | Specific Adrenal1_high |
| Micu3                                                                         | 7.9316  | 1.0217  | 2.16341e-15 | 4.32213e-14 | Specific Adrenal1_high |
| Irf8                                                                          | 7.9089  | 1.06444 | 2.59677e-15 | 5.16872e-14 | Specific Adrenal1_high |
| Tmem120b                                                                      | 7.88232 | 1.31937 | 3.21348e-15 | 6.36097e-14 | Specific Adrenal1_high |
| Ccser1                                                                        | 7.86006 | 1.19135 | 3.83941e-15 | 7.5721e-14  | Specific Adrenal1_high |
| Cd40                                                                          | 7.8556  | 1.72632 | 3.97857e-15 | 7.82742e-14 | Specific Adrenal1_high |
| Tnfaip8l1                                                                     | 7.77225 | 1.0181  | 7.71046e-15 | 1.48972e-13 | Specific Adrenal1_high |
| Arrdc4                                                                        | 7.7595  | 1.15412 | 8.52665e-15 | 1.63956e-13 | Specific Adrenal1_high |
| Rapgef4os1                                                                    | 7.75744 | 1.17059 | 8.666e-15   | 1.66438e-13 | Specific Adrenal1_high |
| Apol9b                                                                        | 7.73231 | 2.66783 | 1.05614e-14 | 2.01284e-13 | Specific Adrenal1_high |
| Uchl1                                                                         | 7.72744 | 1.80007 | 1.09731e-14 | 2.08761e-13 | Specific Adrenal1_high |
| Rhbdl2                                                                        | 7.71788 | 1.11601 | 1.18279e-14 | 2.24495e-13 | Specific Adrenal1_high |
| Pcnx3                                                                         | 7.71564 | 1.0948  | 1.20377e-14 | 2.28341e-13 | Specific Adrenal1_high |
| Rab11fip2                                                                     | 7.68899 | 1.07127 | 1.48302e-14 | 2.80009e-13 | Specific Adrenal1_high |
| Pla2g4a                                                                       | 7.67543 | 2.86731 | 1.64869e-14 | 3.09645e-13 | Specific Adrenal1_high |
| Sema5b                                                                        | 7.65627 | 3.67846 | 1.91408e-14 | 3.57409e-13 | Specific Adrenal1_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                        |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|------------------------|
| Lanc13                                                                        | 7.61599 | 2.85795 | 2.6167e-14  | 4.84682e-13 | Specific Adrenal1_high |
| Gata6                                                                         | 7.57047 | 5.1655  | 3.71888e-14 | 6.80635e-13 | Specific Adrenal1_high |
| Snn                                                                           | 7.5144  | 1.36982 | 5.71723e-14 | 1.03639e-12 | Specific Adrenal1_high |
| Gpr137b                                                                       | 7.51362 | 1.2263  | 5.75132e-14 | 1.04198e-12 | Specific Adrenal1_high |
| Rnf122                                                                        | 7.50167 | 1.52121 | 6.30121e-14 | 1.13587e-12 | Specific Adrenal1_high |
| Adamts1                                                                       | 7.47455 | 2.75243 | 7.74705e-14 | 1.38644e-12 | Specific Adrenal1_high |
| Ahd1                                                                          | 7.47407 | 1.29472 | 7.77498e-14 | 1.39067e-12 | Specific Adrenal1_high |
| Phf11b                                                                        | 7.40306 | 1.6262  | 1.33078e-13 | 2.34392e-12 | Specific Adrenal1_high |
| Nhs                                                                           | 7.38915 | 1.27993 | 1.47766e-13 | 2.59556e-12 | Specific Adrenal1_high |
| Pts                                                                           | 7.35319 | 1.16163 | 1.93532e-13 | 3.36286e-12 | Specific Adrenal1_high |
| Stn1                                                                          | 7.32437 | 1.11866 | 2.40027e-13 | 4.13957e-12 | Specific Adrenal1_high |
| Cacna2d3                                                                      | 7.31723 | 6.02662 | 2.53141e-13 | 4.3541e-12  | Specific Adrenal1_high |
| A4galt                                                                        | 7.30792 | 1.29633 | 2.71315e-13 | 4.65184e-12 | Specific Adrenal1_high |
| Slc25a27                                                                      | 7.30395 | 1.19007 | 2.79449e-13 | 4.78621e-12 | Specific Adrenal1_high |
| Nmt2                                                                          | 7.29191 | 1.08226 | 3.05598e-13 | 5.2313e-12  | Specific Adrenal1_high |
| Serp2                                                                         | 7.28522 | 1.72537 | 3.21156e-13 | 5.48309e-12 | Specific Adrenal1_high |
| Itpr3                                                                         | 7.15985 | 1.23545 | 8.07658e-13 | 1.33514e-11 | Specific Adrenal1_high |
| Map3k14                                                                       | 7.12965 | 1.12749 | 1.00623e-12 | 1.65577e-11 | Specific Adrenal1_high |
| Sdk2                                                                          | 7.11758 | 2.59848 | 1.09839e-12 | 1.80098e-11 | Specific Adrenal1_high |
| Gm43813                                                                       | 7.07524 | 1.31774 | 1.49191e-12 | 2.41072e-11 | Specific Adrenal1_high |
| Bckdha                                                                        | 7.06376 | 1.04594 | 1.62061e-12 | 2.61086e-11 | Specific Adrenal1_high |
| Ddx41                                                                         | 7.0236  | 1.05147 | 2.16219e-12 | 3.45919e-11 | Specific Adrenal1_high |
| Ltp3                                                                          | 7.01767 | 2.34988 | 2.25594e-12 | 3.60203e-11 | Specific Adrenal1_high |
| Ifi27l2a                                                                      | 7.01396 | 1.6631  | 2.3167e-12  | 3.69356e-11 | Specific Adrenal1_high |
| Stk32c                                                                        | 6.98195 | 1.72109 | 2.91115e-12 | 4.61623e-11 | Specific Adrenal1_high |
| Oxa1l                                                                         | 6.96759 | 1.06491 | 3.22425e-12 | 5.08773e-11 | Specific Adrenal1_high |
| 3110099E03Rik                                                                 | 6.958   | 2.07927 | 3.45149e-12 | 5.41981e-11 | Specific Adrenal1_high |
| Nupr1                                                                         | 6.941   | 2.16313 | 3.89348e-12 | 6.09311e-11 | Specific Adrenal1_high |
| Pck2                                                                          | 6.90935 | 1.00653 | 4.86879e-12 | 7.55352e-11 | Specific Adrenal1_high |
| Slc25a25                                                                      | 6.87315 | 1.25549 | 6.2801e-12  | 9.65031e-11 | Specific Adrenal1_high |
| Spry7                                                                         | 6.86782 | 1.14288 | 6.51926e-12 | 1.00035e-10 | Specific Adrenal1_high |
| Gramd4                                                                        | 6.81534 | 1.66968 | 9.40409e-12 | 1.42876e-10 | Specific Adrenal1_high |
| Cecr2                                                                         | 6.73361 | 1.15476 | 1.65506e-11 | 2.46124e-10 | Specific Adrenal1_high |
| Adamts5                                                                       | 6.72534 | 1.92879 | 1.75177e-11 | 2.59549e-10 | Specific Adrenal1_high |
| Oas1a                                                                         | 6.7074  | 1.44119 | 1.98125e-11 | 2.92878e-10 | Specific Adrenal1_high |
| Elf4                                                                          | 6.68715 | 1.02401 | 2.27558e-11 | 3.35007e-10 | Specific Adrenal1_high |
| 9130017K11Rik                                                                 | 6.67869 | 1.95755 | 2.41095e-11 | 3.53967e-10 | Specific Adrenal1_high |
| Gdpd5                                                                         | 6.67762 | 1.41189 | 2.42846e-11 | 3.56376e-10 | Specific Adrenal1_high |
| Cyp7b1                                                                        | 6.67595 | 1.16326 | 2.45637e-11 | 3.59981e-10 | Specific Adrenal1_high |
| G630016G05Rik                                                                 | 6.67179 | 1.91375 | 2.52706e-11 | 3.6967e-10  | Specific Adrenal1_high |
| Cd274                                                                         | 6.6101  | 1.09157 | 3.84068e-11 | 5.54545e-10 | Specific Adrenal1_high |
| Prkag2                                                                        | 6.55625 | 1.29357 | 5.51792e-11 | 7.87212e-10 | Specific Adrenal1_high |
| 1110051M20Rik                                                                 | 6.55128 | 1.54531 | 5.70463e-11 | 8.13131e-10 | Specific Adrenal1_high |
| Mafb                                                                          | 6.54779 | 1.11827 | 5.8394e-11  | 8.31239e-10 | Specific Adrenal1_high |
| B3galnt1                                                                      | 6.50089 | 2.27619 | 7.98474e-11 | 1.11984e-09 | Specific Adrenal1_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                        |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|------------------------|
| Errf1                                                                         | 6.46464 | 1.71332 | 1.0154e-10  | 1.40636e-09 | Specific Adrenal1_high |
| Peg3                                                                          | 6.45217 | 2.63128 | 1.10262e-10 | 1.52324e-09 | Specific Adrenal1_high |
| Abcc9                                                                         | 6.43939 | 1.06725 | 1.19952e-10 | 1.65286e-09 | Specific Adrenal1_high |
| Fblim1                                                                        | 6.43499 | 2.17136 | 1.2348e-10  | 1.69929e-09 | Specific Adrenal1_high |
| Nlrc3                                                                         | 6.39506 | 1.29071 | 1.60482e-10 | 2.1843e-09  | Specific Adrenal1_high |
| Cables1                                                                       | 6.36983 | 1.47933 | 1.89237e-10 | 2.55521e-09 | Specific Adrenal1_high |
| Gimap3                                                                        | 6.36375 | 2.61776 | 1.96888e-10 | 2.65297e-09 | Specific Adrenal1_high |
| Zfp667                                                                        | 6.35783 | 1.19389 | 2.04624e-10 | 2.74918e-09 | Specific Adrenal1_high |
| Tmx4                                                                          | 6.32022 | 1.01231 | 2.61186e-10 | 3.47871e-09 | Specific Adrenal1_high |
| Sh3d21                                                                        | 6.24589 | 1.0417  | 4.2138e-10  | 5.51002e-09 | Specific Adrenal1_high |
| Hoxd8                                                                         | 6.21965 | 1.21107 | 4.98275e-10 | 6.46317e-09 | Specific Adrenal1_high |
| Adprhl2                                                                       | 6.21935 | 1.02671 | 4.99226e-10 | 6.4729e-09  | Specific Adrenal1_high |
| Cep164                                                                        | 6.21299 | 1.02972 | 5.19846e-10 | 6.72135e-09 | Specific Adrenal1_high |
| 2700033N17Rik                                                                 | 6.20713 | 1.27684 | 5.39612e-10 | 6.96856e-09 | Specific Adrenal1_high |
| Il2rg                                                                         | 6.20316 | 1.09166 | 5.53393e-10 | 7.14367e-09 | Specific Adrenal1_high |
| Msmg                                                                          | 6.16154 | 2.01281 | 7.20427e-10 | 9.19328e-09 | Specific Adrenal1_high |
| Pag1                                                                          | 6.15187 | 3.18104 | 7.65752e-10 | 9.75623e-09 | Specific Adrenal1_high |
| Mid1ip1                                                                       | 6.12723 | 1.18445 | 8.94248e-10 | 1.13263e-08 | Specific Adrenal1_high |
| Med25                                                                         | 6.11374 | 1.19552 | 9.73199e-10 | 1.22781e-08 | Specific Adrenal1_high |
| Olfr1396                                                                      | 6.10398 | 1.06425 | 1.03456e-09 | 1.30116e-08 | Specific Adrenal1_high |
| Bst1                                                                          | 6.10166 | 2.8412  | 1.04974e-09 | 1.31872e-08 | Specific Adrenal1_high |
| Gm32401                                                                       | 6.09836 | 1.41487 | 1.07162e-09 | 1.34463e-08 | Specific Adrenal1_high |
| Cd14                                                                          | 6.02476 | 2.49248 | 1.69365e-09 | 2.0862e-08  | Specific Adrenal1_high |
| Ston2                                                                         | 6.02071 | 3.27871 | 1.73655e-09 | 2.13661e-08 | Specific Adrenal1_high |
| mt-Atp8                                                                       | 5.98957 | 1.04808 | 2.10397e-09 | 2.56714e-08 | Specific Adrenal1_high |
| Scap                                                                          | 5.9398  | 1.12382 | 2.85363e-09 | 3.44538e-08 | Specific Adrenal1_high |
| Cxxc5                                                                         | 5.90326 | 1.46577 | 3.56393e-09 | 4.26769e-08 | Specific Adrenal1_high |
| Slc10a6                                                                       | 5.9032  | 2.46081 | 3.56511e-09 | 4.26769e-08 | Specific Adrenal1_high |
| Arhgef18                                                                      | 5.8669  | 1.07324 | 4.44014e-09 | 5.26828e-08 | Specific Adrenal1_high |
| Nos2                                                                          | 5.84935 | 1.68556 | 4.93492e-09 | 5.8275e-08  | Specific Adrenal1_high |
| Usp43                                                                         | 5.83987 | 1.52108 | 5.22416e-09 | 6.15106e-08 | Specific Adrenal1_high |
| Fosb                                                                          | 5.83684 | 1.74703 | 5.32002e-09 | 6.25501e-08 | Specific Adrenal1_high |
| Wdr73                                                                         | 5.82282 | 1.17816 | 5.78645e-09 | 6.78295e-08 | Specific Adrenal1_high |
| Kank4                                                                         | 5.7667  | 1.81028 | 8.08384e-09 | 9.33763e-08 | Specific Adrenal1_high |
| Cep104                                                                        | 5.7643  | 1.14885 | 8.19966e-09 | 9.4545e-08  | Specific Adrenal1_high |
| Dnajb4                                                                        | 5.75769 | 1.00583 | 8.52717e-09 | 9.81111e-08 | Specific Adrenal1_high |
| Zc3h12b                                                                       | 5.75703 | 1.9172  | 8.56075e-09 | 9.84273e-08 | Specific Adrenal1_high |
| Zfp827                                                                        | 5.73583 | 1.24461 | 9.70338e-09 | 1.11011e-07 | Specific Adrenal1_high |
| Spire1                                                                        | 5.72273 | 1.62941 | 1.04823e-08 | 1.19584e-07 | Specific Adrenal1_high |
| Tmem192                                                                       | 5.70716 | 1.04742 | 1.14877e-08 | 1.30592e-07 | Specific Adrenal1_high |
| Arrdc2                                                                        | 5.67524 | 1.59855 | 1.38497e-08 | 1.56069e-07 | Specific Adrenal1_high |
| Fkbp10                                                                        | 5.66802 | 2.12442 | 1.44459e-08 | 1.6256e-07  | Specific Adrenal1_high |
| Oasl1                                                                         | 5.60444 | 1.52524 | 2.0893e-08  | 2.32065e-07 | Specific Adrenal1_high |
| F830016B08Rik                                                                 | 5.56101 | 1.50982 | 2.68224e-08 | 2.94144e-07 | Specific Adrenal1_high |
| Add2                                                                          | 5.54419 | 4.08763 | 2.95316e-08 | 3.21778e-07 | Specific Adrenal1_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                        |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|------------------------|
| Gprc5b                                                                        | 5.52253 | 1.54804 | 3.34145e-08 | 3.62131e-07 | Specific Adrenal1_high |
| Tex14                                                                         | 5.52148 | 1.25023 | 3.36148e-08 | 3.63935e-07 | Specific Adrenal1_high |
| Rinl                                                                          | 5.50909 | 1.11792 | 3.6069e-08  | 3.88811e-07 | Specific Adrenal1_high |
| Mn1                                                                           | 5.4717  | 1.22181 | 4.45748e-08 | 4.7668e-07  | Specific Adrenal1_high |
| Nipal3                                                                        | 5.46489 | 1.02197 | 4.63191e-08 | 4.94351e-07 | Specific Adrenal1_high |
| Cdkl5                                                                         | 5.46483 | 1.56156 | 4.63362e-08 | 4.9437e-07  | Specific Adrenal1_high |
| Rhobtb3                                                                       | 5.40837 | 1.71785 | 6.36014e-08 | 6.69942e-07 | Specific Adrenal1_high |
| Pkia                                                                          | 5.31907 | 2.05015 | 1.04302e-07 | 1.06902e-06 | Specific Adrenal1_high |
| Tnfrsf11b                                                                     | 5.31781 | 4.15701 | 1.05025e-07 | 1.07574e-06 | Specific Adrenal1_high |
| Stxbp4                                                                        | 5.24137 | 1.11553 | 1.59389e-07 | 1.60208e-06 | Specific Adrenal1_high |
| Zdhhc15                                                                       | 5.2324  | 2.21521 | 1.67324e-07 | 1.6787e-06  | Specific Adrenal1_high |
| Frk                                                                           | 5.23111 | 1.3622  | 1.68496e-07 | 1.68888e-06 | Specific Adrenal1_high |
| Gm12743                                                                       | 5.22415 | 1.13853 | 1.74961e-07 | 1.74934e-06 | Specific Adrenal1_high |
| Cd74                                                                          | 5.2159  | 2.26421 | 1.82923e-07 | 1.82668e-06 | Specific Adrenal1_high |
| Gm49767                                                                       | 5.1611  | 1.32337 | 2.45509e-07 | 2.40773e-06 | Specific Adrenal1_high |
| Ring1                                                                         | 5.15083 | 1.24826 | 2.59344e-07 | 2.53648e-06 | Specific Adrenal1_high |
| 4930481A15Rik                                                                 | 5.12713 | 1.33427 | 2.94187e-07 | 2.85478e-06 | Specific Adrenal1_high |
| Smo                                                                           | 5.11327 | 1.38368 | 3.16635e-07 | 3.05334e-06 | Specific Adrenal1_high |
| Mmp11                                                                         | 5.10766 | 2.27969 | 3.26167e-07 | 3.13963e-06 | Specific Adrenal1_high |
| Ctsf                                                                          | 5.10159 | 1.30385 | 3.36818e-07 | 3.23732e-06 | Specific Adrenal1_high |
| Arhgap25                                                                      | 5.0975  | 1.13337 | 3.44176e-07 | 3.30313e-06 | Specific Adrenal1_high |
| Prdm11                                                                        | 5.09699 | 1.18034 | 3.45097e-07 | 3.31e-06    | Specific Adrenal1_high |
| Cep85                                                                         | 5.09364 | 1.50999 | 3.51246e-07 | 3.36698e-06 | Specific Adrenal1_high |
| Itga3                                                                         | 5.09119 | 1.28852 | 3.55832e-07 | 3.40892e-06 | Specific Adrenal1_high |
| Prmt7                                                                         | 5.08663 | 1.26892 | 3.64478e-07 | 3.48944e-06 | Specific Adrenal1_high |
| Hoxd3os1                                                                      | 5.07746 | 1.26285 | 3.82514e-07 | 3.65261e-06 | Specific Adrenal1_high |
| Slc52a3                                                                       | 5.07182 | 1.78893 | 3.94032e-07 | 3.76037e-06 | Specific Adrenal1_high |
| D16Erttd472e                                                                  | 5.05518 | 1.35436 | 4.29991e-07 | 4.09144e-06 | Specific Adrenal1_high |
| F2rl3                                                                         | 5.05458 | 2.8147  | 4.31341e-07 | 4.10308e-06 | Specific Adrenal1_high |
| Bmf                                                                           | 5.02969 | 1.38053 | 4.91272e-07 | 4.64851e-06 | Specific Adrenal1_high |
| H2afy2                                                                        | 5.026   | 1.25368 | 5.00824e-07 | 4.73751e-06 | Specific Adrenal1_high |
| Gpsm1                                                                         | 5.02185 | 1.44838 | 5.11758e-07 | 4.83244e-06 | Specific Adrenal1_high |
| Fzd8                                                                          | 4.99193 | 1.19192 | 5.97803e-07 | 5.60722e-06 | Specific Adrenal1_high |
| Smim8                                                                         | 4.9864  | 1.32345 | 6.15135e-07 | 5.7631e-06  | Specific Adrenal1_high |
| Dact1                                                                         | 4.98632 | 2.9423  | 6.15395e-07 | 5.76316e-06 | Specific Adrenal1_high |
| Zfp703                                                                        | 4.98354 | 1.39344 | 6.24306e-07 | 5.83547e-06 | Specific Adrenal1_high |
| Chml                                                                          | 4.89182 | 1.18769 | 9.99064e-07 | 9.13733e-06 | Specific Adrenal1_high |
| Ccdc125                                                                       | 4.8608  | 1.23654 | 1.16913e-06 | 1.06146e-05 | Specific Adrenal1_high |
| Timmdc1                                                                       | 4.82687 | 1.01038 | 1.38693e-06 | 1.24936e-05 | Specific Adrenal1_high |
| Gnptab                                                                        | 4.80171 | 1.02176 | 1.57314e-06 | 1.41119e-05 | Specific Adrenal1_high |
| Epb4114aos                                                                    | 4.79466 | 1.04933 | 1.62948e-06 | 1.4589e-05  | Specific Adrenal1_high |
| Sidt2                                                                         | 4.78291 | 1.02082 | 1.72778e-06 | 1.54263e-05 | Specific Adrenal1_high |
| Phtf2                                                                         | 4.76789 | 1.60123 | 1.86163e-06 | 1.65755e-05 | Specific Adrenal1_high |
| Tet1                                                                          | 4.75517 | 1.56311 | 1.98276e-06 | 1.75716e-05 | Specific Adrenal1_high |
| Retreg1                                                                       | 4.75228 | 3.66754 | 2.01131e-06 | 1.78099e-05 | Specific Adrenal1_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                        |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|------------------------|
| Uggt2                                                                         | 4.72636 | 1.86096 | 2.28577e-06 | 2.00696e-05 | Specific Adrenal1_high |
| Hoxb8                                                                         | 4.71918 | 2.04794 | 2.36795e-06 | 2.07179e-05 | Specific Adrenal1_high |
| B230354K17Rik                                                                 | 4.66789 | 1.01279 | 3.04312e-06 | 2.62342e-05 | Specific Adrenal1_high |
| Ptk7                                                                          | 4.65499 | 1.97973 | 3.23998e-06 | 2.78569e-05 | Specific Adrenal1_high |
| Abhd8                                                                         | 4.6377  | 1.12533 | 3.52307e-06 | 3.01703e-05 | Specific Adrenal1_high |
| Trpc1                                                                         | 4.63736 | 2.57368 | 3.52882e-06 | 3.02116e-05 | Specific Adrenal1_high |
| Nt5dc2                                                                        | 4.60912 | 2.26402 | 4.04369e-06 | 3.44461e-05 | Specific Adrenal1_high |
| P3h4                                                                          | 4.6089  | 1.52196 | 4.04803e-06 | 3.44649e-05 | Specific Adrenal1_high |
| Zer1                                                                          | 4.59179 | 1.28081 | 4.39457e-06 | 3.72874e-05 | Specific Adrenal1_high |
| Syne3                                                                         | 4.58877 | 1.40801 | 4.45871e-06 | 3.78118e-05 | Specific Adrenal1_high |
| Mboat2                                                                        | 4.58535 | 2.0395  | 4.53237e-06 | 3.83961e-05 | Specific Adrenal1_high |
| Pcdh9                                                                         | 4.58365 | 3.79373 | 4.56933e-06 | 3.86889e-05 | Specific Adrenal1_high |
| Snai1                                                                         | 4.56966 | 1.0145  | 4.88512e-06 | 4.11899e-05 | Specific Adrenal1_high |
| Dync2h1                                                                       | 4.5451  | 1.10588 | 5.49093e-06 | 4.59379e-05 | Specific Adrenal1_high |
| Slc41a3                                                                       | 4.49635 | 1.8798  | 6.91313e-06 | 5.70673e-05 | Specific Adrenal1_high |
| Slc15a2                                                                       | 4.45578 | 1.86357 | 8.35869e-06 | 6.83191e-05 | Specific Adrenal1_high |
| Mboat7                                                                        | 4.4385  | 1.25911 | 9.05874e-06 | 7.37235e-05 | Specific Adrenal1_high |
| Adamts12                                                                      | 4.42909 | 1.60027 | 9.46315e-06 | 7.68985e-05 | Specific Adrenal1_high |
| Hdx                                                                           | 4.4211  | 1.22853 | 9.81978e-06 | 7.96162e-05 | Specific Adrenal1_high |
| Reck                                                                          | 4.4172  | 1.04008 | 9.99886e-06 | 8.09928e-05 | Specific Adrenal1_high |
| Snta1                                                                         | 4.40781 | 1.81878 | 1.04419e-05 | 8.43848e-05 | Specific Adrenal1_high |
| Cep126                                                                        | 4.40439 | 1.88171 | 1.06084e-05 | 8.56441e-05 | Specific Adrenal1_high |
| Pard6g                                                                        | 4.39489 | 1.70561 | 1.10827e-05 | 8.92281e-05 | Specific Adrenal1_high |
| Ccdc157                                                                       | 4.38451 | 1.12349 | 1.16248e-05 | 9.33133e-05 | Specific Adrenal1_high |
| H2-Aa                                                                         | 4.32262 | 2.18995 | 1.54189e-05 | 0.00012201  | Specific Adrenal1_high |
| Satb1                                                                         | 4.31721 | 2.6291  | 1.58014e-05 | 0.000124694 | Specific Adrenal1_high |
| Kif3c                                                                         | 4.29885 | 1.16989 | 1.71687e-05 | 0.000134668 | Specific Adrenal1_high |
| Rasd1                                                                         | 4.29408 | 1.28034 | 1.75416e-05 | 0.000137396 | Specific Adrenal1_high |
| Tmem71                                                                        | 4.29282 | 1.40887 | 1.76421e-05 | 0.000138146 | Specific Adrenal1_high |
| Paxx                                                                          | 4.27621 | 1.0561  | 1.90099e-05 | 0.000148389 | Specific Adrenal1_high |
| Simc1                                                                         | 4.26519 | 1.01487 | 1.99736e-05 | 0.000155422 | Specific Adrenal1_high |
| B930036N10Rik                                                                 | 4.26047 | 1.70725 | 2.03993e-05 | 0.000158582 | Specific Adrenal1_high |
| Gm16118                                                                       | 4.25508 | 3.96294 | 2.08976e-05 | 0.000162143 | Specific Adrenal1_high |
| Hip1r                                                                         | 4.25493 | 1.04948 | 2.09113e-05 | 0.000162211 | Specific Adrenal1_high |
| Gm16070                                                                       | 4.25079 | 1.76714 | 2.13016e-05 | 0.000165119 | Specific Adrenal1_high |
| Gm831                                                                         | 4.24008 | 2.29984 | 2.2344e-05  | 0.000172785 | Specific Adrenal1_high |
| Gipc2                                                                         | 4.22316 | 2.07731 | 2.40899e-05 | 0.000185663 | Specific Adrenal1_high |
| Gm11730                                                                       | 4.22106 | 1.20781 | 2.4316e-05  | 0.000187227 | Specific Adrenal1_high |
| Ankrd39                                                                       | 4.21948 | 1.18362 | 2.44868e-05 | 0.000188497 | Specific Adrenal1_high |
| Slc39a3                                                                       | 4.20332 | 1.14154 | 2.63026e-05 | 0.000201897 | Specific Adrenal1_high |
| Per1                                                                          | 4.19392 | 1.49823 | 2.7418e-05  | 0.00020986  | Specific Adrenal1_high |
| Nod2                                                                          | 4.17238 | 1.5761  | 3.01429e-05 | 0.000229574 | Specific Adrenal1_high |
| Hlf                                                                           | 4.17201 | 1.02005 | 3.01926e-05 | 0.00022979  | Specific Adrenal1_high |
| Adamts7                                                                       | 4.17136 | 1.16792 | 3.02793e-05 | 0.000230286 | Specific Adrenal1_high |
| Tmem252                                                                       | 4.15766 | 1.58778 | 3.21527e-05 | 0.000243445 | Specific Adrenal1_high |



| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                        |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|------------------------|
| Gadd45a                                                                       | 4.08353 | 1.05776 | 4.43575e-05 | 0.000329897 | Specific Adrenal1_high |
| Ift22                                                                         | 4.08216 | 1.54578 | 4.4619e-05  | 0.000331689 | Specific Adrenal1_high |
| Trim62                                                                        | 4.06761 | 1.13928 | 4.74982e-05 | 0.000351877 | Specific Adrenal1_high |
| Ptpn3                                                                         | 4.05916 | 2.07121 | 4.92496e-05 | 0.000364016 | Specific Adrenal1_high |
| 1700084C06Rik                                                                 | 4.05208 | 1.19548 | 5.07638e-05 | 0.000374608 | Specific Adrenal1_high |
| Fam20c                                                                        | 4.0379  | 3.5459  | 5.39319e-05 | 0.000396807 | Specific Adrenal1_high |
| Kap                                                                           | 4.00735 | 1.01754 | 6.14042e-05 | 0.000448413 | Specific Adrenal1_high |
| Akap17b                                                                       | 3.96245 | 1.58266 | 7.41841e-05 | 0.000535203 | Specific Adrenal1_high |
| Sh2d4b                                                                        | 3.94653 | 1.06764 | 7.92907e-05 | 0.00056912  | Specific Adrenal1_high |
| Col25a1                                                                       | 3.93613 | 1.57464 | 8.28072e-05 | 0.000592778 | Specific Adrenal1_high |
| AC106834.1                                                                    | 3.92445 | 2.9589  | 8.69291e-05 | 0.000620771 | Specific Adrenal1_high |
| Cdk5rap1                                                                      | 3.92221 | 1.09065 | 8.774e-05   | 0.000626146 | Specific Adrenal1_high |
| Plcg2                                                                         | 3.92102 | 2.00249 | 8.8175e-05  | 0.000628695 | Specific Adrenal1_high |
| Apln                                                                          | 3.88215 | 2.11377 | 0.000103537 | 0.000731121 | Specific Adrenal1_high |
| Hoxd4                                                                         | 3.87762 | 1.63265 | 0.000105484 | 0.000743406 | Specific Adrenal1_high |
| Lman2l                                                                        | 3.86717 | 1.19982 | 0.000110106 | 0.000774294 | Specific Adrenal1_high |
| D330023K18Rik                                                                 | 3.85508 | 1.17764 | 0.000115691 | 0.00081092  | Specific Adrenal1_high |
| Ly75                                                                          | 3.82779 | 1.57378 | 0.0001293   | 0.000899279 | Specific Adrenal1_high |
| Ahi1                                                                          | 3.8208  | 1.55001 | 0.000133018 | 0.000923148 | Specific Adrenal1_high |
| Vars                                                                          | 3.81873 | 1.04386 | 0.00013414  | 0.000930537 | Specific Adrenal1_high |
| Tmem119                                                                       | 3.81478 | 3.92733 | 0.000136304 | 0.000944937 | Specific Adrenal1_high |
| Tnfrsf8                                                                       | 3.80159 | 1.18196 | 0.000143768 | 0.000992422 | Specific Adrenal1_high |
| Ift57                                                                         | 3.79858 | 1.34506 | 0.000145527 | 0.00100328  | Specific Adrenal1_high |
| Ttc9                                                                          | 3.78287 | 1.74638 | 0.000155031 | 0.00106584  | Specific Adrenal1_high |
| Cfap43                                                                        | 3.77695 | 2.37681 | 0.00015876  | 0.00109032  | Specific Adrenal1_high |
| 1700012D14Rik                                                                 | 3.77076 | 1.20852 | 0.000162748 | 0.0011158   | Specific Adrenal1_high |
| Dennd4a                                                                       | 3.7691  | 1.03542 | 0.000163841 | 0.00112258  | Specific Adrenal1_high |
| Dnal4                                                                         | 3.74406 | 1.03332 | 0.000181067 | 0.00123198  | Specific Adrenal1_high |
| Atat1                                                                         | 3.73912 | 1.09573 | 0.000184665 | 0.00125461  | Specific Adrenal1_high |
| Fhit                                                                          | 3.72336 | 2.72536 | 0.000196593 | 0.00133228  | Specific Adrenal1_high |
| Dhx58                                                                         | 3.7224  | 1.16442 | 0.000197336 | 0.00133592  | Specific Adrenal1_high |
| Nmb                                                                           | 3.68784 | 1.04759 | 0.000226169 | 0.00151806  | Specific Adrenal1_high |
| Syt11                                                                         | 3.64215 | 1.6592  | 0.00027037  | 0.00179533  | Specific Adrenal1_high |
| Gm16252                                                                       | 3.60047 | 2.3289  | 0.000317644 | 0.00208777  | Specific Adrenal1_high |
| Map3k6                                                                        | 3.59957 | 1.47122 | 0.000318742 | 0.00209371  | Specific Adrenal1_high |
| Gm11707                                                                       | 3.58968 | 1.0145  | 0.000331089 | 0.00217084  | Specific Adrenal1_high |
| Trf                                                                           | 3.57005 | 1.8792  | 0.000356908 | 0.00232549  | Specific Adrenal1_high |
| Zfp113                                                                        | 3.51286 | 1.19815 | 0.000443317 | 0.00284882  | Specific Adrenal1_high |
| Pitpnm1                                                                       | 3.49772 | 1.24854 | 0.000469249 | 0.00300054  | Specific Adrenal1_high |
| Kcnrg                                                                         | 3.49388 | 1.18331 | 0.000476052 | 0.00304102  | Specific Adrenal1_high |
| Fam210a                                                                       | 3.49166 | 1.11867 | 0.000480035 | 0.00306404  | Specific Adrenal1_high |
| Zfp982                                                                        | 3.48942 | 1.47023 | 0.000484068 | 0.00308857  | Specific Adrenal1_high |
| Ltf                                                                           | 3.48442 | 2.93168 | 0.000493212 | 0.00314442  | Specific Adrenal1_high |
| Brip1                                                                         | 3.47645 | 1.26655 | 0.000508106 | 0.00323141  | Specific Adrenal1_high |
| Tmem108                                                                       | 3.44135 | 2.04919 | 0.000578814 | 0.00363349  | Specific Adrenal1_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                        |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|------------------------|
| Shroom3                                                                       | 3.44114 | 2.82961 | 0.00057928  | 0.0036357   | Specific Adrenal1_high |
| Fam216a                                                                       | 3.42772 | 1.1237  | 0.000608674 | 0.0038076   | Specific Adrenal1_high |
| Gin1                                                                          | 3.42181 | 1.06023 | 0.000622066 | 0.00388686  | Specific Adrenal1_high |
| Abtb2                                                                         | 3.41262 | 2.92673 | 0.000643408 | 0.00400857  | Specific Adrenal1_high |
| Klhl26                                                                        | 3.41203 | 1.00521 | 0.000644809 | 0.00401653  | Specific Adrenal1_high |
| Slc8a1                                                                        | 3.39734 | 2.02514 | 0.000680438 | 0.00422949  | Specific Adrenal1_high |
| 9130008F23Rik                                                                 | 3.38718 | 2.19555 | 0.00070615  | 0.00438215  | Specific Adrenal1_high |
| Hacd1                                                                         | 3.38583 | 1.02573 | 0.000709631 | 0.00439993  | Specific Adrenal1_high |
| Chchd4                                                                        | 3.37573 | 1.07275 | 0.000736205 | 0.00455158  | Specific Adrenal1_high |
| H2-Eb1                                                                        | 3.36248 | 2.09348 | 0.000772466 | 0.00476118  | Specific Adrenal1_high |
| Lzts1                                                                         | 3.3624  | 1.34857 | 0.00077268  | 0.00476159  | Specific Adrenal1_high |
| Tprkb                                                                         | 3.35607 | 1.17068 | 0.00079059  | 0.00485805  | Specific Adrenal1_high |
| Gm33370                                                                       | 3.34045 | 1.52091 | 0.000836428 | 0.00512314  | Specific Adrenal1_high |
| Slc24a3                                                                       | 3.30916 | 2.22832 | 0.000935768 | 0.00568139  | Specific Adrenal1_high |
| Platr25                                                                       | 3.28795 | 1.05844 | 0.00100921  | 0.00608899  | Specific Adrenal1_high |
| Rab11fip5                                                                     | 3.28557 | 1.34958 | 0.00101776  | 0.00613602  | Specific Adrenal1_high |
| 4933412E12Rik                                                                 | 3.27979 | 1.01661 | 0.00103883  | 0.00625839  | Specific Adrenal1_high |
| Gm31763                                                                       | 3.26479 | 1.01683 | 0.00109545  | 0.00657497  | Specific Adrenal1_high |
| Gstz1                                                                         | 3.26262 | 1.0202  | 0.00110388  | 0.00662061  | Specific Adrenal1_high |
| Bhlhe22                                                                       | 3.24883 | 1.76031 | 0.00115882  | 0.00692308  | Specific Adrenal1_high |
| Cpt1c                                                                         | 3.23642 | 2.3369  | 0.00121039  | 0.00721521  | Specific Adrenal1_high |
| Ttc8                                                                          | 3.23088 | 1.39885 | 0.00123409  | 0.00734833  | Specific Adrenal1_high |
| E230001N04Rik                                                                 | 3.22889 | 3.74086 | 0.00124272  | 0.00739559  | Specific Adrenal1_high |
| Klc4                                                                          | 3.2182  | 1.00915 | 0.00128998  | 0.00766413  | Specific Adrenal1_high |
| Rrad                                                                          | 3.18935 | 1.21362 | 0.00142592  | 0.00841146  | Specific Adrenal1_high |
| Slc35e4                                                                       | 3.17394 | 1.11136 | 0.00150388  | 0.008839    | Specific Adrenal1_high |
| Acad10                                                                        | 3.16872 | 1.23614 | 0.0015311   | 0.00898594  | Specific Adrenal1_high |
| Fam149a                                                                       | 3.15734 | 1.40782 | 0.00159214  | 0.00932722  | Specific Adrenal1_high |
| Ino80dos                                                                      | 3.14654 | 1.01859 | 0.00165215  | 0.00964903  | Specific Adrenal1_high |
| Tmem184c                                                                      | 3.14602 | 1.31409 | 0.00165508  | 0.00966085  | Specific Adrenal1_high |
| Csrnp1                                                                        | 3.13593 | 1.14008 | 0.0017131   | 0.0099887   | Specific Adrenal1_high |
| Fabp4                                                                         | 31.6831 | 5.6073  | 2.6588e-220 | 8.5839e-216 | Specific Adrenal2_high |
| Cd36                                                                          | 31.3673 | 5.67075 | 5.6516e-216 | 9.1231e-212 | Specific Adrenal2_high |
| Cav1                                                                          | 29.657  | 4.72113 | 2.7526e-193 | 2.9622e-189 | Specific Adrenal2_high |
| Ablim3                                                                        | 26.8278 | 6.94712 | 1.5316e-158 | 9.8896e-155 | Specific Adrenal2_high |
| Ablim1                                                                        | 26.6134 | 4.26004 | 4.7471e-156 | 2.5544e-152 | Specific Adrenal2_high |
| Mgll                                                                          | 26.1156 | 2.82348 | 2.4247e-150 | 1.1183e-146 | Specific Adrenal2_high |
| Aqp7                                                                          | 26.0756 | 10.1519 | 6.9011e-150 | 2.785e-146  | Specific Adrenal2_high |
| Cavin1                                                                        | 25.2834 | 3.59069 | 4.8679e-141 | 1.7462e-137 | Specific Adrenal2_high |
| Ehd2                                                                          | 24.6039 | 3.96776 | 1.1467e-133 | 3.7022e-130 | Specific Adrenal2_high |
| Fabp5                                                                         | 24.46   | 3.88049 | 3.9433e-132 | 1.1573e-128 | Specific Adrenal2_high |
| Tspan13                                                                       | 24.1932 | 3.63863 | 2.626e-129  | 7.0651e-126 | Specific Adrenal2_high |
| Cxcl12                                                                        | 23.5378 | 4.3544  | 1.6738e-122 | 4.1567e-119 | Specific Adrenal2_high |
| Cavin2                                                                        | 22.9963 | 2.4418  | 5.075e-117  | 1.024e-113  | Specific Adrenal2_high |
| Dach1                                                                         | 22.8409 | 5.88242 | 1.8006e-115 | 3.4195e-112 | Specific Adrenal2_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                        |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|------------------------|
| Tcf15                                                                         | 22.7074 | 4.36644 | 3.7899e-114 | 6.7976e-111 | Specific Adrenal2_high |
| Pparg                                                                         | 22.5998 | 5.39147 | 4.3562e-113 | 7.4022e-110 | Specific Adrenal2_high |
| Afdn                                                                          | 22.2508 | 2.59988 | 1.1088e-109 | 1.7046e-106 | Specific Adrenal2_high |
| Gpihbp1                                                                       | 21.9517 | 2.38559 | 8.3456e-107 | 1.2247e-103 | Specific Adrenal2_high |
| Cst3                                                                          | 21.9443 | 2.3687  | 9.8285e-107 | 1.3796e-103 | Specific Adrenal2_high |
| Cdh5                                                                          | 21.4695 | 1.65179 | 3.002e-102  | 4.0383e-99  | Specific Adrenal2_high |
| Cdh13                                                                         | 21.455  | 3.35678 | 4.0985e-102 | 5.2928e-99  | Specific Adrenal2_high |
| Lpl                                                                           | 21.3023 | 5.76659 | 1.081e-100  | 1.34225e-97 | Specific Adrenal2_high |
| Sparcl1                                                                       | 20.5652 | 3.18014 | 5.62957e-94 | 6.4911e-91  | Specific Adrenal2_high |
| C1qtnf9                                                                       | 20.2961 | 7.29524 | 1.39258e-91 | 1.49865e-88 | Specific Adrenal2_high |
| Timp4                                                                         | 20.2121 | 9.79791 | 7.66426e-91 | 7.98196e-88 | Specific Adrenal2_high |
| Ctnnbip1                                                                      | 20.1204 | 3.4604  | 4.89286e-90 | 4.93644e-87 | Specific Adrenal2_high |
| Lims2                                                                         | 20.0526 | 2.38693 | 1.91735e-89 | 1.8758e-86  | Specific Adrenal2_high |
| Tmsb4x                                                                        | 19.7703 | 1.65791 | 5.36948e-87 | 4.95296e-84 | Specific Adrenal2_high |
| Dst                                                                           | 19.507  | 3.06417 | 9.56666e-85 | 8.57943e-82 | Specific Adrenal2_high |
| Car4                                                                          | 19.3399 | 3.36638 | 2.47941e-83 | 2.16345e-80 | Specific Adrenal2_high |
| mt-Co3                                                                        | 19.2748 | 1.57344 | 8.73978e-83 | 7.42536e-80 | Specific Adrenal2_high |
| Ybx1                                                                          | 19.2253 | 1.68771 | 2.27401e-82 | 1.88247e-79 | Specific Adrenal2_high |
| Angptl4                                                                       | 18.9421 | 8.94779 | 5.12796e-80 | 4.03796e-77 | Specific Adrenal2_high |
| Pkp4                                                                          | 18.7842 | 2.69325 | 1.01745e-78 | 7.63919e-76 | Specific Adrenal2_high |
| Etl4                                                                          | 18.7124 | 2.19913 | 3.92582e-78 | 2.88057e-75 | Specific Adrenal2_high |
| Cldn5                                                                         | 18.6836 | 2.60199 | 6.73021e-78 | 4.82855e-75 | Specific Adrenal2_high |
| Sparc                                                                         | 18.5441 | 1.50318 | 9.1011e-77  | 6.38758e-74 | Specific Adrenal2_high |
| Rflnb                                                                         | 18.515  | 2.46598 | 1.56391e-76 | 1.07427e-73 | Specific Adrenal2_high |
| mt-Cytb                                                                       | 18.209  | 1.58903 | 4.38274e-74 | 2.94785e-71 | Specific Adrenal2_high |
| Pdzd2                                                                         | 18.1487 | 3.0205  | 1.31401e-73 | 8.65772e-71 | Specific Adrenal2_high |
| Cav2                                                                          | 18.0799 | 2.1663  | 4.58766e-73 | 2.96225e-70 | Specific Adrenal2_high |
| mt-Co2                                                                        | 17.9884 | 1.46944 | 2.40105e-72 | 1.51996e-69 | Specific Adrenal2_high |
| Cd300lg                                                                       | 17.8072 | 1.73305 | 6.21221e-71 | 3.78417e-68 | Specific Adrenal2_high |
| Adamts9                                                                       | 17.6913 | 3.11837 | 4.8935e-70  | 2.82119e-67 | Specific Adrenal2_high |
| Meox2                                                                         | 17.5621 | 9.90557 | 4.80957e-69 | 2.72415e-66 | Specific Adrenal2_high |
| mt-Atp6                                                                       | 17.4245 | 1.35169 | 5.37767e-68 | 2.99342e-65 | Specific Adrenal2_high |
| Airm                                                                          | 17.3749 | 2.64091 | 1.27796e-67 | 6.99302e-65 | Specific Adrenal2_high |
| Hspa12b                                                                       | 17.3277 | 2.74405 | 2.90608e-67 | 1.56371e-64 | Specific Adrenal2_high |
| Itga6                                                                         | 17.3038 | 2.11491 | 4.40485e-67 | 2.33132e-64 | Specific Adrenal2_high |
| Slc28a2                                                                       | 17.3022 | 6.67377 | 4.52461e-67 | 2.35608e-64 | Specific Adrenal2_high |
| mt-Nd2                                                                        | 17.2632 | 1.60383 | 8.90345e-67 | 4.49137e-64 | Specific Adrenal2_high |
| Fth1                                                                          | 17.0288 | 1.48909 | 5.02345e-65 | 2.42063e-62 | Specific Adrenal2_high |
| mt-Nd3                                                                        | 16.9985 | 2.10502 | 8.42082e-65 | 3.99803e-62 | Specific Adrenal2_high |
| mt-Nd4                                                                        | 16.5872 | 1.54103 | 8.62599e-62 | 3.81493e-59 | Specific Adrenal2_high |
| Palmd                                                                         | 16.4379 | 2.50348 | 1.02495e-60 | 4.47168e-58 | Specific Adrenal2_high |
| Ccdc85a                                                                       | 16.3884 | 2.40981 | 2.31366e-60 | 9.93663e-58 | Specific Adrenal2_high |
| Id1                                                                           | 16.1657 | 2.05527 | 8.80856e-59 | 3.4681e-56  | Specific Adrenal2_high |
| Mecom                                                                         | 16.082  | 2.72159 | 3.4137e-58  | 1.2966e-55  | Specific Adrenal2_high |
| Cdkn1c                                                                        | 15.7717 | 3.34866 | 4.8688e-56  | 1.72735e-53 | Specific Adrenal2_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                        |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|------------------------|
| Arhgap18                                                                      | 15.7502 | 2.1028  | 6.85039e-56 | 2.37812e-53 | Specific Adrenal2_high |
| Slfn5                                                                         | 15.5579 | 1.53545 | 1.4069e-54  | 4.68265e-52 | Specific Adrenal2_high |
| Lnx1                                                                          | 15.5341 | 11.1191 | 2.03989e-54 | 6.7202e-52  | Specific Adrenal2_high |
| Col4a1                                                                        | 15.5146 | 1.36682 | 2.76439e-54 | 8.92484e-52 | Specific Adrenal2_high |
| Sorbs1                                                                        | 15.4233 | 1.95239 | 1.14107e-53 | 3.61172e-51 | Specific Adrenal2_high |
| Tpst1                                                                         | 15.3941 | 4.4205  | 1.79362e-53 | 5.62205e-51 | Specific Adrenal2_high |
| Arhgef28                                                                      | 15.3664 | 3.4129  | 2.74967e-53 | 8.53587e-51 | Specific Adrenal2_high |
| Ext1                                                                          | 15.293  | 2.14958 | 8.50958e-53 | 2.61649e-50 | Specific Adrenal2_high |
| Diaph2                                                                        | 14.9751 | 2.24115 | 1.06872e-50 | 3.10843e-48 | Specific Adrenal2_high |
| mt-Nd5                                                                        | 14.7521 | 1.95431 | 2.98073e-49 | 8.51617e-47 | Specific Adrenal2_high |
| Gng11                                                                         | 14.6765 | 1.35072 | 9.11918e-49 | 2.56011e-46 | Specific Adrenal2_high |
| Rbp7                                                                          | 14.6477 | 2.96487 | 1.39399e-48 | 3.87974e-46 | Specific Adrenal2_high |
| Aplp2                                                                         | 14.4063 | 1.21061 | 4.72642e-47 | 1.29316e-44 | Specific Adrenal2_high |
| Psap                                                                          | 14.347  | 1.27519 | 1.11189e-46 | 3.01657e-44 | Specific Adrenal2_high |
| mt-Nd1                                                                        | 14.1487 | 1.19103 | 1.90134e-45 | 5.11539e-43 | Specific Adrenal2_high |
| Tmem182                                                                       | 14.1168 | 11.2744 | 2.99111e-45 | 7.98083e-43 | Specific Adrenal2_high |
| Ly6c1                                                                         | 14.1037 | 2.19696 | 3.60344e-45 | 9.53583e-43 | Specific Adrenal2_high |
| Plin2                                                                         | 14.0378 | 2.37356 | 9.14966e-45 | 2.34442e-42 | Specific Adrenal2_high |
| S1pr1                                                                         | 13.8789 | 1.67404 | 8.5046e-44  | 2.16198e-41 | Specific Adrenal2_high |
| Kank3                                                                         | 13.8567 | 1.46646 | 1.15926e-43 | 2.92397e-41 | Specific Adrenal2_high |
| Gfo1                                                                          | 13.8292 | 2.59497 | 1.69971e-43 | 4.25388e-41 | Specific Adrenal2_high |
| Col4a2                                                                        | 13.7408 | 1.37779 | 5.78715e-43 | 1.43722e-40 | Specific Adrenal2_high |
| Hspb1                                                                         | 13.7268 | 1.79932 | 7.02036e-43 | 1.73017e-40 | Specific Adrenal2_high |
| Spaar                                                                         | 13.6965 | 4.40652 | 1.06474e-42 | 2.60417e-40 | Specific Adrenal2_high |
| Crip1                                                                         | 13.6608 | 1.95944 | 1.73931e-42 | 4.15954e-40 | Specific Adrenal2_high |
| Jam2                                                                          | 13.6483 | 1.66913 | 2.06674e-42 | 4.90623e-40 | Specific Adrenal2_high |
| Ppp1r2                                                                        | 13.3299 | 1.22296 | 1.55107e-40 | 3.60261e-38 | Specific Adrenal2_high |
| Ebf3                                                                          | 13.222  | 3.33011 | 6.54563e-40 | 1.49876e-37 | Specific Adrenal2_high |
| Abcb1b                                                                        | 13.216  | 5.22269 | 7.09401e-40 | 1.61289e-37 | Specific Adrenal2_high |
| 2026-09-04 00:00:00                                                           | 13.1579 | 1.90565 | 1.53237e-39 | 3.41191e-37 | Specific Adrenal2_high |
| Tns1                                                                          | 13.1566 | 1.34945 | 1.55893e-39 | 3.44726e-37 | Specific Adrenal2_high |
| Tmem245                                                                       | 13.0854 | 2.15593 | 3.98837e-39 | 8.7003e-37  | Specific Adrenal2_high |
| Atp5j                                                                         | 13.0676 | 1.32791 | 5.04337e-39 | 1.0855e-36  | Specific Adrenal2_high |
| Elmo1                                                                         | 12.9279 | 1.92422 | 3.13044e-38 | 6.47862e-36 | Specific Adrenal2_high |
| Dock9                                                                         | 12.9107 | 1.42124 | 3.91896e-38 | 8.05884e-36 | Specific Adrenal2_high |
| Lmo1                                                                          | 12.8945 | 5.86692 | 4.83215e-38 | 9.87379e-36 | Specific Adrenal2_high |
| Aqp1                                                                          | 12.8533 | 2.147   | 8.24274e-38 | 1.66323e-35 | Specific Adrenal2_high |
| Cxcl9                                                                         | 12.8183 | 3.16633 | 1.29546e-37 | 2.58171e-35 | Specific Adrenal2_high |
| Gstt2                                                                         | 12.76   | 3.06669 | 2.7427e-37  | 5.36656e-35 | Specific Adrenal2_high |
| Lmo7                                                                          | 12.6643 | 3.44962 | 9.32889e-37 | 1.80349e-34 | Specific Adrenal2_high |
| Selenow                                                                       | 12.5684 | 1.339   | 3.1503e-36  | 6.05401e-34 | Specific Adrenal2_high |
| mt-Co1                                                                        | 12.4884 | 1.04175 | 8.64123e-36 | 1.61261e-33 | Specific Adrenal2_high |
| Enah                                                                          | 12.4697 | 4.09974 | 1.09172e-35 | 2.02565e-33 | Specific Adrenal2_high |
| Sult1a1                                                                       | 12.4421 | 2.27266 | 1.54484e-35 | 2.85e-33    | Specific Adrenal2_high |
| Hrct1                                                                         | 12.3973 | 4.03527 | 2.70183e-35 | 4.92818e-33 | Specific Adrenal2_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                        |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|------------------------|
| Cd93                                                                          | 12.3103 | 1.24242 | 7.97317e-35 | 1.43008e-32 | Specific Adrenal2_high |
| Fli1                                                                          | 12.2534 | 1.16062 | 1.61135e-34 | 2.81203e-32 | Specific Adrenal2_high |
| Vwa3a                                                                         | 12.1396 | 3.79964 | 6.51036e-34 | 1.124e-31   | Specific Adrenal2_high |
| Scd1                                                                          | 12.1282 | 7.29469 | 7.49056e-34 | 1.28634e-31 | Specific Adrenal2_high |
| Unc45b                                                                        | 12.0427 | 1.75872 | 2.11789e-33 | 3.5799e-31  | Specific Adrenal2_high |
| Ushbp1                                                                        | 11.9807 | 1.14314 | 4.48508e-33 | 7.54171e-31 | Specific Adrenal2_high |
| Ubc                                                                           | 11.9654 | 1.11505 | 5.39435e-33 | 9.02365e-31 | Specific Adrenal2_high |
| Papss2                                                                        | 11.8436 | 3.1734  | 2.32291e-32 | 3.86573e-30 | Specific Adrenal2_high |
| Ahnak                                                                         | 11.7663 | 1.36694 | 5.81856e-32 | 9.48748e-30 | Specific Adrenal2_high |
| Xdh                                                                           | 11.748  | 1.70246 | 7.22692e-32 | 1.17247e-29 | Specific Adrenal2_high |
| Cped1                                                                         | 11.7338 | 1.84106 | 8.55004e-32 | 1.37332e-29 | Specific Adrenal2_high |
| Adipor2                                                                       | 11.6703 | 2.33176 | 1.80839e-31 | 2.87605e-29 | Specific Adrenal2_high |
| Car3                                                                          | 11.6391 | 7.60177 | 2.60645e-31 | 4.09779e-29 | Specific Adrenal2_high |
| Rgcc                                                                          | 11.6195 | 1.77444 | 3.28138e-31 | 5.06887e-29 | Specific Adrenal2_high |
| Fryl                                                                          | 11.5819 | 1.46882 | 5.08863e-31 | 7.78608e-29 | Specific Adrenal2_high |
| Gda                                                                           | 11.5104 | 2.62676 | 1.16959e-30 | 1.78114e-28 | Specific Adrenal2_high |
| Ccdc85b                                                                       | 11.4009 | 1.21026 | 4.13611e-30 | 6.2109e-28  | Specific Adrenal2_high |
| Myl12a                                                                        | 11.2964 | 1.13006 | 1.36744e-29 | 1.99764e-27 | Specific Adrenal2_high |
| Ech1                                                                          | 11.2419 | 1.67115 | 2.53769e-29 | 3.6252e-27  | Specific Adrenal2_high |
| Ctd                                                                           | 11.1839 | 11.4203 | 4.88922e-29 | 6.89294e-27 | Specific Adrenal2_high |
| Adgrg1                                                                        | 11.0868 | 1.89117 | 1.45409e-28 | 2.0062e-26  | Specific Adrenal2_high |
| Kitl                                                                          | 11.0594 | 1.27151 | 1.97395e-28 | 2.70038e-26 | Specific Adrenal2_high |
| Grk5                                                                          | 11.0276 | 1.80976 | 2.81326e-28 | 3.80025e-26 | Specific Adrenal2_high |
| Itpkb                                                                         | 10.999  | 1.07397 | 3.86222e-28 | 5.19549e-26 | Specific Adrenal2_high |
| Tubb4b                                                                        | 10.9777 | 1.5421  | 4.8912e-28  | 6.55237e-26 | Specific Adrenal2_high |
| Klf4                                                                          | 10.9318 | 1.62897 | 8.11889e-28 | 1.07426e-25 | Specific Adrenal2_high |
| Dbi                                                                           | 10.9116 | 1.3739  | 1.01456e-27 | 1.33151e-25 | Specific Adrenal2_high |
| Depp1                                                                         | 10.786  | 3.29087 | 4.00671e-27 | 5.19505e-25 | Specific Adrenal2_high |
| Plcb4                                                                         | 10.6981 | 1.24255 | 1.03937e-26 | 1.32633e-24 | Specific Adrenal2_high |
| Dusp1                                                                         | 10.5372 | 1.21946 | 5.82215e-26 | 7.14708e-24 | Specific Adrenal2_high |
| Fry                                                                           | 10.4016 | 1.48282 | 2.43756e-25 | 2.92552e-23 | Specific Adrenal2_high |
| Gstm1                                                                         | 10.3632 | 1.71211 | 3.6454e-25  | 4.34287e-23 | Specific Adrenal2_high |
| Csf2rb                                                                        | 10.3279 | 6.13846 | 5.27066e-25 | 6.256e-23   | Specific Adrenal2_high |
| Ifng1                                                                         | 10.1701 | 1.41201 | 2.69626e-24 | 3.10889e-22 | Specific Adrenal2_high |
| Ebf1                                                                          | 10.1563 | 1.44286 | 3.10599e-24 | 3.55592e-22 | Specific Adrenal2_high |
| Ypel3                                                                         | 10.1082 | 1.63234 | 5.08098e-24 | 5.75577e-22 | Specific Adrenal2_high |
| Egln1                                                                         | 10.1007 | 1.70316 | 5.48502e-24 | 6.19174e-22 | Specific Adrenal2_high |
| AU020206                                                                      | 10.0956 | 1.74385 | 5.77569e-24 | 6.49714e-22 | Specific Adrenal2_high |
| Pim3                                                                          | 10.0909 | 1.84016 | 6.06368e-24 | 6.79743e-22 | Specific Adrenal2_high |
| Mast4                                                                         | 10.0319 | 1.51184 | 1.10413e-23 | 1.2237e-21  | Specific Adrenal2_high |
| Rapgef1                                                                       | 9.99876 | 1.21584 | 1.54317e-23 | 1.6946e-21  | Specific Adrenal2_high |
| AW112010                                                                      | 9.99621 | 1.35215 | 1.58347e-23 | 1.73296e-21 | Specific Adrenal2_high |
| Efnb1                                                                         | 9.97763 | 1.41183 | 1.90969e-23 | 2.05515e-21 | Specific Adrenal2_high |
| Klf6                                                                          | 9.87268 | 1.59436 | 5.46841e-23 | 5.82666e-21 | Specific Adrenal2_high |
| Btg2                                                                          | 9.83154 | 1.52645 | 8.23504e-23 | 8.6885e-21  | Specific Adrenal2_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                        |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|------------------------|
| Fmo1                                                                          | 9.76187 | 1.75122 | 1.64105e-22 | 1.70908e-20 | Specific Adrenal2_high |
| mt-Nd4l                                                                       | 9.7507  | 1.72924 | 1.83206e-22 | 1.89577e-20 | Specific Adrenal2_high |
| Slco2b1                                                                       | 9.74248 | 2.58431 | 1.98651e-22 | 2.04902e-20 | Specific Adrenal2_high |
| Rnf220                                                                        | 9.64916 | 1.79205 | 4.95619e-22 | 5.00033e-20 | Specific Adrenal2_high |
| Ercc1                                                                         | 9.63509 | 2.80787 | 5.68429e-22 | 5.69929e-20 | Specific Adrenal2_high |
| Magi1                                                                         | 9.60715 | 1.01329 | 7.4587e-22  | 7.38663e-20 | Specific Adrenal2_high |
| Prag1                                                                         | 9.56056 | 2.55194 | 1.17126e-21 | 1.15639e-19 | Specific Adrenal2_high |
| Elovl5                                                                        | 9.52309 | 1.53854 | 1.68112e-21 | 1.64469e-19 | Specific Adrenal2_high |
| Stxbp6                                                                        | 9.50241 | 3.27709 | 2.05091e-21 | 1.98244e-19 | Specific Adrenal2_high |
| Gask1b                                                                        | 9.44376 | 2.04384 | 3.59649e-21 | 3.46605e-19 | Specific Adrenal2_high |
| Arid5b                                                                        | 9.4102  | 1.28227 | 4.9518e-21  | 4.72985e-19 | Specific Adrenal2_high |
| Cas21                                                                         | 9.39954 | 2.85579 | 5.48037e-21 | 5.20394e-19 | Specific Adrenal2_high |
| Ppp2r5a                                                                       | 9.39136 | 1.11388 | 5.92302e-21 | 5.59137e-19 | Specific Adrenal2_high |
| Inf2                                                                          | 9.27863 | 3.02506 | 1.71675e-20 | 1.58812e-18 | Specific Adrenal2_high |
| Ehd1                                                                          | 9.22982 | 2.34848 | 2.71098e-20 | 2.45854e-18 | Specific Adrenal2_high |
| Uaca                                                                          | 9.1997  | 1.29757 | 3.58965e-20 | 3.2372e-18  | Specific Adrenal2_high |
| Jup                                                                           | 9.19571 | 1.11293 | 3.7251e-20  | 3.35e-18    | Specific Adrenal2_high |
| Gpr160                                                                        | 9.00123 | 5.6401  | 2.23207e-19 | 1.91655e-17 | Specific Adrenal2_high |
| Inka1                                                                         | 8.9795  | 2.03876 | 2.72003e-19 | 2.32318e-17 | Specific Adrenal2_high |
| Ap1nr                                                                         | 8.92394 | 1.71385 | 4.49998e-19 | 3.79326e-17 | Specific Adrenal2_high |
| Myo1b                                                                         | 8.86113 | 1.59621 | 7.92054e-19 | 6.57364e-17 | Specific Adrenal2_high |
| Cdh23                                                                         | 8.8406  | 4.83598 | 9.52101e-19 | 7.86153e-17 | Specific Adrenal2_high |
| Cep85l                                                                        | 8.69667 | 1.44764 | 3.41767e-18 | 2.7654e-16  | Specific Adrenal2_high |
| Prr13                                                                         | 8.66198 | 1.65245 | 4.63646e-18 | 3.74221e-16 | Specific Adrenal2_high |
| Pdgfb                                                                         | 8.62172 | 1.21315 | 6.59568e-18 | 5.21916e-16 | Specific Adrenal2_high |
| Tsnax                                                                         | 8.61439 | 1.96445 | 7.03153e-18 | 5.55044e-16 | Specific Adrenal2_high |
| Kcna5                                                                         | 8.5734  | 5.64668 | 1.00474e-17 | 7.87332e-16 | Specific Adrenal2_high |
| Mgat4a                                                                        | 8.5048  | 4.99428 | 1.81908e-17 | 1.39831e-15 | Specific Adrenal2_high |
| Rnf125                                                                        | 8.45732 | 2.26781 | 2.73594e-17 | 2.08325e-15 | Specific Adrenal2_high |
| St8sia4                                                                       | 8.40946 | 1.53456 | 4.11896e-17 | 3.09978e-15 | Specific Adrenal2_high |
| Evl                                                                           | 8.37794 | 1.89733 | 5.38638e-17 | 4.02544e-15 | Specific Adrenal2_high |
| Tmsb10                                                                        | 8.37636 | 1.09012 | 5.45902e-17 | 4.07031e-15 | Specific Adrenal2_high |
| Rasgrf2                                                                       | 8.37112 | 1.35757 | 5.70719e-17 | 4.24554e-15 | Specific Adrenal2_high |
| Epb41                                                                         | 8.33605 | 1.62662 | 7.68166e-17 | 5.63642e-15 | Specific Adrenal2_high |
| Cd200                                                                         | 8.32908 | 1.11182 | 8.14722e-17 | 5.96446e-15 | Specific Adrenal2_high |
| Trpm3                                                                         | 8.28423 | 4.04499 | 1.18877e-16 | 8.60527e-15 | Specific Adrenal2_high |
| Cdk14                                                                         | 8.25312 | 4.16133 | 1.5431e-16  | 1.10464e-14 | Specific Adrenal2_high |
| Gbp2                                                                          | 8.18151 | 1.71716 | 2.80315e-16 | 1.98901e-14 | Specific Adrenal2_high |
| Cyth1                                                                         | 8.17647 | 1.44188 | 2.92269e-16 | 2.06928e-14 | Specific Adrenal2_high |
| Psmb8                                                                         | 8.15493 | 1.05786 | 3.49387e-16 | 2.45217e-14 | Specific Adrenal2_high |
| Rassf9                                                                        | 8.13398 | 1.93056 | 4.15412e-16 | 2.88421e-14 | Specific Adrenal2_high |
| Nxpe4                                                                         | 8.12577 | 1.17428 | 4.44516e-16 | 3.07966e-14 | Specific Adrenal2_high |
| Galnt15                                                                       | 8.075   | 1.80742 | 6.74776e-16 | 4.6155e-14  | Specific Adrenal2_high |
| Epb41l4a                                                                      | 8.07263 | 2.88834 | 6.88017e-16 | 4.68621e-14 | Specific Adrenal2_high |
| Myadm                                                                         | 8.01994 | 1.7028  | 1.05796e-15 | 7.13074e-14 | Specific Adrenal2_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                        |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|------------------------|
| Ggta1                                                                         | 8.0039  | 1.30478 | 1.2054e-15  | 8.10758e-14 | Specific Adrenal2_high |
| Psme2                                                                         | 8.00112 | 1.04654 | 1.23293e-15 | 8.2583e-14  | Specific Adrenal2_high |
| Rgs5                                                                          | 7.99438 | 3.06264 | 1.30226e-15 | 8.68667e-14 | Specific Adrenal2_high |
| Adora2a                                                                       | 7.98754 | 2.82988 | 1.37663e-15 | 9.14496e-14 | Specific Adrenal2_high |
| Gm12002                                                                       | 7.89907 | 1.30808 | 2.80981e-15 | 1.82525e-13 | Specific Adrenal2_high |
| Pxdc1                                                                         | 7.8579  | 2.94848 | 3.90619e-15 | 2.52223e-13 | Specific Adrenal2_high |
| Prnp                                                                          | 7.82611 | 2.84128 | 5.03202e-15 | 3.23623e-13 | Specific Adrenal2_high |
| Kif26a                                                                        | 7.8258  | 2.05442 | 5.04449e-15 | 3.2378e-13  | Specific Adrenal2_high |
| Vim                                                                           | 7.79964 | 1.21379 | 6.20855e-15 | 3.96917e-13 | Specific Adrenal2_high |
| Ndufa8                                                                        | 7.72631 | 1.03117 | 1.10712e-14 | 6.98114e-13 | Specific Adrenal2_high |
| Rfxap                                                                         | 7.72511 | 2.48041 | 1.11752e-14 | 7.033e-13   | Specific Adrenal2_high |
| Pnp1a2                                                                        | 7.63899 | 1.86602 | 2.18926e-14 | 1.35924e-12 | Specific Adrenal2_high |
| Igf2r                                                                         | 7.62457 | 1.94059 | 2.44845e-14 | 1.50568e-12 | Specific Adrenal2_high |
| Tob1                                                                          | 7.56035 | 2.46335 | 4.01983e-14 | 2.44868e-12 | Specific Adrenal2_high |
| 4930523C07Rik                                                                 | 7.49688 | 1.39052 | 6.53541e-14 | 3.93302e-12 | Specific Adrenal2_high |
| Mcf2l                                                                         | 7.46349 | 1.15057 | 8.42612e-14 | 5.05645e-12 | Specific Adrenal2_high |
| Adh1                                                                          | 7.42889 | 6.29411 | 1.09509e-13 | 6.52308e-12 | Specific Adrenal2_high |
| Tmem86a                                                                       | 7.394   | 3.36722 | 1.42477e-13 | 8.44015e-12 | Specific Adrenal2_high |
| Bmp6                                                                          | 7.38661 | 1.10002 | 1.50624e-13 | 8.89013e-12 | Specific Adrenal2_high |
| Gulp1                                                                         | 7.38255 | 1.46378 | 1.55286e-13 | 9.13191e-12 | Specific Adrenal2_high |
| Mgst1                                                                         | 7.37653 | 2.54158 | 1.62468e-13 | 9.51957e-12 | Specific Adrenal2_high |
| Art3                                                                          | 7.36805 | 1.88713 | 1.73138e-13 | 1.01264e-11 | Specific Adrenal2_high |
| Ptger4                                                                        | 7.32803 | 5.08521 | 2.33562e-13 | 1.35866e-11 | Specific Adrenal2_high |
| Pcdh1                                                                         | 7.32302 | 1.65595 | 2.42455e-13 | 1.40533e-11 | Specific Adrenal2_high |
| Tmem123                                                                       | 7.29097 | 1.36172 | 3.07739e-13 | 1.77101e-11 | Specific Adrenal2_high |
| Tspan6                                                                        | 7.2824  | 3.85531 | 3.27924e-13 | 1.88046e-11 | Specific Adrenal2_high |
| Tbx3                                                                          | 7.22213 | 2.65084 | 5.11789e-13 | 2.909e-11   | Specific Adrenal2_high |
| Pcdh19                                                                        | 7.17706 | 3.51615 | 7.12241e-13 | 4.01304e-11 | Specific Adrenal2_high |
| Eepd1                                                                         | 7.13495 | 1.65292 | 9.68238e-13 | 5.39889e-11 | Specific Adrenal2_high |
| Filip1l                                                                       | 7.05915 | 1.70133 | 1.67525e-12 | 9.26122e-11 | Specific Adrenal2_high |
| Syt7                                                                          | 7.03917 | 2.32956 | 1.93389e-12 | 1.06003e-10 | Specific Adrenal2_high |
| Dipk2b                                                                        | 7.01008 | 1.83736 | 2.38183e-12 | 1.29675e-10 | Specific Adrenal2_high |
| Hadhb                                                                         | 6.92643 | 1.37422 | 4.31606e-12 | 2.30321e-10 | Specific Adrenal2_high |
| Egr1                                                                          | 6.84809 | 1.82232 | 7.48401e-12 | 3.90973e-10 | Specific Adrenal2_high |
| Ccdc88c                                                                       | 6.83677 | 1.65495 | 8.09963e-12 | 4.21769e-10 | Specific Adrenal2_high |
| Myo1d                                                                         | 6.79111 | 1.0667  | 1.11277e-11 | 5.77586e-10 | Specific Adrenal2_high |
| Ric1                                                                          | 6.78504 | 1.50467 | 1.16052e-11 | 6.01401e-10 | Specific Adrenal2_high |
| Cd247                                                                         | 6.76688 | 6.65206 | 1.31592e-11 | 6.76504e-10 | Specific Adrenal2_high |
| Tm6sf1                                                                        | 6.75406 | 1.78407 | 1.43759e-11 | 7.37037e-10 | Specific Adrenal2_high |
| Ccn1                                                                          | 6.73705 | 2.63103 | 1.61638e-11 | 8.23106e-10 | Specific Adrenal2_high |
| Samd5                                                                         | 6.72434 | 6.53521 | 1.76388e-11 | 8.96116e-10 | Specific Adrenal2_high |
| Stom                                                                          | 6.69205 | 1.55766 | 2.20059e-11 | 1.10492e-09 | Specific Adrenal2_high |
| Chchd10                                                                       | 6.68882 | 1.98705 | 2.2497e-11  | 1.12782e-09 | Specific Adrenal2_high |
| Glicc1                                                                        | 6.68342 | 2.61527 | 2.33435e-11 | 1.16663e-09 | Specific Adrenal2_high |
| Ly6e                                                                          | 6.64438 | 1.00322 | 3.04497e-11 | 1.50087e-09 | Specific Adrenal2_high |



| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                        |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|------------------------|
| Pbld1                                                                         | 6.63308 | 5.40863 | 3.28752e-11 | 1.60815e-09 | Specific Adrenal2_high |
| Lpar6                                                                         | 6.61972 | 1.06271 | 3.59877e-11 | 1.75243e-09 | Specific Adrenal2_high |
| Tubb2a                                                                        | 6.60719 | 1.73738 | 3.91688e-11 | 1.9016e-09  | Specific Adrenal2_high |
| Stard13                                                                       | 6.58526 | 1.83698 | 4.54103e-11 | 2.18166e-09 | Specific Adrenal2_high |
| Nova2                                                                         | 6.46534 | 1.03206 | 1.01068e-10 | 4.72897e-09 | Specific Adrenal2_high |
| Timm10b                                                                       | 6.41732 | 1.157   | 1.38698e-10 | 6.41529e-09 | Specific Adrenal2_high |
| Eps8                                                                          | 6.38005 | 3.57371 | 1.77031e-10 | 8.08409e-09 | Specific Adrenal2_high |
| Dipk2a                                                                        | 6.37115 | 2.07075 | 1.87611e-10 | 8.54307e-09 | Specific Adrenal2_high |
| Ddt                                                                           | 6.35403 | 2.14186 | 2.09748e-10 | 9.47095e-09 | Specific Adrenal2_high |
| Sym                                                                           | 6.28108 | 2.15542 | 3.36221e-10 | 1.48291e-08 | Specific Adrenal2_high |
| Cldn15                                                                        | 6.25992 | 1.68652 | 3.85167e-10 | 1.68955e-08 | Specific Adrenal2_high |
| Ier2                                                                          | 6.23984 | 1.04628 | 4.38029e-10 | 1.9059e-08  | Specific Adrenal2_high |
| Btg3                                                                          | 6.23624 | 1.33338 | 4.48209e-10 | 1.94757e-08 | Specific Adrenal2_high |
| Ccser1                                                                        | 6.22179 | 1.80753 | 4.91521e-10 | 2.12396e-08 | Specific Adrenal2_high |
| Pxdn                                                                          | 6.21524 | 1.03281 | 5.12455e-10 | 2.20301e-08 | Specific Adrenal2_high |
| Lipe                                                                          | 6.21113 | 1.57548 | 5.2604e-10  | 2.25242e-08 | Specific Adrenal2_high |
| N4bp3                                                                         | 6.16634 | 1.68538 | 6.98868e-10 | 2.96102e-08 | Specific Adrenal2_high |
| Crybg1                                                                        | 6.15534 | 4.02712 | 7.4919e-10  | 3.16178e-08 | Specific Adrenal2_high |
| Apol10b                                                                       | 6.13162 | 2.98285 | 8.69881e-10 | 3.64729e-08 | Specific Adrenal2_high |
| Enpp4                                                                         | 6.10261 | 1.37319 | 1.04353e-09 | 4.34153e-08 | Specific Adrenal2_high |
| Mospd2                                                                        | 6.09087 | 1.30682 | 1.12301e-09 | 4.64824e-08 | Specific Adrenal2_high |
| Dgke                                                                          | 6.08222 | 1.28683 | 1.18531e-09 | 4.87486e-08 | Specific Adrenal2_high |
| Snn                                                                           | 6.05631 | 2.17745 | 1.39284e-09 | 5.69592e-08 | Specific Adrenal2_high |
| St6galnac2                                                                    | 5.97692 | 2.80033 | 2.27393e-09 | 9.10841e-08 | Specific Adrenal2_high |
| Cecr2                                                                         | 5.96982 | 2.13307 | 2.37517e-09 | 9.46697e-08 | Specific Adrenal2_high |
| Inka2                                                                         | 5.93491 | 3.86616 | 2.94001e-09 | 1.15895e-07 | Specific Adrenal2_high |
| Slc6a6                                                                        | 5.90134 | 1.01062 | 3.60566e-09 | 1.4059e-07  | Specific Adrenal2_high |
| Lrrc36                                                                        | 5.84023 | 8.69418 | 5.21292e-09 | 2.01333e-07 | Specific Adrenal2_high |
| Sncaip                                                                        | 5.84001 | 1.06672 | 5.21964e-09 | 2.01333e-07 | Specific Adrenal2_high |
| Pnkd                                                                          | 5.83369 | 1.02332 | 5.42135e-09 | 2.08367e-07 | Specific Adrenal2_high |
| Adcy4                                                                         | 5.82338 | 1.20792 | 5.76685e-09 | 2.20857e-07 | Specific Adrenal2_high |
| Unc13b                                                                        | 5.74339 | 1.83914 | 9.28009e-09 | 3.47977e-07 | Specific Adrenal2_high |
| Agmo                                                                          | 5.74225 | 1.52407 | 9.34266e-09 | 3.49916e-07 | Specific Adrenal2_high |
| Nepn                                                                          | 5.73646 | 8.00858 | 9.66782e-09 | 3.61256e-07 | Specific Adrenal2_high |
| Kcnc2                                                                         | 5.73372 | 5.93273 | 9.82517e-09 | 3.66712e-07 | Specific Adrenal2_high |
| Cltb                                                                          | 5.66144 | 1.07878 | 1.50108e-08 | 5.52592e-07 | Specific Adrenal2_high |
| Ldlrad3                                                                       | 5.65015 | 1.52976 | 1.60306e-08 | 5.86789e-07 | Specific Adrenal2_high |
| Gstt1                                                                         | 5.64897 | 5.26873 | 1.6141e-08  | 5.90163e-07 | Specific Adrenal2_high |
| Hist1h2bc                                                                     | 5.53878 | 1.84413 | 3.04582e-08 | 1.08777e-06 | Specific Adrenal2_high |
| Acly                                                                          | 5.5358  | 1.13951 | 3.09813e-08 | 1.10401e-06 | Specific Adrenal2_high |
| Acot7                                                                         | 5.52858 | 3.17152 | 3.22838e-08 | 1.14915e-06 | Specific Adrenal2_high |
| Actn1                                                                         | 5.50144 | 1.91472 | 3.767e-08   | 1.33353e-06 | Specific Adrenal2_high |
| Atp13a3                                                                       | 5.48162 | 1.87831 | 4.21444e-08 | 1.47734e-06 | Specific Adrenal2_high |
| Chek2                                                                         | 5.4438  | 2.07567 | 5.21565e-08 | 1.81452e-06 | Specific Adrenal2_high |
| Vsir                                                                          | 5.40374 | 1.28384 | 6.52651e-08 | 2.24876e-06 | Specific Adrenal2_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                        |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|------------------------|
| Socs2                                                                         | 5.38666 | 1.20752 | 7.17796e-08 | 2.46009e-06 | Specific Adrenal2_high |
| Cyb5r1                                                                        | 5.36408 | 1.54341 | 8.1362e-08  | 2.75921e-06 | Specific Adrenal2_high |
| Elf4                                                                          | 5.35888 | 1.72074 | 8.37405e-08 | 2.8369e-06  | Specific Adrenal2_high |
| Fam189a2                                                                      | 5.35347 | 1.36806 | 8.62835e-08 | 2.91692e-06 | Specific Adrenal2_high |
| Plekhg5                                                                       | 5.33008 | 1.3146  | 9.81708e-08 | 3.28781e-06 | Specific Adrenal2_high |
| Lratd2                                                                        | 5.23705 | 2.08945 | 1.63167e-07 | 5.35351e-06 | Specific Adrenal2_high |
| Bbs9                                                                          | 5.23193 | 1.20316 | 1.67752e-07 | 5.49276e-06 | Specific Adrenal2_high |
| Nrep                                                                          | 5.18573 | 1.33414 | 2.15166e-07 | 6.93971e-06 | Specific Adrenal2_high |
| Ifi27l2a                                                                      | 5.15088 | 2.18816 | 2.59265e-07 | 8.25481e-06 | Specific Adrenal2_high |
| Adamts5                                                                       | 5.14751 | 2.86776 | 2.63964e-07 | 8.38787e-06 | Specific Adrenal2_high |
| Gopc                                                                          | 5.14553 | 1.18533 | 2.66771e-07 | 8.46041e-06 | Specific Adrenal2_high |
| Hadha                                                                         | 5.14046 | 1.01607 | 2.74063e-07 | 8.66614e-06 | Specific Adrenal2_high |
| Rassf1                                                                        | 5.13931 | 1.04891 | 2.75743e-07 | 8.70221e-06 | Specific Adrenal2_high |
| Zfp979                                                                        | 5.12767 | 1.77055 | 2.93347e-07 | 9.24875e-06 | Specific Adrenal2_high |
| Fasn                                                                          | 5.08847 | 4.26032 | 3.60956e-07 | 1.1325e-05  | Specific Adrenal2_high |
| Abcb1a                                                                        | 5.08502 | 1.05383 | 3.6759e-07  | 1.1522e-05  | Specific Adrenal2_high |
| Plaat3                                                                        | 5.08295 | 1.47244 | 3.71622e-07 | 1.16371e-05 | Specific Adrenal2_high |
| Gm29007                                                                       | 5.0575  | 10.9739 | 4.24798e-07 | 1.31998e-05 | Specific Adrenal2_high |
| Lmbr1                                                                         | 5.05491 | 1.33985 | 4.30595e-07 | 1.33671e-05 | Specific Adrenal2_high |
| Lcorl                                                                         | 5.02741 | 1.12202 | 4.97155e-07 | 1.53595e-05 | Specific Adrenal2_high |
| Fhl1                                                                          | 5.01105 | 5.08929 | 5.41325e-07 | 1.65813e-05 | Specific Adrenal2_high |
| Hoxd8                                                                         | 5.00793 | 2.38857 | 5.50179e-07 | 1.68206e-05 | Specific Adrenal2_high |
| Dgkd                                                                          | 4.99589 | 1.46582 | 5.85642e-07 | 1.78372e-05 | Specific Adrenal2_high |
| Irak2                                                                         | 4.95528 | 1.34122 | 7.22267e-07 | 2.1732e-05  | Specific Adrenal2_high |
| Hsd17b11                                                                      | 4.95228 | 1.33854 | 7.33471e-07 | 2.2028e-05  | Specific Adrenal2_high |
| Sik1                                                                          | 4.94518 | 2.05684 | 7.6073e-07  | 2.2762e-05  | Specific Adrenal2_high |
| Gpr4                                                                          | 4.94092 | 1.29789 | 7.77542e-07 | 2.32005e-05 | Specific Adrenal2_high |
| Gbp4                                                                          | 4.93456 | 1.05549 | 8.03323e-07 | 2.39035e-05 | Specific Adrenal2_high |
| Nrarp                                                                         | 4.93245 | 1.37401 | 8.12069e-07 | 2.41193e-05 | Specific Adrenal2_high |
| Coro6                                                                         | 4.91948 | 4.94433 | 8.67734e-07 | 2.54912e-05 | Specific Adrenal2_high |
| Fam181b                                                                       | 4.88748 | 4.39496 | 1.02133e-06 | 2.97058e-05 | Specific Adrenal2_high |
| Mall                                                                          | 4.86159 | 2.75011 | 1.16445e-06 | 3.36264e-05 | Specific Adrenal2_high |
| Ppm1h                                                                         | 4.85869 | 1.14562 | 1.18168e-06 | 3.40935e-05 | Specific Adrenal2_high |
| Hoxb8                                                                         | 4.81484 | 3.01057 | 1.47318e-06 | 4.19044e-05 | Specific Adrenal2_high |
| Ctla2b                                                                        | 4.75896 | 1.56743 | 1.94596e-06 | 5.43942e-05 | Specific Adrenal2_high |
| Lzts2                                                                         | 4.75531 | 1.20223 | 1.98144e-06 | 5.52901e-05 | Specific Adrenal2_high |
| Efr3b                                                                         | 4.75073 | 1.12431 | 2.02687e-06 | 5.63145e-05 | Specific Adrenal2_high |
| Uba7                                                                          | 4.74236 | 1.29751 | 2.11246e-06 | 5.84912e-05 | Specific Adrenal2_high |
| Arhgap28                                                                      | 4.7362  | 3.09091 | 2.17765e-06 | 6.0193e-05  | Specific Adrenal2_high |
| Ephx1                                                                         | 4.72224 | 1.58383 | 2.33264e-06 | 6.4257e-05  | Specific Adrenal2_high |
| Lpcat3                                                                        | 4.71025 | 1.23559 | 2.47411e-06 | 6.78069e-05 | Specific Adrenal2_high |
| Stimate                                                                       | 4.64044 | 1.3126  | 3.47667e-06 | 9.31488e-05 | Specific Adrenal2_high |
| Nos2                                                                          | 4.61454 | 2.41667 | 3.93971e-06 | 0.000104334 | Specific Adrenal2_high |
| Tsfm                                                                          | 4.60624 | 1.70106 | 4.10009e-06 | 0.000107882 | Specific Adrenal2_high |
| Zyx                                                                           | 4.5873  | 1.15776 | 4.49006e-06 | 0.000117283 | Specific Adrenal2_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                        |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|------------------------|
| Oat                                                                           | 4.57    | 1.57333 | 4.87733e-06 | 0.000126783 | Specific Adrenal2_high |
| Ckb                                                                           | 4.55199 | 1.16364 | 5.31407e-06 | 0.000137803 | Specific Adrenal2_high |
| Inpp1                                                                         | 4.5488  | 1.15734 | 5.39517e-06 | 0.000139682 | Specific Adrenal2_high |
| Tmem238                                                                       | 4.51901 | 1.97094 | 6.21307e-06 | 0.000159705 | Specific Adrenal2_high |
| Atp9a                                                                         | 4.49205 | 1.17466 | 7.05405e-06 | 0.000180174 | Specific Adrenal2_high |
| Nck2                                                                          | 4.4526  | 1.41369 | 8.48384e-06 | 0.000214824 | Specific Adrenal2_high |
| Jag2                                                                          | 4.44459 | 1.12832 | 8.80592e-06 | 0.000222456 | Specific Adrenal2_high |
| Hrh2                                                                          | 4.43896 | 11.7923 | 9.03956e-06 | 0.000228002 | Specific Adrenal2_high |
| Nudt4                                                                         | 4.43111 | 1.10059 | 9.37476e-06 | 0.00023572  | Specific Adrenal2_high |
| Acacb                                                                         | 4.40468 | 2.10588 | 1.05938e-05 | 0.000264926 | Specific Adrenal2_high |
| Pkn3                                                                          | 4.36873 | 2.26894 | 1.24972e-05 | 0.000310603 | Specific Adrenal2_high |
| Hoxa7                                                                         | 4.32941 | 1.5857  | 1.49508e-05 | 0.000366505 | Specific Adrenal2_high |
| Hmgcl                                                                         | 4.30655 | 1.26408 | 1.65824e-05 | 0.000403438 | Specific Adrenal2_high |
| mt-Atp8                                                                       | 4.30443 | 1.77429 | 1.67415e-05 | 0.000407002 | Specific Adrenal2_high |
| Litaf                                                                         | 4.29071 | 1.18478 | 1.78105e-05 | 0.000432014 | Specific Adrenal2_high |
| Hdac9                                                                         | 4.28813 | 1.64997 | 1.80182e-05 | 0.000436724 | Specific Adrenal2_high |
| Sybu                                                                          | 4.22906 | 1.46196 | 2.34668e-05 | 0.000559546 | Specific Adrenal2_high |
| Cnst                                                                          | 4.21292 | 1.15703 | 2.52086e-05 | 0.000598427 | Specific Adrenal2_high |
| Gm1673                                                                        | 4.21246 | 2.13936 | 2.52602e-05 | 0.000599211 | Specific Adrenal2_high |
| Il4ra                                                                         | 4.1974  | 1.45411 | 2.70001e-05 | 0.000638138 | Specific Adrenal2_high |
| Prickle3                                                                      | 4.19569 | 1.72414 | 2.72041e-05 | 0.000642221 | Specific Adrenal2_high |
| Tnfrsf21                                                                      | 4.16485 | 4.99197 | 3.11555e-05 | 0.00072888  | Specific Adrenal2_high |
| Tnc                                                                           | 4.16389 | 8.15977 | 3.12876e-05 | 0.000731442 | Specific Adrenal2_high |
| Itpril1                                                                       | 4.1399  | 2.80769 | 3.47451e-05 | 0.000803457 | Specific Adrenal2_high |
| Mif                                                                           | 4.12363 | 1.23511 | 3.72954e-05 | 0.000857609 | Specific Adrenal2_high |
| Fbln2                                                                         | 4.11399 | 2.07332 | 3.88878e-05 | 0.00088853  | Specific Adrenal2_high |
| Retn                                                                          | 4.08269 | 9.72405 | 4.45174e-05 | 0.00100296  | Specific Adrenal2_high |
| Tmem255b                                                                      | 4.06656 | 2.13344 | 4.77118e-05 | 0.00107045  | Specific Adrenal2_high |
| Gstt3                                                                         | 4.04123 | 3.46075 | 5.31721e-05 | 0.00118146  | Specific Adrenal2_high |
| Eva1a                                                                         | 4.0155  | 3.29081 | 5.93208e-05 | 0.00130195  | Specific Adrenal2_high |
| Gprc5b                                                                        | 4.00594 | 2.08975 | 6.17724e-05 | 0.00135117  | Specific Adrenal2_high |
| Pth1r                                                                         | 3.90329 | 5.61221 | 9.4894e-05  | 0.00202221  | Specific Adrenal2_high |
| Krt222                                                                        | 3.90225 | 4.65041 | 9.53031e-05 | 0.00202959  | Specific Adrenal2_high |
| Snx10                                                                         | 3.89309 | 2.45583 | 9.89774e-05 | 0.00209677  | Specific Adrenal2_high |
| 1110008P14Rik                                                                 | 3.88178 | 1.69905 | 0.000103697 | 0.00218957  | Specific Adrenal2_high |
| Pja1                                                                          | 3.83143 | 1.61691 | 0.000127401 | 0.00264852  | Specific Adrenal2_high |
| Gbp3                                                                          | 3.81262 | 1.20154 | 0.000137502 | 0.00284204  | Specific Adrenal2_high |
| Apold1                                                                        | 3.8098  | 1.21558 | 0.000139081 | 0.0028655   | Specific Adrenal2_high |
| Ppa1                                                                          | 3.79329 | 2.12615 | 0.000148662 | 0.00304928  | Specific Adrenal2_high |
| Emc6                                                                          | 3.77969 | 1.05366 | 0.000157025 | 0.00320453  | Specific Adrenal2_high |
| Unc119                                                                        | 3.76756 | 3.61262 | 0.00016485  | 0.0033536   | Specific Adrenal2_high |
| Sgf29                                                                         | 3.76722 | 1.33031 | 0.000165076 | 0.0033561   | Specific Adrenal2_high |
| Cables2                                                                       | 3.76458 | 1.55909 | 0.00016683  | 0.00338749  | Specific Adrenal2_high |
| Sema3g                                                                        | 3.75102 | 1.32684 | 0.00017612  | 0.00355598  | Specific Adrenal2_high |
| Unc5b                                                                         | 3.74362 | 1.18812 | 0.000181386 | 0.0036509   | Specific Adrenal2_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                         |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|-------------------------|
| Rnf4                                                                          | 3.68583 | 1.02308 | 0.000227959 | 0.00448486  | Specific Adrenal2_high  |
| Mustn1                                                                        | 3.68445 | 2.73423 | 0.000229201 | 0.00450656  | Specific Adrenal2_high  |
| Bcar3                                                                         | 3.63707 | 1.68343 | 0.000275756 | 0.00532463  | Specific Adrenal2_high  |
| Pfkp                                                                          | 3.62535 | 1.19157 | 0.000288567 | 0.00555207  | Specific Adrenal2_high  |
| Gm32688                                                                       | 3.61042 | 1.11181 | 0.000305706 | 0.00586087  | Specific Adrenal2_high  |
| Snx11                                                                         | 3.59753 | 1.6731  | 0.000321254 | 0.00611899  | Specific Adrenal2_high  |
| Tnfaip8                                                                       | 3.54134 | 2.17686 | 0.000398108 | 0.00746828  | Specific Adrenal2_high  |
| Fdx1                                                                          | 3.53748 | 1.10176 | 0.000403961 | 0.00756928  | Specific Adrenal2_high  |
| Mea1                                                                          | 3.53281 | 1.39253 | 0.000411116 | 0.00769516  | Specific Adrenal2_high  |
| Ampd3                                                                         | 3.52236 | 1.42314 | 0.000427717 | 0.00797277  | Specific Adrenal2_high  |
| D830026I12Rik                                                                 | 3.51816 | 2.91693 | 0.000434554 | 0.00808156  | Specific Adrenal2_high  |
| Neurl1b                                                                       | 3.51774 | 1.59309 | 0.00043524  | 0.00808297  | Specific Adrenal2_high  |
| Chrm3                                                                         | 25.5476 | 3.64017 | 5.8363e-144 | 1.8843e-139 | Specific Pituitary_high |
| Gh                                                                            | 24.8882 | 5.55695 | 9.9906e-137 | 1.6127e-132 | Specific Pituitary_high |
| Pomc                                                                          | 24.4948 | 4.93008 | 1.6768e-132 | 1.8046e-128 | Specific Pituitary_high |
| AY036118                                                                      | 23.561  | 3.67073 | 9.6822e-123 | 7.8148e-119 | Specific Pituitary_high |
| Pbx1                                                                          | 22.614  | 3.08272 | 3.1543e-113 | 2.0367e-109 | Specific Pituitary_high |
| Meis2                                                                         | 21.2446 | 1.77732 | 3.6968e-100 | 1.705e-96   | Specific Pituitary_high |
| Pcdh7                                                                         | 20.6527 | 5.20062 | 9.23466e-95 | 3.72676e-91 | Specific Pituitary_high |
| Plvap                                                                         | 20.1644 | 2.46843 | 2.01273e-90 | 7.22011e-87 | Specific Pituitary_high |
| Cmss1                                                                         | 19.4063 | 2.05202 | 6.82587e-84 | 2.00339e-80 | Specific Pituitary_high |
| Ltbp1                                                                         | 18.9346 | 2.87208 | 5.91346e-80 | 1.59097e-76 | Specific Pituitary_high |
| Prss23                                                                        | 17.4371 | 3.2023  | 4.31186e-68 | 9.28055e-65 | Specific Pituitary_high |
| Malat1                                                                        | 17.3076 | 1.43203 | 4.12034e-67 | 8.31407e-64 | Specific Pituitary_high |
| Igfbp3                                                                        | 17.0695 | 2.37346 | 2.50416e-65 | 4.7557e-62  | Specific Pituitary_high |
| Abcg2                                                                         | 16.2781 | 1.82888 | 1.41163e-59 | 2.07156e-56 | Specific Pituitary_high |
| Itm2a                                                                         | 16.2201 | 2.5646  | 3.63893e-59 | 5.10794e-56 | Specific Pituitary_high |
| Kirrel3                                                                       | 16.051  | 4.19846 | 5.62571e-58 | 7.26505e-55 | Specific Pituitary_high |
| H2-D1                                                                         | 15.6672 | 1.06608 | 2.53564e-55 | 3.14858e-52 | Specific Pituitary_high |
| Lmo2                                                                          | 15.61   | 1.80387 | 6.22587e-55 | 7.44453e-52 | Specific Pituitary_high |
| Igfbp5                                                                        | 15.5247 | 2.47697 | 2.3613e-54  | 2.62878e-51 | Specific Pituitary_high |
| Ehd4                                                                          | 14.9938 | 1.67744 | 8.06528e-51 | 8.3996e-48  | Specific Pituitary_high |
| Cga                                                                           | 14.7461 | 4.1052  | 3.25868e-49 | 3.18808e-46 | Specific Pituitary_high |
| Trp53i11                                                                      | 14.5555 | 2.08421 | 5.39246e-48 | 4.83599e-45 | Specific Pituitary_high |
| Ptpru                                                                         | 14.5295 | 2.18164 | 7.88528e-48 | 6.88044e-45 | Specific Pituitary_high |
| Pdia5                                                                         | 14.486  | 2.28505 | 1.48643e-47 | 1.23049e-44 | Specific Pituitary_high |
| Abca1                                                                         | 14.461  | 2.66999 | 2.13616e-47 | 1.72415e-44 | Specific Pituitary_high |
| Flrt2                                                                         | 14.0782 | 3.16676 | 5.17111e-45 | 3.55211e-42 | Specific Pituitary_high |
| Rflnb                                                                         | 13.809  | 1.62269 | 2.24882e-43 | 1.45206e-40 | Specific Pituitary_high |
| Jund                                                                          | 13.5638 | 1.52009 | 6.56447e-42 | 3.9247e-39  | Specific Pituitary_high |
| Tanc2                                                                         | 13.2931 | 1.85036 | 2.53783e-40 | 1.36556e-37 | Specific Pituitary_high |
| Scn1b                                                                         | 13.0866 | 2.45641 | 3.92956e-39 | 1.95178e-36 | Specific Pituitary_high |
| Scarb1                                                                        | 12.8766 | 1.4612  | 6.09195e-38 | 2.85041e-35 | Specific Pituitary_high |
| Robo2                                                                         | 12.7652 | 4.52125 | 2.56622e-37 | 1.1196e-34  | Specific Pituitary_high |
| Gas7                                                                          | 12.6601 | 2.02674 | 9.83945e-37 | 4.07265e-34 | Specific Pituitary_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                         |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|-------------------------|
| Lbp                                                                           | 12.3357 | 2.60415 | 5.81622e-35 | 2.13382e-32 | Specific Pituitary_high |
| Apoe                                                                          | 12.3317 | 1.22184 | 6.11722e-35 | 2.21904e-32 | Specific Pituitary_high |
| Col15a1                                                                       | 12.2022 | 1.89697 | 3.02652e-34 | 1.07375e-31 | Specific Pituitary_high |
| Limch1                                                                        | 12.1625 | 1.3454  | 4.92273e-34 | 1.7275e-31  | Specific Pituitary_high |
| Nos1ap                                                                        | 11.8486 | 3.01118 | 2.18913e-32 | 6.92902e-30 | Specific Pituitary_high |
| Tnfaip2                                                                       | 11.6794 | 1.76762 | 1.62378e-31 | 4.80953e-29 | Specific Pituitary_high |
| Pcdh17                                                                        | 11.5376 | 1.18191 | 8.52181e-31 | 2.39241e-28 | Specific Pituitary_high |
| Cavin3                                                                        | 11.4947 | 1.35511 | 1.40342e-30 | 3.90597e-28 | Specific Pituitary_high |
| Adams9                                                                        | 11.2167 | 2.02772 | 3.37769e-29 | 8.86575e-27 | Specific Pituitary_high |
| Elmo1                                                                         | 10.9795 | 1.63922 | 4.79396e-28 | 1.19056e-25 | Specific Pituitary_high |
| Smco4                                                                         | 10.8733 | 1.31394 | 1.54505e-27 | 3.77893e-25 | Specific Pituitary_high |
| Nav3                                                                          | 10.8498 | 1.94065 | 1.99836e-27 | 4.81471e-25 | Specific Pituitary_high |
| Jun                                                                           | 10.8214 | 1.29336 | 2.72675e-27 | 6.52098e-25 | Specific Pituitary_high |
| Etl4                                                                          | 10.7585 | 1.07979 | 5.40351e-27 | 1.27338e-24 | Specific Pituitary_high |
| Ctla2a                                                                        | 10.5637 | 1.10466 | 4.39169e-26 | 9.91508e-24 | Specific Pituitary_high |
| Piezo2                                                                        | 10.5553 | 1.37453 | 4.79924e-26 | 1.076e-23   | Specific Pituitary_high |
| Hspa1a                                                                        | 10.358  | 1.90306 | 3.85118e-25 | 8.23414e-23 | Specific Pituitary_high |
| Nectin2                                                                       | 10.2514 | 1.78961 | 1.16673e-24 | 2.43018e-22 | Specific Pituitary_high |
| 2610307P16Rik                                                                 | 10.033  | 1.95289 | 1.0919e-23  | 2.16269e-21 | Specific Pituitary_high |
| Mmrn1                                                                         | 9.84646 | 4.91012 | 7.10036e-23 | 1.32506e-20 | Specific Pituitary_high |
| Auts2                                                                         | 9.70515 | 1.334   | 2.86642e-22 | 5.19901e-20 | Specific Pituitary_high |
| 2026-09-04 00:00:00                                                           | 9.6643  | 1.53082 | 4.27544e-22 | 7.66847e-20 | Specific Pituitary_high |
| Pltp                                                                          | 9.4835  | 1.34094 | 2.45888e-21 | 4.24518e-19 | Specific Pituitary_high |
| Ly6e                                                                          | 9.43402 | 1.00509 | 3.94659e-21 | 6.74157e-19 | Specific Pituitary_high |
| G0s2                                                                          | 9.39743 | 4.83008 | 5.59115e-21 | 9.35287e-19 | Specific Pituitary_high |
| Aplnr                                                                         | 9.34779 | 1.67089 | 8.9502e-21  | 1.48947e-18 | Specific Pituitary_high |
| Fos                                                                           | 9.27781 | 2.16154 | 1.73002e-20 | 2.77879e-18 | Specific Pituitary_high |
| Slit3                                                                         | 9.12838 | 2.01315 | 6.95341e-20 | 1.05395e-17 | Specific Pituitary_high |
| Filip1l                                                                       | 8.73431 | 2.2695  | 2.45155e-18 | 3.27059e-16 | Specific Pituitary_high |
| Chn2                                                                          | 8.57124 | 1.5853  | 1.02381e-17 | 1.26642e-15 | Specific Pituitary_high |
| Arhgap6                                                                       | 8.42166 | 3.09015 | 3.71193e-17 | 4.43851e-15 | Specific Pituitary_high |
| Junb                                                                          | 8.33129 | 1.5202  | 7.99643e-17 | 9.23302e-15 | Specific Pituitary_high |
| Emcn                                                                          | 8.21046 | 1.24103 | 2.20341e-16 | 2.47004e-14 | Specific Pituitary_high |
| Cyba                                                                          | 8.0217  | 1.07872 | 1.0429e-15  | 1.10757e-13 | Specific Pituitary_high |
| Ccser1                                                                        | 8.00586 | 2.29709 | 1.18631e-15 | 1.2448e-13  | Specific Pituitary_high |
| Hspa1b                                                                        | 7.9086  | 1.41289 | 2.60307e-15 | 2.6595e-13  | Specific Pituitary_high |
| Pdgfb                                                                         | 7.67183 | 1.12426 | 1.69559e-14 | 1.57305e-12 | Specific Pituitary_high |
| Col4a3                                                                        | 7.64959 | 2.00926 | 2.01615e-14 | 1.84919e-12 | Specific Pituitary_high |
| Sorbs2                                                                        | 7.59842 | 1.33547 | 2.99769e-14 | 2.71094e-12 | Specific Pituitary_high |
| Cped1                                                                         | 7.58319 | 1.22031 | 3.37147e-14 | 3.04044e-12 | Specific Pituitary_high |
| H2-Q7                                                                         | 7.54107 | 1.01928 | 4.66146e-14 | 4.14588e-12 | Specific Pituitary_high |
| Sema3d                                                                        | 7.33662 | 2.24436 | 2.19063e-13 | 1.81811e-11 | Specific Pituitary_high |
| Cited2                                                                        | 7.20425 | 2.31075 | 5.83647e-13 | 4.69901e-11 | Specific Pituitary_high |
| Foxl2                                                                         | 7.13472 | 4.13838 | 9.69848e-13 | 7.6744e-11  | Specific Pituitary_high |
| Me3                                                                           | 6.88802 | 2.91436 | 5.6574e-12  | 4.00546e-10 | Specific Pituitary_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                         |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|-------------------------|
| Gng2                                                                          | 6.87958 | 1.43636 | 6.00292e-12 | 4.1949e-10  | Specific Pituitary_high |
| Hmgn3                                                                         | 6.81255 | 1.92732 | 9.58838e-12 | 6.50338e-10 | Specific Pituitary_high |
| Pde8a                                                                         | 6.73692 | 1.03288 | 1.61775e-11 | 1.05301e-09 | Specific Pituitary_high |
| Ccn2                                                                          | 6.64391 | 2.69882 | 3.05464e-11 | 1.92615e-09 | Specific Pituitary_high |
| Pard3                                                                         | 6.57072 | 2.95364 | 5.00721e-11 | 3.0617e-09  | Specific Pituitary_high |
| Vegfc                                                                         | 6.54434 | 1.82052 | 5.97596e-11 | 3.59281e-09 | Specific Pituitary_high |
| Gsta3                                                                         | 6.42098 | 4.68765 | 1.354e-10   | 7.86224e-09 | Specific Pituitary_high |
| Fbln5                                                                         | 6.42064 | 2.73302 | 1.35702e-10 | 7.86561e-09 | Specific Pituitary_high |
| Sned1                                                                         | 6.37804 | 2.36915 | 1.79364e-10 | 1.01414e-08 | Specific Pituitary_high |
| Tbxa2r                                                                        | 6.33472 | 1.05608 | 2.37766e-10 | 1.31668e-08 | Specific Pituitary_high |
| Zfp521                                                                        | 6.31241 | 1.39956 | 2.74715e-10 | 1.50071e-08 | Specific Pituitary_high |
| Mgp                                                                           | 6.27805 | 3.1083  | 3.4285e-10  | 1.86345e-08 | Specific Pituitary_high |
| Lipc                                                                          | 6.23764 | 4.10654 | 4.44223e-10 | 2.35496e-08 | Specific Pituitary_high |
| Stxbp6                                                                        | 6.1397  | 2.55799 | 8.26757e-10 | 4.25029e-08 | Specific Pituitary_high |
| Myo1b                                                                         | 6.06817 | 1.32347 | 1.29377e-09 | 6.45583e-08 | Specific Pituitary_high |
| Prl                                                                           | 6.06686 | 3.16129 | 1.30435e-09 | 6.48859e-08 | Specific Pituitary_high |
| Cdh2                                                                          | 6.05129 | 4.4254  | 1.43692e-09 | 7.05031e-08 | Specific Pituitary_high |
| Wdr17                                                                         | 6.03737 | 4.00421 | 1.56643e-09 | 7.61631e-08 | Specific Pituitary_high |
| Sat1                                                                          | 6.01666 | 1.22989 | 1.78057e-09 | 8.61853e-08 | Specific Pituitary_high |
| Mal                                                                           | 5.99368 | 1.61214 | 2.05147e-09 | 9.84128e-08 | Specific Pituitary_high |
| Hexb                                                                          | 5.97732 | 1.18969 | 2.2684e-09  | 1.08176e-07 | Specific Pituitary_high |
| Hlf                                                                           | 5.93607 | 3.04197 | 2.91939e-09 | 1.37394e-07 | Specific Pituitary_high |
| Nhsl1                                                                         | 5.73862 | 1.25698 | 9.54505e-09 | 4.08703e-07 | Specific Pituitary_high |
| Krt80                                                                         | 5.71956 | 3.54188 | 1.06799e-08 | 4.53311e-07 | Specific Pituitary_high |
| Gsn                                                                           | 5.69899 | 3.567   | 1.20519e-08 | 5.05975e-07 | Specific Pituitary_high |
| Nceh1                                                                         | 5.69464 | 1.74688 | 1.23631e-08 | 5.16493e-07 | Specific Pituitary_high |
| Serpnb6b                                                                      | 5.51653 | 2.07182 | 3.45759e-08 | 1.32418e-06 | Specific Pituitary_high |
| Entpd1                                                                        | 5.42212 | 1.07053 | 5.88969e-08 | 2.1806e-06  | Specific Pituitary_high |
| Micall1                                                                       | 5.3688  | 1.2762  | 7.92615e-08 | 2.84328e-06 | Specific Pituitary_high |
| Stk10                                                                         | 5.34346 | 1.43726 | 9.1188e-08  | 3.24053e-06 | Specific Pituitary_high |
| Rasa4                                                                         | 5.34311 | 1.89151 | 9.13633e-08 | 3.24139e-06 | Specific Pituitary_high |
| Nkd2                                                                          | 5.27994 | 3.23798 | 1.29228e-07 | 4.44315e-06 | Specific Pituitary_high |
| Tmem200a                                                                      | 5.22563 | 4.08003 | 1.73561e-07 | 5.82474e-06 | Specific Pituitary_high |
| Gm15261                                                                       | 4.87902 | 3.75569 | 1.06614e-06 | 3.09536e-05 | Specific Pituitary_high |
| Zfp667                                                                        | 4.80901 | 2.17461 | 1.51676e-06 | 4.29172e-05 | Specific Pituitary_high |
| Mxra8                                                                         | 4.77526 | 1.21594 | 1.79474e-06 | 5.02106e-05 | Specific Pituitary_high |
| Rnf220                                                                        | 4.72428 | 1.02689 | 2.30932e-06 | 6.28109e-05 | Specific Pituitary_high |
| Sipa1l1                                                                       | 4.69979 | 1.14006 | 2.60428e-06 | 7.00076e-05 | Specific Pituitary_high |
| Has3                                                                          | 4.67516 | 3.12036 | 2.93717e-06 | 7.80465e-05 | Specific Pituitary_high |
| Pdgfa                                                                         | 4.59957 | 2.34027 | 4.23371e-06 | 0.000108821 | Specific Pituitary_high |
| Syn3                                                                          | 4.56581 | 1.79583 | 4.97562e-06 | 0.000125755 | Specific Pituitary_high |
| Esrrg                                                                         | 4.52179 | 1.54073 | 6.13193e-06 | 0.000150911 | Specific Pituitary_high |
| Ppp1r14a                                                                      | 4.4524  | 1.90892 | 8.49171e-06 | 0.000201733 | Specific Pituitary_high |
| Tspan3                                                                        | 4.45143 | 1.40764 | 8.53018e-06 | 0.000202349 | Specific Pituitary_high |
| Col8a1                                                                        | 4.4449  | 2.58336 | 8.79332e-06 | 0.00020798  | Specific Pituitary_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                         |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|-------------------------|
| Hspb8                                                                         | 4.40534 | 3.59494 | 1.05617e-05 | 0.00024549  | Specific Pituitary_high |
| Odc1                                                                          | 4.39079 | 1.6866  | 1.12937e-05 | 0.000259699 | Specific Pituitary_high |
| Kcnq1ot1                                                                      | 4.38984 | 1.2625  | 1.13432e-05 | 0.000260467 | Specific Pituitary_high |
| Slc18a2                                                                       | 4.33288 | 2.72634 | 1.47169e-05 | 0.000328587 | Specific Pituitary_high |
| Gm35853                                                                       | 4.31427 | 3.88467 | 1.6013e-05  | 0.000353853 | Specific Pituitary_high |
| Setbp1                                                                        | 4.28254 | 4.03668 | 1.8477e-05  | 0.000401975 | Specific Pituitary_high |
| Tbl1xr1                                                                       | 4.17987 | 1.19575 | 2.91672e-05 | 0.000604794 | Specific Pituitary_high |
| Stard13                                                                       | 4.06375 | 1.30352 | 4.82913e-05 | 0.000948926 | Specific Pituitary_high |
| Syt15                                                                         | 4.04781 | 2.47392 | 5.16995e-05 | 0.00100549  | Specific Pituitary_high |
| Col4a4                                                                        | 4.03474 | 1.83136 | 5.46618e-05 | 0.00105548  | Specific Pituitary_high |
| L3mbt13                                                                       | 3.98379 | 1.29111 | 6.78249e-05 | 0.00126941  | Specific Pituitary_high |
| Irx5                                                                          | 3.96549 | 1.55328 | 7.32454e-05 | 0.00136374  | Specific Pituitary_high |
| Robo3                                                                         | 3.95594 | 2.76176 | 7.62338e-05 | 0.00140802  | Specific Pituitary_high |
| Lrg1                                                                          | 3.93853 | 1.48176 | 8.19826e-05 | 0.00150046  | Specific Pituitary_high |
| Mapkapk3                                                                      | 3.8996  | 3.07948 | 9.63502e-05 | 0.00173581  | Specific Pituitary_high |
| Angpt2                                                                        | 3.80393 | 1.87131 | 0.000142419 | 0.00243152  | Specific Pituitary_high |
| Gm266                                                                         | 3.78034 | 4.35982 | 0.000156616 | 0.00263901  | Specific Pituitary_high |
| Egr1                                                                          | 3.70574 | 1.08667 | 0.000210777 | 0.00342301  | Specific Pituitary_high |
| Brip1                                                                         | 3.65607 | 2.42433 | 0.000256109 | 0.00407716  | Specific Pituitary_high |
| Ttc9                                                                          | 3.564   | 2.90992 | 0.00036524  | 0.00554124  | Specific Pituitary_high |
| Creb5                                                                         | 3.55064 | 2.634   | 0.000384297 | 0.00578957  | Specific Pituitary_high |
| A4galt                                                                        | 3.49884 | 1.63699 | 0.000467283 | 0.00689232  | Specific Pituitary_high |
| Nudt4                                                                         | 3.40797 | 1.07632 | 0.000654473 | 0.009235    | Specific Pituitary_high |
| Gpm6a                                                                         | 3.38347 | 2.83309 | 0.00071577  | 0.00998213  | Specific Pituitary_high |
| Plat                                                                          | 18.4499 | 6.17175 | 5.22031e-76 | 1.68538e-71 | Specific Kidney_high    |
| Kap                                                                           | 17.6211 | 6.39987 | 1.69603e-69 | 2.73782e-65 | Specific Kidney_high    |
| Pi16                                                                          | 16.7891 | 7.98984 | 2.93024e-63 | 3.15343e-59 | Specific Kidney_high    |
| Emcn                                                                          | 15.6309 | 2.57794 | 4.48666e-55 | 3.6213e-51  | Specific Kidney_high    |
| Sgk1                                                                          | 15.5315 | 2.69487 | 2.12402e-54 | 1.37148e-50 | Specific Kidney_high    |
| Dkk2                                                                          | 15.4482 | 5.26117 | 7.76328e-54 | 4.17729e-50 | Specific Kidney_high    |
| S100a6                                                                        | 14.7248 | 3.40549 | 4.46552e-49 | 2.05956e-45 | Specific Kidney_high    |
| Igfbp5                                                                        | 14.5341 | 4.37388 | 7.37109e-48 | 2.97469e-44 | Specific Kidney_high    |
| Lpl                                                                           | 14.0015 | 5.25381 | 1.52581e-44 | 5.47341e-41 | Specific Kidney_high    |
| Plscr2                                                                        | 13.8797 | 2.94791 | 8.40774e-44 | 2.71444e-40 | Specific Kidney_high    |
| Mapt                                                                          | 13.1004 | 4.16567 | 3.27441e-39 | 8.80953e-36 | Specific Kidney_high    |
| Cyp4b1                                                                        | 12.845  | 2.5388  | 9.17822e-38 | 2.27938e-34 | Specific Kidney_high    |
| Gpx3                                                                          | 12.4794 | 4.31774 | 9.66679e-36 | 2.08062e-32 | Specific Kidney_high    |
| Sema5a                                                                        | 11.9528 | 7.7386  | 6.27618e-33 | 1.01313e-29 | Specific Kidney_high    |
| Adgre5                                                                        | 11.6399 | 2.53829 | 2.58241e-31 | 3.47388e-28 | Specific Kidney_high    |
| Gimap5                                                                        | 11.5871 | 2.52084 | 4.7912e-31  | 6.18736e-28 | Specific Kidney_high    |
| Plscr1                                                                        | 11.3256 | 2.93337 | 9.79881e-30 | 1.21675e-26 | Specific Kidney_high    |
| Slc9a3r2                                                                      | 11.3166 | 1.84706 | 1.08569e-29 | 1.29821e-26 | Specific Kidney_high    |
| Gimap4                                                                        | 10.8515 | 1.75829 | 1.96201e-27 | 2.11145e-24 | Specific Kidney_high    |
| Meis2                                                                         | 10.8187 | 1.67786 | 2.80746e-27 | 2.92383e-24 | Specific Kidney_high    |
| Tbx3                                                                          | 10.7869 | 4.92594 | 3.96965e-27 | 4.00501e-24 | Specific Kidney_high    |



| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                      |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|----------------------|
| Nrp1                                                                          | 10.6433 | 1.21077 | 1.87337e-26 | 1.83278e-23 | Specific Kidney_high |
| Srgn                                                                          | 10.5914 | 1.49918 | 3.26736e-26 | 3.10255e-23 | Specific Kidney_high |
| Clic1                                                                         | 10.4917 | 1.57473 | 9.43194e-26 | 8.70029e-23 | Specific Kidney_high |
| Efnb2                                                                         | 10.4499 | 1.98044 | 1.46607e-25 | 1.31478e-22 | Specific Kidney_high |
| Pbx1                                                                          | 10.3814 | 2.68868 | 3.01265e-25 | 2.62874e-22 | Specific Kidney_high |
| AU021092                                                                      | 10.3585 | 2.4465  | 3.82752e-25 | 3.25188e-22 | Specific Kidney_high |
| Tspo                                                                          | 10.2107 | 1.79771 | 1.77601e-24 | 1.43346e-21 | Specific Kidney_high |
| Slc6a6                                                                        | 10.1508 | 2.16923 | 3.28511e-24 | 2.52524e-21 | Specific Kidney_high |
| Ctla2a                                                                        | 9.82129 | 1.76596 | 9.11659e-23 | 6.54065e-20 | Specific Kidney_high |
| Ptma                                                                          | 9.79653 | 1.0981  | 1.16526e-22 | 8.17835e-20 | Specific Kidney_high |
| Gnas                                                                          | 9.76937 | 1.04854 | 1.52392e-22 | 1.0468e-19  | Specific Kidney_high |
| Chrm3                                                                         | 9.62551 | 2.34533 | 6.23985e-22 | 4.1113e-19  | Specific Kidney_high |
| Smpdl3a                                                                       | 9.54649 | 2.06393 | 1.3417e-21  | 8.66337e-19 | Specific Kidney_high |
| Heg1                                                                          | 9.54214 | 1.42716 | 1.3991e-21  | 8.85684e-19 | Specific Kidney_high |
| Epha6                                                                         | 9.51122 | 7.40189 | 1.88431e-21 | 1.1699e-18  | Specific Kidney_high |
| Gm6213                                                                        | 9.43339 | 4.82969 | 3.97059e-21 | 2.33073e-18 | Specific Kidney_high |
| Alpl                                                                          | 9.29065 | 3.7388  | 1.53346e-20 | 8.68559e-18 | Specific Kidney_high |
| Samd12                                                                        | 9.28531 | 1.84337 | 1.61233e-20 | 8.97483e-18 | Specific Kidney_high |
| Gm30382                                                                       | 9.21286 | 4.13296 | 3.17537e-20 | 1.73757e-17 | Specific Kidney_high |
| Tcim                                                                          | 9.09162 | 1.46298 | 9.75733e-20 | 5.25026e-17 | Specific Kidney_high |
| Erc2                                                                          | 8.99719 | 8.19518 | 2.31566e-19 | 1.20582e-16 | Specific Kidney_high |
| H2afz                                                                         | 8.93062 | 1.51683 | 4.23619e-19 | 2.17088e-16 | Specific Kidney_high |
| Cd24a                                                                         | 8.92702 | 1.97413 | 4.37625e-19 | 2.20761e-16 | Specific Kidney_high |
| Aopep                                                                         | 8.82344 | 1.33029 | 1.11e-18    | 5.19367e-16 | Specific Kidney_high |
| Tmem176b                                                                      | 8.78155 | 1.72852 | 1.61234e-18 | 7.43636e-16 | Specific Kidney_high |
| Icam2                                                                         | 8.68548 | 1.59007 | 3.77136e-18 | 1.62344e-15 | Specific Kidney_high |
| Klf2                                                                          | 8.62231 | 1.34792 | 6.56166e-18 | 2.78741e-15 | Specific Kidney_high |
| Syne1                                                                         | 8.57375 | 1.21639 | 1.00167e-17 | 4.14601e-15 | Specific Kidney_high |
| Gimap1                                                                        | 8.53908 | 1.77691 | 1.35292e-17 | 5.45988e-15 | Specific Kidney_high |
| Mpped2                                                                        | 8.42818 | 3.76597 | 3.51085e-17 | 1.38229e-14 | Specific Kidney_high |
| Laptm4a                                                                       | 8.40294 | 1.11954 | 4.35448e-17 | 1.67362e-14 | Specific Kidney_high |
| Plpp1                                                                         | 8.35054 | 1.22296 | 6.79495e-17 | 2.52155e-14 | Specific Kidney_high |
| Malat1                                                                        | 8.33806 | 1.26456 | 7.55207e-17 | 2.77067e-14 | Specific Kidney_high |
| H3f3a                                                                         | 8.30307 | 1.13971 | 1.01458e-16 | 3.68041e-14 | Specific Kidney_high |
| Klf12                                                                         | 8.29034 | 1.77588 | 1.12921e-16 | 4.05073e-14 | Specific Kidney_high |
| Sec62                                                                         | 8.2713  | 1.13871 | 1.32503e-16 | 4.70094e-14 | Specific Kidney_high |
| Clic5                                                                         | 8.12845 | 1.74333 | 4.34814e-16 | 1.46229e-13 | Specific Kidney_high |
| Casc4                                                                         | 8.11628 | 7.66655 | 4.8067e-16  | 1.59984e-13 | Specific Kidney_high |
| Exoc3l2                                                                       | 8.08912 | 1.20682 | 6.00988e-16 | 1.97989e-13 | Specific Kidney_high |
| Atp13a3                                                                       | 8.07606 | 4.14266 | 6.68947e-16 | 2.18151e-13 | Specific Kidney_high |
| Plcb1                                                                         | 8.04838 | 1.50701 | 8.38959e-16 | 2.68176e-13 | Specific Kidney_high |
| Podxl                                                                         | 8.04201 | 1.26673 | 8.83752e-16 | 2.79725e-13 | Specific Kidney_high |
| Cavin2                                                                        | 7.91847 | 1.34997 | 2.40449e-15 | 7.46432e-13 | Specific Kidney_high |
| Itgb1                                                                         | 7.85305 | 1.04528 | 4.06036e-15 | 1.22513e-12 | Specific Kidney_high |
| Ehd3                                                                          | 7.76964 | 1.91557 | 7.87113e-15 | 2.28936e-12 | Specific Kidney_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                      |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|----------------------|
| Ddah2                                                                         | 7.67068 | 1.85883 | 1.71088e-14 | 4.84524e-12 | Specific Kidney_high |
| Crip2                                                                         | 7.62528 | 1.17311 | 2.43504e-14 | 6.71925e-12 | Specific Kidney_high |
| Ntn4                                                                          | 7.62231 | 1.74273 | 2.49182e-14 | 6.81765e-12 | Specific Kidney_high |
| Cd81                                                                          | 7.47417 | 1.14099 | 7.76951e-14 | 2.02289e-11 | Specific Kidney_high |
| Arid5b                                                                        | 7.35412 | 1.53155 | 1.92186e-13 | 4.77286e-11 | Specific Kidney_high |
| Fgf1                                                                          | 7.34451 | 2.34875 | 2.06516e-13 | 5.0896e-11  | Specific Kidney_high |
| Tm4sf1                                                                        | 7.26456 | 1.20713 | 3.74259e-13 | 9.01713e-11 | Specific Kidney_high |
| Akap13                                                                        | 7.16993 | 1.39859 | 7.50384e-13 | 1.78134e-10 | Specific Kidney_high |
| Arap2                                                                         | 7.1522  | 1.8733  | 8.53966e-13 | 2.01243e-10 | Specific Kidney_high |
| Gimap6                                                                        | 7.14431 | 1.07109 | 9.04478e-13 | 2.11602e-10 | Specific Kidney_high |
| Limch1                                                                        | 7.04645 | 1.35836 | 1.83537e-12 | 4.20248e-10 | Specific Kidney_high |
| Vdac3                                                                         | 7.027   | 1.53265 | 2.11013e-12 | 4.78715e-10 | Specific Kidney_high |
| Id1                                                                           | 6.97231 | 1.37859 | 3.11769e-12 | 6.94171e-10 | Specific Kidney_high |
| Rpl21                                                                         | 6.96995 | 1.00265 | 3.17056e-12 | 7.01107e-10 | Specific Kidney_high |
| Gngt2                                                                         | 6.90358 | 1.37278 | 5.07071e-12 | 1.09139e-09 | Specific Kidney_high |
| Ctnna3                                                                        | 6.71396 | 2.41569 | 1.89409e-11 | 3.89494e-09 | Specific Kidney_high |
| Hipk2                                                                         | 6.68184 | 1.2624  | 2.35954e-11 | 4.82138e-09 | Specific Kidney_high |
| S100a1                                                                        | 6.62543 | 1.32151 | 3.4624e-11  | 6.90022e-09 | Specific Kidney_high |
| Mecom                                                                         | 6.5506  | 1.91544 | 5.73069e-11 | 1.12131e-08 | Specific Kidney_high |
| Dynll1                                                                        | 6.50915 | 1.0168  | 7.55755e-11 | 1.42719e-08 | Specific Kidney_high |
| Plaaf3                                                                        | 6.50912 | 2.7188  | 7.55925e-11 | 1.42719e-08 | Specific Kidney_high |
| S100a10                                                                       | 6.50025 | 1.0771  | 8.01869e-11 | 1.50514e-08 | Specific Kidney_high |
| Smad6                                                                         | 6.49339 | 1.51896 | 8.39261e-11 | 1.56622e-08 | Specific Kidney_high |
| Rdx                                                                           | 6.49097 | 1.09289 | 8.52833e-11 | 1.5824e-08  | Specific Kidney_high |
| Plac8                                                                         | 6.34968 | 4.1883  | 2.1577e-10  | 3.7252e-08  | Specific Kidney_high |
| Selenom                                                                       | 6.28733 | 1.22102 | 3.22972e-10 | 5.37481e-08 | Specific Kidney_high |
| Gimap3                                                                        | 6.28235 | 4.53291 | 3.33501e-10 | 5.52158e-08 | Specific Kidney_high |
| Clu                                                                           | 6.28032 | 2.49703 | 3.3788e-10  | 5.56553e-08 | Specific Kidney_high |
| Ccnd1                                                                         | 6.16789 | 1.21104 | 6.92051e-10 | 1.09293e-07 | Specific Kidney_high |
| Ankrd33b                                                                      | 6.10715 | 2.43298 | 1.01423e-09 | 1.53221e-07 | Specific Kidney_high |
| Mtch1                                                                         | 6.09687 | 1.13919 | 1.08168e-09 | 1.61677e-07 | Specific Kidney_high |
| Tmem234                                                                       | 6.07956 | 1.1304  | 1.20509e-09 | 1.78011e-07 | Specific Kidney_high |
| Prr13                                                                         | 6.05226 | 1.92976 | 1.42827e-09 | 2.06778e-07 | Specific Kidney_high |
| Col18a1                                                                       | 6.03521 | 6.04578 | 1.58753e-09 | 2.28809e-07 | Specific Kidney_high |
| Tmem176a                                                                      | 5.98304 | 1.29963 | 2.19011e-09 | 3.04066e-07 | Specific Kidney_high |
| Specc1                                                                        | 5.98272 | 4.03576 | 2.19444e-09 | 3.04066e-07 | Specific Kidney_high |
| Dram1                                                                         | 5.78001 | 2.17382 | 7.46986e-09 | 9.80344e-07 | Specific Kidney_high |
| Pcsk5                                                                         | 5.7676  | 3.93137 | 8.04069e-09 | 1.04675e-06 | Specific Kidney_high |
| Ccdc80                                                                        | 5.75882 | 1.82455 | 8.47053e-09 | 1.09388e-06 | Specific Kidney_high |
| Ly6c1                                                                         | 5.74319 | 1.57394 | 9.291e-09   | 1.19506e-06 | Specific Kidney_high |
| Gata5                                                                         | 5.73342 | 9.17774 | 9.84237e-09 | 1.25597e-06 | Specific Kidney_high |
| Cst3                                                                          | 5.72307 | 1.00492 | 1.04619e-08 | 1.32455e-06 | Specific Kidney_high |
| Smad7                                                                         | 5.6713  | 1.29638 | 1.4172e-08  | 1.75978e-06 | Specific Kidney_high |
| Pdgfb                                                                         | 5.62404 | 1.33556 | 1.86542e-08 | 2.27253e-06 | Specific Kidney_high |
| Rnasek                                                                        | 5.6173  | 1.02253 | 1.93965e-08 | 2.34538e-06 | Specific Kidney_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                      |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|----------------------|
| Csf1                                                                          | 5.5826  | 1.84455 | 2.36955e-08 | 2.83337e-06 | Specific Kidney_high |
| Ankrd44                                                                       | 5.54331 | 1.09594 | 2.96801e-08 | 3.50997e-06 | Specific Kidney_high |
| S100a11                                                                       | 5.50787 | 1.16168 | 3.63209e-08 | 4.23329e-06 | Specific Kidney_high |
| Dad1                                                                          | 5.49599 | 1.00345 | 3.88528e-08 | 4.44809e-06 | Specific Kidney_high |
| Gabarapl2                                                                     | 5.45073 | 1.10998 | 5.01649e-08 | 5.66284e-06 | Specific Kidney_high |
| Atp2a3                                                                        | 5.39546 | 5.39574 | 6.83485e-08 | 7.4048e-06  | Specific Kidney_high |
| Klk8                                                                          | 5.34878 | 2.99952 | 8.85508e-08 | 9.46643e-06 | Specific Kidney_high |
| Maged2                                                                        | 5.34452 | 2.72016 | 9.06575e-08 | 9.63597e-06 | Specific Kidney_high |
| Edf1                                                                          | 5.32565 | 1.00691 | 1.00595e-07 | 1.06134e-05 | Specific Kidney_high |
| Rpl22l1                                                                       | 5.3084  | 1.06981 | 1.10594e-07 | 1.15478e-05 | Specific Kidney_high |
| Cacna1a                                                                       | 5.28856 | 4.51235 | 1.23283e-07 | 1.27162e-05 | Specific Kidney_high |
| Tspan7                                                                        | 5.25708 | 1.19398 | 1.46358e-07 | 1.48124e-05 | Specific Kidney_high |
| Cd9                                                                           | 5.25269 | 1.07674 | 1.49893e-07 | 1.50289e-05 | Specific Kidney_high |
| Zeb2                                                                          | 5.21636 | 1.25713 | 1.82468e-07 | 1.79057e-05 | Specific Kidney_high |
| Ccdc12                                                                        | 5.19866 | 1.25009 | 2.00732e-07 | 1.95199e-05 | Specific Kidney_high |
| Asap2                                                                         | 5.19455 | 1.36808 | 2.05212e-07 | 1.98362e-05 | Specific Kidney_high |
| Sema6d                                                                        | 5.17536 | 1.20224 | 2.27472e-07 | 2.17277e-05 | Specific Kidney_high |
| Krtcap2                                                                       | 5.16786 | 1.0098  | 2.36792e-07 | 2.23533e-05 | Specific Kidney_high |
| Tnfaip2                                                                       | 5.10291 | 1.35511 | 3.34468e-07 | 3.0677e-05  | Specific Kidney_high |
| Trpm3                                                                         | 5.07946 | 3.9691  | 3.7851e-07  | 3.42302e-05 | Specific Kidney_high |
| Klf4                                                                          | 5.07079 | 1.25333 | 3.96163e-07 | 3.56809e-05 | Specific Kidney_high |
| Ddit4l                                                                        | 5.02055 | 5.75666 | 5.15252e-07 | 4.54505e-05 | Specific Kidney_high |
| Itga3                                                                         | 4.96547 | 3.20001 | 6.85367e-07 | 5.86925e-05 | Specific Kidney_high |
| Fxyd2                                                                         | 4.85497 | 3.09548 | 1.20407e-06 | 9.86632e-05 | Specific Kidney_high |
| Exoc3l4                                                                       | 4.83716 | 1.6348  | 1.31708e-06 | 0.000106571 | Specific Kidney_high |
| Mast4                                                                         | 4.80627 | 1.34989 | 1.53769e-06 | 0.000122277 | Specific Kidney_high |
| Slco2a1                                                                       | 4.77519 | 1.2089  | 1.79541e-06 | 0.000141378 | Specific Kidney_high |
| Olfml2b                                                                       | 4.73969 | 5.77763 | 2.14047e-06 | 0.000164536 | Specific Kidney_high |
| Ccrl2                                                                         | 4.68544 | 1.7231  | 2.79364e-06 | 0.000209264 | Specific Kidney_high |
| Ckb                                                                           | 4.67947 | 1.91914 | 2.87615e-06 | 0.000213463 | Specific Kidney_high |
| Ltbp1                                                                         | 4.67765 | 1.37323 | 2.90185e-06 | 0.000214877 | Specific Kidney_high |
| Tmem26                                                                        | 4.63985 | 2.27519 | 3.48659e-06 | 0.000250701 | Specific Kidney_high |
| Uqcc2                                                                         | 4.60736 | 1.13247 | 4.07811e-06 | 0.000286845 | Specific Kidney_high |
| Ncoa7                                                                         | 4.59721 | 1.20454 | 4.28192e-06 | 0.000299874 | Specific Kidney_high |
| Hbegf                                                                         | 4.58499 | 1.5026  | 4.54005e-06 | 0.000317244 | Specific Kidney_high |
| Id2                                                                           | 4.58455 | 1.09705 | 4.5496e-06  | 0.000317244 | Specific Kidney_high |
| Gjc1                                                                          | 4.57533 | 1.66    | 4.75476e-06 | 0.000329415 | Specific Kidney_high |
| Fas                                                                           | 4.56244 | 1.14022 | 5.05636e-06 | 0.000347524 | Specific Kidney_high |
| Hoxa7                                                                         | 4.52876 | 2.58193 | 5.93301e-06 | 0.000400758 | Specific Kidney_high |
| Adamts16                                                                      | 4.5164  | 6.57749 | 6.29012e-06 | 0.00042396  | Specific Kidney_high |
| Sncg                                                                          | 4.50758 | 1.86124 | 6.55726e-06 | 0.000438304 | Specific Kidney_high |
| Lrrc8b                                                                        | 4.48982 | 1.99694 | 7.1284e-06  | 0.000471599 | Specific Kidney_high |
| Arhgap5                                                                       | 4.46787 | 1.00453 | 7.9002e-06  | 0.000519466 | Specific Kidney_high |
| Fstl1                                                                         | 4.44511 | 1.60969 | 8.78459e-06 | 0.000563838 | Specific Kidney_high |
| Plaur                                                                         | 4.42577 | 2.10649 | 9.61003e-06 | 0.000602173 | Specific Kidney_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                      |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|----------------------|
| Mal                                                                           | 4.42114 | 1.84325 | 9.81827e-06 | 0.00061312  | Specific Kidney_high |
| Rflna                                                                         | 4.37258 | 2.59708 | 1.22787e-05 | 0.000747959 | Specific Kidney_high |
| Palmd                                                                         | 4.33184 | 1.23049 | 1.47866e-05 | 0.000887332 | Specific Kidney_high |
| Pdpdf                                                                         | 4.32828 | 1.37337 | 1.50279e-05 | 0.000900141 | Specific Kidney_high |
| mt-Nd5                                                                        | 4.29832 | 1.13905 | 1.72095e-05 | 0.0010176   | Specific Kidney_high |
| Polb                                                                          | 4.29699 | 1.69268 | 1.73134e-05 | 0.00102187  | Specific Kidney_high |
| Pcdh1                                                                         | 4.28479 | 1.78659 | 1.82912e-05 | 0.00107557  | Specific Kidney_high |
| Kank4                                                                         | 4.27237 | 3.17144 | 1.93405e-05 | 0.00113118  | Specific Kidney_high |
| Akap9                                                                         | 4.26521 | 1.21554 | 1.99717e-05 | 0.00116178  | Specific Kidney_high |
| Meg3                                                                          | 4.24671 | 6.63922 | 2.16936e-05 | 0.00124401  | Specific Kidney_high |
| Nol7                                                                          | 4.23233 | 1.1075  | 2.31284e-05 | 0.00131926  | Specific Kidney_high |
| Pde6d                                                                         | 4.13307 | 1.85981 | 3.57955e-05 | 0.00193254  | Specific Kidney_high |
| Lypd6                                                                         | 4.12154 | 3.77971 | 3.76342e-05 | 0.00201831  | Specific Kidney_high |
| Tbx3os1                                                                       | 4.10904 | 6.56178 | 3.97306e-05 | 0.00210624  | Specific Kidney_high |
| Ncald                                                                         | 4.02816 | 1.50947 | 5.62148e-05 | 0.00285361  | Specific Kidney_high |
| Sox17                                                                         | 4.00713 | 1.30944 | 6.1462e-05  | 0.0031038   | Specific Kidney_high |
| Lrrc3b                                                                        | 3.96626 | 1.41611 | 7.30106e-05 | 0.0036042   | Specific Kidney_high |
| Polr2e                                                                        | 3.95708 | 1.23233 | 7.58711e-05 | 0.00373399  | Specific Kidney_high |
| Lmo7                                                                          | 3.86965 | 2.18731 | 0.000108993 | 0.00521311  | Specific Kidney_high |
| Stmn2                                                                         | 3.80107 | 2.79191 | 0.000144074 | 0.00670237  | Specific Kidney_high |
| Ripor2                                                                        | 3.78929 | 1.87636 | 0.000151078 | 0.0069879   | Specific Kidney_high |
| P2ry1                                                                         | 3.76807 | 2.27852 | 0.000164515 | 0.00753385  | Specific Kidney_high |
| Stab2                                                                         | 69.4167 | 7.7246  | 0           | 0           | Specific Liver_high  |
| Mrc1                                                                          | 68.9229 | 5.97257 | 0           | 0           | Specific Liver_high  |
| Ralgapa2                                                                      | 67.4601 | 5.57311 | 0           | 0           | Specific Liver_high  |
| Maf                                                                           | 66.9996 | 5.36167 | 0           | 0           | Specific Liver_high  |
| Slc9a9                                                                        | 66.6215 | 6.26105 | 0           | 0           | Specific Liver_high  |
| Dnase1l3                                                                      | 66.1742 | 6.78837 | 0           | 0           | Specific Liver_high  |
| Plxnc1                                                                        | 66.167  | 6.21019 | 0           | 0           | Specific Liver_high  |
| Dpp4                                                                          | 65.6629 | 6.16607 | 0           | 0           | Specific Liver_high  |
| Cd55                                                                          | 65.4549 | 6.04172 | 0           | 0           | Specific Liver_high  |
| Palld                                                                         | 65.2391 | 5.90311 | 0           | 0           | Specific Liver_high  |
| Bmp2                                                                          | 64.6334 | 5.77264 | 0           | 0           | Specific Liver_high  |
| Fcgr2b                                                                        | 64.5417 | 6.5249  | 0           | 0           | Specific Liver_high  |
| Cemip2                                                                        | 64.4343 | 3.86832 | 0           | 0           | Specific Liver_high  |
| Gata4                                                                         | 64.3905 | 6.42376 | 0           | 0           | Specific Liver_high  |
| Ptpnb                                                                         | 64.1644 | 2.20463 | 0           | 0           | Specific Liver_high  |
| Psd3                                                                          | 63.9832 | 4.00735 | 0           | 0           | Specific Liver_high  |
| F8                                                                            | 63.0295 | 4.05842 | 0           | 0           | Specific Liver_high  |
| Zeb2                                                                          | 62.9368 | 5.31771 | 0           | 0           | Specific Liver_high  |
| Adam23                                                                        | 62.5825 | 6.25404 | 0           | 0           | Specific Liver_high  |
| Clec4g                                                                        | 62.0064 | 6.31084 | 0           | 0           | Specific Liver_high  |
| B3galt1                                                                       | 61.8416 | 5.63894 | 0           | 0           | Specific Liver_high  |
| Tspan7                                                                        | 61.6029 | 4.30007 | 0           | 0           | Specific Liver_high  |
| Jak1                                                                          | 61.5712 | 3.27638 | 0           | 0           | Specific Liver_high  |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |   |   |                     |
|-------------------------------------------------------------------------------|---------|---------|---|---|---------------------|
| Il6st                                                                         | 61.2375 | 3.88654 | 0 | 0 | Specific Liver_high |
| Dab2                                                                          | 60.6988 | 3.5576  | 0 | 0 | Specific Liver_high |
| Sntb1                                                                         | 60.689  | 4.31505 | 0 | 0 | Specific Liver_high |
| Prickle1                                                                      | 60.6725 | 4.09516 | 0 | 0 | Specific Liver_high |
| Lrmda                                                                         | 59.884  | 3.37812 | 0 | 0 | Specific Liver_high |
| Gatm                                                                          | 59.5162 | 4.86348 | 0 | 0 | Specific Liver_high |
| Fyn                                                                           | 59.4261 | 2.79551 | 0 | 0 | Specific Liver_high |
| Gpr182                                                                        | 59.382  | 4.47574 | 0 | 0 | Specific Liver_high |
| Ehd3                                                                          | 59.3577 | 3.84861 | 0 | 0 | Specific Liver_high |
| Oit3                                                                          | 58.928  | 5.10717 | 0 | 0 | Specific Liver_high |
| Man2a1                                                                        | 58.884  | 3.445   | 0 | 0 | Specific Liver_high |
| Snx24                                                                         | 58.6387 | 5.52573 | 0 | 0 | Specific Liver_high |
| Selenop                                                                       | 58.5752 | 3.40612 | 0 | 0 | Specific Liver_high |
| Fam124a                                                                       | 58.5728 | 4.5398  | 0 | 0 | Specific Liver_high |
| Igfbp4                                                                        | 58.1655 | 3.56017 | 0 | 0 | Specific Liver_high |
| Itga9                                                                         | 58.0765 | 3.30656 | 0 | 0 | Specific Liver_high |
| Aqp1                                                                          | 57.8261 | 4.64128 | 0 | 0 | Specific Liver_high |
| Aass                                                                          | 57.421  | 5.77867 | 0 | 0 | Specific Liver_high |
| Plekkg1                                                                       | 56.8729 | 2.72654 | 0 | 0 | Specific Liver_high |
| Stab1                                                                         | 56.7288 | 3.1561  | 0 | 0 | Specific Liver_high |
| Itsn1                                                                         | 56.358  | 4.01904 | 0 | 0 | Specific Liver_high |
| Prkce                                                                         | 56.2793 | 2.7089  | 0 | 0 | Specific Liver_high |
| St3gal4                                                                       | 56.271  | 2.93443 | 0 | 0 | Specific Liver_high |
| Atrnl1                                                                        | 56.1499 | 3.23292 | 0 | 0 | Specific Liver_high |
| Mid1                                                                          | 56.0199 | 4.12498 | 0 | 0 | Specific Liver_high |
| Zswim6                                                                        | 55.28   | 2.92933 | 0 | 0 | Specific Liver_high |
| Epb41l2                                                                       | 55.1564 | 3.02437 | 0 | 0 | Specific Liver_high |
| Lgmn                                                                          | 55.1156 | 4.60416 | 0 | 0 | Specific Liver_high |
| Slc43a2                                                                       | 55.0782 | 5.50356 | 0 | 0 | Specific Liver_high |
| Mtss1                                                                         | 54.6664 | 2.86156 | 0 | 0 | Specific Liver_high |
| Rasal2                                                                        | 54.6055 | 2.35543 | 0 | 0 | Specific Liver_high |
| Iqgap2                                                                        | 54.2781 | 5.82873 | 0 | 0 | Specific Liver_high |
| Arhgap23                                                                      | 53.9952 | 3.11972 | 0 | 0 | Specific Liver_high |
| Ankrd44                                                                       | 53.9455 | 3.09467 | 0 | 0 | Specific Liver_high |
| Tmcc3                                                                         | 53.8348 | 2.87072 | 0 | 0 | Specific Liver_high |
| Lamp2                                                                         | 53.7493 | 2.555   | 0 | 0 | Specific Liver_high |
| Exoc6                                                                         | 53.7111 | 3.33676 | 0 | 0 | Specific Liver_high |
| Cnksr3                                                                        | 53.5269 | 3.85567 | 0 | 0 | Specific Liver_high |
| Man1a                                                                         | 53.1031 | 3.26243 | 0 | 0 | Specific Liver_high |
| Pard3b                                                                        | 53.0804 | 3.02245 | 0 | 0 | Specific Liver_high |
| Ap1b1                                                                         | 52.9948 | 3.99478 | 0 | 0 | Specific Liver_high |
| Dse                                                                           | 52.8083 | 4.19837 | 0 | 0 | Specific Liver_high |
| Acer3                                                                         | 52.7971 | 4.09432 | 0 | 0 | Specific Liver_high |
| Lifr                                                                          | 52.6741 | 2.81773 | 0 | 0 | Specific Liver_high |
| Mertk                                                                         | 52.6353 | 3.0019  | 0 | 0 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |   |   |                     |
|-------------------------------------------------------------------------------|---------|---------|---|---|---------------------|
| Lhfpl2                                                                        | 52.5448 | 3.26121 | 0 | 0 | Specific Liver_high |
| Fam222b                                                                       | 52.3191 | 3.22083 | 0 | 0 | Specific Liver_high |
| Bmp6                                                                          | 51.6994 | 3.73822 | 0 | 0 | Specific Liver_high |
| Arhgap45                                                                      | 51.6495 | 4.42326 | 0 | 0 | Specific Liver_high |
| Nr2f2                                                                         | 51.6335 | 3.06493 | 0 | 0 | Specific Liver_high |
| Tfpi                                                                          | 51.5184 | 3.44871 | 0 | 0 | Specific Liver_high |
| Sema6a                                                                        | 51.5096 | 2.29489 | 0 | 0 | Specific Liver_high |
| Sh3rf1                                                                        | 51.5075 | 2.847   | 0 | 0 | Specific Liver_high |
| Sash1                                                                         | 50.7648 | 2.35806 | 0 | 0 | Specific Liver_high |
| Camk1d                                                                        | 50.6912 | 3.11392 | 0 | 0 | Specific Liver_high |
| Myo10                                                                         | 50.4292 | 2.59007 | 0 | 0 | Specific Liver_high |
| Itga8                                                                         | 50.4251 | 5.01685 | 0 | 0 | Specific Liver_high |
| Ago3                                                                          | 50.3105 | 2.98736 | 0 | 0 | Specific Liver_high |
| Znrf1                                                                         | 49.9854 | 2.64641 | 0 | 0 | Specific Liver_high |
| Raph1                                                                         | 49.9104 | 2.93546 | 0 | 0 | Specific Liver_high |
| Macf1                                                                         | 49.7264 | 1.83128 | 0 | 0 | Specific Liver_high |
| Tpbgl                                                                         | 49.6651 | 5.19188 | 0 | 0 | Specific Liver_high |
| Lpp                                                                           | 49.659  | 2.36876 | 0 | 0 | Specific Liver_high |
| Anapc15                                                                       | 49.5353 | 4.50754 | 0 | 0 | Specific Liver_high |
| Hivep3                                                                        | 49.4853 | 2.96584 | 0 | 0 | Specific Liver_high |
| Gm15675                                                                       | 49.3483 | 5.61183 | 0 | 0 | Specific Liver_high |
| Ppfia2                                                                        | 49.0978 | 4.08557 | 0 | 0 | Specific Liver_high |
| Pitpnc1                                                                       | 48.576  | 1.94547 | 0 | 0 | Specific Liver_high |
| Msrp3                                                                         | 48.5378 | 2.64808 | 0 | 0 | Specific Liver_high |
| Mb21d2                                                                        | 48.0416 | 3.89628 | 0 | 0 | Specific Liver_high |
| Tmem164                                                                       | 47.9935 | 2.81657 | 0 | 0 | Specific Liver_high |
| Masp1                                                                         | 47.8441 | 5.54208 | 0 | 0 | Specific Liver_high |
| Gm42418                                                                       | 47.6105 | 2.08053 | 0 | 0 | Specific Liver_high |
| Bcas3                                                                         | 47.3048 | 2.62259 | 0 | 0 | Specific Liver_high |
| Pan3                                                                          | 46.9446 | 2.33218 | 0 | 0 | Specific Liver_high |
| Ap2a2                                                                         | 46.7777 | 2.82611 | 0 | 0 | Specific Liver_high |
| Fmnl2                                                                         | 46.7224 | 2.28244 | 0 | 0 | Specific Liver_high |
| Flt4                                                                          | 46.6344 | 2.37513 | 0 | 0 | Specific Liver_high |
| Dmd                                                                           | 46.6002 | 3.74426 | 0 | 0 | Specific Liver_high |
| Sh3bp5                                                                        | 46.499  | 2.10988 | 0 | 0 | Specific Liver_high |
| Cd36                                                                          | 46.4069 | 3.03402 | 0 | 0 | Specific Liver_high |
| Slc38a6                                                                       | 46.3317 | 3.46998 | 0 | 0 | Specific Liver_high |
| Foxn3                                                                         | 46.2392 | 1.97037 | 0 | 0 | Specific Liver_high |
| Meis1                                                                         | 46.1722 | 3.61925 | 0 | 0 | Specific Liver_high |
| Srgap1                                                                        | 46.1686 | 2.65616 | 0 | 0 | Specific Liver_high |
| Snx2                                                                          | 45.8169 | 2.63823 | 0 | 0 | Specific Liver_high |
| Slco2a1                                                                       | 45.7948 | 3.17572 | 0 | 0 | Specific Liver_high |
| Fbxl7                                                                         | 45.7724 | 2.23874 | 0 | 0 | Specific Liver_high |
| Tmem106a                                                                      | 45.5145 | 3.83054 | 0 | 0 | Specific Liver_high |
| Plcb4                                                                         | 45.4723 | 2.32821 | 0 | 0 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |   |   |                     |
|-------------------------------------------------------------------------------|---------|---------|---|---|---------------------|
| Cltc                                                                          | 45.2267 | 2.11238 | 0 | 0 | Specific Liver_high |
| Fchsd2                                                                        | 44.9844 | 2.51069 | 0 | 0 | Specific Liver_high |
| Phldb2                                                                        | 44.9105 | 2.16627 | 0 | 0 | Specific Liver_high |
| Ssh2                                                                          | 44.88   | 2.37195 | 0 | 0 | Specific Liver_high |
| Lars2                                                                         | 44.8698 | 2.56199 | 0 | 0 | Specific Liver_high |
| Hs3st3b1                                                                      | 44.788  | 3.98953 | 0 | 0 | Specific Liver_high |
| Hgf                                                                           | 44.7091 | 5.99128 | 0 | 0 | Specific Liver_high |
| Tacc1                                                                         | 44.6703 | 2.13071 | 0 | 0 | Specific Liver_high |
| Snx5                                                                          | 44.5902 | 3.11668 | 0 | 0 | Specific Liver_high |
| Ctsb                                                                          | 44.5829 | 2.20468 | 0 | 0 | Specific Liver_high |
| Numb                                                                          | 44.5712 | 2.01994 | 0 | 0 | Specific Liver_high |
| Ppp3ca                                                                        | 44.4807 | 2.0136  | 0 | 0 | Specific Liver_high |
| Fbxl17                                                                        | 44.4567 | 2.11463 | 0 | 0 | Specific Liver_high |
| Hpgd                                                                          | 44.2341 | 5.20723 | 0 | 0 | Specific Liver_high |
| Add3                                                                          | 44.1073 | 2.35995 | 0 | 0 | Specific Liver_high |
| Smad6                                                                         | 43.9956 | 3.05767 | 0 | 0 | Specific Liver_high |
| Phf21a                                                                        | 43.8078 | 2.30267 | 0 | 0 | Specific Liver_high |
| Msr1                                                                          | 43.7301 | 5.14534 | 0 | 0 | Specific Liver_high |
| Nav1                                                                          | 43.6933 | 2.06991 | 0 | 0 | Specific Liver_high |
| Car8                                                                          | 43.6721 | 2.74893 | 0 | 0 | Specific Liver_high |
| Enox2                                                                         | 43.6415 | 2.62154 | 0 | 0 | Specific Liver_high |
| Rora                                                                          | 43.6384 | 2.41491 | 0 | 0 | Specific Liver_high |
| Tns3                                                                          | 43.5571 | 3.24503 | 0 | 0 | Specific Liver_high |
| Ttc7b                                                                         | 43.4855 | 2.45948 | 0 | 0 | Specific Liver_high |
| Wnt2                                                                          | 43.3397 | 5.11181 | 0 | 0 | Specific Liver_high |
| Cdk8                                                                          | 43.322  | 2.3241  | 0 | 0 | Specific Liver_high |
| Shroom2                                                                       | 43.2347 | 3.22896 | 0 | 0 | Specific Liver_high |
| Lyve1                                                                         | 43.1175 | 5.89446 | 0 | 0 | Specific Liver_high |
| Cd59a                                                                         | 42.961  | 2.68346 | 0 | 0 | Specific Liver_high |
| Ccdc80                                                                        | 42.9556 | 4.34971 | 0 | 0 | Specific Liver_high |
| Snx8                                                                          | 42.7511 | 3.81808 | 0 | 0 | Specific Liver_high |
| Exoc4                                                                         | 42.6574 | 2.04155 | 0 | 0 | Specific Liver_high |
| Zfpm2                                                                         | 42.6453 | 4.04201 | 0 | 0 | Specific Liver_high |
| St6galnac3                                                                    | 42.3294 | 1.9656  | 0 | 0 | Specific Liver_high |
| Smap2                                                                         | 42.254  | 2.53168 | 0 | 0 | Specific Liver_high |
| Slc39a8                                                                       | 42.1812 | 3.78491 | 0 | 0 | Specific Liver_high |
| Mcu                                                                           | 42.1806 | 2.61201 | 0 | 0 | Specific Liver_high |
| Rere                                                                          | 41.9825 | 2.05567 | 0 | 0 | Specific Liver_high |
| Vav3                                                                          | 41.9484 | 2.11697 | 0 | 0 | Specific Liver_high |
| Cottl1                                                                        | 41.9451 | 2.85314 | 0 | 0 | Specific Liver_high |
| Kit                                                                           | 41.8218 | 4.23592 | 0 | 0 | Specific Liver_high |
| Ets1                                                                          | 41.7818 | 1.61486 | 0 | 0 | Specific Liver_high |
| Agpat5                                                                        | 41.7404 | 2.97749 | 0 | 0 | Specific Liver_high |
| Myliip                                                                        | 41.5179 | 2.41648 | 0 | 0 | Specific Liver_high |
| Fgd6                                                                          | 41.5088 | 2.55338 | 0 | 0 | Specific Liver_high |



| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |   |   |                     |
|-------------------------------------------------------------------------------|---------|---------|---|---|---------------------|
| Tnik                                                                          | 41.3987 | 5.09456 | 0 | 0 | Specific Liver_high |
| Mir99ahg                                                                      | 41.2941 | 2.36063 | 0 | 0 | Specific Liver_high |
| Tcf12                                                                         | 41.2231 | 1.85394 | 0 | 0 | Specific Liver_high |
| Cadps2                                                                        | 41.1782 | 4.27629 | 0 | 0 | Specific Liver_high |
| Cd38                                                                          | 41.1355 | 1.87189 | 0 | 0 | Specific Liver_high |
| Rgl1                                                                          | 41.0797 | 1.82258 | 0 | 0 | Specific Liver_high |
| Mir100hg                                                                      | 41.0553 | 4.52384 | 0 | 0 | Specific Liver_high |
| Fus                                                                           | 40.9789 | 1.79329 | 0 | 0 | Specific Liver_high |
| Fnbp1                                                                         | 40.8676 | 2.56617 | 0 | 0 | Specific Liver_high |
| Dpy19l4                                                                       | 40.7763 | 3.0431  | 0 | 0 | Specific Liver_high |
| Dlc1                                                                          | 40.7641 | 1.69862 | 0 | 0 | Specific Liver_high |
| Nfia                                                                          | 40.6621 | 1.87304 | 0 | 0 | Specific Liver_high |
| Npr1                                                                          | 40.6124 | 2.22709 | 0 | 0 | Specific Liver_high |
| Eps15                                                                         | 40.4562 | 2.17648 | 0 | 0 | Specific Liver_high |
| Tanc1                                                                         | 40.2696 | 1.963   | 0 | 0 | Specific Liver_high |
| Snx13                                                                         | 40.0068 | 2.24573 | 0 | 0 | Specific Liver_high |
| Sbf2                                                                          | 39.9885 | 1.85612 | 0 | 0 | Specific Liver_high |
| Rasgef1b                                                                      | 39.8609 | 4.94664 | 0 | 0 | Specific Liver_high |
| Cd84                                                                          | 39.7534 | 5.60873 | 0 | 0 | Specific Liver_high |
| Pros1                                                                         | 39.739  | 2.15959 | 0 | 0 | Specific Liver_high |
| Prkg1                                                                         | 39.7368 | 2.07438 | 0 | 0 | Specific Liver_high |
| Sgpp1                                                                         | 39.5419 | 2.4044  | 0 | 0 | Specific Liver_high |
| Morrbid                                                                       | 39.4883 | 4.07901 | 0 | 0 | Specific Liver_high |
| Ncoa3                                                                         | 39.4499 | 1.97153 | 0 | 0 | Specific Liver_high |
| Celf1                                                                         | 39.1752 | 2.02609 | 0 | 0 | Specific Liver_high |
| Flnb                                                                          | 39.1068 | 1.95785 | 0 | 0 | Specific Liver_high |
| Degs1                                                                         | 39.0572 | 2.22583 | 0 | 0 | Specific Liver_high |
| Tgfb3                                                                         | 39.0329 | 1.99389 | 0 | 0 | Specific Liver_high |
| Dock7                                                                         | 39.0279 | 4.72609 | 0 | 0 | Specific Liver_high |
| Spats2                                                                        | 38.9735 | 2.73512 | 0 | 0 | Specific Liver_high |
| Rgs7bp                                                                        | 38.8881 | 5.01718 | 0 | 0 | Specific Liver_high |
| Mmp14                                                                         | 38.7721 | 3.54509 | 0 | 0 | Specific Liver_high |
| Dpysl3                                                                        | 38.7703 | 2.81382 | 0 | 0 | Specific Liver_high |
| Pakap-1                                                                       | 38.7565 | 1.71881 | 0 | 0 | Specific Liver_high |
| Ptpn12                                                                        | 38.698  | 1.95275 | 0 | 0 | Specific Liver_high |
| Bace2                                                                         | 38.6619 | 2.47152 | 0 | 0 | Specific Liver_high |
| Fndc3b                                                                        | 38.6382 | 1.99371 | 0 | 0 | Specific Liver_high |
| Adgrl2                                                                        | 38.5658 | 1.7355  | 0 | 0 | Specific Liver_high |
| Pdlim1                                                                        | 38.49   | 2.80771 | 0 | 0 | Specific Liver_high |
| Pde2a                                                                         | 38.3954 | 1.76194 | 0 | 0 | Specific Liver_high |
| Fam172a                                                                       | 38.3257 | 1.99605 | 0 | 0 | Specific Liver_high |
| Auts2                                                                         | 38.3103 | 2.44113 | 0 | 0 | Specific Liver_high |
| Xiap                                                                          | 38.2922 | 1.71866 | 0 | 0 | Specific Liver_high |
| Gnaq                                                                          | 38.2213 | 1.69061 | 0 | 0 | Specific Liver_high |
| Itga1                                                                         | 38.1101 | 1.87936 | 0 | 0 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Slc40a1                                                                       | 38.1073 | 3.31903 | 0           | 0           | Specific Liver_high |
| Fnip1                                                                         | 37.9889 | 2.31768 | 0           | 0           | Specific Liver_high |
| Peak1                                                                         | 37.9844 | 1.67477 | 0           | 0           | Specific Liver_high |
| Nrp2                                                                          | 37.9787 | 1.81263 | 0           | 0           | Specific Liver_high |
| Stox2                                                                         | 37.9377 | 1.8979  | 0           | 0           | Specific Liver_high |
| Ctdspl                                                                        | 37.6764 | 1.92002 | 0           | 0           | Specific Liver_high |
| Rfk                                                                           | 37.5467 | 2.70539 | 0           | 2.0132e-306 | Specific Liver_high |
| Fam171a1                                                                      | 37.5436 | 1.93022 | 0           | 2.2543e-306 | Specific Liver_high |
| Cxcl16                                                                        | 37.5131 | 3.68691 | 5.6251e-308 | 7.039e-306  | Specific Liver_high |
| Ldlrad4                                                                       | 37.4234 | 1.99356 | 1.6277e-306 | 2.0289e-304 | Specific Liver_high |
| Btbd9                                                                         | 37.2552 | 1.9172  | 8.7209e-304 | 1.0829e-301 | Specific Liver_high |
| Bgn                                                                           | 37.2037 | 2.55634 | 5.9341e-303 | 7.3403e-301 | Specific Liver_high |
| Trip12                                                                        | 37.1912 | 1.93433 | 9.4627e-303 | 1.166e-300  | Specific Liver_high |
| Inpp5a                                                                        | 37.1771 | 1.85522 | 1.6032e-302 | 1.968e-300  | Specific Liver_high |
| C5ar2                                                                         | 37.1664 | 6.08199 | 2.3858e-302 | 2.9176e-300 | Specific Liver_high |
| Tbc1d5                                                                        | 37.1399 | 1.88577 | 6.3862e-302 | 7.7804e-300 | Specific Liver_high |
| Frmd4b                                                                        | 37.1193 | 1.91217 | 1.3744e-301 | 1.6681e-299 | Specific Liver_high |
| Stk3                                                                          | 36.9428 | 1.95895 | 9.4999e-299 | 1.1402e-296 | Specific Liver_high |
| Acap2                                                                         | 36.9424 | 1.85512 | 9.6351e-299 | 1.1521e-296 | Specific Liver_high |
| Mt1                                                                           | 36.8433 | 3.08449 | 3.7467e-297 | 4.4309e-295 | Specific Liver_high |
| Abi1                                                                          | 36.7989 | 2.02613 | 1.9207e-296 | 2.2631e-294 | Specific Liver_high |
| Tmem64                                                                        | 36.6968 | 2.55894 | 8.2015e-295 | 9.6285e-293 | Specific Liver_high |
| Fmn1                                                                          | 36.648  | 5.37524 | 4.9168e-294 | 5.7306e-292 | Specific Liver_high |
| Strn3                                                                         | 36.5608 | 1.65982 | 1.201e-292  | 1.3947e-290 | Specific Liver_high |
| Ntn4                                                                          | 36.5367 | 2.49895 | 2.8943e-292 | 3.3492e-290 | Specific Liver_high |
| Arhgdib                                                                       | 36.5198 | 3.21673 | 5.387e-292  | 6.2113e-290 | Specific Liver_high |
| Magi1                                                                         | 36.5134 | 1.76024 | 6.7976e-292 | 7.81e-290   | Specific Liver_high |
| Ppp2r5e                                                                       | 36.4892 | 1.98001 | 1.6442e-291 | 1.8824e-289 | Specific Liver_high |
| Rreb1                                                                         | 36.4163 | 2.08858 | 2.35e-290   | 2.6714e-288 | Specific Liver_high |
| Robo1                                                                         | 36.3536 | 5.09039 | 2.3072e-289 | 2.6045e-287 | Specific Liver_high |
| Ptbp3                                                                         | 36.3339 | 1.58581 | 4.7118e-289 | 5.282e-287  | Specific Liver_high |
| Prex2                                                                         | 36.2217 | 1.56003 | 2.7759e-287 | 3.101e-285  | Specific Liver_high |
| Taok3                                                                         | 36.2137 | 3.02373 | 3.7055e-287 | 4.1252e-285 | Specific Liver_high |
| Herc4                                                                         | 36.2109 | 2.18329 | 4.1072e-287 | 4.5567e-285 | Specific Liver_high |
| Skap2                                                                         | 36.1063 | 2.0413  | 1.8048e-285 | 1.9955e-283 | Specific Liver_high |
| Foxp1                                                                         | 36.0045 | 1.55394 | 7.1018e-284 | 7.7987e-282 | Specific Liver_high |
| Gphn                                                                          | 35.767  | 1.66027 | 3.6027e-280 | 3.9163e-278 | Specific Liver_high |
| Slf2                                                                          | 35.7278 | 2.71312 | 1.4631e-279 | 1.5851e-277 | Specific Liver_high |
| Fer                                                                           | 35.6747 | 2.13169 | 9.7461e-279 | 1.0524e-276 | Specific Liver_high |
| Lrp6                                                                          | 35.6313 | 2.1149  | 4.5925e-278 | 4.9423e-276 | Specific Liver_high |
| Pla2r1                                                                        | 35.5466 | 2.52208 | 9.3674e-277 | 9.981e-275  | Specific Liver_high |
| Lrrc58                                                                        | 35.5324 | 1.6803  | 1.5552e-276 | 1.6516e-274 | Specific Liver_high |
| Arrb1                                                                         | 35.4706 | 2.58669 | 1.3944e-275 | 1.476e-273  | Specific Liver_high |
| Pde1c                                                                         | 35.4528 | 4.06746 | 2.6303e-275 | 2.7752e-273 | Specific Liver_high |
| Arl15                                                                         | 35.325  | 1.69118 | 2.4316e-273 | 2.5571e-271 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Apc                                                                           | 35.3167 | 1.83913 | 3.2524e-273 | 3.4093e-271 | Specific Liver_high |
| Slc7a7                                                                        | 35.2644 | 2.77506 | 2.063e-272  | 2.1555e-270 | Specific Liver_high |
| Cyp4b1                                                                        | 35.2148 | 1.97417 | 1.1874e-271 | 1.2326e-269 | Specific Liver_high |
| Scarb2                                                                        | 35.1653 | 1.97846 | 6.7891e-271 | 7.0252e-269 | Specific Liver_high |
| Daam1                                                                         | 35.1651 | 2.57835 | 6.8389e-271 | 7.0541e-269 | Specific Liver_high |
| Snx29                                                                         | 35.1206 | 2.35518 | 3.2675e-270 | 3.349e-268  | Specific Liver_high |
| Asap1                                                                         | 35.1138 | 1.50131 | 4.1502e-270 | 4.2401e-268 | Specific Liver_high |
| Kansl1                                                                        | 35.1071 | 1.62418 | 5.257e-270  | 5.354e-268  | Specific Liver_high |
| Arrb2                                                                         | 35.0856 | 3.91243 | 1.1174e-269 | 1.1345e-267 | Specific Liver_high |
| Tpp1                                                                          | 35.0563 | 2.08136 | 3.1244e-269 | 3.1522e-267 | Specific Liver_high |
| Cmip                                                                          | 34.9953 | 1.72503 | 2.6546e-268 | 2.6616e-266 | Specific Liver_high |
| Ccnd2                                                                         | 34.979  | 1.80474 | 4.6947e-268 | 4.6781e-266 | Specific Liver_high |
| Dennd1a                                                                       | 34.9687 | 1.80852 | 6.7292e-268 | 6.6847e-266 | Specific Liver_high |
| Itpkb                                                                         | 34.9263 | 1.54967 | 2.9636e-267 | 2.935e-265  | Specific Liver_high |
| Clec1b                                                                        | 34.9061 | 4.45492 | 6.0048e-267 | 5.9286e-265 | Specific Liver_high |
| Cmss1                                                                         | 34.8169 | 1.72149 | 1.3509e-265 | 1.3256e-263 | Specific Liver_high |
| Arid1b                                                                        | 34.806  | 1.78832 | 1.9719e-265 | 1.9234e-263 | Specific Liver_high |
| Adgrg3                                                                        | 34.724  | 3.07107 | 3.4202e-264 | 3.3259e-262 | Specific Liver_high |
| Apaf1                                                                         | 34.7112 | 2.52865 | 5.3437e-264 | 5.1653e-262 | Specific Liver_high |
| Acvr1                                                                         | 34.6534 | 2.63151 | 3.9672e-263 | 3.8233e-261 | Specific Liver_high |
| Galnt18                                                                       | 34.6349 | 1.91297 | 7.5357e-263 | 7.2408e-261 | Specific Liver_high |
| Arhgap32                                                                      | 34.499  | 2.91257 | 8.3174e-261 | 7.9682e-259 | Specific Liver_high |
| Ctnnd1                                                                        | 34.484  | 1.5464  | 1.3925e-260 | 1.3301e-258 | Specific Liver_high |
| Zeb1                                                                          | 34.4459 | 1.56643 | 5.1824e-260 | 4.9355e-258 | Specific Liver_high |
| Klhl3                                                                         | 34.3167 | 3.25724 | 4.4284e-258 | 4.1804e-256 | Specific Liver_high |
| Ncoa2                                                                         | 34.2983 | 1.86919 | 8.3339e-258 | 7.8443e-256 | Specific Liver_high |
| Rapgef5                                                                       | 34.2722 | 1.61195 | 2.0395e-257 | 1.9141e-255 | Specific Liver_high |
| Il1a                                                                          | 34.2007 | 5.82276 | 2.3644e-256 | 2.2126e-254 | Specific Liver_high |
| Nptn                                                                          | 34.0858 | 1.8976  | 1.1976e-254 | 1.1175e-252 | Specific Liver_high |
| Zfp608                                                                        | 33.9841 | 1.86518 | 3.8287e-253 | 3.5418e-251 | Specific Liver_high |
| Acer2                                                                         | 33.9226 | 1.93928 | 3.0953e-252 | 2.8471e-250 | Specific Liver_high |
| Wls                                                                           | 33.9042 | 2.08694 | 5.772e-252  | 5.294e-250  | Specific Liver_high |
| Fcgrt                                                                         | 33.8634 | 1.73452 | 2.3073e-251 | 2.1043e-249 | Specific Liver_high |
| Ypel2                                                                         | 33.8411 | 2.5551  | 4.8974e-251 | 4.4539e-249 | Specific Liver_high |
| Nrip1                                                                         | 33.7674 | 1.99271 | 5.949e-250  | 5.3951e-248 | Specific Liver_high |
| Camk2d                                                                        | 33.7343 | 1.65058 | 1.8194e-249 | 1.6454e-247 | Specific Liver_high |
| Sptlc2                                                                        | 33.6277 | 1.79035 | 6.5942e-248 | 5.9137e-246 | Specific Liver_high |
| Ophn1                                                                         | 33.6133 | 2.14576 | 1.0741e-247 | 9.6059e-246 | Specific Liver_high |
| Srgap2                                                                        | 33.609  | 1.52873 | 1.2398e-247 | 1.1057e-245 | Specific Liver_high |
| Serpina3g                                                                     | 33.544  | 4.84009 | 1.1006e-246 | 9.7353e-245 | Specific Liver_high |
| Psen2                                                                         | 33.5422 | 3.14493 | 1.1713e-246 | 1.0332e-244 | Specific Liver_high |
| Spag9                                                                         | 33.5346 | 1.49584 | 1.5091e-246 | 1.3276e-244 | Specific Liver_high |
| Il13ra1                                                                       | 33.4738 | 2.85586 | 1.1601e-245 | 1.0178e-243 | Specific Liver_high |
| Fcho2                                                                         | 33.3933 | 1.53099 | 1.7153e-244 | 1.4967e-242 | Specific Liver_high |
| Gab2                                                                          | 33.3708 | 1.88112 | 3.6413e-244 | 3.1687e-242 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Eml4                                                                          | 33.3669 | 1.75949 | 4.1396e-244 | 3.5927e-242 | Specific Liver_high |
| Apoe                                                                          | 33.3357 | 1.69801 | 1.1759e-243 | 1.0097e-241 | Specific Liver_high |
| Elf1                                                                          | 33.2554 | 1.56778 | 1.7076e-242 | 1.4624e-240 | Specific Liver_high |
| Tet3                                                                          | 33.1908 | 1.92317 | 1.4635e-241 | 1.25e-239   | Specific Liver_high |
| Cfh                                                                           | 32.9755 | 3.90649 | 1.8237e-238 | 1.5535e-236 | Specific Liver_high |
| Frmd4a                                                                        | 32.9303 | 2.25405 | 8.0997e-238 | 6.8815e-236 | Specific Liver_high |
| Sirpa                                                                         | 32.9208 | 2.86594 | 1.1075e-237 | 9.3845e-236 | Specific Liver_high |
| Lyn                                                                           | 32.902  | 1.60776 | 2.0548e-237 | 1.7367e-235 | Specific Liver_high |
| Kat2b                                                                         | 32.8376 | 1.84562 | 1.7147e-236 | 1.4454e-234 | Specific Liver_high |
| Zfp652                                                                        | 32.8271 | 1.71106 | 2.4166e-236 | 2.0318e-234 | Specific Liver_high |
| Rasgrp3                                                                       | 32.624  | 1.38218 | 1.8747e-233 | 1.564e-231  | Specific Liver_high |
| C1qtnf1                                                                       | 32.5864 | 4.94939 | 6.398e-233  | 5.3237e-231 | Specific Liver_high |
| Wdfy3                                                                         | 32.5362 | 1.59434 | 3.286e-232  | 2.7272e-230 | Specific Liver_high |
| Ralgs2                                                                        | 32.4829 | 2.3687  | 1.862e-231  | 1.5375e-229 | Specific Liver_high |
| Myo7a                                                                         | 32.4815 | 2.80071 | 1.9488e-231 | 1.605e-229  | Specific Liver_high |
| Plxnd1                                                                        | 32.3783 | 1.55028 | 5.538e-230  | 4.5264e-228 | Specific Liver_high |
| Emilin1                                                                       | 32.3509 | 2.26592 | 1.3472e-229 | 1.0983e-227 | Specific Liver_high |
| Rell1                                                                         | 32.2051 | 1.94343 | 1.499e-227  | 1.216e-225  | Specific Liver_high |
| Gna13                                                                         | 32.1048 | 2.04986 | 3.7722e-226 | 3.0446e-224 | Specific Liver_high |
| Pitpna                                                                        | 32.076  | 1.49735 | 9.5281e-226 | 7.6712e-224 | Specific Liver_high |
| Tcf7l1                                                                        | 32.0492 | 1.67457 | 2.2521e-225 | 1.8087e-223 | Specific Liver_high |
| Khdrbs3                                                                       | 31.9802 | 4.30328 | 2.0568e-224 | 1.6477e-222 | Specific Liver_high |
| Atp2b4                                                                        | 31.9775 | 1.69249 | 2.2424e-224 | 1.7919e-222 | Specific Liver_high |
| Golga7                                                                        | 31.9722 | 1.88932 | 2.6576e-224 | 2.1185e-222 | Specific Liver_high |
| Dapk2                                                                         | 31.9575 | 1.96522 | 4.2467e-224 | 3.377e-222  | Specific Liver_high |
| Tcf7l2                                                                        | 31.9054 | 1.93037 | 2.2488e-223 | 1.7751e-221 | Specific Liver_high |
| 4932438A13Rik                                                                 | 31.8875 | 1.72544 | 3.9783e-223 | 3.1327e-221 | Specific Liver_high |
| Ubash3b                                                                       | 31.8829 | 2.23307 | 4.6095e-223 | 3.6121e-221 | Specific Liver_high |
| Marcks1                                                                       | 31.8671 | 1.82398 | 7.6372e-223 | 5.9701e-221 | Specific Liver_high |
| Map4k5                                                                        | 31.8327 | 1.74657 | 2.2864e-222 | 1.783e-220  | Specific Liver_high |
| Trps1                                                                         | 31.806  | 2.1312  | 5.3436e-222 | 4.1571e-220 | Specific Liver_high |
| Klf7                                                                          | 31.7242 | 1.33436 | 7.216e-221  | 5.6002e-219 | Specific Liver_high |
| Eng                                                                           | 31.722  | 1.13051 | 7.7262e-221 | 5.9818e-219 | Specific Liver_high |
| Erbin                                                                         | 31.6457 | 1.61978 | 8.6855e-220 | 6.7084e-218 | Specific Liver_high |
| Ddx17                                                                         | 31.5518 | 1.59216 | 1.6964e-218 | 1.304e-216  | Specific Liver_high |
| Gpatch2                                                                       | 31.5307 | 2.01225 | 3.3e-218    | 2.5306e-216 | Specific Liver_high |
| Hecw2                                                                         | 31.528  | 1.49763 | 3.5961e-218 | 2.7512e-216 | Specific Liver_high |
| Stim2                                                                         | 31.5276 | 1.53989 | 3.6327e-218 | 2.7726e-216 | Specific Liver_high |
| Arhgap35                                                                      | 31.5084 | 2.21406 | 6.6757e-218 | 5.0832e-216 | Specific Liver_high |
| Calcr1                                                                        | 31.4835 | 1.45192 | 1.4607e-217 | 1.1096e-215 | Specific Liver_high |
| Lrch1                                                                         | 31.4305 | 1.47316 | 7.761e-217  | 5.8818e-215 | Specific Liver_high |
| Picalm                                                                        | 31.3975 | 1.56608 | 2.1913e-216 | 1.6568e-214 | Specific Liver_high |
| Mgat5                                                                         | 31.3537 | 2.4602  | 8.6717e-216 | 6.5412e-214 | Specific Liver_high |
| Map3k3                                                                        | 31.3128 | 1.61814 | 3.1214e-215 | 2.3436e-213 | Specific Liver_high |
| Zfand3                                                                        | 31.3116 | 1.48729 | 3.2404e-215 | 2.4273e-213 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| 2026-09-11 00:00:00                                                           | 31.2865 | 1.65613 | 7.1217e-215 | 5.3223e-213 | Specific Liver_high |
| Mbnl1                                                                         | 31.1854 | 1.40724 | 1.6826e-213 | 1.2517e-211 | Specific Liver_high |
| Tex2                                                                          | 31.062  | 2.66058 | 7.8592e-212 | 5.8062e-210 | Specific Liver_high |
| Slc29a1                                                                       | 31.0492 | 1.54912 | 1.1692e-211 | 8.6179e-210 | Specific Liver_high |
| Snx18                                                                         | 31.0114 | 3.14667 | 3.7896e-211 | 2.7869e-209 | Specific Liver_high |
| Kcnb1                                                                         | 31.0027 | 2.29339 | 4.9499e-211 | 3.6238e-209 | Specific Liver_high |
| Slc9a1                                                                        | 30.9907 | 2.31513 | 7.1952e-211 | 5.2556e-209 | Specific Liver_high |
| Aff1                                                                          | 30.989  | 1.98011 | 7.5734e-211 | 5.5194e-209 | Specific Liver_high |
| Anks1                                                                         | 30.9352 | 1.85833 | 4.0149e-210 | 2.9063e-208 | Specific Liver_high |
| Nqo2                                                                          | 30.8669 | 2.45451 | 3.3226e-209 | 2.3998e-207 | Specific Liver_high |
| Bmpr2                                                                         | 30.8525 | 1.3224  | 5.184e-209  | 3.7358e-207 | Specific Liver_high |
| Pik3r1                                                                        | 30.8048 | 1.90883 | 2.257e-208  | 1.6193e-206 | Specific Liver_high |
| Cdh13                                                                         | 30.7672 | 2.68287 | 7.2031e-208 | 5.1564e-206 | Specific Liver_high |
| Cpne2                                                                         | 30.767  | 2.27153 | 7.2535e-208 | 5.181e-206  | Specific Liver_high |
| Ica1                                                                          | 30.7415 | 1.5299  | 1.5911e-207 | 1.1315e-205 | Specific Liver_high |
| Plxna4                                                                        | 30.7098 | 1.80754 | 4.2064e-207 | 2.9847e-205 | Specific Liver_high |
| Dnmt3a                                                                        | 30.7097 | 1.90374 | 4.2186e-207 | 2.9868e-205 | Specific Liver_high |
| Slmap                                                                         | 30.6552 | 1.65321 | 2.254e-206  | 1.5924e-204 | Specific Liver_high |
| Snd1                                                                          | 30.6459 | 2.00705 | 2.9975e-206 | 2.1084e-204 | Specific Liver_high |
| Agap1                                                                         | 30.6437 | 1.73715 | 3.2103e-206 | 2.2532e-204 | Specific Liver_high |
| Prkn                                                                          | 30.6385 | 2.98895 | 3.7611e-206 | 2.634e-204  | Specific Liver_high |
| Zbtb46                                                                        | 30.6317 | 1.48627 | 4.6404e-206 | 3.2357e-204 | Specific Liver_high |
| Hspa1b                                                                        | 30.6238 | 2.21173 | 5.8956e-206 | 4.1021e-204 | Specific Liver_high |
| Itpr2                                                                         | 30.5295 | 1.77946 | 1.0577e-204 | 7.3278e-203 | Specific Liver_high |
| Chd7                                                                          | 30.5116 | 2.13359 | 1.8295e-204 | 1.2648e-202 | Specific Liver_high |
| Dleu2                                                                         | 30.4702 | 1.60116 | 6.4746e-204 | 4.4665e-202 | Specific Liver_high |
| Sik3                                                                          | 30.3119 | 1.54818 | 7.9805e-202 | 5.4819e-200 | Specific Liver_high |
| Prkcb                                                                         | 30.2461 | 4.40857 | 5.8795e-201 | 4.0216e-199 | Specific Liver_high |
| Atp6v0a1                                                                      | 30.1615 | 2.17648 | 7.5724e-200 | 5.1686e-198 | Specific Liver_high |
| Ralb                                                                          | 30.1357 | 1.68263 | 1.6518e-199 | 1.1227e-197 | Specific Liver_high |
| Tnfaip1                                                                       | 30.1333 | 1.45698 | 1.7731e-199 | 1.2026e-197 | Specific Liver_high |
| Amotl1                                                                        | 30.1135 | 1.42617 | 3.2267e-199 | 2.1839e-197 | Specific Liver_high |
| Gpr155                                                                        | 30.081  | 4.04671 | 8.577e-199  | 5.7569e-197 | Specific Liver_high |
| Tfec                                                                          | 29.9814 | 5.15864 | 1.7136e-197 | 1.143e-195  | Specific Liver_high |
| Ctsl                                                                          | 29.9547 | 1.36256 | 3.8165e-197 | 2.5353e-195 | Specific Liver_high |
| Exoc5                                                                         | 29.9411 | 1.57949 | 5.7406e-197 | 3.8057e-195 | Specific Liver_high |
| Fto                                                                           | 29.9383 | 1.65038 | 6.2463e-197 | 4.1324e-195 | Specific Liver_high |
| Ccnd1                                                                         | 29.8956 | 1.59623 | 2.2411e-196 | 1.4797e-194 | Specific Liver_high |
| Luc7l2                                                                        | 29.8894 | 1.34764 | 2.7007e-196 | 1.7758e-194 | Specific Liver_high |
| Rapgef2                                                                       | 29.8199 | 1.33693 | 2.1556e-195 | 1.4116e-193 | Specific Liver_high |
| Agfg2                                                                         | 29.7649 | 3.34798 | 1.1132e-194 | 7.2755e-193 | Specific Liver_high |
| Helz                                                                          | 29.7529 | 1.58075 | 1.5896e-194 | 1.0368e-192 | Specific Liver_high |
| Cyp26b1                                                                       | 29.7501 | 2.1812  | 1.7316e-194 | 1.1271e-192 | Specific Liver_high |
| Nedd4l                                                                        | 29.6021 | 1.81805 | 1.4026e-192 | 9.1112e-191 | Specific Liver_high |
| Il1r1                                                                         | 29.5783 | 2.44917 | 2.8414e-192 | 1.8421e-190 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Glul                                                                          | 29.5582 | 1.87636 | 5.1514e-192 | 3.3329e-190 | Specific Liver_high |
| Stk39                                                                         | 29.4659 | 2.5667  | 7.8668e-191 | 5.0695e-189 | Specific Liver_high |
| Man2b1                                                                        | 29.422  | 2.00283 | 2.8733e-190 | 1.8442e-188 | Specific Liver_high |
| Cdh4                                                                          | 29.4141 | 3.27519 | 3.6208e-190 | 2.3148e-188 | Specific Liver_high |
| Tnpo1                                                                         | 29.3794 | 1.72953 | 1.0076e-189 | 6.4292e-188 | Specific Liver_high |
| Gls                                                                           | 29.3432 | 1.70397 | 2.9226e-189 | 1.8611e-187 | Specific Liver_high |
| Mib1                                                                          | 29.3275 | 1.59295 | 4.6221e-189 | 2.9375e-187 | Specific Liver_high |
| Tbc1d22a                                                                      | 29.3205 | 1.73767 | 5.688e-189  | 3.6078e-187 | Specific Liver_high |
| Rbpms                                                                         | 29.2693 | 1.28283 | 2.5499e-188 | 1.6142e-186 | Specific Liver_high |
| Rcn1                                                                          | 29.2431 | 2.20046 | 5.4906e-188 | 3.4689e-186 | Specific Liver_high |
| Ext1                                                                          | 29.1986 | 1.72825 | 2.0218e-187 | 1.2724e-185 | Specific Liver_high |
| Zcchc24                                                                       | 29.187  | 2.05001 | 2.8324e-187 | 1.7791e-185 | Specific Liver_high |
| Dnmbp                                                                         | 29.1785 | 2.2047  | 3.6361e-187 | 2.275e-185  | Specific Liver_high |
| Pde4d                                                                         | 29.1645 | 1.53747 | 5.4756e-187 | 3.4194e-185 | Specific Liver_high |
| Rfx7                                                                          | 29.1286 | 2.02721 | 1.561e-186  | 9.729e-185  | Specific Liver_high |
| Usp9x                                                                         | 29.1235 | 1.64153 | 1.8085e-186 | 1.125e-184  | Specific Liver_high |
| Prkch                                                                         | 29.0828 | 1.31046 | 5.9243e-186 | 3.6782e-184 | Specific Liver_high |
| Gna12                                                                         | 28.9975 | 1.63913 | 7.0802e-185 | 4.3874e-183 | Specific Liver_high |
| Nfkb1                                                                         | 28.9726 | 1.48451 | 1.4586e-184 | 9.0043e-183 | Specific Liver_high |
| Ptk2                                                                          | 28.9647 | 1.28677 | 1.8341e-184 | 1.1301e-182 | Specific Liver_high |
| Tmem30a                                                                       | 28.9263 | 1.38371 | 5.5676e-184 | 3.4173e-182 | Specific Liver_high |
| Dcbld1                                                                        | 28.9123 | 1.76525 | 8.3513e-184 | 5.1161e-182 | Specific Liver_high |
| Greb1l                                                                        | 28.8762 | 5.50946 | 2.3748e-183 | 1.4521e-181 | Specific Liver_high |
| Ptpkr                                                                         | 28.7775 | 1.53957 | 4.1014e-182 | 2.4983e-180 | Specific Liver_high |
| Xkr6                                                                          | 28.7658 | 3.04581 | 5.75e-182   | 3.496e-180  | Specific Liver_high |
| Lmtk2                                                                         | 28.7657 | 1.96282 | 5.7648e-182 | 3.4984e-180 | Specific Liver_high |
| Lama4                                                                         | 28.7602 | 1.52235 | 6.7444e-182 | 4.0852e-180 | Specific Liver_high |
| Ankrd17                                                                       | 28.7584 | 1.48888 | 7.1046e-182 | 4.2953e-180 | Specific Liver_high |
| Irf2bp2                                                                       | 28.746  | 1.59761 | 1.017e-181  | 6.1371e-180 | Specific Liver_high |
| Mbnl2                                                                         | 28.7021 | 1.26229 | 3.5868e-181 | 2.1604e-179 | Specific Liver_high |
| Prkacb                                                                        | 28.6758 | 1.9078  | 7.6363e-181 | 4.591e-179  | Specific Liver_high |
| Smyd3                                                                         | 28.6662 | 2.14109 | 1.0065e-180 | 6.04e-179   | Specific Liver_high |
| Stard8                                                                        | 28.6652 | 1.35476 | 1.0371e-180 | 6.2119e-179 | Specific Liver_high |
| Jarid2                                                                        | 28.6087 | 1.70802 | 5.2451e-180 | 3.1301e-178 | Specific Liver_high |
| Stag2                                                                         | 28.5806 | 1.51472 | 1.1696e-179 | 6.9669e-178 | Specific Liver_high |
| Snrk                                                                          | 28.5284 | 1.20655 | 5.2105e-179 | 3.098e-177  | Specific Liver_high |
| Asah2                                                                         | 28.5039 | 1.92763 | 1.0488e-178 | 6.2128e-177 | Specific Liver_high |
| Mkin1                                                                         | 28.4905 | 1.38328 | 1.5353e-178 | 9.0783e-177 | Specific Liver_high |
| Vti1a                                                                         | 28.4901 | 1.46962 | 1.5549e-178 | 9.177e-177  | Specific Liver_high |
| Pced1b                                                                        | 28.4749 | 1.81905 | 2.3989e-178 | 1.4133e-176 | Specific Liver_high |
| Gns                                                                           | 28.354  | 2.06954 | 7.4755e-177 | 4.3881e-175 | Specific Liver_high |
| Gfod1                                                                         | 28.3519 | 2.29726 | 7.9367e-177 | 4.6504e-175 | Specific Liver_high |
| Gm16083                                                                       | 28.2596 | 4.33281 | 1.0844e-175 | 6.3308e-174 | Specific Liver_high |
| Snap23                                                                        | 28.2285 | 1.80149 | 2.6138e-175 | 1.5232e-173 | Specific Liver_high |
| Npl                                                                           | 28.2253 | 4.85443 | 2.865e-175  | 1.6666e-173 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Ifi204                                                                        | 28.1825 | 2.07412 | 9.585e-175  | 5.5657e-173 | Specific Liver_high |
| Pik3c2b                                                                       | 28.1027 | 1.83801 | 9.083e-174  | 5.2647e-172 | Specific Liver_high |
| Rab27a                                                                        | 28.0305 | 3.74962 | 6.9035e-173 | 3.9943e-171 | Specific Liver_high |
| Mtmr3                                                                         | 28.0211 | 1.56382 | 8.9988e-173 | 5.1973e-171 | Specific Liver_high |
| Tulp4                                                                         | 27.9786 | 1.59271 | 2.9621e-172 | 1.7077e-170 | Specific Liver_high |
| Crim1                                                                         | 27.9489 | 1.28025 | 6.7976e-172 | 3.912e-170  | Specific Liver_high |
| Coro1c                                                                        | 27.9297 | 1.68687 | 1.1624e-171 | 6.6778e-170 | Specific Liver_high |
| Vps13c                                                                        | 27.9038 | 1.97413 | 2.401e-171  | 1.3768e-169 | Specific Liver_high |
| Igf1r                                                                         | 27.8724 | 1.29472 | 5.7676e-171 | 3.3016e-169 | Specific Liver_high |
| Stat5b                                                                        | 27.848  | 1.75808 | 1.1387e-170 | 6.4951e-169 | Specific Liver_high |
| Wdfy2                                                                         | 27.7751 | 1.86993 | 8.6739e-170 | 4.9302e-168 | Specific Liver_high |
| Ptp4a2                                                                        | 27.719  | 1.29527 | 4.1219e-169 | 2.3306e-167 | Specific Liver_high |
| Pias1                                                                         | 27.7003 | 1.50417 | 6.9229e-169 | 3.9074e-167 | Specific Liver_high |
| Fam120a                                                                       | 27.6672 | 1.5865  | 1.7334e-168 | 9.7668e-167 | Specific Liver_high |
| Calm2                                                                         | 27.6608 | 1.13409 | 2.0717e-168 | 1.1652e-166 | Specific Liver_high |
| Atp9b                                                                         | 27.6404 | 1.69929 | 3.6368e-168 | 2.042e-166  | Specific Liver_high |
| Creb3l2                                                                       | 27.6141 | 1.62383 | 7.5427e-168 | 4.2277e-166 | Specific Liver_high |
| Adipor1                                                                       | 27.6062 | 1.43558 | 9.3662e-168 | 5.2407e-166 | Specific Liver_high |
| Wdr59                                                                         | 27.5526 | 3.12284 | 4.1145e-167 | 2.2982e-165 | Specific Liver_high |
| Lrrk2                                                                         | 27.3873 | 1.66588 | 3.8856e-165 | 2.1629e-163 | Specific Liver_high |
| Slc25a37                                                                      | 27.3835 | 2.78826 | 4.3071e-165 | 2.3892e-163 | Specific Liver_high |
| Etv6                                                                          | 27.3732 | 1.40746 | 5.7174e-165 | 3.1662e-163 | Specific Liver_high |
| Vps8                                                                          | 27.3695 | 2.39615 | 6.325e-165  | 3.4966e-163 | Specific Liver_high |
| Elk3                                                                          | 27.3498 | 1.11142 | 1.0874e-164 | 6.0011e-163 | Specific Liver_high |
| Nr5a2                                                                         | 27.3128 | 1.94603 | 2.9875e-164 | 1.6431e-162 | Specific Liver_high |
| Exoc6b                                                                        | 27.2625 | 1.31822 | 1.1801e-163 | 6.4795e-162 | Specific Liver_high |
| Usp3                                                                          | 27.2621 | 1.74287 | 1.194e-163  | 6.5448e-162 | Specific Liver_high |
| Eif4g3                                                                        | 27.2503 | 1.37442 | 1.6475e-163 | 9.0151e-162 | Specific Liver_high |
| Arhgef12                                                                      | 27.2468 | 1.15663 | 1.814e-163  | 9.9095e-162 | Specific Liver_high |
| Nsmce2                                                                        | 27.2331 | 1.67271 | 2.6353e-163 | 1.4372e-161 | Specific Liver_high |
| Nt5c3                                                                         | 27.2281 | 2.34661 | 3.0204e-163 | 1.6444e-161 | Specific Liver_high |
| Tbc1d4                                                                        | 27.1979 | 1.83426 | 6.8771e-163 | 3.7379e-161 | Specific Liver_high |
| Ntng2                                                                         | 27.1445 | 2.62327 | 2.9414e-162 | 1.596e-160  | Specific Liver_high |
| Large1                                                                        | 27.1382 | 1.52296 | 3.487e-162  | 1.8889e-160 | Specific Liver_high |
| Slc12a6                                                                       | 27.1235 | 1.42269 | 5.2036e-162 | 2.8141e-160 | Specific Liver_high |
| Wwc2                                                                          | 27.111  | 1.31274 | 7.2969e-162 | 3.9395e-160 | Specific Liver_high |
| Pxk                                                                           | 27.0753 | 1.63387 | 1.9254e-161 | 1.0377e-159 | Specific Liver_high |
| Prr5l                                                                         | 27.0603 | 2.63976 | 2.889e-161  | 1.5545e-159 | Specific Liver_high |
| Gatad2b                                                                       | 27.0119 | 1.49946 | 1.0715e-160 | 5.7562e-159 | Specific Liver_high |
| Mlxip                                                                         | 26.9634 | 1.95349 | 3.9758e-160 | 2.1322e-158 | Specific Liver_high |
| Tbl1x                                                                         | 26.896  | 1.33428 | 2.4487e-159 | 1.3067e-157 | Specific Liver_high |
| 2210408l21Rik                                                                 | 26.852  | 2.23513 | 7.9997e-159 | 4.2619e-157 | Specific Liver_high |
| Trio                                                                          | 26.8462 | 1.42958 | 9.3398e-159 | 4.9676e-157 | Specific Liver_high |
| Rassf3                                                                        | 26.8375 | 1.30116 | 1.1817e-158 | 6.2685e-157 | Specific Liver_high |
| Sbno2                                                                         | 26.8374 | 2.21144 | 1.1824e-158 | 6.2685e-157 | Specific Liver_high |



| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Agfg1                                                                         | 26.8329 | 1.58929 | 1.3355e-158 | 7.0682e-157 | Specific Liver_high |
| Lrrc32                                                                        | 26.7698 | 2.06464 | 7.2567e-158 | 3.8344e-156 | Specific Liver_high |
| Wdr26                                                                         | 26.7334 | 1.42594 | 1.928e-157  | 1.0171e-155 | Specific Liver_high |
| Cldn5                                                                         | 26.7244 | 1.31514 | 2.4499e-157 | 1.2903e-155 | Specific Liver_high |
| Atxn1                                                                         | 26.7235 | 1.28237 | 2.5078e-157 | 1.3186e-155 | Specific Liver_high |
| Olfm1                                                                         | 26.7159 | 3.73191 | 3.0788e-157 | 1.6163e-155 | Specific Liver_high |
| B130024G19Rik                                                                 | 26.7046 | 3.35367 | 4.1653e-157 | 2.1831e-155 | Specific Liver_high |
| Gramd1b                                                                       | 26.6898 | 3.66254 | 6.1825e-157 | 3.235e-155  | Specific Liver_high |
| Pds5a                                                                         | 26.6658 | 1.42533 | 1.1742e-156 | 6.1341e-155 | Specific Liver_high |
| Asx1                                                                          | 26.6585 | 1.57432 | 1.4272e-156 | 7.4437e-155 | Specific Liver_high |
| Tmcc1                                                                         | 26.6386 | 1.44283 | 2.4236e-156 | 1.2621e-154 | Specific Liver_high |
| Pde7b                                                                         | 26.6341 | 1.38142 | 2.7328e-156 | 1.4208e-154 | Specific Liver_high |
| Lepr                                                                          | 26.6231 | 2.75733 | 3.6628e-156 | 1.9012e-154 | Specific Liver_high |
| Lnpep                                                                         | 26.5943 | 1.42249 | 7.8961e-156 | 4.0854e-154 | Specific Liver_high |
| 6030498E09Rik                                                                 | 26.5779 | 4.97483 | 1.2242e-155 | 6.3238e-154 | Specific Liver_high |
| Ambra1                                                                        | 26.5624 | 1.41412 | 1.8451e-155 | 9.5161e-154 | Specific Liver_high |
| Mgmt                                                                          | 26.5517 | 2.77719 | 2.452e-155  | 1.2625e-153 | Specific Liver_high |
| Rbfox2                                                                        | 26.5219 | 1.26889 | 5.4265e-155 | 2.7897e-153 | Specific Liver_high |
| Tmem132e                                                                      | 26.4951 | 5.46938 | 1.1043e-154 | 5.6683e-153 | Specific Liver_high |
| Maml2                                                                         | 26.4433 | 1.26371 | 4.3603e-154 | 2.2345e-152 | Specific Liver_high |
| Amotl2                                                                        | 26.4377 | 1.79934 | 5.0598e-154 | 2.5889e-152 | Specific Liver_high |
| Ubr5                                                                          | 26.4259 | 1.49583 | 6.9157e-154 | 3.5328e-152 | Specific Liver_high |
| Cdk17                                                                         | 26.4217 | 1.25056 | 7.7198e-154 | 3.9374e-152 | Specific Liver_high |
| Lgals1                                                                        | 26.4186 | 2.60791 | 8.3755e-154 | 4.265e-152  | Specific Liver_high |
| Zfp503                                                                        | 26.4083 | 1.69914 | 1.0996e-153 | 5.5904e-152 | Specific Liver_high |
| Fars2                                                                         | 26.4046 | 1.77204 | 1.2133e-153 | 6.1591e-152 | Specific Liver_high |
| Qk                                                                            | 26.3727 | 1.07879 | 2.8164e-153 | 1.4274e-151 | Specific Liver_high |
| Slc44a1                                                                       | 26.3626 | 1.44515 | 3.6801e-153 | 1.8623e-151 | Specific Liver_high |
| Dennd2a                                                                       | 26.3036 | 4.54319 | 1.7428e-152 | 8.7916e-151 | Specific Liver_high |
| Ubl3                                                                          | 26.2903 | 1.34997 | 2.4784e-152 | 1.2483e-150 | Specific Liver_high |
| Adarb1                                                                        | 26.2869 | 1.40244 | 2.7103e-152 | 1.3629e-150 | Specific Liver_high |
| Atxn7l1                                                                       | 26.2867 | 1.81196 | 2.72e-152   | 1.3657e-150 | Specific Liver_high |
| Parp8                                                                         | 26.1925 | 2.66183 | 3.2356e-151 | 1.617e-149  | Specific Liver_high |
| Canx                                                                          | 26.1853 | 1.29641 | 3.9095e-151 | 1.9508e-149 | Specific Liver_high |
| Plet1os                                                                       | 26.1852 | 2.91138 | 3.9158e-151 | 1.9509e-149 | Specific Liver_high |
| Tmem51                                                                        | 26.1564 | 3.5721  | 8.3275e-151 | 4.1426e-149 | Specific Liver_high |
| Hmbox1                                                                        | 26.077  | 1.29996 | 6.6406e-150 | 3.2933e-148 | Specific Liver_high |
| Maml3                                                                         | 26.0516 | 1.39913 | 1.2886e-149 | 6.371e-148  | Specific Liver_high |
| Camta1                                                                        | 26.0134 | 1.59424 | 3.4917e-149 | 1.7237e-147 | Specific Liver_high |
| Sfi1                                                                          | 26.0094 | 2.69056 | 3.8724e-149 | 1.9087e-147 | Specific Liver_high |
| Pxdn                                                                          | 25.9217 | 1.5763  | 3.7871e-148 | 1.861e-146  | Specific Liver_high |
| Rarb                                                                          | 25.9217 | 1.53247 | 3.7871e-148 | 1.861e-146  | Specific Liver_high |
| Rb1                                                                           | 25.9171 | 1.43365 | 4.2763e-148 | 2.0982e-146 | Specific Liver_high |
| Mdfic                                                                         | 25.9013 | 1.34097 | 6.4381e-148 | 3.1541e-146 | Specific Liver_high |
| Zfhx3                                                                         | 25.9012 | 1.34082 | 6.4579e-148 | 3.159e-146  | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Rnf157                                                                        | 25.8184 | 2.28379 | 5.5099e-147 | 2.6912e-145 | Specific Liver_high |
| Farp1                                                                         | 25.8183 | 1.86397 | 5.5254e-147 | 2.6947e-145 | Specific Liver_high |
| Ddx6                                                                          | 25.8097 | 1.25581 | 6.9014e-147 | 3.3556e-145 | Specific Liver_high |
| Kdelr2                                                                        | 25.7756 | 1.47399 | 1.6631e-146 | 8.0744e-145 | Specific Liver_high |
| Aak1                                                                          | 25.7315 | 1.67849 | 5.1971e-146 | 2.5193e-144 | Specific Liver_high |
| Magi3                                                                         | 25.7253 | 1.37775 | 6.0862e-146 | 2.9459e-144 | Specific Liver_high |
| Clasp2                                                                        | 25.7076 | 1.58751 | 9.6088e-146 | 4.6371e-144 | Specific Liver_high |
| Gm46565                                                                       | 25.6413 | 3.90462 | 5.2823e-145 | 2.5416e-143 | Specific Liver_high |
| Vps13b                                                                        | 25.6411 | 1.446   | 5.3125e-145 | 2.5523e-143 | Specific Liver_high |
| Tshz3                                                                         | 25.5796 | 1.44664 | 2.5754e-144 | 1.2355e-142 | Specific Liver_high |
| Galnt1                                                                        | 25.5741 | 1.55749 | 2.9587e-144 | 1.4172e-142 | Specific Liver_high |
| Smad7                                                                         | 25.5694 | 1.41709 | 3.3436e-144 | 1.5992e-142 | Specific Liver_high |
| Rbms1                                                                         | 25.5678 | 1.04523 | 3.4859e-144 | 1.6648e-142 | Specific Liver_high |
| Babam2                                                                        | 25.5493 | 1.38647 | 5.5972e-144 | 2.6692e-142 | Specific Liver_high |
| Nsd3                                                                          | 25.5334 | 1.36366 | 8.3841e-144 | 3.9865e-142 | Specific Liver_high |
| Kcnq1                                                                         | 25.512  | 1.52598 | 1.4496e-143 | 6.8824e-142 | Specific Liver_high |
| Tbc1d1                                                                        | 25.4766 | 1.66469 | 3.5823e-143 | 1.6983e-141 | Specific Liver_high |
| Atf7ip                                                                        | 25.4453 | 1.42469 | 7.9579e-143 | 3.7672e-141 | Specific Liver_high |
| Arhgef7                                                                       | 25.3935 | 1.38849 | 2.9742e-142 | 1.4059e-140 | Specific Liver_high |
| Sgk3                                                                          | 25.3923 | 1.74058 | 3.0685e-142 | 1.4483e-140 | Specific Liver_high |
| Dock1                                                                         | 25.3702 | 1.19056 | 5.3808e-142 | 2.536e-140  | Specific Liver_high |
| Zcchc14                                                                       | 25.3663 | 1.37545 | 5.9416e-142 | 2.7963e-140 | Specific Liver_high |
| Wdr7                                                                          | 25.3267 | 1.89641 | 1.6222e-141 | 7.6236e-140 | Specific Liver_high |
| Akr1b8                                                                        | 25.282  | 4.8422  | 5.0398e-141 | 2.365e-139  | Specific Liver_high |
| Wac                                                                           | 25.2697 | 1.25231 | 6.8883e-141 | 3.2277e-139 | Specific Liver_high |
| Mark2                                                                         | 25.2089 | 1.45496 | 3.2031e-140 | 1.4944e-138 | Specific Liver_high |
| Tmcc2                                                                         | 25.076  | 2.27387 | 9.0845e-139 | 4.2261e-137 | Specific Liver_high |
| Jmjd1c                                                                        | 25.0692 | 1.2089  | 1.0789e-138 | 5.005e-137  | Specific Liver_high |
| Sh3kbp1                                                                       | 25.0692 | 2.79691 | 1.079e-138  | 5.005e-137  | Specific Liver_high |
| Cavin2                                                                        | 25.0376 | 1.33187 | 2.3854e-138 | 1.1049e-136 | Specific Liver_high |
| Zfp532                                                                        | 25.037  | 1.82518 | 2.4218e-138 | 1.1202e-136 | Specific Liver_high |
| AC149090.1                                                                    | 25.0312 | 1.46411 | 2.7978e-138 | 1.2922e-136 | Specific Liver_high |
| Tcn2                                                                          | 25.0296 | 1.25352 | 2.9099e-138 | 1.3421e-136 | Specific Liver_high |
| Pde10a                                                                        | 25.0122 | 2.02072 | 4.5073e-138 | 2.0759e-136 | Specific Liver_high |
| Dusp3                                                                         | 24.9427 | 1.12038 | 2.56e-137   | 1.1773e-135 | Specific Liver_high |
| Cdkal1                                                                        | 24.9203 | 1.45393 | 4.4806e-137 | 2.0577e-135 | Specific Liver_high |
| Clint1                                                                        | 24.885  | 1.55987 | 1.081e-136  | 4.9504e-135 | Specific Liver_high |
| Lpar6                                                                         | 24.8395 | 1.48082 | 3.3568e-136 | 1.5351e-134 | Specific Liver_high |
| Hmcn1                                                                         | 24.8248 | 1.48845 | 4.8376e-136 | 2.2091e-134 | Specific Liver_high |
| Strn4                                                                         | 24.8099 | 1.69612 | 7.0169e-136 | 3.1997e-134 | Specific Liver_high |
| Taok2                                                                         | 24.7886 | 1.34331 | 1.1889e-135 | 5.4136e-134 | Specific Liver_high |
| Taok1                                                                         | 24.7772 | 1.20241 | 1.578e-135  | 7.1756e-134 | Specific Liver_high |
| Pum2                                                                          | 24.7208 | 1.22661 | 6.3858e-135 | 2.8915e-133 | Specific Liver_high |
| Slc16a2                                                                       | 24.7086 | 1.96151 | 8.6455e-135 | 3.9093e-133 | Specific Liver_high |
| Dhrs3                                                                         | 24.6766 | 1.18166 | 1.9081e-134 | 8.6037e-133 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Cd47                                                                          | 24.6714 | 1.03125 | 2.17e-134   | 9.7709e-133 | Specific Liver_high |
| G3bp2                                                                         | 24.5663 | 1.36088 | 2.8968e-133 | 1.3007e-131 | Specific Liver_high |
| Cd164                                                                         | 24.545  | 1.52162 | 4.8895e-133 | 2.1925e-131 | Specific Liver_high |
| Ndfip1                                                                        | 24.5326 | 1.16255 | 6.6317e-133 | 2.9695e-131 | Specific Liver_high |
| Ap2s1                                                                         | 24.518  | 1.3049  | 9.4933e-133 | 4.245e-131  | Specific Liver_high |
| Nckap1                                                                        | 24.4636 | 1.15595 | 3.6098e-132 | 1.6119e-130 | Specific Liver_high |
| Rufy3                                                                         | 24.4512 | 2.32024 | 4.8888e-132 | 2.1801e-130 | Specific Liver_high |
| Hdac1                                                                         | 24.4484 | 1.3469  | 5.2386e-132 | 2.3328e-130 | Specific Liver_high |
| Gng12                                                                         | 24.4444 | 1.2302  | 5.7731e-132 | 2.5673e-130 | Specific Liver_high |
| Nf1                                                                           | 24.4076 | 1.2597  | 1.4217e-131 | 6.3048e-130 | Specific Liver_high |
| Smg1                                                                          | 24.3782 | 1.33024 | 2.9142e-131 | 1.2906e-129 | Specific Liver_high |
| Fam20a                                                                        | 24.377  | 2.31196 | 3.0024e-131 | 1.3279e-129 | Specific Liver_high |
| Gnpda1                                                                        | 24.3485 | 3.58785 | 6.0055e-131 | 2.6524e-129 | Specific Liver_high |
| Ttc39b                                                                        | 24.3121 | 1.96466 | 1.4611e-130 | 6.444e-129  | Specific Liver_high |
| Ckap4                                                                         | 24.3098 | 1.86946 | 1.5443e-130 | 6.8017e-129 | Specific Liver_high |
| Cyth3                                                                         | 24.2987 | 1.53372 | 2.0232e-130 | 8.8992e-129 | Specific Liver_high |
| Rnf145                                                                        | 24.2771 | 1.78511 | 3.418e-130  | 1.5013e-128 | Specific Liver_high |
| Me2                                                                           | 24.2569 | 2.75038 | 5.5866e-130 | 2.4506e-128 | Specific Liver_high |
| Dennd4c                                                                       | 24.2437 | 1.88247 | 7.7093e-130 | 3.3771e-128 | Specific Liver_high |
| Tnrc6b                                                                        | 24.2336 | 1.18504 | 9.8442e-130 | 4.3065e-128 | Specific Liver_high |
| Gas7                                                                          | 24.2223 | 1.40494 | 1.2941e-129 | 5.6461e-128 | Specific Liver_high |
| Sdccag8                                                                       | 24.2194 | 2.0303  | 1.3903e-129 | 6.0574e-128 | Specific Liver_high |
| Oip5os1                                                                       | 24.2152 | 1.10449 | 1.538e-129  | 6.6918e-128 | Specific Liver_high |
| Zfp148                                                                        | 24.2119 | 1.27652 | 1.6679e-129 | 7.2476e-128 | Specific Liver_high |
| Sgms1                                                                         | 24.1877 | 1.11743 | 2.9953e-129 | 1.2998e-127 | Specific Liver_high |
| Tmtc2                                                                         | 24.1733 | 1.24794 | 4.2527e-129 | 1.8429e-127 | Specific Liver_high |
| St6gal1                                                                       | 24.1439 | 3.50743 | 8.6585e-129 | 3.7472e-127 | Specific Liver_high |
| St3gal3                                                                       | 24.1311 | 2.3806  | 1.1784e-128 | 5.0932e-127 | Specific Liver_high |
| Pcdh12                                                                        | 24.1256 | 1.3847  | 1.3462e-128 | 5.8103e-127 | Specific Liver_high |
| Plxna2                                                                        | 24.1233 | 1.14424 | 1.425e-128  | 6.1423e-127 | Specific Liver_high |
| Zfp407                                                                        | 24.1061 | 1.39273 | 2.1591e-128 | 9.2943e-127 | Specific Liver_high |
| Ogt                                                                           | 24.1002 | 1.31634 | 2.4847e-128 | 1.0682e-126 | Specific Liver_high |
| Rpn1                                                                          | 24.0608 | 1.23406 | 6.4407e-128 | 2.7614e-126 | Specific Liver_high |
| Abcg1                                                                         | 24.0585 | 1.63746 | 6.7966e-128 | 2.9102e-126 | Specific Liver_high |
| Cflar                                                                         | 23.9414 | 1.17835 | 1.1362e-126 | 4.8459e-125 | Specific Liver_high |
| Med13                                                                         | 23.938  | 1.33678 | 1.2324e-126 | 5.249e-125  | Specific Liver_high |
| Ksr1                                                                          | 23.8958 | 1.96849 | 3.3894e-126 | 1.4417e-124 | Specific Liver_high |
| Ube2h                                                                         | 23.8688 | 1.27634 | 6.4556e-126 | 2.7424e-124 | Specific Liver_high |
| Vps41                                                                         | 23.8652 | 1.94201 | 7.0351e-126 | 2.9807e-124 | Specific Liver_high |
| Rab5c                                                                         | 23.8631 | 1.16552 | 7.4072e-126 | 3.1342e-124 | Specific Liver_high |
| Slc39a1                                                                       | 23.8509 | 1.96715 | 9.9216e-126 | 4.1927e-124 | Specific Liver_high |
| B4galt1                                                                       | 23.8245 | 1.66735 | 1.8604e-125 | 7.8413e-124 | Specific Liver_high |
| Map2k5                                                                        | 23.7989 | 1.40013 | 3.4259e-125 | 1.442e-123  | Specific Liver_high |
| Wipf1                                                                         | 23.7984 | 1.27903 | 3.4677e-125 | 1.4578e-123 | Specific Liver_high |
| Wnk1                                                                          | 23.7899 | 1.1124  | 4.2458e-125 | 1.7825e-123 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Arl8b                                                                         | 23.7487 | 1.63865 | 1.1325e-124 | 4.7485e-123 | Specific Liver_high |
| Smurf2                                                                        | 23.7361 | 1.15358 | 1.5273e-124 | 6.3955e-123 | Specific Liver_high |
| Upp2                                                                          | 23.7345 | 2.06968 | 1.5869e-124 | 6.6363e-123 | Specific Liver_high |
| Arhgap12                                                                      | 23.7193 | 1.62175 | 2.2778e-124 | 9.5011e-123 | Specific Liver_high |
| Rerg                                                                          | 23.7137 | 5.68028 | 2.6075e-124 | 1.0862e-122 | Specific Liver_high |
| Cradd                                                                         | 23.7066 | 1.71603 | 3.081e-124  | 1.2818e-122 | Specific Liver_high |
| Rbm6                                                                          | 23.6699 | 1.24546 | 7.3627e-124 | 3.0554e-122 | Specific Liver_high |
| Tspan2                                                                        | 23.5914 | 2.632   | 4.7222e-123 | 1.9571e-121 | Specific Liver_high |
| Bmp2k                                                                         | 23.5841 | 2.5625  | 5.6161e-123 | 2.3246e-121 | Specific Liver_high |
| Sp100                                                                         | 23.5619 | 1.1197  | 9.4706e-123 | 3.915e-121  | Specific Liver_high |
| Chst15                                                                        | 23.5538 | 1.19626 | 1.1488e-122 | 4.7427e-121 | Specific Liver_high |
| Vcl                                                                           | 23.5491 | 1.2949  | 1.2813e-122 | 5.2832e-121 | Specific Liver_high |
| Rsrc1                                                                         | 23.5454 | 1.4265  | 1.3988e-122 | 5.7601e-121 | Specific Liver_high |
| Add1                                                                          | 23.54   | 1.2833  | 1.5883e-122 | 6.5323e-121 | Specific Liver_high |
| Myzap                                                                         | 23.5313 | 2.93165 | 1.9508e-122 | 8.013e-121  | Specific Liver_high |
| 2510009E07Rik                                                                 | 23.5065 | 1.3373  | 3.5003e-122 | 1.4359e-120 | Specific Liver_high |
| Ddx3x                                                                         | 23.4546 | 1.20845 | 1.187e-121  | 4.8571e-120 | Specific Liver_high |
| Tnks2                                                                         | 23.4233 | 1.20703 | 2.4737e-121 | 1.0109e-119 | Specific Liver_high |
| Actr2                                                                         | 23.4209 | 1.17358 | 2.6163e-121 | 1.0678e-119 | Specific Liver_high |
| Fam189a2                                                                      | 23.417  | 2.41761 | 2.8677e-121 | 1.169e-119  | Specific Liver_high |
| Ppp6r3                                                                        | 23.398  | 1.24727 | 4.4839e-121 | 1.8255e-119 | Specific Liver_high |
| Lima1                                                                         | 23.3964 | 1.23032 | 4.6527e-121 | 1.8918e-119 | Specific Liver_high |
| Fbxw11                                                                        | 23.3776 | 1.45545 | 7.216e-121  | 2.9304e-119 | Specific Liver_high |
| Dmxl1                                                                         | 23.3716 | 1.50122 | 8.3103e-121 | 3.3706e-119 | Specific Liver_high |
| Phactr2                                                                       | 23.3666 | 1.16338 | 9.3467e-121 | 3.7862e-119 | Specific Liver_high |
| Gse1                                                                          | 23.3397 | 1.32434 | 1.7551e-120 | 7.1005e-119 | Specific Liver_high |
| Ndst1                                                                         | 23.3301 | 1.45708 | 2.1957e-120 | 8.8723e-119 | Specific Liver_high |
| Map4                                                                          | 23.2843 | 1.09282 | 6.4004e-120 | 2.583e-118  | Specific Liver_high |
| Ptbp2                                                                         | 23.2713 | 1.63969 | 8.6553e-120 | 3.4842e-118 | Specific Liver_high |
| Arhgef11                                                                      | 23.2713 | 1.4655  | 8.6676e-120 | 3.4849e-118 | Specific Liver_high |
| Cdc27                                                                         | 23.2692 | 1.7749  | 9.0994e-120 | 3.6539e-118 | Specific Liver_high |
| Yes1                                                                          | 23.2665 | 1.15138 | 9.6807e-120 | 3.8825e-118 | Specific Liver_high |
| Zfr                                                                           | 23.2494 | 1.18867 | 1.4436e-119 | 5.7826e-118 | Specific Liver_high |
| Smg6                                                                          | 23.2319 | 1.24645 | 2.1676e-119 | 8.6718e-118 | Specific Liver_high |
| Calu                                                                          | 23.2241 | 1.28971 | 2.6021e-119 | 1.0384e-117 | Specific Liver_high |
| Med13l                                                                        | 23.1808 | 1.27983 | 7.1091e-119 | 2.8335e-117 | Specific Liver_high |
| Dhx57                                                                         | 23.1738 | 1.97554 | 8.3614e-119 | 3.3286e-117 | Specific Liver_high |
| Mbd5                                                                          | 23.1719 | 1.19497 | 8.7455e-119 | 3.4772e-117 | Specific Liver_high |
| Copa                                                                          | 23.1645 | 1.27439 | 1.0374e-118 | 4.1195e-117 | Specific Liver_high |
| Psme4                                                                         | 23.1157 | 1.40225 | 3.2216e-118 | 1.2762e-116 | Specific Liver_high |
| Atp1b3                                                                        | 23.0606 | 1.13359 | 1.1504e-117 | 4.5461e-116 | Specific Liver_high |
| A830082K12Rik                                                                 | 23.0445 | 3.5086  | 1.672e-117  | 6.599e-116  | Specific Liver_high |
| Stxbp5                                                                        | 23.027  | 1.53672 | 2.4985e-117 | 9.8491e-116 | Specific Liver_high |
| Atf6                                                                          | 23.0242 | 1.73735 | 2.668e-117  | 1.0504e-115 | Specific Liver_high |
| Fam102b                                                                       | 22.9902 | 2.5683  | 5.8391e-117 | 2.2962e-115 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Tasor                                                                         | 22.9801 | 1.22298 | 7.374e-117  | 2.8962e-115 | Specific Liver_high |
| Slc26a10                                                                      | 22.9072 | 2.67303 | 3.9423e-116 | 1.5428e-114 | Specific Liver_high |
| Mindy3                                                                        | 22.8504 | 1.57652 | 1.4473e-115 | 5.6431e-114 | Specific Liver_high |
| Ppp1r16b                                                                      | 22.8458 | 1.15717 | 1.6092e-115 | 6.267e-114  | Specific Liver_high |
| Pcmdt1                                                                        | 22.8327 | 1.1063  | 2.1723e-115 | 8.4496e-114 | Specific Liver_high |
| Cog5                                                                          | 22.7881 | 1.35293 | 6.0166e-115 | 2.3347e-113 | Specific Liver_high |
| Setx                                                                          | 22.7662 | 1.43979 | 9.9147e-115 | 3.8427e-113 | Specific Liver_high |
| Tle4                                                                          | 22.7542 | 1.55981 | 1.3035e-114 | 5.0459e-113 | Specific Liver_high |
| Ssr3                                                                          | 22.6965 | 1.4235  | 4.85e-114   | 1.8752e-112 | Specific Liver_high |
| Vcpip1                                                                        | 22.6945 | 1.85945 | 5.0817e-114 | 1.9625e-112 | Specific Liver_high |
| Lasp1                                                                         | 22.6875 | 1.26046 | 5.9503e-114 | 2.2952e-112 | Specific Liver_high |
| Ski                                                                           | 22.6253 | 1.25758 | 2.443e-113  | 9.4007e-112 | Specific Liver_high |
| Kdm2a                                                                         | 22.6172 | 1.23887 | 2.935e-113  | 1.1281e-111 | Specific Liver_high |
| Evi5                                                                          | 22.5866 | 1.35337 | 5.8692e-113 | 2.2531e-111 | Specific Liver_high |
| Stag1                                                                         | 22.5655 | 1.07224 | 9.4643e-113 | 3.6289e-111 | Specific Liver_high |
| Uty                                                                           | 22.553  | 1.40789 | 1.2561e-112 | 4.8104e-111 | Specific Liver_high |
| Schip1                                                                        | 22.55   | 1.2748  | 1.3436e-112 | 5.1396e-111 | Specific Liver_high |
| Kcnk6                                                                         | 22.5372 | 2.99198 | 1.7948e-112 | 6.8494e-111 | Specific Liver_high |
| Mical2                                                                        | 22.5224 | 3.94742 | 2.5068e-112 | 9.5553e-111 | Specific Liver_high |
| Trpm7                                                                         | 22.5126 | 1.17461 | 3.1275e-112 | 1.1893e-110 | Specific Liver_high |
| BC005537                                                                      | 22.4979 | 1.28467 | 4.354e-112  | 1.6538e-110 | Specific Liver_high |
| Atp11c                                                                        | 22.4976 | 1.23237 | 4.3782e-112 | 1.661e-110  | Specific Liver_high |
| Ptpn9                                                                         | 22.4874 | 1.40515 | 5.5086e-112 | 2.0874e-110 | Specific Liver_high |
| Phc3                                                                          | 22.4811 | 1.42445 | 6.3511e-112 | 2.4038e-110 | Specific Liver_high |
| Prkcq                                                                         | 22.4771 | 1.6529  | 6.9581e-112 | 2.6274e-110 | Specific Liver_high |
| Trappc9                                                                       | 22.4523 | 1.89321 | 1.2145e-111 | 4.5807e-110 | Specific Liver_high |
| Cblb                                                                          | 22.4469 | 1.89389 | 1.3712e-111 | 5.1654e-110 | Specific Liver_high |
| Adam19                                                                        | 22.4453 | 1.79408 | 1.4232e-111 | 5.3489e-110 | Specific Liver_high |
| Id4                                                                           | 22.4403 | 1.8053  | 1.5911e-111 | 5.973e-110  | Specific Liver_high |
| Map3k7                                                                        | 22.4243 | 1.79575 | 2.2796e-111 | 8.5479e-110 | Specific Liver_high |
| Zmynd8                                                                        | 22.3837 | 1.3339  | 5.6682e-111 | 2.1205e-109 | Specific Liver_high |
| Chchd3                                                                        | 22.3707 | 1.3542  | 7.5885e-111 | 2.8323e-109 | Specific Liver_high |
| Crk                                                                           | 22.3518 | 1.14277 | 1.1607e-110 | 4.3271e-109 | Specific Liver_high |
| Elmsan1                                                                       | 22.3086 | 1.85098 | 3.0494e-110 | 1.1316e-108 | Specific Liver_high |
| Zmynd15                                                                       | 22.2721 | 4.00555 | 6.8928e-110 | 2.5549e-108 | Specific Liver_high |
| Ifi207                                                                        | 22.2654 | 2.64925 | 7.995e-110  | 2.9601e-108 | Specific Liver_high |
| Kdm5a                                                                         | 22.2012 | 1.37345 | 3.3438e-109 | 1.2352e-107 | Specific Liver_high |
| Dst                                                                           | 22.1695 | 1.53987 | 6.7611e-109 | 2.4947e-107 | Specific Liver_high |
| Gm10605                                                                       | 22.1593 | 4.11491 | 8.4918e-109 | 3.1296e-107 | Specific Liver_high |
| Rptor                                                                         | 22.1584 | 1.63004 | 8.6489e-109 | 3.1839e-107 | Specific Liver_high |
| Pea15a                                                                        | 22.1394 | 1.08306 | 1.3203e-108 | 4.8495e-107 | Specific Liver_high |
| Cxcl9                                                                         | 22.1382 | 3.1211  | 1.3551e-108 | 4.9714e-107 | Specific Liver_high |
| Atxn2                                                                         | 22.1323 | 1.34962 | 1.5439e-108 | 5.6579e-107 | Specific Liver_high |
| Stxbp1                                                                        | 22.1111 | 1.53015 | 2.4739e-108 | 9.0454e-107 | Specific Liver_high |
| Asxl2                                                                         | 22.1091 | 1.3856  | 2.5806e-108 | 9.4249e-107 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Hdc                                                                           | 22.1082 | 4.4921  | 2.6343e-108 | 9.6101e-107 | Specific Liver_high |
| Nek7                                                                          | 22.1014 | 1.15823 | 3.0679e-108 | 1.1179e-106 | Specific Liver_high |
| Slc2a13                                                                       | 22.0957 | 2.00577 | 3.4795e-108 | 1.265e-106  | Specific Liver_high |
| Hdac7                                                                         | 22.0477 | 1.0529  | 1.0053e-107 | 3.6469e-106 | Specific Liver_high |
| Slk                                                                           | 22.0111 | 1.07456 | 2.2559e-107 | 8.174e-106  | Specific Liver_high |
| Rap1gds1                                                                      | 22.0018 | 1.16703 | 2.7679e-107 | 1.0018e-105 | Specific Liver_high |
| Rras2                                                                         | 21.9572 | 2.14746 | 7.3966e-107 | 2.6711e-105 | Specific Liver_high |
| Cux1                                                                          | 21.9314 | 1.25683 | 1.3048e-106 | 4.7067e-105 | Specific Liver_high |
| Itch                                                                          | 21.9279 | 1.1522  | 1.4091e-106 | 5.0774e-105 | Specific Liver_high |
| Ankib1                                                                        | 21.9258 | 1.5695  | 1.4738e-106 | 5.3046e-105 | Specific Liver_high |
| Slc35b3                                                                       | 21.9188 | 1.77897 | 1.7198e-106 | 6.1829e-105 | Specific Liver_high |
| Kidins220                                                                     | 21.9004 | 1.32874 | 2.5734e-106 | 9.2418e-105 | Specific Liver_high |
| Btrc                                                                          | 21.8988 | 1.72451 | 2.6695e-106 | 9.5761e-105 | Specific Liver_high |
| Hspa1a                                                                        | 21.8964 | 1.52354 | 2.8108e-106 | 1.0072e-104 | Specific Liver_high |
| Sil1                                                                          | 21.8849 | 2.07274 | 3.6175e-106 | 1.2948e-104 | Specific Liver_high |
| Sppl3                                                                         | 21.8787 | 1.183   | 4.1485e-106 | 1.4832e-104 | Specific Liver_high |
| Nbea                                                                          | 21.8776 | 1.0736  | 4.2475e-106 | 1.5169e-104 | Specific Liver_high |
| Mcf2                                                                          | 21.8732 | 1.66339 | 4.6778e-106 | 1.6688e-104 | Specific Liver_high |
| Sfpq                                                                          | 21.8605 | 1.09727 | 6.1719e-106 | 2.1993e-104 | Specific Liver_high |
| Ephb4                                                                         | 21.8403 | 1.09312 | 9.6039e-106 | 3.4148e-104 | Specific Liver_high |
| Galk2                                                                         | 21.8267 | 2.20998 | 1.2944e-105 | 4.5921e-104 | Specific Liver_high |
| Dnajc13                                                                       | 21.822  | 1.52038 | 1.4345e-105 | 5.0836e-104 | Specific Liver_high |
| Rngtt                                                                         | 21.8186 | 1.65831 | 1.5446e-105 | 5.4679e-104 | Specific Liver_high |
| Fkbp15                                                                        | 21.8056 | 1.64525 | 2.0525e-105 | 7.2581e-104 | Specific Liver_high |
| Akap12                                                                        | 21.8044 | 1.24719 | 2.105e-105  | 7.4356e-104 | Specific Liver_high |
| Srpk2                                                                         | 21.796  | 1.31431 | 2.5318e-105 | 8.9333e-104 | Specific Liver_high |
| Gsk3b                                                                         | 21.7801 | 1.04057 | 3.5815e-105 | 1.2623e-103 | Specific Liver_high |
| Nlk                                                                           | 21.7721 | 1.18186 | 4.2705e-105 | 1.5035e-103 | Specific Liver_high |
| Hmg20a                                                                        | 21.7319 | 1.36689 | 1.0253e-104 | 3.6058e-103 | Specific Liver_high |
| Jak2                                                                          | 21.6998 | 1.69435 | 2.0611e-104 | 7.233e-103  | Specific Liver_high |
| Spint2                                                                        | 21.6995 | 4.31354 | 2.0758e-104 | 7.2765e-103 | Specific Liver_high |
| Pdcd6ip                                                                       | 21.6962 | 1.186   | 2.2258e-104 | 7.7938e-103 | Specific Liver_high |
| Dpagt1                                                                        | 21.6927 | 1.86173 | 2.406e-104  | 8.4157e-103 | Specific Liver_high |
| Sec63                                                                         | 21.6717 | 1.17909 | 3.7913e-104 | 1.3247e-102 | Specific Liver_high |
| Shroom4                                                                       | 21.6639 | 1.24038 | 4.4946e-104 | 1.5687e-102 | Specific Liver_high |
| Rapgef1                                                                       | 21.6504 | 1.07618 | 6.0245e-104 | 2.0959e-102 | Specific Liver_high |
| Srsf6                                                                         | 21.6322 | 1.46973 | 8.9314e-104 | 3.1039e-102 | Specific Liver_high |
| Lcor                                                                          | 21.6031 | 1.24221 | 1.6805e-103 | 5.8337e-102 | Specific Liver_high |
| Pi4ka                                                                         | 21.5881 | 1.60591 | 2.3242e-103 | 8.0597e-102 | Specific Liver_high |
| Coro2b                                                                        | 21.5553 | 1.39575 | 4.7205e-103 | 1.6335e-101 | Specific Liver_high |
| Sh3tc1                                                                        | 21.5507 | 1.39286 | 5.2195e-103 | 1.8042e-101 | Specific Liver_high |
| Rffl                                                                          | 21.5308 | 1.99935 | 8.0083e-103 | 2.7652e-101 | Specific Liver_high |
| Tuba1b                                                                        | 21.5308 | 1.09912 | 8.0181e-103 | 2.7656e-101 | Specific Liver_high |
| Larp4b                                                                        | 21.5295 | 1.25441 | 8.2516e-103 | 2.8401e-101 | Specific Liver_high |
| Sdc3                                                                          | 21.5066 | 1.34614 | 1.3499e-102 | 4.6364e-101 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Caprin1                                                                       | 21.5026 | 1.19064 | 1.4724e-102 | 5.0516e-101 | Specific Liver_high |
| Pxn                                                                           | 21.499  | 1.14575 | 1.5923e-102 | 5.4572e-101 | Specific Liver_high |
| Casp4                                                                         | 21.4802 | 2.44223 | 2.3837e-102 | 8.1609e-101 | Specific Liver_high |
| Pafah1b1                                                                      | 21.4774 | 1.02542 | 2.5335e-102 | 8.6645e-101 | Specific Liver_high |
| Fign                                                                          | 21.4589 | 3.86112 | 3.7712e-102 | 1.2884e-100 | Specific Liver_high |
| Ccnt2                                                                         | 21.4585 | 1.33732 | 3.8004e-102 | 1.297e-100  | Specific Liver_high |
| Prcp                                                                          | 21.4171 | 1.79544 | 9.2618e-102 | 3.1442e-100 | Specific Liver_high |
| Hspa5                                                                         | 21.377  | 1.09498 | 2.1875e-101 | 7.4186e-100 | Specific Liver_high |
| Gbf1                                                                          | 21.373  | 1.24268 | 2.3833e-101 | 8.074e-100  | Specific Liver_high |
| 2026-09-10 00:00:00                                                           | 21.3618 | 1.62575 | 3.0269e-101 | 1.0243e-99  | Specific Liver_high |
| Klhl5                                                                         | 21.3561 | 1.05936 | 3.4182e-101 | 1.1556e-99  | Specific Liver_high |
| Gkap1                                                                         | 21.3375 | 1.38005 | 5.0918e-101 | 1.7195e-99  | Specific Liver_high |
| Dpp8                                                                          | 21.3343 | 1.27688 | 5.4566e-101 | 1.8408e-99  | Specific Liver_high |
| Herc1                                                                         | 21.3291 | 1.05623 | 6.1012e-101 | 2.0561e-99  | Specific Liver_high |
| Tent2                                                                         | 21.3251 | 1.42131 | 6.6453e-101 | 2.2348e-99  | Specific Liver_high |
| Fam13b                                                                        | 21.3192 | 1.66754 | 7.5279e-101 | 2.529e-99   | Specific Liver_high |
| Nktr                                                                          | 21.3059 | 1.1777  | 1.0014e-100 | 3.3608e-99  | Specific Liver_high |
| Phf20                                                                         | 21.3009 | 1.26294 | 1.1139e-100 | 3.7345e-99  | Specific Liver_high |
| Tmem131l                                                                      | 21.2959 | 2.70775 | 1.2404e-100 | 4.1543e-99  | Specific Liver_high |
| Mllt10                                                                        | 21.2929 | 1.04607 | 1.3217e-100 | 4.4218e-99  | Specific Liver_high |
| Uvrag                                                                         | 21.2917 | 1.0745  | 1.3565e-100 | 4.5334e-99  | Specific Liver_high |
| Mafig                                                                         | 21.2773 | 1.59018 | 1.8416e-100 | 6.1484e-99  | Specific Liver_high |
| Cnot1                                                                         | 21.2708 | 1.35788 | 2.1139e-100 | 7.0504e-99  | Specific Liver_high |
| Adgra2                                                                        | 21.2556 | 2.42516 | 2.925e-100  | 9.7455e-99  | Specific Liver_high |
| 2026-09-09 00:00:00                                                           | 21.238  | 1.2267  | 4.2547e-100 | 1.41612e-98 | Specific Liver_high |
| Pdk4                                                                          | 21.2342 | 4.17281 | 4.612e-100  | 1.53346e-98 | Specific Liver_high |
| Frrs1                                                                         | 21.2252 | 5.40579 | 5.5851e-100 | 1.85509e-98 | Specific Liver_high |
| Rftn1                                                                         | 21.2248 | 1.28457 | 5.642e-100  | 1.87206e-98 | Specific Liver_high |
| N4bp2l1                                                                       | 21.2203 | 4.39802 | 6.2013e-100 | 2.05555e-98 | Specific Liver_high |
| Irf2                                                                          | 21.2041 | 1.01567 | 8.7487e-100 | 2.89694e-98 | Specific Liver_high |
| Rabgap1l                                                                      | 21.1976 | 1.20811 | 1.0053e-99  | 3.32536e-98 | Specific Liver_high |
| Mpp1                                                                          | 21.1938 | 1.74069 | 1.0895e-99  | 3.60036e-98 | Specific Liver_high |
| Casp8                                                                         | 21.1904 | 1.18791 | 1.1702e-99  | 3.86306e-98 | Specific Liver_high |
| Fnbp1l                                                                        | 21.1871 | 1.09806 | 1.2561e-99  | 4.14239e-98 | Specific Liver_high |
| Dis3l2                                                                        | 21.1866 | 1.49321 | 1.2692e-99  | 4.18108e-98 | Specific Liver_high |
| Slf1                                                                          | 21.1572 | 2.08547 | 2.3713e-99  | 7.80415e-98 | Specific Liver_high |
| Gmids                                                                         | 21.1517 | 1.31629 | 2.6623e-99  | 8.75279e-98 | Specific Liver_high |
| Suclg2                                                                        | 21.1456 | 1.94532 | 3.028e-99   | 9.9449e-98  | Specific Liver_high |
| Herc3                                                                         | 21.1342 | 2.71611 | 3.8586e-99  | 1.26601e-97 | Specific Liver_high |
| Vstm4                                                                         | 21.1122 | 4.93341 | 6.1421e-99  | 2.01317e-97 | Specific Liver_high |
| Nfix                                                                          | 21.1027 | 1.53588 | 7.5186e-99  | 2.46184e-97 | Specific Liver_high |
| Dip2b                                                                         | 21.1012 | 1.05704 | 7.7517e-99  | 2.5356e-97  | Specific Liver_high |
| Map2k4                                                                        | 21.0918 | 1.49453 | 9.452e-99   | 3.08866e-97 | Specific Liver_high |
| Mfsd5                                                                         | 21.0908 | 1.95115 | 9.6569e-99  | 3.15241e-97 | Specific Liver_high |
| Mapre2                                                                        | 21.0875 | 1.47045 | 1.03551e-98 | 3.37692e-97 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Sec31a                                                                        | 21.0707 | 1.39087 | 1.47631e-98 | 4.80954e-97 | Specific Liver_high |
| Vps35                                                                         | 21.0568 | 1.26172 | 1.98174e-98 | 6.44963e-97 | Specific Liver_high |
| Hipk2                                                                         | 21.0178 | 1.17148 | 4.51211e-98 | 1.46553e-96 | Specific Liver_high |
| Rnf115                                                                        | 20.9595 | 1.24131 | 1.5382e-97  | 4.98604e-96 | Specific Liver_high |
| Nsd2                                                                          | 20.9421 | 2.07652 | 2.21445e-97 | 7.16367e-96 | Specific Liver_high |
| Gstm2                                                                         | 20.9043 | 2.48048 | 4.88972e-97 | 1.58023e-95 | Specific Liver_high |
| Lbh                                                                           | 20.8813 | 1.69233 | 7.92534e-97 | 2.5587e-95  | Specific Liver_high |
| Pip4k2a                                                                       | 20.8629 | 1.06177 | 1.16338e-96 | 3.74848e-95 | Specific Liver_high |
| Ube2e2                                                                        | 20.836  | 1.38743 | 2.04137e-96 | 6.5643e-95  | Specific Liver_high |
| Ppp1cb                                                                        | 20.8295 | 1.02792 | 2.34141e-96 | 7.52165e-95 | Specific Liver_high |
| Abcc5                                                                         | 20.8205 | 1.8439  | 2.82235e-96 | 9.05762e-95 | Specific Liver_high |
| Lpgat1                                                                        | 20.7917 | 1.94744 | 5.14767e-96 | 1.64873e-94 | Specific Liver_high |
| Gm12840                                                                       | 20.7879 | 5.45612 | 5.57053e-96 | 1.7824e-94  | Specific Liver_high |
| Rnf144a                                                                       | 20.7798 | 1.05965 | 6.59263e-96 | 2.10736e-94 | Specific Liver_high |
| St3gal5                                                                       | 20.779  | 1.20975 | 6.70237e-96 | 2.14032e-94 | Specific Liver_high |
| Smarca2                                                                       | 20.7577 | 1.03571 | 1.04416e-95 | 3.33109e-94 | Specific Liver_high |
| Serpina3f                                                                     | 20.7367 | 4.73745 | 1.61768e-95 | 5.15058e-94 | Specific Liver_high |
| Fam219a                                                                       | 20.7295 | 1.09318 | 1.87803e-95 | 5.97361e-94 | Specific Liver_high |
| Pip5k1a                                                                       | 20.6917 | 1.55267 | 4.11499e-95 | 1.3076e-93  | Specific Liver_high |
| Tom1l2                                                                        | 20.654  | 1.13433 | 8.97988e-95 | 2.84789e-93 | Specific Liver_high |
| Dmwd                                                                          | 20.6387 | 1.8241  | 1.2325e-94  | 3.90111e-93 | Specific Liver_high |
| Snx9                                                                          | 20.6385 | 1.15704 | 1.23865e-94 | 3.91673e-93 | Specific Liver_high |
| Stx8                                                                          | 20.6332 | 1.22314 | 1.38252e-94 | 4.36739e-93 | Specific Liver_high |
| Mapk1                                                                         | 20.622  | 1.11821 | 1.74263e-94 | 5.4996e-93  | Specific Liver_high |
| Osbpl8                                                                        | 20.584  | 1.21694 | 3.81585e-94 | 1.20307e-92 | Specific Liver_high |
| Rabgap1                                                                       | 20.5731 | 1.21052 | 4.77963e-94 | 1.504e-92   | Specific Liver_high |
| A330023F24Rik                                                                 | 20.5724 | 1.54464 | 4.85178e-94 | 1.52522e-92 | Specific Liver_high |
| Id2                                                                           | 20.5685 | 1.31867 | 5.2562e-94  | 1.65074e-92 | Specific Liver_high |
| Vps54                                                                         | 20.5575 | 1.22737 | 6.59098e-94 | 2.06793e-92 | Specific Liver_high |
| Tjp2                                                                          | 20.5423 | 1.17534 | 9.0136e-94  | 2.82528e-92 | Specific Liver_high |
| Ctsd                                                                          | 20.5347 | 1.04682 | 1.05435e-93 | 3.3016e-92  | Specific Liver_high |
| Vcam1                                                                         | 20.5295 | 3.78495 | 1.17479e-93 | 3.67521e-92 | Specific Liver_high |
| Fmo1                                                                          | 20.5125 | 1.3314  | 1.66413e-93 | 5.20101e-92 | Specific Liver_high |
| Setd5                                                                         | 20.5073 | 1.01852 | 1.85456e-93 | 5.79057e-92 | Specific Liver_high |
| F2r                                                                           | 20.504  | 1.03217 | 1.98425e-93 | 6.18952e-92 | Specific Liver_high |
| Fut11                                                                         | 20.4915 | 1.52177 | 2.56147e-93 | 7.98233e-92 | Specific Liver_high |
| Mob1a                                                                         | 20.4856 | 1.26118 | 2.89521e-93 | 9.01367e-92 | Specific Liver_high |
| Dennd6a                                                                       | 20.4721 | 1.09665 | 3.81627e-93 | 1.18698e-91 | Specific Liver_high |
| Galnt2                                                                        | 20.4257 | 1.81818 | 9.87522e-93 | 3.06854e-91 | Specific Liver_high |
| Rasgrp2                                                                       | 20.4045 | 1.44011 | 1.52607e-92 | 4.73741e-91 | Specific Liver_high |
| Mark3                                                                         | 20.3935 | 1.13112 | 1.90851e-92 | 5.90759e-91 | Specific Liver_high |
| Prcc2b                                                                        | 20.3911 | 1.03735 | 2.00511e-92 | 6.20068e-91 | Specific Liver_high |
| Renbp                                                                         | 20.3795 | 1.97912 | 2.53983e-92 | 7.84675e-91 | Specific Liver_high |
| Peli1                                                                         | 20.3751 | 1.07297 | 2.78388e-92 | 8.5925e-91  | Specific Liver_high |
| Pikfyve                                                                       | 20.3377 | 1.80246 | 5.96067e-92 | 1.83801e-90 | Specific Liver_high |



| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Wdr11                                                                         | 20.3357 | 1.8098  | 6.21236e-92 | 1.9138e-90  | Specific Liver_high |
| Rnf216                                                                        | 20.3353 | 1.15813 | 6.26817e-92 | 1.92915e-90 | Specific Liver_high |
| Kif13b                                                                        | 20.3333 | 1.38657 | 6.51964e-92 | 2.00463e-90 | Specific Liver_high |
| Etf1                                                                          | 20.3188 | 1.43967 | 8.76789e-92 | 2.69335e-90 | Specific Liver_high |
| Ppp1r15a                                                                      | 20.3013 | 2.14956 | 1.25097e-91 | 3.83548e-90 | Specific Liver_high |
| Fam107b                                                                       | 20.2829 | 2.77026 | 1.82078e-91 | 5.57193e-90 | Specific Liver_high |
| Rab3il1                                                                       | 20.2329 | 2.45019 | 5.02044e-91 | 1.53199e-89 | Specific Liver_high |
| Fbxo11                                                                        | 20.2223 | 1.08186 | 6.22682e-91 | 1.89654e-89 | Specific Liver_high |
| Ranbp9                                                                        | 20.2183 | 1.2834  | 6.7593e-91  | 2.05678e-89 | Specific Liver_high |
| Ttl7                                                                          | 20.2159 | 1.60539 | 7.09302e-91 | 2.15629e-89 | Specific Liver_high |
| Atg4b                                                                         | 20.2041 | 1.92086 | 9.01454e-91 | 2.73786e-89 | Specific Liver_high |
| Xpc                                                                           | 20.2012 | 1.55506 | 9.5501e-91  | 2.89779e-89 | Specific Liver_high |
| Zmym4                                                                         | 20.1899 | 1.21288 | 1.20038e-90 | 3.63547e-89 | Specific Liver_high |
| Lrp5                                                                          | 20.1868 | 1.26107 | 1.2787e-90  | 3.86906e-89 | Specific Liver_high |
| Cnr2                                                                          | 20.1746 | 3.16819 | 1.6359e-90  | 4.94061e-89 | Specific Liver_high |
| Wwox                                                                          | 20.1563 | 1.27515 | 2.36691e-90 | 7.14165e-89 | Specific Liver_high |
| Ptgs1                                                                         | 20.1491 | 1.12828 | 2.74087e-90 | 8.26227e-89 | Specific Liver_high |
| Pam                                                                           | 20.0975 | 1.08531 | 7.76411e-90 | 2.32743e-88 | Specific Liver_high |
| Cbl                                                                           | 20.0917 | 1.27416 | 8.72361e-90 | 2.61263e-88 | Specific Liver_high |
| Tnks                                                                          | 20.0574 | 1.39692 | 1.73971e-89 | 5.2006e-88  | Specific Liver_high |
| Appl2                                                                         | 20.0326 | 2.82087 | 2.8659e-89  | 8.55927e-88 | Specific Liver_high |
| Gapvd1                                                                        | 20.0067 | 1.12929 | 4.81977e-89 | 1.43814e-87 | Specific Liver_high |
| Dnajc7                                                                        | 20.0032 | 1.17793 | 5.16299e-89 | 1.53912e-87 | Specific Liver_high |
| Tceal9                                                                        | 19.9638 | 1.03875 | 1.13814e-88 | 3.38661e-87 | Specific Liver_high |
| Lims1                                                                         | 19.9486 | 1.0061  | 1.5402e-88  | 4.57878e-87 | Specific Liver_high |
| Vps35l                                                                        | 19.918  | 1.63535 | 2.8427e-88  | 8.43534e-87 | Specific Liver_high |
| Fam3c                                                                         | 19.8987 | 1.16716 | 4.17706e-88 | 1.23721e-86 | Specific Liver_high |
| Pum1                                                                          | 19.8945 | 1.02983 | 4.54028e-88 | 1.34357e-86 | Specific Liver_high |
| Camsap2                                                                       | 19.8919 | 1.30436 | 4.78144e-88 | 1.41363e-86 | Specific Liver_high |
| Rcbtb1                                                                        | 19.8821 | 1.67208 | 5.81802e-88 | 1.71853e-86 | Specific Liver_high |
| Rasa1                                                                         | 19.8748 | 1.09787 | 6.72577e-88 | 1.98484e-86 | Specific Liver_high |
| Eif4enif1                                                                     | 19.8565 | 1.71632 | 9.68452e-88 | 2.85278e-86 | Specific Liver_high |
| Tle1                                                                          | 19.8546 | 1.75111 | 1.00524e-87 | 2.95845e-86 | Specific Liver_high |
| Tcf20                                                                         | 19.829  | 1.6077  | 1.67244e-87 | 4.91308e-86 | Specific Liver_high |
| Capza1                                                                        | 19.7997 | 1.09831 | 2.99729e-87 | 8.78109e-86 | Specific Liver_high |
| Rab8b                                                                         | 19.7911 | 1.25734 | 3.55351e-87 | 1.04012e-85 | Specific Liver_high |
| Ppp1r9a                                                                       | 19.7901 | 5.11087 | 3.62575e-87 | 1.0603e-85  | Specific Liver_high |
| Ythdf3                                                                        | 19.7648 | 1.24751 | 5.98413e-87 | 1.74209e-85 | Specific Liver_high |
| Cln5                                                                          | 19.7488 | 2.88994 | 8.22229e-87 | 2.3915e-85  | Specific Liver_high |
| Zfp710                                                                        | 19.7394 | 1.18494 | 9.90255e-87 | 2.87762e-85 | Specific Liver_high |
| Cnot4                                                                         | 19.7326 | 1.04911 | 1.13253e-86 | 3.28809e-85 | Specific Liver_high |
| Afg1l                                                                         | 19.6752 | 1.42965 | 3.51703e-86 | 1.01927e-84 | Specific Liver_high |
| Abat                                                                          | 19.6489 | 3.86415 | 5.90967e-86 | 1.71116e-84 | Specific Liver_high |
| Kat6a                                                                         | 19.6312 | 1.08187 | 8.37658e-86 | 2.42111e-84 | Specific Liver_high |
| Crif3                                                                         | 19.6268 | 1.75506 | 9.13375e-86 | 2.6376e-84  | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Tnrc18                                                                        | 19.6218 | 1.1824  | 1.00745e-85 | 2.90665e-84 | Specific Liver_high |
| Nufip2                                                                        | 19.5902 | 1.12768 | 1.87656e-85 | 5.40936e-84 | Specific Liver_high |
| Cep83                                                                         | 19.5894 | 1.68111 | 1.90283e-85 | 5.48018e-84 | Specific Liver_high |
| Atp2c1                                                                        | 19.5701 | 1.08713 | 2.78252e-85 | 8.00657e-84 | Specific Liver_high |
| Lrmp                                                                          | 19.4993 | 3.81314 | 1.11218e-84 | 3.18888e-83 | Specific Liver_high |
| Huwe1                                                                         | 19.4782 | 1.02852 | 1.67921e-84 | 4.81041e-83 | Specific Liver_high |
| Rnf38                                                                         | 19.475  | 1.20248 | 1.78992e-84 | 5.12302e-83 | Specific Liver_high |
| Brwd1                                                                         | 19.4569 | 1.30905 | 2.5452e-84  | 7.27827e-83 | Specific Liver_high |
| Dusp10                                                                        | 19.4529 | 4.47953 | 2.75584e-84 | 7.87366e-83 | Specific Liver_high |
| Slco3a1                                                                       | 19.3665 | 1.26817 | 1.47935e-83 | 4.2043e-82  | Specific Liver_high |
| Grina                                                                         | 19.3532 | 1.45002 | 1.91635e-83 | 5.44145e-82 | Specific Liver_high |
| Sh3d19                                                                        | 19.3489 | 1.0942  | 2.08416e-83 | 5.91275e-82 | Specific Liver_high |
| Cox16                                                                         | 19.3301 | 1.04681 | 2.99689e-83 | 8.49469e-82 | Specific Liver_high |
| Mtmr12                                                                        | 19.3158 | 1.39623 | 3.95221e-83 | 1.11927e-81 | Specific Liver_high |
| Hes1                                                                          | 19.2811 | 1.11205 | 7.74698e-83 | 2.19204e-81 | Specific Liver_high |
| Map3k2                                                                        | 19.2801 | 1.37297 | 7.8932e-83  | 2.23145e-81 | Specific Liver_high |
| Ubr3                                                                          | 19.2778 | 1.03118 | 8.24793e-83 | 2.3297e-81  | Specific Liver_high |
| Rybp                                                                          | 19.264  | 1.42881 | 1.07685e-82 | 3.03898e-81 | Specific Liver_high |
| Itpr1                                                                         | 19.2568 | 1.03455 | 1.23793e-82 | 3.49054e-81 | Specific Liver_high |
| Cep170                                                                        | 19.2549 | 1.45293 | 1.28469e-82 | 3.61923e-81 | Specific Liver_high |
| Ankyf1                                                                        | 19.2355 | 1.24874 | 1.8655e-82  | 5.25089e-81 | Specific Liver_high |
| Abl1                                                                          | 19.2114 | 1.33701 | 2.97365e-82 | 8.35548e-81 | Specific Liver_high |
| Hdac8                                                                         | 19.2052 | 1.40265 | 3.34835e-82 | 9.40014e-81 | Specific Liver_high |
| Tspan14                                                                       | 19.2006 | 1.0065  | 3.65913e-82 | 1.02637e-80 | Specific Liver_high |
| Cpeb4                                                                         | 19.1756 | 1.23986 | 5.9184e-82  | 1.65864e-80 | Specific Liver_high |
| Desi2                                                                         | 19.1514 | 1.23299 | 9.42214e-82 | 2.63828e-80 | Specific Liver_high |
| P2ry1                                                                         | 19.1463 | 3.20995 | 1.0384e-81  | 2.90509e-80 | Specific Liver_high |
| Zfp871                                                                        | 19.1332 | 1.17913 | 1.33612e-81 | 3.73477e-80 | Specific Liver_high |
| Chst7                                                                         | 19.131  | 1.91384 | 1.39418e-81 | 3.89371e-80 | Specific Liver_high |
| Znrf2                                                                         | 19.1275 | 2.22908 | 1.4898e-81  | 4.15716e-80 | Specific Liver_high |
| 2900097C17Rik                                                                 | 19.1146 | 1.19182 | 1.91076e-81 | 5.31343e-80 | Specific Liver_high |
| Gm30648                                                                       | 19.1124 | 4.0503  | 1.9903e-81  | 5.52984e-80 | Specific Liver_high |
| Atxn7                                                                         | 19.1124 | 1.18132 | 1.99246e-81 | 5.53108e-80 | Specific Liver_high |
| Tead1                                                                         | 19.1065 | 1.21049 | 2.22741e-81 | 6.178e-80   | Specific Liver_high |
| Wapl                                                                          | 19.0645 | 1.00745 | 4.98456e-81 | 1.37779e-79 | Specific Liver_high |
| Braf                                                                          | 19.0632 | 1.05886 | 5.10651e-81 | 1.4103e-79  | Specific Liver_high |
| Zzef1                                                                         | 19.0619 | 1.1757  | 5.23568e-81 | 1.44473e-79 | Specific Liver_high |
| Exoc2                                                                         | 19.0492 | 1.35557 | 6.66597e-81 | 1.83784e-79 | Specific Liver_high |
| Plekho2                                                                       | 19.029  | 1.53433 | 9.81652e-81 | 2.70415e-79 | Specific Liver_high |
| Zcchc7                                                                        | 19.0149 | 1.00077 | 1.28417e-80 | 3.53448e-79 | Specific Liver_high |
| Nucb1                                                                         | 19.0094 | 1.00725 | 1.42643e-80 | 3.92268e-79 | Specific Liver_high |
| Mt2                                                                           | 18.9796 | 3.96942 | 2.51577e-80 | 6.90661e-79 | Specific Liver_high |
| Pten                                                                          | 18.9657 | 1.00497 | 3.27348e-80 | 8.96389e-79 | Specific Liver_high |
| Nr3c2                                                                         | 18.9492 | 1.30417 | 4.48468e-80 | 1.22702e-78 | Specific Liver_high |
| Ckap5                                                                         | 18.9067 | 1.37381 | 1.00433e-79 | 2.74089e-78 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Kdm4c                                                                         | 18.9042 | 1.14688 | 1.05403e-79 | 2.8741e-78  | Specific Liver_high |
| Klhl6                                                                         | 18.8859 | 1.2224  | 1.49038e-79 | 4.06051e-78 | Specific Liver_high |
| Eya3                                                                          | 18.8734 | 1.47218 | 1.88893e-79 | 5.142e-78   | Specific Liver_high |
| Rad21                                                                         | 18.8442 | 1.09122 | 3.27952e-79 | 8.90491e-78 | Specific Liver_high |
| Ap3b1                                                                         | 18.8381 | 1.13471 | 3.67558e-79 | 9.97195e-78 | Specific Liver_high |
| Tut4                                                                          | 18.8377 | 1.10638 | 3.70948e-79 | 1.00555e-77 | Specific Liver_high |
| Aff4                                                                          | 18.836  | 1.01144 | 3.82667e-79 | 1.03644e-77 | Specific Liver_high |
| 2610507B11Rik                                                                 | 18.8316 | 1.30425 | 4.16398e-79 | 1.12686e-77 | Specific Liver_high |
| Dyrk1a                                                                        | 18.7761 | 1.18736 | 1.18537e-78 | 3.20249e-77 | Specific Liver_high |
| Spats2l                                                                       | 18.7742 | 1.55551 | 1.22727e-78 | 3.31291e-77 | Specific Liver_high |
| Wbp1l                                                                         | 18.67   | 1.46444 | 8.67812e-78 | 2.33867e-76 | Specific Liver_high |
| Celf4                                                                         | 18.6388 | 2.87498 | 1.55802e-77 | 4.19173e-76 | Specific Liver_high |
| Reep1                                                                         | 18.5978 | 2.50455 | 3.3503e-77  | 8.98374e-76 | Specific Liver_high |
| Gypc                                                                          | 18.58   | 2.68844 | 4.66801e-77 | 1.25068e-75 | Specific Liver_high |
| Ocrl                                                                          | 18.57   | 1.68955 | 5.62312e-77 | 1.50533e-75 | Specific Liver_high |
| Pias2                                                                         | 18.5669 | 1.41908 | 5.95203e-77 | 1.59206e-75 | Specific Liver_high |
| Clasp1                                                                        | 18.5608 | 1.287   | 6.67436e-77 | 1.78379e-75 | Specific Liver_high |
| Arnt                                                                          | 18.5584 | 1.19661 | 6.97947e-77 | 1.86379e-75 | Specific Liver_high |
| Usp47                                                                         | 18.5199 | 1.15415 | 1.42665e-76 | 3.80655e-75 | Specific Liver_high |
| Vsir                                                                          | 18.494  | 1.67986 | 2.30875e-76 | 6.15507e-75 | Specific Liver_high |
| Cdk13                                                                         | 18.4879 | 1.06778 | 2.58235e-76 | 6.87881e-75 | Specific Liver_high |
| Ugp2                                                                          | 18.4705 | 1.66407 | 3.56943e-76 | 9.50033e-75 | Specific Liver_high |
| Tardbp                                                                        | 18.4632 | 1.29235 | 4.08679e-76 | 1.08684e-74 | Specific Liver_high |
| Bcar1                                                                         | 18.4623 | 1.21519 | 4.15592e-76 | 1.10431e-74 | Specific Liver_high |
| Scamp1                                                                        | 18.4621 | 1.35311 | 4.16865e-76 | 1.10678e-74 | Specific Liver_high |
| Chm                                                                           | 18.4619 | 1.40086 | 4.18617e-76 | 1.11052e-74 | Specific Liver_high |
| Jpt1                                                                          | 18.4552 | 1.46152 | 4.73935e-76 | 1.25418e-74 | Specific Liver_high |
| St3gal1                                                                       | 18.4539 | 1.05979 | 4.84819e-76 | 1.28193e-74 | Specific Liver_high |
| Marf1                                                                         | 18.4472 | 1.14024 | 5.49575e-76 | 1.45197e-74 | Specific Liver_high |
| Sord                                                                          | 18.4321 | 3.82506 | 7.26778e-76 | 1.91856e-74 | Specific Liver_high |
| Faf1                                                                          | 18.4208 | 1.04146 | 8.95324e-76 | 2.36156e-74 | Specific Liver_high |
| Rab3gap2                                                                      | 18.3916 | 1.44661 | 1.53251e-75 | 4.03565e-74 | Specific Liver_high |
| Gm4951                                                                        | 18.3828 | 1.19286 | 1.80407e-75 | 4.7469e-74  | Specific Liver_high |
| Tmem87b                                                                       | 18.3773 | 1.49583 | 1.99541e-75 | 5.24608e-74 | Specific Liver_high |
| Bbx                                                                           | 18.3659 | 1.07797 | 2.46435e-75 | 6.47367e-74 | Specific Liver_high |
| Fbxw7                                                                         | 18.3617 | 1.29301 | 2.66389e-75 | 6.99217e-74 | Specific Liver_high |
| Gm15564                                                                       | 18.3291 | 2.77859 | 4.84695e-75 | 1.2681e-73  | Specific Liver_high |
| Prr14l                                                                        | 18.3171 | 1.34106 | 6.04842e-75 | 1.58116e-73 | Specific Liver_high |
| Fam49a                                                                        | 18.3075 | 3.15221 | 7.20859e-75 | 1.88292e-73 | Specific Liver_high |
| Oga                                                                           | 18.3061 | 1.06174 | 7.39391e-75 | 1.92977e-73 | Specific Liver_high |
| Mest                                                                          | 18.2923 | 2.8577  | 9.53678e-75 | 2.48302e-73 | Specific Liver_high |
| Man1c1                                                                        | 18.2635 | 1.24541 | 1.61651e-74 | 4.20201e-73 | Specific Liver_high |
| Tbc1d23                                                                       | 18.2453 | 1.29928 | 2.25431e-74 | 5.8505e-73  | Specific Liver_high |
| Hipk3                                                                         | 18.236  | 1.04166 | 2.67401e-74 | 6.93417e-73 | Specific Liver_high |
| Ston1                                                                         | 18.2245 | 1.10183 | 3.30079e-74 | 8.55266e-73 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Manba                                                                         | 18.2057 | 2.01162 | 4.6541e-74  | 1.20495e-72 | Specific Liver_high |
| Rab31                                                                         | 18.1979 | 1.11165 | 5.36533e-74 | 1.38798e-72 | Specific Liver_high |
| Atg10                                                                         | 18.1935 | 1.59957 | 5.81266e-74 | 1.50249e-72 | Specific Liver_high |
| Ap1g1                                                                         | 18.161  | 1.35852 | 1.05005e-73 | 2.70991e-72 | Specific Liver_high |
| Fndc3a                                                                        | 18.1326 | 1.07781 | 1.76104e-73 | 4.53754e-72 | Specific Liver_high |
| Synj1                                                                         | 18.1151 | 1.34914 | 2.42311e-73 | 6.22852e-72 | Specific Liver_high |
| Thada                                                                         | 18.0944 | 1.45161 | 3.52597e-73 | 9.05617e-72 | Specific Liver_high |
| Mga                                                                           | 18.0882 | 1.12595 | 3.95089e-73 | 1.01314e-71 | Specific Liver_high |
| P2rx4                                                                         | 18.0862 | 1.9774  | 4.08955e-73 | 1.04787e-71 | Specific Liver_high |
| Fam126a                                                                       | 18.0813 | 1.69129 | 4.47291e-73 | 1.14518e-71 | Specific Liver_high |
| Bicra                                                                         | 18.0516 | 1.33684 | 7.6612e-73  | 1.95837e-71 | Specific Liver_high |
| Dym                                                                           | 18.0504 | 1.45487 | 7.83528e-73 | 1.9997e-71  | Specific Liver_high |
| Atp6v0a2                                                                      | 18.0331 | 1.29458 | 1.07013e-72 | 2.72471e-71 | Specific Liver_high |
| P4ha1                                                                         | 17.9935 | 1.55883 | 2.18938e-72 | 5.56569e-71 | Specific Liver_high |
| Etv1                                                                          | 17.9895 | 2.27929 | 2.35452e-72 | 5.98077e-71 | Specific Liver_high |
| Ecpas                                                                         | 17.9769 | 1.03233 | 2.95648e-72 | 7.49802e-71 | Specific Liver_high |
| Gmfb                                                                          | 17.9603 | 1.22506 | 3.9858e-72  | 1.00927e-70 | Specific Liver_high |
| Ireb2                                                                         | 17.9352 | 1.39679 | 6.26383e-72 | 1.58486e-70 | Specific Liver_high |
| Sel1l                                                                         | 17.9341 | 1.1633  | 6.39383e-72 | 1.61648e-70 | Specific Liver_high |
| Tmem135                                                                       | 17.9303 | 1.33098 | 6.84533e-72 | 1.72928e-70 | Specific Liver_high |
| Kdm3a                                                                         | 17.9198 | 1.49173 | 8.2562e-72  | 2.08243e-70 | Specific Liver_high |
| Atp6v1h                                                                       | 17.9162 | 1.32226 | 8.81404e-72 | 2.21967e-70 | Specific Liver_high |
| Appbp2                                                                        | 17.9121 | 1.16112 | 9.48794e-72 | 2.38752e-70 | Specific Liver_high |
| Nsf                                                                           | 17.9097 | 1.26635 | 9.90124e-72 | 2.48764e-70 | Specific Liver_high |
| Parva                                                                         | 17.8951 | 1.2089  | 1.28743e-71 | 3.23208e-70 | Specific Liver_high |
| Pacs1                                                                         | 17.8893 | 1.0153  | 1.43032e-71 | 3.58804e-70 | Specific Liver_high |
| Ppm1h                                                                         | 17.8806 | 1.54748 | 1.67152e-71 | 4.18983e-70 | Specific Liver_high |
| Slc38a10                                                                      | 17.869  | 1.30588 | 2.05665e-71 | 5.15121e-70 | Specific Liver_high |
| Fgd4                                                                          | 17.8661 | 3.1068  | 2.16534e-71 | 5.41924e-70 | Specific Liver_high |
| Uhmk1                                                                         | 17.8415 | 1.33626 | 3.36664e-71 | 8.4127e-70  | Specific Liver_high |
| Gm47283                                                                       | 17.8396 | 1.53264 | 3.48259e-71 | 8.69569e-70 | Specific Liver_high |
| Bach1                                                                         | 17.8317 | 1.40019 | 4.01252e-71 | 1.00112e-69 | Specific Liver_high |
| Slc24a5                                                                       | 17.8092 | 2.60059 | 5.99528e-71 | 1.4935e-69  | Specific Liver_high |
| Spopl                                                                         | 17.8063 | 1.33264 | 6.31636e-71 | 1.57227e-69 | Specific Liver_high |
| Cdc73                                                                         | 17.7957 | 1.13219 | 7.6315e-71  | 1.89671e-69 | Specific Liver_high |
| Rnase4                                                                        | 17.7953 | 1.92458 | 7.67921e-71 | 1.9071e-69  | Specific Liver_high |
| Scfd2                                                                         | 17.7681 | 1.7405  | 1.24757e-70 | 3.09116e-69 | Specific Liver_high |
| Tpp2                                                                          | 17.753  | 1.18673 | 1.63276e-70 | 4.03628e-69 | Specific Liver_high |
| Flrt1                                                                         | 17.724  | 4.76233 | 2.73515e-70 | 6.75626e-69 | Specific Liver_high |
| Neat1                                                                         | 17.7192 | 1.02371 | 2.97996e-70 | 7.34973e-69 | Specific Liver_high |
| Relch                                                                         | 17.689  | 1.18919 | 5.0951e-70  | 1.25569e-68 | Specific Liver_high |
| Neurl3                                                                        | 17.6834 | 1.91093 | 5.63492e-70 | 1.38767e-68 | Specific Liver_high |
| Dynl12                                                                        | 17.664  | 1.12974 | 7.93833e-70 | 1.95342e-68 | Specific Liver_high |
| Cntfr                                                                         | 17.6615 | 4.61573 | 8.2952e-70  | 2.03968e-68 | Specific Liver_high |
| 2026-03-06 00:00:00                                                           | 17.6585 | 1.17572 | 8.75396e-70 | 2.15085e-68 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Nrf1                                                                          | 17.6133 | 1.07934 | 1.94728e-69 | 4.76633e-68 | Specific Liver_high |
| Btaf1                                                                         | 17.6089 | 1.28999 | 2.10354e-69 | 5.14491e-68 | Specific Liver_high |
| Stard4                                                                        | 17.5888 | 1.32414 | 3.0026e-69  | 7.33275e-68 | Specific Liver_high |
| Atp6v1a                                                                       | 17.5684 | 1.10703 | 4.3006e-69  | 1.04947e-67 | Specific Liver_high |
| Setd2                                                                         | 17.5682 | 1.02685 | 4.31637e-69 | 1.05243e-67 | Specific Liver_high |
| Ube4b                                                                         | 17.5635 | 1.22389 | 4.68786e-69 | 1.14138e-67 | Specific Liver_high |
| Rnf19a                                                                        | 17.5585 | 1.0236  | 5.12475e-69 | 1.24682e-67 | Specific Liver_high |
| Strn                                                                          | 17.534  | 1.33432 | 7.88168e-69 | 1.91323e-67 | Specific Liver_high |
| Tmlhe                                                                         | 17.5042 | 1.68525 | 1.33004e-68 | 3.22375e-67 | Specific Liver_high |
| Sec24d                                                                        | 17.4868 | 2.00137 | 1.80572e-68 | 4.37341e-67 | Specific Liver_high |
| Tram1                                                                         | 17.4408 | 1.03117 | 4.0458e-68  | 9.75494e-67 | Specific Liver_high |
| Tcp11l2                                                                       | 17.4386 | 1.27568 | 4.20482e-68 | 1.01308e-66 | Specific Liver_high |
| Dennd1b                                                                       | 17.4183 | 1.28597 | 5.98886e-68 | 1.44076e-66 | Specific Liver_high |
| Ylpm1                                                                         | 17.3716 | 1.08467 | 1.35389e-67 | 3.24743e-66 | Specific Liver_high |
| Tbx2                                                                          | 17.3697 | 2.4685  | 1.4002e-67  | 3.356e-66   | Specific Liver_high |
| Api5                                                                          | 17.3568 | 1.23643 | 1.75242e-67 | 4.19709e-66 | Specific Liver_high |
| Fam171a2                                                                      | 17.3416 | 2.09243 | 2.2827e-67  | 5.45903e-66 | Specific Liver_high |
| Ulk2                                                                          | 17.3314 | 1.02182 | 2.72787e-67 | 6.51883e-66 | Specific Liver_high |
| Zmym2                                                                         | 17.3264 | 1.10945 | 2.97422e-67 | 7.10227e-66 | Specific Liver_high |
| Map2k6                                                                        | 17.3145 | 1.33165 | 3.65474e-67 | 8.71441e-66 | Specific Liver_high |
| Osbp11                                                                        | 17.3119 | 1.43204 | 3.82795e-67 | 9.12069e-66 | Specific Liver_high |
| Gmpr                                                                          | 17.3112 | 1.55911 | 3.87148e-67 | 9.21761e-66 | Specific Liver_high |
| Ern1                                                                          | 17.283  | 2.76791 | 6.3188e-67  | 1.50223e-65 | Specific Liver_high |
| Hibadh                                                                        | 17.2762 | 1.41025 | 7.10811e-67 | 1.68739e-65 | Specific Liver_high |
| Tnpo3                                                                         | 17.2728 | 1.14418 | 7.54165e-67 | 1.78768e-65 | Specific Liver_high |
| Sirt2                                                                         | 17.2673 | 1.08906 | 8.29796e-67 | 1.96552e-65 | Specific Liver_high |
| Scamp5                                                                        | 17.2665 | 5.02213 | 8.40995e-67 | 1.99058e-65 | Specific Liver_high |
| Arhgef10l                                                                     | 17.23   | 2.39604 | 1.58231e-66 | 3.74249e-65 | Specific Liver_high |
| Osmr                                                                          | 17.2148 | 1.0944  | 2.05465e-66 | 4.85256e-65 | Specific Liver_high |
| Fat4                                                                          | 17.1958 | 1.11676 | 2.85549e-66 | 6.73899e-65 | Specific Liver_high |
| Rnasel                                                                        | 17.1807 | 2.7171  | 3.70477e-66 | 8.73693e-65 | Specific Liver_high |
| Bcor                                                                          | 17.1802 | 1.25848 | 3.73685e-66 | 8.80614e-65 | Specific Liver_high |
| Nod1                                                                          | 17.1659 | 1.30692 | 4.77675e-66 | 1.12485e-64 | Specific Liver_high |
| Abi2                                                                          | 17.1496 | 1.11725 | 6.32837e-66 | 1.48807e-64 | Specific Liver_high |
| Heatr5a                                                                       | 17.1354 | 1.2998  | 8.08004e-66 | 1.89719e-64 | Specific Liver_high |
| Ube2d1                                                                        | 17.1352 | 1.2179  | 8.10367e-66 | 1.90136e-64 | Specific Liver_high |
| Rpa1                                                                          | 17.1282 | 1.75307 | 9.15124e-66 | 2.14559e-64 | Specific Liver_high |
| Gsap                                                                          | 17.1281 | 3.99741 | 9.16238e-66 | 2.14664e-64 | Specific Liver_high |
| Dcaf8                                                                         | 17.1259 | 1.0147  | 9.51827e-66 | 2.22841e-64 | Specific Liver_high |
| Ifitm10                                                                       | 17.1163 | 2.58819 | 1.12124e-65 | 2.62314e-64 | Specific Liver_high |
| Armcx1                                                                        | 17.1057 | 1.78645 | 1.34617e-65 | 3.1448e-64  | Specific Liver_high |
| Nek9                                                                          | 17.0846 | 1.18951 | 1.93338e-65 | 4.51331e-64 | Specific Liver_high |
| R3hdm1                                                                        | 17.067  | 1.01213 | 2.61062e-65 | 6.08988e-64 | Specific Liver_high |
| Baz2a                                                                         | 17.0655 | 1.19396 | 2.68073e-65 | 6.24891e-64 | Specific Liver_high |
| Cpeb3                                                                         | 17.0285 | 1.97604 | 5.04465e-65 | 1.17339e-63 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Ccdc50                                                                        | 17.007  | 1.05326 | 7.29246e-65 | 1.69501e-63 | Specific Liver_high |
| Lrba                                                                          | 17.0026 | 1.01416 | 7.86067e-65 | 1.82577e-63 | Specific Liver_high |
| Rcor1                                                                         | 16.9985 | 1.08054 | 8.42879e-65 | 1.95632e-63 | Specific Liver_high |
| Snx30                                                                         | 16.9799 | 2.64798 | 1.15586e-64 | 2.6789e-63  | Specific Liver_high |
| Rnf13                                                                         | 16.967  | 1.18546 | 1.44171e-64 | 3.33901e-63 | Specific Liver_high |
| Tpd52                                                                         | 16.9651 | 2.24201 | 1.48819e-64 | 3.44417e-63 | Specific Liver_high |
| Csnk1g3                                                                       | 16.946  | 1.0964  | 2.05861e-64 | 4.7609e-63  | Specific Liver_high |
| Plekha2                                                                       | 16.9337 | 1.79514 | 2.54079e-64 | 5.87184e-63 | Specific Liver_high |
| Phkb                                                                          | 16.9204 | 1.23321 | 3.18455e-64 | 7.35431e-63 | Specific Liver_high |
| Soat1                                                                         | 16.9154 | 3.07179 | 3.46508e-64 | 7.99642e-63 | Specific Liver_high |
| Mapk1p1l                                                                      | 16.9146 | 1.22221 | 3.51398e-64 | 8.10349e-63 | Specific Liver_high |
| Scly                                                                          | 16.9076 | 1.70404 | 3.95352e-64 | 9.11058e-63 | Specific Liver_high |
| Dusp6                                                                         | 16.892  | 1.14351 | 5.15025e-64 | 1.18599e-62 | Specific Liver_high |
| Ddah1                                                                         | 16.8917 | 2.10895 | 5.17627e-64 | 1.19113e-62 | Specific Liver_high |
| Slc30a9                                                                       | 16.8852 | 1.35233 | 5.78014e-64 | 1.32914e-62 | Specific Liver_high |
| Mapk8                                                                         | 16.8534 | 1.33497 | 9.89813e-64 | 2.26961e-62 | Specific Liver_high |
| Gna14                                                                         | 16.8504 | 5.78877 | 1.04267e-63 | 2.3891e-62  | Specific Liver_high |
| Atad2b                                                                        | 16.8426 | 1.00602 | 1.18866e-63 | 2.71977e-62 | Specific Liver_high |
| Rcan1                                                                         | 16.8097 | 1.68376 | 2.07346e-63 | 4.7409e-62  | Specific Liver_high |
| Mfsd1                                                                         | 16.7793 | 1.39857 | 3.46205e-63 | 7.89911e-62 | Specific Liver_high |
| Med27                                                                         | 16.7743 | 1.43406 | 3.75961e-63 | 8.57196e-62 | Specific Liver_high |
| Hpse                                                                          | 16.7732 | 5.24201 | 3.83469e-63 | 8.73699e-62 | Specific Liver_high |
| Nkd1                                                                          | 16.7543 | 2.27571 | 5.26721e-63 | 1.19924e-61 | Specific Liver_high |
| Gja4                                                                          | 16.742  | 1.64699 | 6.47993e-63 | 1.47327e-61 | Specific Liver_high |
| Slc9a3r1                                                                      | 16.7397 | 2.57069 | 6.73496e-63 | 1.5291e-61  | Specific Liver_high |
| Fam135a                                                                       | 16.7364 | 1.0574  | 7.11801e-63 | 1.61493e-61 | Specific Liver_high |
| Tmem241                                                                       | 16.7022 | 1.21319 | 1.26222e-62 | 2.85569e-61 | Specific Liver_high |
| Mapk14                                                                        | 16.6557 | 1.1159  | 2.75139e-62 | 6.20313e-61 | Specific Liver_high |
| Cmtm6                                                                         | 16.6479 | 1.02499 | 3.13219e-62 | 7.05179e-61 | Specific Liver_high |
| Pgm5                                                                          | 16.6369 | 3.13509 | 3.76287e-62 | 8.44228e-61 | Specific Liver_high |
| Ilrun                                                                         | 16.6116 | 1.03911 | 5.74475e-62 | 1.28709e-60 | Specific Liver_high |
| Stim1                                                                         | 16.5789 | 1.25139 | 9.90154e-62 | 2.21073e-60 | Specific Liver_high |
| 1700047M11Rik                                                                 | 16.5699 | 4.77982 | 1.15001e-61 | 2.56409e-60 | Specific Liver_high |
| Mfsd14b                                                                       | 16.5652 | 1.18386 | 1.24406e-61 | 2.76996e-60 | Specific Liver_high |
| Lbr                                                                           | 16.5561 | 1.11886 | 1.44745e-61 | 3.21395e-60 | Specific Liver_high |
| Ccn4                                                                          | 16.5264 | 2.92208 | 2.37069e-61 | 5.25671e-60 | Specific Liver_high |
| Nipsnap2                                                                      | 16.4898 | 1.24365 | 4.34591e-61 | 9.61671e-60 | Specific Liver_high |
| E2f3                                                                          | 16.4829 | 2.1625  | 4.86717e-61 | 1.07554e-59 | Specific Liver_high |
| Gm20732                                                                       | 16.4736 | 1.66274 | 5.67725e-61 | 1.25284e-59 | Specific Liver_high |
| Fbxw4                                                                         | 16.4472 | 1.35135 | 8.78089e-61 | 1.93509e-59 | Specific Liver_high |
| Chd8                                                                          | 16.4438 | 1.07502 | 9.29309e-61 | 2.04657e-59 | Specific Liver_high |
| B4galt5                                                                       | 16.4228 | 2.54941 | 1.31285e-60 | 2.88926e-59 | Specific Liver_high |
| Rnf185                                                                        | 16.4194 | 1.54026 | 1.38835e-60 | 3.05332e-59 | Specific Liver_high |
| Hexb                                                                          | 16.4078 | 1.09458 | 1.68245e-60 | 3.6951e-59  | Specific Liver_high |
| Chd2                                                                          | 16.4074 | 1.00455 | 1.6936e-60  | 3.71706e-59 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Pde4b                                                                         | 16.3724 | 1.21409 | 3.01013e-60 | 6.58862e-59 | Specific Liver_high |
| Usp15                                                                         | 16.3621 | 1.00198 | 3.56342e-60 | 7.7891e-59  | Specific Liver_high |
| St7                                                                           | 16.3603 | 1.74863 | 3.67502e-60 | 8.01675e-59 | Specific Liver_high |
| Glb1                                                                          | 16.304  | 1.53397 | 9.24026e-60 | 2.00485e-58 | Specific Liver_high |
| Smg7                                                                          | 16.3028 | 1.09567 | 9.42035e-60 | 2.04255e-58 | Specific Liver_high |
| Cenpa                                                                         | 16.2759 | 2.39272 | 1.46454e-59 | 3.1712e-58  | Specific Liver_high |
| Prcc2a                                                                        | 16.2653 | 1.0523  | 1.74058e-59 | 3.76136e-58 | Specific Liver_high |
| Nfkbiz                                                                        | 16.2426 | 1.91218 | 2.52093e-59 | 5.43312e-58 | Specific Liver_high |
| Dock8                                                                         | 16.2386 | 1.44575 | 2.68979e-59 | 5.78933e-58 | Specific Liver_high |
| Ssx2ip                                                                        | 16.2371 | 2.74643 | 2.75702e-59 | 5.93007e-58 | Specific Liver_high |
| Gmfg                                                                          | 16.1918 | 1.14825 | 5.7592e-59  | 1.23463e-57 | Specific Liver_high |
| Rnd3                                                                          | 16.182  | 1.58826 | 6.75946e-59 | 1.4481e-57  | Specific Liver_high |
| Ptch2                                                                         | 16.1727 | 4.0981  | 7.85529e-59 | 1.68175e-57 | Specific Liver_high |
| Eri3                                                                          | 16.1699 | 1.53106 | 8.21838e-59 | 1.75832e-57 | Specific Liver_high |
| Mapk6                                                                         | 16.1633 | 1.75766 | 9.15598e-59 | 1.95762e-57 | Specific Liver_high |
| Cept1                                                                         | 16.108  | 1.00691 | 2.24084e-58 | 4.77528e-57 | Specific Liver_high |
| Micall2                                                                       | 16.1061 | 1.728   | 2.31309e-58 | 4.926e-57   | Specific Liver_high |
| Fam111a                                                                       | 16.06   | 1.88529 | 4.86223e-58 | 1.0341e-56  | Specific Liver_high |
| Tmem47                                                                        | 16.057  | 1.42093 | 5.10903e-58 | 1.08517e-56 | Specific Liver_high |
| Golga3                                                                        | 16.0371 | 1.52558 | 7.04096e-58 | 1.49256e-56 | Specific Liver_high |
| Kif16b                                                                        | 16.01   | 1.45353 | 1.08799e-57 | 2.30181e-56 | Specific Liver_high |
| Trappc8                                                                       | 16.0079 | 1.04664 | 1.12635e-57 | 2.37985e-56 | Specific Liver_high |
| Rhobtb1                                                                       | 15.9508 | 1.05955 | 2.8119e-57  | 5.92961e-56 | Specific Liver_high |
| Lin52                                                                         | 15.9506 | 1.84958 | 2.82063e-57 | 5.94412e-56 | Specific Liver_high |
| Stk24                                                                         | 15.9439 | 1.25747 | 3.14283e-57 | 6.61881e-56 | Specific Liver_high |
| Prrg1                                                                         | 15.9428 | 1.08343 | 3.19717e-57 | 6.72886e-56 | Specific Liver_high |
| Pcca                                                                          | 15.9195 | 1.39834 | 4.63973e-57 | 9.7395e-56  | Specific Liver_high |
| Dnajc10                                                                       | 15.9167 | 1.04482 | 4.85554e-57 | 1.01859e-55 | Specific Liver_high |
| Slc31a1                                                                       | 15.9084 | 1.69764 | 5.54056e-57 | 1.16154e-55 | Specific Liver_high |
| Usp7                                                                          | 15.8949 | 1.02439 | 6.8729e-57  | 1.43898e-55 | Specific Liver_high |
| Hoxb3                                                                         | 15.8815 | 1.75889 | 8.50998e-57 | 1.78059e-55 | Specific Liver_high |
| 4930503L19Rik                                                                 | 15.8764 | 1.28551 | 9.2308e-57  | 1.93016e-55 | Specific Liver_high |
| Lmo4                                                                          | 15.8667 | 1.43616 | 1.07738e-56 | 2.25133e-55 | Specific Liver_high |
| Trp53inp1                                                                     | 15.8542 | 2.08137 | 1.3153e-56  | 2.74495e-55 | Specific Liver_high |
| Rnf144b                                                                       | 15.8423 | 1.47885 | 1.58933e-56 | 3.31256e-55 | Specific Liver_high |
| Mdm4                                                                          | 15.8106 | 1.04554 | 2.62948e-56 | 5.47343e-55 | Specific Liver_high |
| Vamp7                                                                         | 15.7915 | 1.26875 | 3.55843e-56 | 7.40232e-55 | Specific Liver_high |
| Bok                                                                           | 15.7901 | 1.2793  | 3.63919e-56 | 7.56543e-55 | Specific Liver_high |
| Pear1                                                                         | 15.7693 | 1.06757 | 5.05674e-56 | 1.04988e-54 | Specific Liver_high |
| Cysltr2                                                                       | 15.735  | 1.97619 | 8.71054e-56 | 1.80269e-54 | Specific Liver_high |
| Usp54                                                                         | 15.728  | 1.88774 | 9.71751e-56 | 2.0098e-54  | Specific Liver_high |
| Cxcl10                                                                        | 15.7146 | 3.76    | 1.20099e-55 | 2.47915e-54 | Specific Liver_high |
| Vps13a                                                                        | 15.7144 | 1.20314 | 1.20457e-55 | 2.48495e-54 | Specific Liver_high |
| Mob1b                                                                         | 15.7112 | 1.46051 | 1.26843e-55 | 2.61335e-54 | Specific Liver_high |
| Kyat3                                                                         | 15.7085 | 2.80666 | 1.32231e-55 | 2.72262e-54 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Adss                                                                          | 15.691  | 1.22272 | 1.74349e-55 | 3.58526e-54 | Specific Liver_high |
| Ugcg                                                                          | 15.6783 | 1.62969 | 2.12891e-55 | 4.36669e-54 | Specific Liver_high |
| Rel                                                                           | 15.668  | 1.91956 | 2.50182e-55 | 5.12509e-54 | Specific Liver_high |
| Gm26885                                                                       | 15.6575 | 3.58021 | 2.95221e-55 | 6.04389e-54 | Specific Liver_high |
| Firre                                                                         | 15.6236 | 1.58563 | 5.02559e-55 | 1.02626e-53 | Specific Liver_high |
| Cux2                                                                          | 15.604  | 5.07946 | 6.83428e-55 | 1.39296e-53 | Specific Liver_high |
| Csnk1d                                                                        | 15.5916 | 1.2493  | 8.30027e-55 | 1.68962e-53 | Specific Liver_high |
| Smurf1                                                                        | 15.5822 | 1.23919 | 9.61552e-55 | 1.95613e-53 | Specific Liver_high |
| Usp32                                                                         | 15.5696 | 1.05982 | 1.17215e-54 | 2.38006e-53 | Specific Liver_high |
| Zfp395                                                                        | 15.5499 | 2.06754 | 1.59397e-54 | 3.23249e-53 | Specific Liver_high |
| Tmem106b                                                                      | 15.5498 | 1.15719 | 1.59585e-54 | 3.23427e-53 | Specific Liver_high |
| Hlcs                                                                          | 15.5369 | 1.62999 | 1.95319e-54 | 3.95105e-53 | Specific Liver_high |
| Nup98                                                                         | 15.5346 | 1.11183 | 2.02387e-54 | 4.09147e-53 | Specific Liver_high |
| Mbd1                                                                          | 15.5336 | 1.48689 | 2.05539e-54 | 4.15259e-53 | Specific Liver_high |
| Wars                                                                          | 15.5329 | 1.04518 | 2.07714e-54 | 4.19374e-53 | Specific Liver_high |
| Iqsec1                                                                        | 15.5248 | 1.04757 | 2.35836e-54 | 4.75577e-53 | Specific Liver_high |
| Atp6v1b2                                                                      | 15.518  | 1.59873 | 2.62159e-54 | 5.27998e-53 | Specific Liver_high |
| Abl2                                                                          | 15.4615 | 1.05958 | 6.30805e-54 | 1.26651e-52 | Specific Liver_high |
| Xpo6                                                                          | 15.4514 | 1.52285 | 7.38202e-54 | 1.4803e-52  | Specific Liver_high |
| Atp2a2                                                                        | 15.4474 | 1.0056  | 7.85358e-54 | 1.57388e-52 | Specific Liver_high |
| Pank2                                                                         | 15.4281 | 1.01452 | 1.05976e-53 | 2.11984e-52 | Specific Liver_high |
| Usp6nl                                                                        | 15.4092 | 1.26321 | 1.41982e-53 | 2.83657e-52 | Specific Liver_high |
| Idh1                                                                          | 15.4031 | 1.6746  | 1.56115e-53 | 3.11506e-52 | Specific Liver_high |
| Acox1                                                                         | 15.4022 | 1.23557 | 1.58098e-53 | 3.15074e-52 | Specific Liver_high |
| Washc4                                                                        | 15.3969 | 1.12265 | 1.71835e-53 | 3.42239e-52 | Specific Liver_high |
| Pld1                                                                          | 15.3809 | 1.45876 | 2.1984e-53  | 4.3704e-52  | Specific Liver_high |
| Rhod                                                                          | 15.3759 | 3.02005 | 2.37457e-53 | 4.71773e-52 | Specific Liver_high |
| Ssh1                                                                          | 15.3647 | 1.08382 | 2.82333e-53 | 5.60586e-52 | Specific Liver_high |
| Plcl2                                                                         | 15.3355 | 1.88633 | 4.42484e-53 | 8.77493e-52 | Specific Liver_high |
| Pgghg                                                                         | 15.317  | 2.22734 | 5.89093e-53 | 1.16609e-51 | Specific Liver_high |
| Loxl2                                                                         | 15.3162 | 3.60943 | 5.95929e-53 | 1.1789e-51  | Specific Liver_high |
| Igsf3                                                                         | 15.295  | 4.71705 | 8.26066e-53 | 1.63117e-51 | Specific Liver_high |
| Gigyf1                                                                        | 15.2882 | 1.18961 | 9.15913e-53 | 1.80527e-51 | Specific Liver_high |
| Tsc22d4                                                                       | 15.2838 | 1.00137 | 9.80441e-53 | 1.93127e-51 | Specific Liver_high |
| Tet2                                                                          | 15.2593 | 1.43251 | 1.4269e-52  | 2.80386e-51 | Specific Liver_high |
| Dnajc5                                                                        | 15.257  | 1.00703 | 1.47974e-52 | 2.90593e-51 | Specific Liver_high |
| Tacc2                                                                         | 15.2423 | 1.96787 | 1.85326e-52 | 3.63502e-51 | Specific Liver_high |
| Col27a1                                                                       | 15.2318 | 4.39478 | 2.17479e-52 | 4.26051e-51 | Specific Liver_high |
| Scaf4                                                                         | 15.2133 | 1.22556 | 2.8869e-52  | 5.65213e-51 | Specific Liver_high |
| Mnat1                                                                         | 15.1824 | 1.11925 | 4.62647e-52 | 9.0415e-51  | Specific Liver_high |
| Tbck                                                                          | 15.1785 | 1.15797 | 4.90792e-52 | 9.58573e-51 | Specific Liver_high |
| Pdpk1                                                                         | 15.1719 | 1.11476 | 5.42655e-52 | 1.05859e-50 | Specific Liver_high |
| Sfxn1                                                                         | 15.166  | 2.13794 | 5.94052e-52 | 1.15745e-50 | Specific Liver_high |
| 1810013L24Rik                                                                 | 15.1612 | 1.15413 | 6.38949e-52 | 1.24343e-50 | Specific Liver_high |
| Cat                                                                           | 15.1373 | 1.18184 | 9.19314e-52 | 1.7858e-50  | Specific Liver_high |



| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Agmo                                                                          | 15.1305 | 1.80813 | 1.0191e-51  | 1.97846e-50 | Specific Liver_high |
| Commdd10                                                                      | 15.1242 | 1.31245 | 1.12112e-51 | 2.17521e-50 | Specific Liver_high |
| Naa15                                                                         | 15.0647 | 1.08492 | 2.7645e-51  | 5.34123e-50 | Specific Liver_high |
| Ppp3r1                                                                        | 15.0576 | 1.26054 | 3.076e-51   | 5.93952e-50 | Specific Liver_high |
| Dcaf5                                                                         | 15.0542 | 1.15819 | 3.23768e-51 | 6.24424e-50 | Specific Liver_high |
| Vwa5a                                                                         | 15.0483 | 1.30335 | 3.54212e-51 | 6.82323e-50 | Specific Liver_high |
| Tlr4                                                                          | 15.0366 | 1.64631 | 4.22827e-51 | 8.13041e-50 | Specific Liver_high |
| Pml                                                                           | 15.0287 | 1.22161 | 4.76548e-51 | 9.15795e-50 | Specific Liver_high |
| Vezt                                                                          | 15.022  | 1.1878  | 5.27138e-51 | 1.01241e-49 | Specific Liver_high |
| Itm2c                                                                         | 15.0117 | 1.07174 | 6.15643e-51 | 1.18099e-49 | Specific Liver_high |
| Plekhm3                                                                       | 15.0053 | 1.42861 | 6.78071e-51 | 1.29766e-49 | Specific Liver_high |
| Lrig2                                                                         | 14.9922 | 1.45645 | 8.26326e-51 | 1.58045e-49 | Specific Liver_high |
| Fads1                                                                         | 14.932  | 1.93379 | 2.0411e-50  | 3.89001e-49 | Specific Liver_high |
| Rnpep                                                                         | 14.9167 | 1.00075 | 2.56803e-50 | 4.8885e-49  | Specific Liver_high |
| Rubcn                                                                         | 14.8951 | 1.38378 | 3.54629e-50 | 6.73878e-49 | Specific Liver_high |
| C330007P06Rik                                                                 | 14.8659 | 1.27467 | 5.48843e-50 | 1.04048e-48 | Specific Liver_high |
| Gbp4                                                                          | 14.8628 | 1.04079 | 5.74924e-50 | 1.08928e-48 | Specific Liver_high |
| Limd1                                                                         | 14.8604 | 1.0969  | 5.95825e-50 | 1.12822e-48 | Specific Liver_high |
| Nr2f1                                                                         | 14.8549 | 2.50317 | 6.46763e-50 | 1.22396e-48 | Specific Liver_high |
| Dmxl2                                                                         | 14.8458 | 1.9687  | 7.41018e-50 | 1.40151e-48 | Specific Liver_high |
| Ikzf2                                                                         | 14.8451 | 2.8387  | 7.4888e-50  | 1.41555e-48 | Specific Liver_high |
| Far1                                                                          | 14.8395 | 1.10274 | 8.13578e-50 | 1.53694e-48 | Specific Liver_high |
| Ankrd13c                                                                      | 14.8091 | 1.13423 | 1.27999e-49 | 2.41522e-48 | Specific Liver_high |
| Fam174b                                                                       | 14.7996 | 1.09815 | 1.47354e-49 | 2.77557e-48 | Specific Liver_high |
| Ehbp1                                                                         | 14.798  | 1.0909  | 1.50985e-49 | 2.8423e-48  | Specific Liver_high |
| Ccdc88c                                                                       | 14.7839 | 1.53911 | 1.86101e-49 | 3.49929e-48 | Specific Liver_high |
| Xpo1                                                                          | 14.7174 | 1.14446 | 4.98583e-49 | 9.33144e-48 | Specific Liver_high |
| Zyg11b                                                                        | 14.7073 | 1.07665 | 5.78379e-49 | 1.08124e-47 | Specific Liver_high |
| Arfgef2                                                                       | 14.7026 | 1.39225 | 6.20474e-49 | 1.15926e-47 | Specific Liver_high |
| Hmox2                                                                         | 14.6959 | 1.02496 | 6.8476e-49  | 1.27863e-47 | Specific Liver_high |
| Pelo                                                                          | 14.6935 | 1.26722 | 7.09817e-49 | 1.32388e-47 | Specific Liver_high |
| Twf1                                                                          | 14.6933 | 1.04832 | 7.12194e-49 | 1.32678e-47 | Specific Liver_high |
| Armxc3                                                                        | 14.6916 | 1.38672 | 7.29969e-49 | 1.35911e-47 | Specific Liver_high |
| Msantd4                                                                       | 14.6707 | 1.24276 | 9.92358e-49 | 1.8434e-47  | Specific Liver_high |
| Golph3                                                                        | 14.6686 | 1.0732  | 1.02482e-48 | 1.90261e-47 | Specific Liver_high |
| Ssbp3                                                                         | 14.6642 | 1.10952 | 1.09281e-48 | 2.02767e-47 | Specific Liver_high |
| Ces2g                                                                         | 14.6421 | 2.15731 | 1.51245e-48 | 2.80146e-47 | Specific Liver_high |
| Inpp5b                                                                        | 14.6169 | 1.45139 | 2.19194e-48 | 4.05308e-47 | Specific Liver_high |
| Micu1                                                                         | 14.6141 | 1.35068 | 2.28386e-48 | 4.21822e-47 | Specific Liver_high |
| Klhl13                                                                        | 14.6079 | 3.19075 | 2.5011e-48  | 4.61417e-47 | Specific Liver_high |
| Hace1                                                                         | 14.5812 | 1.27814 | 3.69982e-48 | 6.81395e-47 | Specific Liver_high |
| Rev3l                                                                         | 14.5718 | 1.26416 | 4.24751e-48 | 7.80483e-47 | Specific Liver_high |
| Zfyve1                                                                        | 14.5525 | 1.44685 | 5.62995e-48 | 1.03274e-46 | Specific Liver_high |
| Nbas                                                                          | 14.5381 | 1.37914 | 6.94948e-48 | 1.27407e-46 | Specific Liver_high |
| Gm30938                                                                       | 14.5299 | 4.09796 | 7.8367e-48  | 1.43591e-46 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Slbp                                                                          | 14.5252 | 1.13455 | 8.39481e-48 | 1.5373e-46  | Specific Liver_high |
| Mta3                                                                          | 14.5021 | 1.57634 | 1.17465e-47 | 2.14743e-46 | Specific Liver_high |
| Wrm                                                                           | 14.4822 | 1.13468 | 1.57034e-47 | 2.86918e-46 | Specific Liver_high |
| Zzz3                                                                          | 14.4773 | 1.06758 | 1.68596e-47 | 3.07694e-46 | Specific Liver_high |
| Hnrnp1l                                                                       | 14.4626 | 1.03464 | 2.08915e-47 | 3.80848e-46 | Specific Liver_high |
| Rlf                                                                           | 14.4508 | 1.05034 | 2.47668e-47 | 4.50985e-46 | Specific Liver_high |
| Hid1                                                                          | 14.4326 | 3.66572 | 3.22514e-47 | 5.86281e-46 | Specific Liver_high |
| Osbpl10                                                                       | 14.3972 | 1.75732 | 5.38395e-47 | 9.76522e-46 | Specific Liver_high |
| Washc5                                                                        | 14.3747 | 1.65628 | 7.46455e-47 | 1.35162e-45 | Specific Liver_high |
| Pbx3                                                                          | 14.3684 | 1.19265 | 8.16809e-47 | 1.47735e-45 | Specific Liver_high |
| Armh3                                                                         | 14.3416 | 1.16452 | 1.20282e-46 | 2.17188e-45 | Specific Liver_high |
| Agps                                                                          | 14.3341 | 1.05145 | 1.34002e-46 | 2.41555e-45 | Specific Liver_high |
| Nde1                                                                          | 14.3325 | 1.08931 | 1.37068e-46 | 2.46945e-45 | Specific Liver_high |
| Rbm33                                                                         | 14.3298 | 1.05276 | 1.42481e-46 | 2.56553e-45 | Specific Liver_high |
| Esrrb                                                                         | 14.29   | 5.94963 | 2.52683e-46 | 4.53718e-45 | Specific Liver_high |
| Acadsb                                                                        | 14.2779 | 1.14228 | 3.00434e-46 | 5.39161e-45 | Specific Liver_high |
| Slc17a5                                                                       | 14.2605 | 1.35063 | 3.85727e-46 | 6.91844e-45 | Specific Liver_high |
| Rnf141                                                                        | 14.2528 | 1.36545 | 4.3045e-46  | 7.71632e-45 | Specific Liver_high |
| Cnrip1                                                                        | 14.2345 | 1.23323 | 5.59922e-46 | 1.0015e-44  | Specific Liver_high |
| Cd302                                                                         | 14.2212 | 1.42801 | 6.76647e-46 | 1.20827e-44 | Specific Liver_high |
| Cspp1                                                                         | 14.2205 | 1.10888 | 6.83571e-46 | 1.21929e-44 | Specific Liver_high |
| Traf3                                                                         | 14.2014 | 1.30142 | 8.97431e-46 | 1.5981e-44  | Specific Liver_high |
| Arhgap1                                                                       | 14.1991 | 1.24847 | 9.28468e-46 | 1.65246e-44 | Specific Liver_high |
| Adk                                                                           | 14.1802 | 2.09579 | 1.21412e-45 | 2.15609e-44 | Specific Liver_high |
| Gpr107                                                                        | 14.173  | 1.0776  | 1.3468e-45  | 2.3904e-44  | Specific Liver_high |
| Nup153                                                                        | 14.1593 | 1.28299 | 1.635e-45   | 2.89874e-44 | Specific Liver_high |
| Mad1l1                                                                        | 14.1436 | 1.64633 | 2.04517e-45 | 3.618e-44   | Specific Liver_high |
| Trpc3                                                                         | 14.1209 | 1.02767 | 2.82222e-45 | 4.98716e-44 | Specific Liver_high |
| Htt                                                                           | 14.1125 | 1.48629 | 3.17975e-45 | 5.60974e-44 | Specific Liver_high |
| Susd1                                                                         | 14.1055 | 4.23816 | 3.51492e-45 | 6.19428e-44 | Specific Liver_high |
| Rnf111                                                                        | 14.0857 | 1.00097 | 4.65182e-45 | 8.18888e-44 | Specific Liver_high |
| Hoxa5                                                                         | 14.054  | 1.90845 | 7.28523e-45 | 1.28107e-43 | Specific Liver_high |
| Ackr4                                                                         | 14.0517 | 4.51856 | 7.52352e-45 | 1.32153e-43 | Specific Liver_high |
| Il16                                                                          | 14.0465 | 1.78495 | 8.09986e-45 | 1.42122e-43 | Specific Liver_high |
| Arrdc3                                                                        | 14.0452 | 2.51153 | 8.2375e-45  | 1.44458e-43 | Specific Liver_high |
| Slc25a51                                                                      | 14.0277 | 1.13505 | 1.05448e-44 | 1.84819e-43 | Specific Liver_high |
| Nxpe3                                                                         | 14.0249 | 1.92775 | 1.09777e-44 | 1.92304e-43 | Specific Liver_high |
| 4931406C07Rik                                                                 | 14.0235 | 1.83688 | 1.12041e-44 | 1.96164e-43 | Specific Liver_high |
| Slc39a11                                                                      | 14.0091 | 2.04546 | 1.37101e-44 | 2.39778e-43 | Specific Liver_high |
| Yeats2                                                                        | 13.997  | 1.28058 | 1.62688e-44 | 2.84374e-43 | Specific Liver_high |
| Pibf1                                                                         | 13.9912 | 1.01393 | 1.76301e-44 | 3.07836e-43 | Specific Liver_high |
| Gpat4                                                                         | 13.9611 | 1.24608 | 2.69068e-44 | 4.68548e-43 | Specific Liver_high |
| Rlim                                                                          | 13.9565 | 1.1801  | 2.87273e-44 | 4.99978e-43 | Specific Liver_high |
| Optn                                                                          | 13.9198 | 1.54938 | 4.80326e-44 | 8.33279e-43 | Specific Liver_high |
| Slc25a12                                                                      | 13.896  | 1.35866 | 6.69864e-44 | 1.1596e-42  | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Hdac4                                                                         | 13.8686 | 1.35287 | 9.81465e-44 | 1.69628e-42 | Specific Liver_high |
| Cerk                                                                          | 13.86   | 1.07019 | 1.10696e-43 | 1.91215e-42 | Specific Liver_high |
| Prpf39                                                                        | 13.8432 | 1.04928 | 1.39869e-43 | 2.41351e-42 | Specific Liver_high |
| Sema4b                                                                        | 13.8344 | 3.5282  | 1.58102e-43 | 2.72521e-42 | Specific Liver_high |
| Nynrin                                                                        | 13.8298 | 2.02724 | 1.68533e-43 | 2.90346e-42 | Specific Liver_high |
| Trim33                                                                        | 13.8159 | 1.14695 | 2.04289e-43 | 3.50637e-42 | Specific Liver_high |
| Senp5                                                                         | 13.813  | 1.13588 | 2.12717e-43 | 3.64907e-42 | Specific Liver_high |
| Bcl2l11                                                                       | 13.8122 | 1.48281 | 2.15113e-43 | 3.68822e-42 | Specific Liver_high |
| Lrpprc                                                                        | 13.812  | 1.90713 | 2.15833e-43 | 3.6986e-42  | Specific Liver_high |
| Birc3                                                                         | 13.8117 | 1.3463  | 2.16683e-43 | 3.71119e-42 | Specific Liver_high |
| Cdr2l                                                                         | 13.8046 | 1.50234 | 2.39063e-43 | 4.09235e-42 | Specific Liver_high |
| Plxdc1                                                                        | 13.8039 | 3.81517 | 2.41296e-43 | 4.12838e-42 | Specific Liver_high |
| Arih2                                                                         | 13.794  | 1.15447 | 2.77098e-43 | 4.7359e-42  | Specific Liver_high |
| Lonrf1                                                                        | 13.7871 | 2.48434 | 3.04903e-43 | 5.2056e-42  | Specific Liver_high |
| 2610035D17Rik                                                                 | 13.7867 | 1.13943 | 3.06482e-43 | 5.22979e-42 | Specific Liver_high |
| Txndc5                                                                        | 13.7861 | 1.58377 | 3.09159e-43 | 5.27268e-42 | Specific Liver_high |
| Sgce                                                                          | 13.7725 | 1.36661 | 3.73303e-43 | 6.36331e-42 | Specific Liver_high |
| Nr1d1                                                                         | 13.7717 | 2.25294 | 3.77077e-43 | 6.42424e-42 | Specific Liver_high |
| Hs6st1                                                                        | 13.7298 | 1.83021 | 6.73589e-43 | 1.14397e-41 | Specific Liver_high |
| Tnip1                                                                         | 13.7208 | 1.46905 | 7.62323e-43 | 1.29263e-41 | Specific Liver_high |
| Ltn1                                                                          | 13.7076 | 1.17843 | 9.14848e-43 | 1.54881e-41 | Specific Liver_high |
| Igfbp7                                                                        | 13.6834 | 1.11314 | 1.2764e-42  | 2.15638e-41 | Specific Liver_high |
| Tollip                                                                        | 13.6823 | 1.37453 | 1.29433e-42 | 2.18554e-41 | Specific Liver_high |
| Rab3b                                                                         | 13.6646 | 4.0215  | 1.65112e-42 | 2.78363e-41 | Specific Liver_high |
| Kpnb1                                                                         | 13.6564 | 1.04268 | 1.84853e-42 | 3.11319e-41 | Specific Liver_high |
| Serinc5                                                                       | 13.6516 | 1.47877 | 1.97553e-42 | 3.32534e-41 | Specific Liver_high |
| Ptdss1                                                                        | 13.6396 | 1.1883  | 2.32823e-42 | 3.91698e-41 | Specific Liver_high |
| Dennd2c                                                                       | 13.6358 | 1.31724 | 2.45426e-42 | 4.12472e-41 | Specific Liver_high |
| Tfe3                                                                          | 13.6087 | 1.61036 | 3.55442e-42 | 5.96747e-41 | Specific Liver_high |
| Wdr70                                                                         | 13.6001 | 1.07172 | 3.99995e-42 | 6.70849e-41 | Specific Liver_high |
| Gtf2f2                                                                        | 13.592  | 1.53169 | 4.46803e-42 | 7.48964e-41 | Specific Liver_high |
| Ly96                                                                          | 13.5702 | 1.0477  | 6.01884e-42 | 1.00787e-40 | Specific Liver_high |
| Nexn                                                                          | 13.5198 | 1.40129 | 1.19505e-41 | 1.99392e-40 | Specific Liver_high |
| Tsc1                                                                          | 13.5196 | 1.70174 | 1.19881e-41 | 1.99916e-40 | Specific Liver_high |
| Ncald                                                                         | 13.5139 | 1.25133 | 1.29486e-41 | 2.1571e-40  | Specific Liver_high |
| Slc30a7                                                                       | 13.5032 | 1.30958 | 1.49693e-41 | 2.49244e-40 | Specific Liver_high |
| Tgfbra                                                                        | 13.4715 | 1.5311  | 2.30062e-41 | 3.82469e-40 | Specific Liver_high |
| Fyco1                                                                         | 13.4683 | 1.08971 | 2.40463e-41 | 3.99143e-40 | Specific Liver_high |
| Loxl3                                                                         | 13.4677 | 3.76805 | 2.42236e-41 | 4.0188e-40  | Specific Liver_high |
| 2026-09-08 00:00:00                                                           | 13.4372 | 1.43905 | 3.65901e-41 | 6.06111e-40 | Specific Liver_high |
| Psmd14                                                                        | 13.4345 | 1.00904 | 3.79753e-41 | 6.28735e-40 | Specific Liver_high |
| Tomm70a                                                                       | 13.4252 | 1.01632 | 4.30619e-41 | 7.1222e-40  | Specific Liver_high |
| Adgrl1                                                                        | 13.4104 | 2.04399 | 5.25659e-41 | 8.68966e-40 | Specific Liver_high |
| Trak1                                                                         | 13.4036 | 1.01112 | 5.75931e-41 | 9.51096e-40 | Specific Liver_high |
| Memo1                                                                         | 13.3825 | 1.29901 | 7.65486e-41 | 1.26284e-39 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Hoxb5                                                                         | 13.3812 | 1.19299 | 7.78573e-41 | 1.28377e-39 | Specific Liver_high |
| Suco                                                                          | 13.3793 | 1.17361 | 7.98848e-41 | 1.31586e-39 | Specific Liver_high |
| Prelp                                                                         | 13.3751 | 3.21723 | 8.45697e-41 | 1.39232e-39 | Specific Liver_high |
| Pgm2                                                                          | 13.3727 | 1.22375 | 8.73344e-41 | 1.4371e-39  | Specific Liver_high |
| Socs3                                                                         | 13.3581 | 1.72967 | 1.06211e-40 | 1.74415e-39 | Specific Liver_high |
| Il3ra                                                                         | 13.3485 | 1.30805 | 1.20856e-40 | 1.98264e-39 | Specific Liver_high |
| Ankrd50                                                                       | 13.332  | 1.17628 | 1.50815e-40 | 2.4716e-39  | Specific Liver_high |
| Ago2                                                                          | 13.3245 | 1.03969 | 1.6684e-40  | 2.73146e-39 | Specific Liver_high |
| Cryl1                                                                         | 13.2976 | 1.80623 | 2.3907e-40  | 3.90606e-39 | Specific Liver_high |
| Shb                                                                           | 13.2771 | 1.62929 | 3.14304e-40 | 5.12231e-39 | Specific Liver_high |
| Sft2d2                                                                        | 13.2244 | 1.13993 | 6.34285e-40 | 1.03111e-38 | Specific Liver_high |
| Cc2d1b                                                                        | 13.2173 | 2.26554 | 6.96823e-40 | 1.13107e-38 | Specific Liver_high |
| Vps45                                                                         | 13.2023 | 1.59962 | 8.50787e-40 | 1.37959e-38 | Specific Liver_high |
| Setd7                                                                         | 13.19   | 1.03913 | 1.00139e-39 | 1.62055e-38 | Specific Liver_high |
| Ctnnal1                                                                       | 13.1879 | 4.01266 | 1.02961e-39 | 1.66538e-38 | Specific Liver_high |
| Dhx9                                                                          | 13.1607 | 1.03831 | 1.47661e-39 | 2.38361e-38 | Specific Liver_high |
| B3gnt3                                                                        | 13.1375 | 1.20322 | 2.00792e-39 | 3.23159e-38 | Specific Liver_high |
| Uggt1                                                                         | 13.1317 | 1.04166 | 2.16844e-39 | 3.48472e-38 | Specific Liver_high |
| Tob2                                                                          | 13.1168 | 1.18834 | 2.63924e-39 | 4.23498e-38 | Specific Liver_high |
| Npepps                                                                        | 13.1129 | 1.10793 | 2.77725e-39 | 4.45422e-38 | Specific Liver_high |
| Ahcyl1                                                                        | 13.1036 | 1.07524 | 3.13988e-39 | 5.03082e-38 | Specific Liver_high |
| Wwp2                                                                          | 13.0896 | 1.14007 | 3.77754e-39 | 6.0435e-38  | Specific Liver_high |
| Gak                                                                           | 13.0857 | 1.09836 | 3.97662e-39 | 6.35886e-38 | Specific Liver_high |
| Pabpc4l                                                                       | 13.0671 | 3.48118 | 5.07392e-39 | 8.09745e-38 | Specific Liver_high |
| Esrrg                                                                         | 13.0643 | 1.95701 | 5.26623e-39 | 8.39606e-38 | Specific Liver_high |
| Pnpla7                                                                        | 13.0476 | 2.85317 | 6.55568e-39 | 1.04312e-37 | Specific Liver_high |
| Ppp1r14a                                                                      | 13.0409 | 2.0084  | 7.1651e-39  | 1.13953e-37 | Specific Liver_high |
| Pigk                                                                          | 13.0347 | 1.01757 | 7.76955e-39 | 1.23506e-37 | Specific Liver_high |
| Ppfia1                                                                        | 12.9731 | 1.07893 | 1.73884e-38 | 2.7465e-37  | Specific Liver_high |
| Ripk1                                                                         | 12.9706 | 1.00767 | 1.79718e-38 | 2.83725e-37 | Specific Liver_high |
| Ccdc6                                                                         | 12.956  | 1.63366 | 2.17386e-38 | 3.42858e-37 | Specific Liver_high |
| Dipk2a                                                                        | 12.9515 | 1.91383 | 2.3029e-38  | 3.63033e-37 | Specific Liver_high |
| Cbfa2t2                                                                       | 12.9331 | 1.18467 | 2.92589e-38 | 4.60567e-37 | Specific Liver_high |
| Bend4                                                                         | 12.9299 | 4.2653  | 3.05414e-38 | 4.80521e-37 | Specific Liver_high |
| Rbpj                                                                          | 12.9182 | 1.17693 | 3.55244e-38 | 5.57561e-37 | Specific Liver_high |
| Nckipsd                                                                       | 12.8861 | 1.57081 | 5.39317e-38 | 8.42781e-37 | Specific Liver_high |
| Msh2                                                                          | 12.8802 | 1.57927 | 5.8219e-38  | 9.09338e-37 | Specific Liver_high |
| Mbnl3                                                                         | 12.8706 | 4.53882 | 6.5856e-38  | 1.02812e-36 | Specific Liver_high |
| Psen1                                                                         | 12.8523 | 1.33203 | 8.35021e-38 | 1.30298e-36 | Specific Liver_high |
| Fam193b                                                                       | 12.8401 | 1.02619 | 9.77988e-38 | 1.52533e-36 | Specific Liver_high |
| Uso1                                                                          | 12.824  | 1.12895 | 1.20308e-37 | 1.87549e-36 | Specific Liver_high |
| Cacul1                                                                        | 12.8218 | 1.14635 | 1.23799e-37 | 1.92898e-36 | Specific Liver_high |
| McpH1                                                                         | 12.8078 | 1.9194  | 1.48356e-37 | 2.30605e-36 | Specific Liver_high |
| Slc25a36                                                                      | 12.8042 | 1.17569 | 1.55266e-37 | 2.41115e-36 | Specific Liver_high |
| Ppt1                                                                          | 12.801  | 1.03532 | 1.61827e-37 | 2.51181e-36 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Fech                                                                          | 12.7941 | 1.51934 | 1.76952e-37 | 2.74263e-36 | Specific Liver_high |
| Frs2                                                                          | 12.7859 | 1.02293 | 1.96524e-37 | 3.04452e-36 | Specific Liver_high |
| Xylt1                                                                         | 12.7757 | 1.44198 | 2.24121e-37 | 3.46872e-36 | Specific Liver_high |
| Wdr91                                                                         | 12.7713 | 2.23278 | 2.37237e-37 | 3.66644e-36 | Specific Liver_high |
| Ipo8                                                                          | 12.7701 | 1.09945 | 2.40728e-37 | 3.71684e-36 | Specific Liver_high |
| Bcr                                                                           | 12.7491 | 1.56617 | 3.15405e-37 | 4.86287e-36 | Specific Liver_high |
| Togaram1                                                                      | 12.7001 | 1.09936 | 5.90775e-37 | 9.07382e-36 | Specific Liver_high |
| Usp38                                                                         | 12.6724 | 1.55954 | 8.40788e-37 | 1.28893e-35 | Specific Liver_high |
| Tdrd3                                                                         | 12.6716 | 1.15804 | 8.49839e-37 | 1.30219e-35 | Specific Liver_high |
| Uap1l1                                                                        | 12.6571 | 2.80877 | 1.02247e-36 | 1.56373e-35 | Specific Liver_high |
| Dpf3                                                                          | 12.6532 | 1.52939 | 1.07384e-36 | 1.63997e-35 | Specific Liver_high |
| Cmtm4                                                                         | 12.6325 | 1.70208 | 1.39831e-36 | 2.13147e-35 | Specific Liver_high |
| Sik2                                                                          | 12.609  | 1.14921 | 1.8839e-36  | 2.86759e-35 | Specific Liver_high |
| Tbcd                                                                          | 12.6085 | 1.14483 | 1.89623e-36 | 2.885e-35   | Specific Liver_high |
| Sgpl1                                                                         | 12.6077 | 2.62674 | 1.91597e-36 | 2.91366e-35 | Specific Liver_high |
| Pacs2                                                                         | 12.5677 | 1.3848  | 3.17844e-36 | 4.81992e-35 | Specific Liver_high |
| Clcn3                                                                         | 12.567  | 1.07901 | 3.20855e-36 | 4.86328e-35 | Specific Liver_high |
| Klhl9                                                                         | 12.532  | 1.08523 | 4.98642e-36 | 7.53683e-35 | Specific Liver_high |
| Zfp217                                                                        | 12.5224 | 1.91355 | 5.629e-36   | 8.49614e-35 | Specific Liver_high |
| Tpk1                                                                          | 12.5068 | 1.22458 | 6.85366e-36 | 1.03397e-34 | Specific Liver_high |
| Tgfa                                                                          | 12.5037 | 2.65688 | 7.12883e-36 | 1.07448e-34 | Specific Liver_high |
| Snx25                                                                         | 12.4751 | 1.19923 | 1.02035e-35 | 1.53504e-34 | Specific Liver_high |
| Hoxb4                                                                         | 12.4216 | 1.24006 | 1.99443e-35 | 2.98933e-34 | Specific Liver_high |
| Lpin2                                                                         | 12.4201 | 1.43134 | 2.03255e-35 | 3.04505e-34 | Specific Liver_high |
| Ppp6r1                                                                        | 12.4088 | 1.10496 | 2.34241e-35 | 3.50764e-34 | Specific Liver_high |
| Nhlrc3                                                                        | 12.3908 | 1.77477 | 2.93217e-35 | 4.38468e-34 | Specific Liver_high |
| Sfmbt1                                                                        | 12.3807 | 1.61738 | 3.32252e-35 | 4.96379e-34 | Specific Liver_high |
| Lcp2                                                                          | 12.3757 | 3.88095 | 3.53632e-35 | 5.27832e-34 | Specific Liver_high |
| Amot                                                                          | 12.3571 | 1.38131 | 4.46083e-35 | 6.63676e-34 | Specific Liver_high |
| Twist1                                                                        | 12.3393 | 4.3207  | 5.56118e-35 | 8.26244e-34 | Specific Liver_high |
| Mpp5                                                                          | 12.2873 | 1.22141 | 1.05955e-34 | 1.56771e-33 | Specific Liver_high |
| Fggy                                                                          | 12.2607 | 2.46661 | 1.47144e-34 | 2.17317e-33 | Specific Liver_high |
| Fubp3                                                                         | 12.2331 | 1.31641 | 2.06842e-34 | 3.0451e-33  | Specific Liver_high |
| Gm37494                                                                       | 12.2287 | 1.06677 | 2.18311e-34 | 3.21101e-33 | Specific Liver_high |
| Morc3                                                                         | 12.2195 | 1.04525 | 2.44692e-34 | 3.59412e-33 | Specific Liver_high |
| Vrk2                                                                          | 12.212  | 1.56098 | 2.68322e-34 | 3.93583e-33 | Specific Liver_high |
| Kpna3                                                                         | 12.2001 | 1.07079 | 3.10384e-34 | 4.54661e-33 | Specific Liver_high |
| Kazn                                                                          | 12.1935 | 2.12129 | 3.36819e-34 | 4.92714e-33 | Specific Liver_high |
| Plekhf2                                                                       | 12.1846 | 1.20152 | 3.75328e-34 | 5.4855e-33  | Specific Liver_high |
| Cand1                                                                         | 12.1658 | 1.24141 | 4.72568e-34 | 6.88176e-33 | Specific Liver_high |
| Parg                                                                          | 12.1537 | 1.09956 | 5.48468e-34 | 7.98345e-33 | Specific Liver_high |
| Ranbp10                                                                       | 12.1501 | 1.086   | 5.73161e-34 | 8.33162e-33 | Specific Liver_high |
| Leng8                                                                         | 12.1405 | 1.04341 | 6.43922e-34 | 9.356e-33   | Specific Liver_high |
| Ppp1r21                                                                       | 12.1403 | 1.29417 | 6.45968e-34 | 9.3815e-33  | Specific Liver_high |
| Kpna1                                                                         | 12.1312 | 1.07729 | 7.22063e-34 | 1.04725e-32 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Gsto1                                                                         | 12.1191 | 3.41334 | 8.36672e-34 | 1.21239e-32 | Specific Liver_high |
| Jazf1                                                                         | 12.109  | 1.85751 | 9.46634e-34 | 1.37111e-32 | Specific Liver_high |
| Plxnb2                                                                        | 12.1011 | 1.72415 | 1.04264e-33 | 1.50813e-32 | Specific Liver_high |
| Mapk9                                                                         | 12.0861 | 1.16662 | 1.25045e-33 | 1.8063e-32  | Specific Liver_high |
| Inpp1                                                                         | 12.0647 | 1.17193 | 1.62222e-33 | 2.34019e-32 | Specific Liver_high |
| Il31ra                                                                        | 12.0615 | 2.95031 | 1.68639e-33 | 2.43167e-32 | Specific Liver_high |
| Sec23b                                                                        | 12.0537 | 1.35562 | 1.8546e-33  | 2.67302e-32 | Specific Liver_high |
| 8030462N17Rik                                                                 | 12.0471 | 1.01941 | 2.00796e-33 | 2.89019e-32 | Specific Liver_high |
| Mcm3                                                                          | 12.0344 | 1.25399 | 2.34381e-33 | 3.36909e-32 | Specific Liver_high |
| Rxra                                                                          | 12.0209 | 1.03771 | 2.75892e-33 | 3.9605e-32  | Specific Liver_high |
| Sec22b                                                                        | 11.9918 | 1.08462 | 3.92301e-33 | 5.61411e-32 | Specific Liver_high |
| Dcp1b                                                                         | 11.9651 | 1.24479 | 5.41341e-33 | 7.73669e-32 | Specific Liver_high |
| Irf8                                                                          | 11.958  | 1.46125 | 5.89875e-33 | 8.41916e-32 | Specific Liver_high |
| Nploc4                                                                        | 11.9561 | 1.10879 | 6.03363e-33 | 8.60786e-32 | Specific Liver_high |
| Nxf1                                                                          | 11.9554 | 1.20882 | 6.08353e-33 | 8.67286e-32 | Specific Liver_high |
| Gm1673                                                                        | 11.9458 | 2.69276 | 6.83131e-33 | 9.73296e-32 | Specific Liver_high |
| Slc12a5                                                                       | 11.9336 | 2.60632 | 7.90609e-33 | 1.12345e-31 | Specific Liver_high |
| Ibtk                                                                          | 11.9297 | 1.48213 | 8.28789e-33 | 1.17563e-31 | Specific Liver_high |
| Vps50                                                                         | 11.9146 | 1.5651  | 9.93424e-33 | 1.40546e-31 | Specific Liver_high |
| Fam91a1                                                                       | 11.9028 | 1.16689 | 1.14481e-32 | 1.61823e-31 | Specific Liver_high |
| Mbtps2                                                                        | 11.8943 | 1.15371 | 1.26629e-32 | 1.78837e-31 | Specific Liver_high |
| Cep192                                                                        | 11.8851 | 1.45203 | 1.41415e-32 | 1.99544e-31 | Specific Liver_high |
| Hsph1                                                                         | 11.8816 | 1.78094 | 1.47498e-32 | 2.08037e-31 | Specific Liver_high |
| Slc35a3                                                                       | 11.8757 | 1.11673 | 1.58234e-32 | 2.23083e-31 | Specific Liver_high |
| Dtnbp1                                                                        | 11.8487 | 1.37553 | 2.18587e-32 | 3.07499e-31 | Specific Liver_high |
| Bmper                                                                         | 11.7573 | 3.49635 | 6.47742e-32 | 9.04513e-31 | Specific Liver_high |
| Foxo3                                                                         | 11.7463 | 1.00957 | 7.37626e-32 | 1.02825e-30 | Specific Liver_high |
| Supt3                                                                         | 11.7363 | 1.2975  | 8.29965e-32 | 1.15597e-30 | Specific Liver_high |
| Eif2s3x                                                                       | 11.7278 | 1.01175 | 9.18188e-32 | 1.2783e-30  | Specific Liver_high |
| Clec9a                                                                        | 11.697  | 1.9988  | 1.32016e-31 | 1.83318e-30 | Specific Liver_high |
| Rbfa                                                                          | 11.6871 | 1.01711 | 1.48429e-31 | 2.05755e-30 | Specific Liver_high |
| Senp2                                                                         | 11.6409 | 1.0057  | 2.55201e-31 | 3.53007e-30 | Specific Liver_high |
| Shisa9                                                                        | 11.6384 | 4.07742 | 2.62881e-31 | 3.63474e-30 | Specific Liver_high |
| Hmox1                                                                         | 11.6319 | 1.956   | 2.83868e-31 | 3.92323e-30 | Specific Liver_high |
| Tbc1d30                                                                       | 11.6314 | 1.70407 | 2.85378e-31 | 3.94242e-30 | Specific Liver_high |
| Arhgap21                                                                      | 11.6255 | 1.16179 | 3.05856e-31 | 4.2199e-30  | Specific Liver_high |
| Ric8b                                                                         | 11.6034 | 1.18587 | 3.95837e-31 | 5.45205e-30 | Specific Liver_high |
| Mbd4                                                                          | 11.6016 | 2.17333 | 4.04353e-31 | 5.56697e-30 | Specific Liver_high |
| Il13ra2                                                                       | 11.5987 | 4.65594 | 4.18252e-31 | 5.75342e-30 | Specific Liver_high |
| Slc26a2                                                                       | 11.5598 | 1.89695 | 6.58562e-31 | 9.03214e-30 | Specific Liver_high |
| Cpeb2                                                                         | 11.5495 | 1.76819 | 7.42035e-31 | 1.01727e-29 | Specific Liver_high |
| Zfp451                                                                        | 11.543  | 1.02682 | 8.00678e-31 | 1.09719e-29 | Specific Liver_high |
| Ube2q2                                                                        | 11.532  | 1.07273 | 9.10155e-31 | 1.24457e-29 | Specific Liver_high |
| Emc1                                                                          | 11.5257 | 1.32265 | 9.79448e-31 | 1.33819e-29 | Specific Liver_high |
| Hacd3                                                                         | 11.5047 | 2.50659 | 1.24943e-30 | 1.70202e-29 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Eva1c                                                                         | 11.4845 | 2.16313 | 1.57885e-30 | 2.14715e-29 | Specific Liver_high |
| Snx21                                                                         | 11.4823 | 1.32358 | 1.62015e-30 | 2.20238e-29 | Specific Liver_high |
| Flcn                                                                          | 11.4746 | 2.02303 | 1.77045e-30 | 2.40265e-29 | Specific Liver_high |
| Dhx32                                                                         | 11.4688 | 2.24582 | 1.89162e-30 | 2.56493e-29 | Specific Liver_high |
| Zfp277                                                                        | 11.4641 | 1.01147 | 1.99835e-30 | 2.70851e-29 | Specific Liver_high |
| Catspere2                                                                     | 11.4625 | 2.80988 | 2.03494e-30 | 2.75695e-29 | Specific Liver_high |
| Tnpo2                                                                         | 11.4444 | 1.57727 | 2.50894e-30 | 3.39343e-29 | Specific Liver_high |
| Il4ra                                                                         | 11.4322 | 1.43371 | 2.88537e-30 | 3.89604e-29 | Specific Liver_high |
| Tbc1d15                                                                       | 11.4314 | 1.03134 | 2.91231e-30 | 3.93077e-29 | Specific Liver_high |
| Sumf1                                                                         | 11.4228 | 1.4632  | 3.21757e-30 | 4.34096e-29 | Specific Liver_high |
| Cyld                                                                          | 11.4198 | 1.02322 | 3.33025e-30 | 4.48736e-29 | Specific Liver_high |
| Usp24                                                                         | 11.4134 | 1.07429 | 3.58516e-30 | 4.82883e-29 | Specific Liver_high |
| Fam53a                                                                        | 11.4085 | 1.08467 | 3.792e-30   | 5.10315e-29 | Specific Liver_high |
| Ergic1                                                                        | 11.4013 | 1.02346 | 4.11952e-30 | 5.537e-29   | Specific Liver_high |
| Al662270                                                                      | 11.3983 | 4.27327 | 4.26468e-30 | 5.72972e-29 | Specific Liver_high |
| Pdss2                                                                         | 11.3811 | 1.03124 | 5.196e-30   | 6.97518e-29 | Specific Liver_high |
| Cog3                                                                          | 11.3779 | 1.27088 | 5.38633e-30 | 7.22467e-29 | Specific Liver_high |
| Pfkfb3                                                                        | 11.3704 | 1.13578 | 5.87056e-30 | 7.86762e-29 | Specific Liver_high |
| Cox10                                                                         | 11.3704 | 1.49694 | 5.87373e-30 | 7.86861e-29 | Specific Liver_high |
| Hvcn1                                                                         | 11.351  | 4.87115 | 7.32968e-30 | 9.80276e-29 | Specific Liver_high |
| Enpp6                                                                         | 11.338  | 1.21473 | 8.50294e-30 | 1.13625e-28 | Specific Liver_high |
| Cnp                                                                           | 11.3326 | 1.13525 | 9.04805e-30 | 1.20859e-28 | Specific Liver_high |
| Abhd6                                                                         | 11.3185 | 1.43715 | 1.06229e-29 | 1.41543e-28 | Specific Liver_high |
| Tmem63a                                                                       | 11.3058 | 1.00663 | 1.22791e-29 | 1.63275e-28 | Specific Liver_high |
| Asb4                                                                          | 11.2942 | 2.4299  | 1.40194e-29 | 1.86109e-28 | Specific Liver_high |
| Spcs3                                                                         | 11.2863 | 1.09794 | 1.53408e-29 | 2.03316e-28 | Specific Liver_high |
| Rpr1a                                                                         | 11.2831 | 1.18639 | 1.59066e-29 | 2.10555e-28 | Specific Liver_high |
| Gramd1c                                                                       | 11.2758 | 3.59928 | 1.7289e-29  | 2.2848e-28  | Specific Liver_high |
| Nfxl1                                                                         | 11.2732 | 1.82032 | 1.77911e-29 | 2.34923e-28 | Specific Liver_high |
| Stip1                                                                         | 11.2694 | 1.03737 | 1.85874e-29 | 2.45136e-28 | Specific Liver_high |
| Rcbtb2                                                                        | 11.2671 | 1.01858 | 1.90706e-29 | 2.51303e-28 | Specific Liver_high |
| Creb3l1                                                                       | 11.255  | 2.84213 | 2.18804e-29 | 2.87978e-28 | Specific Liver_high |
| Bcl7a                                                                         | 11.2315 | 1.89285 | 2.8567e-29  | 3.75676e-28 | Specific Liver_high |
| Fbxo38                                                                        | 11.2272 | 1.04238 | 2.99861e-29 | 3.94178e-28 | Specific Liver_high |
| Reps1                                                                         | 11.188  | 1.21356 | 4.67007e-29 | 6.10417e-28 | Specific Liver_high |
| Adam9                                                                         | 11.1838 | 1.18888 | 4.89438e-29 | 6.39479e-28 | Specific Liver_high |
| Pccb                                                                          | 11.1641 | 1.86886 | 6.11099e-29 | 7.96501e-28 | Specific Liver_high |
| Txndc16                                                                       | 11.1026 | 1.86485 | 1.21892e-28 | 1.58298e-27 | Specific Liver_high |
| Usp45                                                                         | 11.0989 | 1.04337 | 1.26976e-28 | 1.64834e-27 | Specific Liver_high |
| Zdhhc21                                                                       | 11.0941 | 1.3856  | 1.33998e-28 | 1.7388e-27  | Specific Liver_high |
| Mtm1                                                                          | 11.0764 | 1.30467 | 1.63298e-28 | 2.11391e-27 | Specific Liver_high |
| Sec24a                                                                        | 11.0507 | 1.16613 | 2.17544e-28 | 2.81049e-27 | Specific Liver_high |
| Ppp6r2                                                                        | 11.0453 | 1.0359  | 2.30938e-28 | 2.98114e-27 | Specific Liver_high |
| Hspa12a                                                                       | 11.0397 | 1.86782 | 2.45961e-28 | 3.17253e-27 | Specific Liver_high |
| Nfatc1                                                                        | 11.0219 | 1.18299 | 2.99645e-28 | 3.86344e-27 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Ints3                                                                         | 10.9754 | 1.10827 | 5.01833e-28 | 6.43434e-27 | Specific Liver_high |
| Slc25a28                                                                      | 10.9563 | 1.32175 | 6.20168e-28 | 7.92955e-27 | Specific Liver_high |
| Ldhb                                                                          | 10.9393 | 1.64856 | 7.47541e-28 | 9.54682e-27 | Specific Liver_high |
| Cachd1                                                                        | 10.9267 | 1.14694 | 8.58987e-28 | 1.09614e-26 | Specific Liver_high |
| 2200002D01Rik                                                                 | 10.8959 | 1.85407 | 1.20612e-27 | 1.53427e-26 | Specific Liver_high |
| Stx18                                                                         | 10.8834 | 1.16606 | 1.38325e-27 | 1.75889e-26 | Specific Liver_high |
| Cnot10                                                                        | 10.874  | 1.03608 | 1.53291e-27 | 1.94536e-26 | Specific Liver_high |
| Orc6                                                                          | 10.8738 | 1.28169 | 1.5368e-27  | 1.94953e-26 | Specific Liver_high |
| Lats1                                                                         | 10.8655 | 1.03148 | 1.68349e-27 | 2.12976e-26 | Specific Liver_high |
| Pde3b                                                                         | 10.8535 | 3.97912 | 1.91936e-27 | 2.4253e-26  | Specific Liver_high |
| Banp                                                                          | 10.8425 | 1.09345 | 2.16439e-27 | 2.73385e-26 | Specific Liver_high |
| E130308A19Rik                                                                 | 10.7978 | 1.6334  | 3.52672e-27 | 4.42519e-26 | Specific Liver_high |
| Usp37                                                                         | 10.764  | 1.07699 | 5.089e-27   | 6.36569e-26 | Specific Liver_high |
| Usp40                                                                         | 10.7355 | 1.16457 | 6.9333e-27  | 8.64587e-26 | Specific Liver_high |
| Rad54l2                                                                       | 10.7254 | 1.11132 | 7.73462e-27 | 9.63767e-26 | Specific Liver_high |
| Clip2                                                                         | 10.7168 | 1.36298 | 8.4876e-27  | 1.05637e-25 | Specific Liver_high |
| Nacc2                                                                         | 10.7025 | 1.37757 | 9.90937e-27 | 1.23095e-25 | Specific Liver_high |
| Trmt9b                                                                        | 10.688  | 2.46843 | 1.15887e-26 | 1.43735e-25 | Specific Liver_high |
| Hs2st1                                                                        | 10.6702 | 1.12454 | 1.4026e-26  | 1.73764e-25 | Specific Liver_high |
| Tom1                                                                          | 10.6658 | 1.24244 | 1.47198e-26 | 1.82289e-25 | Specific Liver_high |
| Arhgef6                                                                       | 10.6535 | 1.27439 | 1.68002e-26 | 2.07734e-25 | Specific Liver_high |
| Smyd4                                                                         | 10.6521 | 2.13543 | 1.70499e-26 | 2.10741e-25 | Specific Liver_high |
| Zfp516                                                                        | 10.6497 | 1.3744  | 1.74955e-26 | 2.16166e-25 | Specific Liver_high |
| Zfhx2                                                                         | 10.6121 | 2.00906 | 2.61873e-26 | 3.22202e-25 | Specific Liver_high |
| Txndc11                                                                       | 10.6095 | 1.33531 | 2.69072e-26 | 3.30807e-25 | Specific Liver_high |
| Dclk2                                                                         | 10.5964 | 1.32942 | 3.09565e-26 | 3.80011e-25 | Specific Liver_high |
| Atp7a                                                                         | 10.5951 | 1.29871 | 3.13967e-26 | 3.85269e-25 | Specific Liver_high |
| Rnf217                                                                        | 10.586  | 1.12626 | 3.45975e-26 | 4.24224e-25 | Specific Liver_high |
| Zfp282                                                                        | 10.5843 | 1.13565 | 3.52592e-26 | 4.32008e-25 | Specific Liver_high |
| Ptpn2                                                                         | 10.5736 | 1.15335 | 3.95006e-26 | 4.83609e-25 | Specific Liver_high |
| Ppard                                                                         | 10.5736 | 1.14568 | 3.95205e-26 | 4.83669e-25 | Specific Liver_high |
| Gxytl1                                                                        | 10.5697 | 1.07697 | 4.11956e-26 | 5.03597e-25 | Specific Liver_high |
| Lpin1                                                                         | 10.5619 | 2.04084 | 4.47305e-26 | 5.45982e-25 | Specific Liver_high |
| Ipo9                                                                          | 10.5595 | 1.13822 | 4.59081e-26 | 5.60145e-25 | Specific Liver_high |
| Rasa3                                                                         | 10.5546 | 1.77194 | 4.8354e-26  | 5.89098e-25 | Specific Liver_high |
| Lipo3                                                                         | 10.5458 | 1.55608 | 5.31414e-26 | 6.4669e-25  | Specific Liver_high |
| Got1                                                                          | 10.5288 | 2.30192 | 6.36671e-26 | 7.73905e-25 | Specific Liver_high |
| Mxi1                                                                          | 10.512  | 1.52995 | 7.60652e-26 | 9.2322e-25  | Specific Liver_high |
| Scpep1                                                                        | 10.4959 | 1.86711 | 9.02281e-26 | 1.0943e-24  | Specific Liver_high |
| Lactb2                                                                        | 10.4935 | 1.47315 | 9.24918e-26 | 1.11981e-24 | Specific Liver_high |
| Fam102a                                                                       | 10.4889 | 1.30605 | 9.71554e-26 | 1.17522e-24 | Specific Liver_high |
| Zfp507                                                                        | 10.4838 | 1.64166 | 1.02573e-25 | 1.24028e-24 | Specific Liver_high |
| Calhm6                                                                        | 10.4609 | 5.44065 | 1.30583e-25 | 1.57661e-24 | Specific Liver_high |
| Slc22a5                                                                       | 10.4591 | 1.76693 | 1.3311e-25  | 1.60653e-24 | Specific Liver_high |
| Xpo4                                                                          | 10.452  | 1.03101 | 1.43543e-25 | 1.73115e-24 | Specific Liver_high |



| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Trim41                                                                        | 10.4339 | 1.17253 | 1.73615e-25 | 2.0907e-24  | Specific Liver_high |
| Trim14                                                                        | 10.4237 | 1.20885 | 1.93221e-25 | 2.32506e-24 | Specific Liver_high |
| Sccpdh                                                                        | 10.4199 | 1.92342 | 2.01194e-25 | 2.42011e-24 | Specific Liver_high |
| Pigu                                                                          | 10.4    | 1.29633 | 2.47825e-25 | 2.97215e-24 | Specific Liver_high |
| Focad                                                                         | 10.3631 | 2.02114 | 3.64961e-25 | 4.36723e-24 | Specific Liver_high |
| Slc36a4                                                                       | 10.3425 | 1.08646 | 4.52376e-25 | 5.40724e-24 | Specific Liver_high |
| Esr1                                                                          | 10.3408 | 3.88513 | 4.60466e-25 | 5.50191e-24 | Specific Liver_high |
| Ctdp1                                                                         | 10.3386 | 1.67387 | 4.7157e-25  | 5.63042e-24 | Specific Liver_high |
| Prelid2                                                                       | 10.3341 | 1.4243  | 4.93753e-25 | 5.89092e-24 | Specific Liver_high |
| Mrps9                                                                         | 10.32   | 1.17994 | 5.72238e-25 | 6.81723e-24 | Specific Liver_high |
| Clec16a                                                                       | 10.3104 | 1.29429 | 6.32454e-25 | 7.52627e-24 | Specific Liver_high |
| Art3                                                                          | 10.3085 | 1.03948 | 6.45312e-25 | 7.67476e-24 | Specific Liver_high |
| Prpf18                                                                        | 10.2938 | 1.02655 | 7.51513e-25 | 8.92992e-24 | Specific Liver_high |
| Gtf2h1                                                                        | 10.2809 | 1.00406 | 8.59299e-25 | 1.01882e-23 | Specific Liver_high |
| Ubp1                                                                          | 10.2776 | 1.11976 | 8.89035e-25 | 1.05369e-23 | Specific Liver_high |
| Sec23ip                                                                       | 10.2751 | 1.26086 | 9.12439e-25 | 1.08103e-23 | Specific Liver_high |
| Rcn3                                                                          | 10.2507 | 1.16389 | 1.17444e-24 | 1.38788e-23 | Specific Liver_high |
| Armcx4                                                                        | 10.2448 | 2.54567 | 1.24844e-24 | 1.47479e-23 | Specific Liver_high |
| Pign                                                                          | 10.2256 | 1.17965 | 1.52246e-24 | 1.79586e-23 | Specific Liver_high |
| Rap2c                                                                         | 10.2092 | 1.26029 | 1.80269e-24 | 2.12485e-23 | Specific Liver_high |
| Unk                                                                           | 10.1916 | 1.40637 | 2.16071e-24 | 2.54222e-23 | Specific Liver_high |
| Lyst                                                                          | 10.1869 | 1.1151  | 2.26837e-24 | 2.66791e-23 | Specific Liver_high |
| Ccdc9b                                                                        | 10.1856 | 1.49576 | 2.29928e-24 | 2.7023e-23  | Specific Liver_high |
| Depdc5                                                                        | 10.1722 | 1.0217  | 2.63792e-24 | 3.09691e-23 | Specific Liver_high |
| Gm49336                                                                       | 10.1666 | 1.20622 | 2.79443e-24 | 3.27827e-23 | Specific Liver_high |
| Ddhd1                                                                         | 10.141  | 1.30067 | 3.6326e-24  | 4.25384e-23 | Specific Liver_high |
| Stx1a                                                                         | 10.1221 | 1.70847 | 4.40841e-24 | 5.15298e-23 | Specific Liver_high |
| Nr6a1                                                                         | 10.0909 | 1.33979 | 6.06362e-24 | 7.06474e-23 | Specific Liver_high |
| C2cd2l                                                                        | 10.0785 | 1.25616 | 6.87626e-24 | 8e-23       | Specific Liver_high |
| Peptd                                                                         | 10.0745 | 1.65191 | 7.15918e-24 | 8.32616e-23 | Specific Liver_high |
| Sec16a                                                                        | 10.0687 | 1.16258 | 7.59512e-24 | 8.82997e-23 | Specific Liver_high |
| Man2a2                                                                        | 10.0682 | 1.95906 | 7.63713e-24 | 8.87562e-23 | Specific Liver_high |
| Dapk1                                                                         | 10.0627 | 2.63512 | 8.07356e-24 | 9.37945e-23 | Specific Liver_high |
| Zhx2                                                                          | 10.0282 | 1.07368 | 1.14627e-23 | 1.32737e-22 | Specific Liver_high |
| Rbms3                                                                         | 9.98995 | 1.6839  | 1.68661e-23 | 1.9489e-22  | Specific Liver_high |
| Ppip5k2                                                                       | 9.9844  | 1.24378 | 1.78385e-23 | 2.05831e-22 | Specific Liver_high |
| Adcy9                                                                         | 9.98201 | 1.03173 | 1.82722e-23 | 2.10609e-22 | Specific Liver_high |
| Khk                                                                           | 9.95744 | 1.69855 | 2.34019e-23 | 2.68777e-22 | Specific Liver_high |
| Zfp1                                                                          | 9.92556 | 1.84772 | 3.22286e-23 | 3.69233e-22 | Specific Liver_high |
| Bahd1                                                                         | 9.91895 | 1.96944 | 3.44357e-23 | 3.9424e-22  | Specific Liver_high |
| Zbtb39                                                                        | 9.8929  | 2.12634 | 4.46902e-23 | 5.10373e-22 | Specific Liver_high |
| Rcc2                                                                          | 9.89207 | 1.23584 | 4.50626e-23 | 5.14443e-22 | Specific Liver_high |
| Usp48                                                                         | 9.85326 | 1.01725 | 6.63587e-23 | 7.54629e-22 | Specific Liver_high |
| Prrc1                                                                         | 9.85072 | 1.00823 | 6.80563e-23 | 7.73661e-22 | Specific Liver_high |
| Zfp69                                                                         | 9.84489 | 1.32308 | 7.21141e-23 | 8.18925e-22 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Alkbh8                                                                        | 9.84378 | 1.08529 | 7.2917e-23  | 8.27752e-22 | Specific Liver_high |
| Nsmaf                                                                         | 9.8402  | 1.07001 | 7.55633e-23 | 8.57491e-22 | Specific Liver_high |
| Slc39a9                                                                       | 9.83403 | 1.09018 | 8.03345e-23 | 9.11314e-22 | Specific Liver_high |
| Gstk1                                                                         | 9.79061 | 1.50276 | 1.23544e-22 | 1.39462e-21 | Specific Liver_high |
| Cd99l2                                                                        | 9.78448 | 1.08929 | 1.31268e-22 | 1.48026e-21 | Specific Liver_high |
| Wdpcp                                                                         | 9.76104 | 1.4431  | 1.65456e-22 | 1.86319e-21 | Specific Liver_high |
| Gpc1                                                                          | 9.72755 | 5.25306 | 2.30064e-22 | 2.58082e-21 | Specific Liver_high |
| Rev1                                                                          | 9.67312 | 1.04388 | 3.92221e-22 | 4.38161e-21 | Specific Liver_high |
| Cd82                                                                          | 9.65522 | 4.2677  | 4.67141e-22 | 5.20237e-21 | Specific Liver_high |
| Clca3a1                                                                       | 9.64169 | 3.91767 | 5.33047e-22 | 5.9302e-21  | Specific Liver_high |
| Gm12648                                                                       | 9.63733 | 4.85891 | 5.56172e-22 | 6.18533e-21 | Specific Liver_high |
| Marveld1                                                                      | 9.63514 | 1.04884 | 5.68129e-22 | 6.31613e-21 | Specific Liver_high |
| Rbbp9                                                                         | 9.62747 | 1.1778  | 6.12202e-22 | 6.79675e-21 | Specific Liver_high |
| Ide                                                                           | 9.60077 | 1.04155 | 7.93483e-22 | 8.80027e-21 | Specific Liver_high |
| Zmym6                                                                         | 9.59239 | 1.67931 | 8.6066e-22  | 9.53222e-21 | Specific Liver_high |
| Crppa                                                                         | 9.58262 | 2.26741 | 9.46173e-22 | 1.04721e-20 | Specific Liver_high |
| Zc3h4                                                                         | 9.56394 | 1.11858 | 1.13355e-21 | 1.25288e-20 | Specific Liver_high |
| Cpped1                                                                        | 9.56151 | 1.18154 | 1.16049e-21 | 1.28221e-20 | Specific Liver_high |
| Parp11                                                                        | 9.54249 | 1.24029 | 1.39445e-21 | 1.53704e-20 | Specific Liver_high |
| Rab11fip3                                                                     | 9.53806 | 1.14147 | 1.45525e-21 | 1.60296e-20 | Specific Liver_high |
| Gab3                                                                          | 9.49018 | 1.02288 | 2.30638e-21 | 2.53012e-20 | Specific Liver_high |
| D130040H23Rik                                                                 | 9.48145 | 1.78614 | 2.50772e-21 | 2.74819e-20 | Specific Liver_high |
| Gfpt1                                                                         | 9.47349 | 1.33529 | 2.70631e-21 | 2.9588e-20  | Specific Liver_high |
| Ubttd1                                                                        | 9.45992 | 1.04181 | 3.08173e-21 | 3.36241e-20 | Specific Liver_high |
| Manea                                                                         | 9.45042 | 1.16544 | 3.37475e-21 | 3.67963e-20 | Specific Liver_high |
| Pofut1                                                                        | 9.43759 | 1.15895 | 3.81465e-21 | 4.15225e-20 | Specific Liver_high |
| Tbc1d14                                                                       | 9.43417 | 1.31215 | 3.94082e-21 | 4.28526e-20 | Specific Liver_high |
| Nuak2                                                                         | 9.42396 | 2.12401 | 4.34406e-21 | 4.71739e-20 | Specific Liver_high |
| Csmd1                                                                         | 9.41253 | 4.54409 | 4.84342e-21 | 5.2526e-20  | Specific Liver_high |
| Asb7                                                                          | 9.40305 | 1.2941  | 5.30015e-21 | 5.74239e-20 | Specific Liver_high |
| Ackr2                                                                         | 9.40305 | 4.20276 | 5.30039e-21 | 5.74239e-20 | Specific Liver_high |
| Pola1                                                                         | 9.39981 | 1.48394 | 5.466e-21   | 5.91981e-20 | Specific Liver_high |
| Chst14                                                                        | 9.39153 | 1.63006 | 5.91358e-21 | 6.40242e-20 | Specific Liver_high |
| Strada                                                                        | 9.37233 | 1.45415 | 7.09516e-21 | 7.66368e-20 | Specific Liver_high |
| Aatf                                                                          | 9.36525 | 1.08354 | 7.58681e-21 | 8.19198e-20 | Specific Liver_high |
| Hexim1                                                                        | 9.36234 | 1.01103 | 7.79918e-21 | 8.41848e-20 | Specific Liver_high |
| Fam214a                                                                       | 9.35955 | 1.88221 | 8.00777e-21 | 8.64074e-20 | Specific Liver_high |
| Gm16014                                                                       | 9.34976 | 2.87623 | 8.78477e-21 | 9.46966e-20 | Specific Liver_high |
| Actn1                                                                         | 9.33056 | 1.28166 | 1.05317e-20 | 1.13338e-19 | Specific Liver_high |
| Vps26c                                                                        | 9.32385 | 1.1076  | 1.12192e-20 | 1.20616e-19 | Specific Liver_high |
| Adamts12                                                                      | 9.32293 | 1.96077 | 1.13169e-20 | 1.21627e-19 | Specific Liver_high |
| Smim9                                                                         | 9.31224 | 2.81195 | 1.25169e-20 | 1.343e-19   | Specific Liver_high |
| Klhl20                                                                        | 9.31005 | 1.01049 | 1.27776e-20 | 1.37006e-19 | Specific Liver_high |
| Cnst                                                                          | 9.30769 | 1.00596 | 1.3064e-20  | 1.4003e-19  | Specific Liver_high |
| lpmk                                                                          | 9.30499 | 1.0653  | 1.34006e-20 | 1.43591e-19 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Nr1d2                                                                         | 9.28645 | 1.25215 | 1.59525e-20 | 1.70539e-19 | Specific Liver_high |
| Fem1b                                                                         | 9.27187 | 1.01249 | 1.82906e-20 | 1.95275e-19 | Specific Liver_high |
| Ankrd27                                                                       | 9.2667  | 1.19677 | 1.92e-20    | 2.04781e-19 | Specific Liver_high |
| Tiparp                                                                        | 9.25166 | 1.80411 | 2.21023e-20 | 2.35424e-19 | Specific Liver_high |
| Tmem170b                                                                      | 9.22816 | 1.96435 | 2.7531e-20  | 2.92766e-19 | Specific Liver_high |
| Zbtb37                                                                        | 9.22667 | 1.47409 | 2.79168e-20 | 2.96771e-19 | Specific Liver_high |
| Pon3                                                                          | 9.22605 | 1.75742 | 2.80795e-20 | 2.98304e-19 | Specific Liver_high |
| Slc49a4                                                                       | 9.21341 | 1.0891  | 3.1591e-20  | 3.35388e-19 | Specific Liver_high |
| Mmut                                                                          | 9.20947 | 1.02442 | 3.27751e-20 | 3.47844e-19 | Specific Liver_high |
| Csprs                                                                         | 9.20668 | 3.83965 | 3.36374e-20 | 3.56645e-19 | Specific Liver_high |
| Zpr1                                                                          | 9.19324 | 1.13594 | 3.81181e-20 | 4.03622e-19 | Specific Liver_high |
| P3h2                                                                          | 9.17421 | 1.55802 | 4.54887e-20 | 4.80406e-19 | Specific Liver_high |
| Edem3                                                                         | 9.15929 | 1.08166 | 5.2238e-20  | 5.51325e-19 | Specific Liver_high |
| Pphln1                                                                        | 9.15872 | 1.1911  | 5.25173e-20 | 5.54092e-19 | Specific Liver_high |
| Ssbp2                                                                         | 9.15763 | 1.44915 | 5.30503e-20 | 5.5935e-19  | Specific Liver_high |
| B4galt6                                                                       | 9.11218 | 2.83173 | 8.07402e-20 | 8.47982e-19 | Specific Liver_high |
| Slc5a3                                                                        | 9.10725 | 2.06366 | 8.4494e-20  | 8.8683e-19  | Specific Liver_high |
| Akt2                                                                          | 9.10002 | 1.92683 | 9.03148e-20 | 9.47308e-19 | Specific Liver_high |
| Hmgxb3                                                                        | 9.0664  | 1.31095 | 1.2301e-19  | 1.28523e-18 | Specific Liver_high |
| Heph                                                                          | 9.05774 | 1.22745 | 1.33179e-19 | 1.38969e-18 | Specific Liver_high |
| Fam8a1                                                                        | 9.05605 | 1.02254 | 1.35263e-19 | 1.41097e-18 | Specific Liver_high |
| Lmbrd2                                                                        | 9.05166 | 1.40024 | 1.40817e-19 | 1.46749e-18 | Specific Liver_high |
| Osbp1a                                                                        | 9.0378  | 1.13374 | 1.59859e-19 | 1.66271e-18 | Specific Liver_high |
| 4732471J01Rik                                                                 | 9.01153 | 1.26997 | 2.03206e-19 | 2.10813e-18 | Specific Liver_high |
| Ccdc8                                                                         | 9.00301 | 2.05024 | 2.19619e-19 | 2.27621e-18 | Specific Liver_high |
| Hcfc2                                                                         | 8.99676 | 1.32054 | 2.32477e-19 | 2.40639e-18 | Specific Liver_high |
| Bahcc1                                                                        | 8.99466 | 1.03521 | 2.36974e-19 | 2.45215e-18 | Specific Liver_high |
| Nol10                                                                         | 8.94131 | 1.48899 | 3.8459e-19  | 3.96566e-18 | Specific Liver_high |
| Ercc6l2                                                                       | 8.93288 | 1.09191 | 4.15054e-19 | 4.27569e-18 | Specific Liver_high |
| Ube3b                                                                         | 8.91806 | 1.03041 | 4.74518e-19 | 4.88359e-18 | Specific Liver_high |
| Lrig3                                                                         | 8.89936 | 2.03349 | 5.61699e-19 | 5.77395e-18 | Specific Liver_high |
| Brwd3                                                                         | 8.8654  | 1.0396  | 7.62276e-19 | 7.81769e-18 | Specific Liver_high |
| Slc7a5                                                                        | 8.8593  | 1.05844 | 8.05198e-19 | 8.25002e-18 | Specific Liver_high |
| Morc4                                                                         | 8.82587 | 2.36233 | 1.08616e-18 | 1.10901e-17 | Specific Liver_high |
| Tifa                                                                          | 8.81018 | 1.26773 | 1.24947e-18 | 1.27494e-17 | Specific Liver_high |
| Entpd5                                                                        | 8.79562 | 1.64057 | 1.42263e-18 | 1.4498e-17  | Specific Liver_high |
| Msra                                                                          | 8.78834 | 1.24431 | 1.51783e-18 | 1.54632e-17 | Specific Liver_high |
| Ascc2                                                                         | 8.78574 | 1.10763 | 1.55334e-18 | 1.58201e-17 | Specific Liver_high |
| Galc                                                                          | 8.7788  | 1.71631 | 1.65231e-18 | 1.68174e-17 | Specific Liver_high |
| Rpe                                                                           | 8.77842 | 1.26284 | 1.65793e-18 | 1.68693e-17 | Specific Liver_high |
| H2-T24                                                                        | 8.77744 | 1.33779 | 1.67232e-18 | 1.7005e-17  | Specific Liver_high |
| Sdc4                                                                          | 8.77547 | 4.18495 | 1.70189e-18 | 1.72948e-17 | Specific Liver_high |
| Vps39                                                                         | 8.75736 | 1.41813 | 1.9987e-18  | 2.026e-17   | Specific Liver_high |
| Prkca                                                                         | 8.74407 | 2.1183  | 2.24864e-18 | 2.27578e-17 | Specific Liver_high |
| Setdb1                                                                        | 8.72934 | 1.03355 | 2.56168e-18 | 2.58854e-17 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Elp3                                                                          | 8.71405 | 1.10028 | 2.93203e-18 | 2.95907e-17 | Specific Liver_high |
| Trim5                                                                         | 8.71164 | 1.43504 | 2.99521e-18 | 3.02094e-17 | Specific Liver_high |
| Ppm1k                                                                         | 8.67858 | 1.42034 | 4.00722e-18 | 4.03157e-17 | Specific Liver_high |
| Slc33a1                                                                       | 8.67125 | 1.32668 | 4.27407e-18 | 4.29202e-17 | Specific Liver_high |
| Casp1                                                                         | 8.65147 | 1.92752 | 5.08401e-18 | 5.09447e-17 | Specific Liver_high |
| Mtr                                                                           | 8.65083 | 1.24881 | 5.11246e-18 | 5.12119e-17 | Specific Liver_high |
| Ttc13                                                                         | 8.64349 | 1.43947 | 5.45227e-18 | 5.45988e-17 | Specific Liver_high |
| Gadd45g                                                                       | 8.64213 | 1.09492 | 5.51753e-18 | 5.5218e-17  | Specific Liver_high |
| 2026-03-03 00:00:00                                                           | 8.63767 | 1.11522 | 5.73734e-18 | 5.73468e-17 | Specific Liver_high |
| Apobec1                                                                       | 8.61474 | 2.10495 | 7.00976e-18 | 6.99351e-17 | Specific Liver_high |
| Nup205                                                                        | 8.60205 | 1.69947 | 7.83058e-18 | 7.80279e-17 | Specific Liver_high |
| Parn                                                                          | 8.59197 | 1.12543 | 8.54939e-18 | 8.49544e-17 | Specific Liver_high |
| Vps33a                                                                        | 8.59131 | 1.36481 | 8.59869e-18 | 8.53918e-17 | Specific Liver_high |
| Akap1                                                                         | 8.5912  | 1.15219 | 8.60681e-18 | 8.54462e-17 | Specific Liver_high |
| Mdn1                                                                          | 8.58501 | 1.25538 | 9.08312e-18 | 9.01194e-17 | Specific Liver_high |
| Kank1                                                                         | 8.57363 | 3.52883 | 1.00272e-17 | 9.93338e-17 | Specific Liver_high |
| Uhrf1bp1l                                                                     | 8.56641 | 1.80933 | 1.06763e-17 | 1.05699e-16 | Specific Liver_high |
| Hmga2                                                                         | 8.55925 | 2.30401 | 1.13604e-17 | 1.12403e-16 | Specific Liver_high |
| Vav2                                                                          | 8.52798 | 2.41773 | 1.48921e-17 | 1.47076e-16 | Specific Liver_high |
| Bcl6                                                                          | 8.52063 | 4.11898 | 1.58684e-17 | 1.56574e-16 | Specific Liver_high |
| Aldh3a2                                                                       | 8.4947  | 1.04062 | 1.98441e-17 | 1.95385e-16 | Specific Liver_high |
| S100pbp                                                                       | 8.48621 | 1.05841 | 2.13478e-17 | 2.10062e-16 | Specific Liver_high |
| Ctps2                                                                         | 8.46562 | 1.0552  | 2.54794e-17 | 2.50336e-16 | Specific Liver_high |
| Sirt5                                                                         | 8.43694 | 1.84344 | 3.25758e-17 | 3.19184e-16 | Specific Liver_high |
| Chic1                                                                         | 8.43589 | 1.39884 | 3.28702e-17 | 3.21971e-16 | Specific Liver_high |
| Srd5a3                                                                        | 8.42634 | 1.17391 | 3.5664e-17  | 3.49019e-16 | Specific Liver_high |
| Taspl                                                                         | 8.40494 | 1.46384 | 4.28097e-17 | 4.17809e-16 | Specific Liver_high |
| Scyl2                                                                         | 8.40478 | 1.08076 | 4.28648e-17 | 4.1822e-16  | Specific Liver_high |
| Zmat3                                                                         | 8.3767  | 1.69547 | 5.44313e-17 | 5.29896e-16 | Specific Liver_high |
| Ccdc93                                                                        | 8.37668 | 1.06204 | 5.44422e-17 | 5.29896e-16 | Specific Liver_high |
| Naa30                                                                         | 8.36608 | 1.147   | 5.95682e-17 | 5.79265e-16 | Specific Liver_high |
| Nt5c2                                                                         | 8.36375 | 1.05176 | 6.07574e-17 | 5.90651e-16 | Specific Liver_high |
| Trmt2b                                                                        | 8.35124 | 1.19293 | 6.7548e-17  | 6.55285e-16 | Specific Liver_high |
| Amigo2                                                                        | 8.34433 | 2.08522 | 7.16179e-17 | 6.93724e-16 | Specific Liver_high |
| Eipr1                                                                         | 8.33131 | 1.48001 | 7.9953e-17  | 7.73766e-16 | Specific Liver_high |
| Lclat1                                                                        | 8.32114 | 1.20927 | 8.71233e-17 | 8.41896e-16 | Specific Liver_high |
| Atad2                                                                         | 8.31537 | 1.22602 | 9.14651e-17 | 8.83588e-16 | Specific Liver_high |
| Cep128                                                                        | 8.30282 | 1.75786 | 1.01672e-16 | 9.80426e-16 | Specific Liver_high |
| Gaa                                                                           | 8.30045 | 1.00116 | 1.03715e-16 | 9.99535e-16 | Specific Liver_high |
| Unc5a                                                                         | 8.29161 | 2.07531 | 1.11729e-16 | 1.07548e-15 | Specific Liver_high |
| Mpp7                                                                          | 8.28285 | 1.28931 | 1.20267e-16 | 1.15663e-15 | Specific Liver_high |
| Hic1                                                                          | 8.26547 | 1.15748 | 1.39142e-16 | 1.33696e-15 | Specific Liver_high |
| C1galt1                                                                       | 8.25448 | 1.00297 | 1.52565e-16 | 1.46203e-15 | Specific Liver_high |
| Megf8                                                                         | 8.24758 | 1.04275 | 1.61632e-16 | 1.54845e-15 | Specific Liver_high |
| Slc38a7                                                                       | 8.22833 | 1.84518 | 1.89845e-16 | 1.81551e-15 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| MacroD2                                                                       | 8.22698 | 1.17334 | 1.91988e-16 | 1.83546e-15 | Specific Liver_high |
| Slc12a9                                                                       | 8.22064 | 1.58861 | 2.02417e-16 | 1.93344e-15 | Specific Liver_high |
| Zfp942                                                                        | 8.21813 | 1.17579 | 2.06698e-16 | 1.97317e-15 | Specific Liver_high |
| Arfgap1                                                                       | 8.21753 | 1.01229 | 2.07741e-16 | 1.98254e-15 | Specific Liver_high |
| Dennd2d                                                                       | 8.20656 | 5.831   | 2.2761e-16  | 2.17023e-15 | Specific Liver_high |
| Arl4c                                                                         | 8.20213 | 3.34631 | 2.3616e-16  | 2.25042e-15 | Specific Liver_high |
| Aldh6a1                                                                       | 8.17211 | 1.40637 | 3.03039e-16 | 2.88177e-15 | Specific Liver_high |
| Efh2                                                                          | 8.15948 | 1.44794 | 3.36467e-16 | 3.1959e-15  | Specific Liver_high |
| Plppr5                                                                        | 8.15502 | 4.1264  | 3.49129e-16 | 3.31226e-15 | Specific Liver_high |
| Ap3s2                                                                         | 8.15492 | 1.05956 | 3.49402e-16 | 3.31388e-15 | Specific Liver_high |
| Dmpk                                                                          | 8.14537 | 2.79959 | 3.78112e-16 | 3.58302e-15 | Specific Liver_high |
| Rspo3                                                                         | 8.14426 | 3.38125 | 3.81607e-16 | 3.61508e-15 | Specific Liver_high |
| Mtmr1                                                                         | 8.11963 | 1.08796 | 4.67618e-16 | 4.4234e-15  | Specific Liver_high |
| Pigm                                                                          | 8.09488 | 1.26689 | 5.73205e-16 | 5.40635e-15 | Specific Liver_high |
| Aox1                                                                          | 8.08509 | 2.80073 | 6.2118e-16  | 5.85712e-15 | Specific Liver_high |
| Limk1                                                                         | 8.07848 | 1.56112 | 6.55787e-16 | 6.17622e-15 | Specific Liver_high |
| Hmgcs1                                                                        | 8.07655 | 1.15596 | 6.66244e-16 | 6.27104e-15 | Specific Liver_high |
| Mroh1                                                                         | 8.0711  | 1.47547 | 6.96668e-16 | 6.5555e-15  | Specific Liver_high |
| Mbd6                                                                          | 8.06154 | 1.14415 | 7.53376e-16 | 7.08292e-15 | Specific Liver_high |
| Trp53bp1                                                                      | 8.0518  | 1.272   | 8.15854e-16 | 7.65915e-15 | Specific Liver_high |
| Colec12                                                                       | 8.01148 | 1.61275 | 1.13333e-15 | 1.05903e-14 | Specific Liver_high |
| Rtkn                                                                          | 8.00882 | 3.33726 | 1.15812e-15 | 1.08188e-14 | Specific Liver_high |
| Crebl2                                                                        | 7.98086 | 1.42855 | 1.45319e-15 | 1.35322e-14 | Specific Liver_high |
| Pde5a                                                                         | 7.96229 | 1.41047 | 1.68881e-15 | 1.56991e-14 | Specific Liver_high |
| Med26                                                                         | 7.95663 | 1.41265 | 1.76794e-15 | 1.64253e-14 | Specific Liver_high |
| Zbtb34                                                                        | 7.95162 | 1.71848 | 1.84095e-15 | 1.70987e-14 | Specific Liver_high |
| Kdm2b                                                                         | 7.92885 | 1.18653 | 2.21192e-15 | 2.04794e-14 | Specific Liver_high |
| Gpatch2l                                                                      | 7.92565 | 1.07096 | 2.26953e-15 | 2.10068e-14 | Specific Liver_high |
| N6amt1                                                                        | 7.91479 | 1.10244 | 2.47669e-15 | 2.2885e-14  | Specific Liver_high |
| Gm13561                                                                       | 7.91167 | 5.0657  | 2.53955e-15 | 2.3459e-14  | Specific Liver_high |
| C1ra                                                                          | 7.8844  | 2.82704 | 3.16059e-15 | 2.91542e-14 | Specific Liver_high |
| Pcdhga12                                                                      | 7.88261 | 1.53622 | 3.20616e-15 | 2.95661e-14 | Specific Liver_high |
| Rmi1                                                                          | 7.87369 | 1.35941 | 3.44341e-15 | 3.17358e-14 | Specific Liver_high |
| Eif2ak1                                                                       | 7.86832 | 1.01186 | 3.59429e-15 | 3.31075e-14 | Specific Liver_high |
| Snx14                                                                         | 7.86344 | 1.02785 | 3.73729e-15 | 3.43854e-14 | Specific Liver_high |
| Ostm1                                                                         | 7.86189 | 1.35719 | 3.7839e-15  | 3.48044e-14 | Specific Liver_high |
| Arap1                                                                         | 7.834   | 2.59255 | 4.72596e-15 | 4.33583e-14 | Specific Liver_high |
| Slc18b1                                                                       | 7.82832 | 1.48405 | 4.94424e-15 | 4.53351e-14 | Specific Liver_high |
| Ubp1                                                                          | 7.80931 | 2.55889 | 5.75006e-15 | 5.2664e-14  | Specific Liver_high |
| Tmem161b                                                                      | 7.79075 | 1.0059  | 6.66116e-15 | 6.0905e-14  | Specific Liver_high |
| Aagab                                                                         | 7.78771 | 1.64971 | 6.82353e-15 | 6.23543e-14 | Specific Liver_high |
| Bcar3                                                                         | 7.78594 | 1.39399 | 6.91971e-15 | 6.31796e-14 | Specific Liver_high |
| Fbxw17                                                                        | 7.77872 | 1.67129 | 7.32644e-15 | 6.68364e-14 | Specific Liver_high |
| Dcp1a                                                                         | 7.77522 | 1.02952 | 7.53193e-15 | 6.86722e-14 | Specific Liver_high |
| Klhl8                                                                         | 7.76439 | 1.72712 | 8.2041e-15  | 7.47163e-14 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Metap1d                                                                       | 7.75875 | 1.31175 | 8.57713e-15 | 7.79815e-14 | Specific Liver_high |
| Fam199x                                                                       | 7.75295 | 1.21855 | 8.9785e-15  | 8.1539e-14  | Specific Liver_high |
| Ivd                                                                           | 7.73834 | 2.02855 | 1.00721e-14 | 9.13675e-14 | Specific Liver_high |
| Slx4ip                                                                        | 7.73409 | 1.3637  | 1.04144e-14 | 9.4446e-14  | Specific Liver_high |
| Cyp2j6                                                                        | 7.72457 | 1.24094 | 1.12235e-14 | 1.0167e-13  | Specific Liver_high |
| Fads2                                                                         | 7.68347 | 3.64082 | 1.54834e-14 | 1.39866e-13 | Specific Liver_high |
| Gfm2                                                                          | 7.63594 | 1.00945 | 2.24176e-14 | 2.01546e-13 | Specific Liver_high |
| C1qtnf6                                                                       | 7.62254 | 1.78674 | 2.48728e-14 | 2.23495e-13 | Specific Liver_high |
| Nars2                                                                         | 7.60583 | 1.17503 | 2.8308e-14  | 2.53938e-13 | Specific Liver_high |
| Dlg5                                                                          | 7.60006 | 1.30997 | 2.95993e-14 | 2.65227e-13 | Specific Liver_high |
| Lnpk                                                                          | 7.58132 | 1.23204 | 3.42057e-14 | 3.05824e-13 | Specific Liver_high |
| Pank1                                                                         | 7.58124 | 1.8664  | 3.42268e-14 | 3.05928e-13 | Specific Liver_high |
| Xpnpep3                                                                       | 7.57588 | 1.2799  | 3.56701e-14 | 3.18476e-13 | Specific Liver_high |
| Zfp934                                                                        | 7.56952 | 1.4583  | 3.74592e-14 | 3.34265e-13 | Specific Liver_high |
| Snx33                                                                         | 7.56567 | 1.74429 | 3.85856e-14 | 3.44221e-13 | Specific Liver_high |
| 4931428F04Rik                                                                 | 7.56494 | 2.8386  | 3.88047e-14 | 3.4608e-13  | Specific Liver_high |
| Hyou1                                                                         | 7.56286 | 1.53337 | 3.94294e-14 | 3.51457e-13 | Specific Liver_high |
| Tbc1d8                                                                        | 7.5453  | 1.36962 | 4.51257e-14 | 4.0201e-13  | Specific Liver_high |
| Fbxl4                                                                         | 7.5286  | 1.17349 | 5.12873e-14 | 4.5602e-13  | Specific Liver_high |
| Slc37a1                                                                       | 7.52068 | 3.57927 | 5.44908e-14 | 4.84105e-13 | Specific Liver_high |
| Cdk6                                                                          | 7.5183  | 1.07442 | 5.54929e-14 | 4.92736e-13 | Specific Liver_high |
| Slc16a12                                                                      | 7.50326 | 3.65717 | 6.22481e-14 | 5.52262e-13 | Specific Liver_high |
| Tmem173                                                                       | 7.49974 | 1.83344 | 6.39449e-14 | 5.66692e-13 | Specific Liver_high |
| Gm48163                                                                       | 7.48631 | 3.25858 | 7.08387e-14 | 6.27614e-13 | Specific Liver_high |
| Slc9a7                                                                        | 7.47884 | 5.67013 | 7.49799e-14 | 6.6394e-13  | Specific Liver_high |
| H6pd                                                                          | 7.45436 | 3.53015 | 9.03079e-14 | 7.977e-13   | Specific Liver_high |
| Dtnb                                                                          | 7.45046 | 1.13782 | 9.30129e-14 | 8.21368e-13 | Specific Liver_high |
| Bckdhb                                                                        | 7.42715 | 1.03023 | 1.10961e-13 | 9.76926e-13 | Specific Liver_high |
| Ints7                                                                         | 7.41749 | 1.08235 | 1.19362e-13 | 1.05031e-12 | Specific Liver_high |
| Tbc1d13                                                                       | 7.41466 | 1.12618 | 1.21939e-13 | 1.07241e-12 | Specific Liver_high |
| Col5a2                                                                        | 7.41362 | 2.07926 | 1.22894e-13 | 1.08051e-12 | Specific Liver_high |
| Pnp2                                                                          | 7.40952 | 3.55952 | 1.26753e-13 | 1.11353e-12 | Specific Liver_high |
| Ints4                                                                         | 7.39335 | 1.08138 | 1.43174e-13 | 1.25642e-12 | Specific Liver_high |
| Igip                                                                          | 7.38823 | 1.20416 | 1.488e-13   | 1.30472e-12 | Specific Liver_high |
| Gart                                                                          | 7.37974 | 1.1551  | 1.58594e-13 | 1.38759e-12 | Specific Liver_high |
| Cd200r1                                                                       | 7.3766  | 6.05109 | 1.62381e-13 | 1.42034e-12 | Specific Liver_high |
| Gtf3c3                                                                        | 7.37057 | 1.07195 | 1.69904e-13 | 1.48533e-12 | Specific Liver_high |
| Nup155                                                                        | 7.35291 | 1.30857 | 1.93935e-13 | 1.68947e-12 | Specific Liver_high |
| Ell                                                                           | 7.34375 | 1.0213  | 2.07699e-13 | 1.80694e-12 | Specific Liver_high |
| Mccc1                                                                         | 7.34152 | 1.47099 | 2.11185e-13 | 1.83678e-12 | Specific Liver_high |
| Plekhb2                                                                       | 7.33571 | 1.6167  | 2.2055e-13  | 1.91667e-12 | Specific Liver_high |
| Cln6                                                                          | 7.33502 | 1.59936 | 2.21687e-13 | 1.92604e-12 | Specific Liver_high |
| Sh2b2                                                                         | 7.31226 | 1.49235 | 2.62685e-13 | 2.27794e-12 | Specific Liver_high |
| Pcnx4                                                                         | 7.30634 | 1.18587 | 2.74518e-13 | 2.378e-12   | Specific Liver_high |
| Cenpc1                                                                        | 7.30419 | 1.08748 | 2.78946e-13 | 2.41442e-12 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Sec22a                                                                        | 7.30209 | 1.09886 | 2.83335e-13 | 2.45109e-12 | Specific Liver_high |
| Zfp984                                                                        | 7.30042 | 1.31162 | 2.86864e-13 | 2.47963e-12 | Specific Liver_high |
| Sgsh                                                                          | 7.29078 | 1.91008 | 3.08157e-13 | 2.66083e-12 | Specific Liver_high |
| Cnnm2                                                                         | 7.28377 | 1.84814 | 3.24623e-13 | 2.80076e-12 | Specific Liver_high |
| 2700049A03Rik                                                                 | 7.28132 | 1.06156 | 3.30582e-13 | 2.85065e-12 | Specific Liver_high |
| Setdb2                                                                        | 7.27649 | 1.16455 | 3.4261e-13  | 2.9528e-12  | Specific Liver_high |
| Slc8b1                                                                        | 7.26792 | 1.19742 | 3.65052e-13 | 3.14369e-12 | Specific Liver_high |
| Uba6                                                                          | 7.23956 | 1.03024 | 4.50144e-13 | 3.86719e-12 | Specific Liver_high |
| Bcl9                                                                          | 7.23002 | 1.13896 | 4.82908e-13 | 4.14425e-12 | Specific Liver_high |
| Efl1                                                                          | 7.22777 | 1.04929 | 4.90993e-13 | 4.21252e-12 | Specific Liver_high |
| Slc9a8                                                                        | 7.21491 | 1.14008 | 5.39707e-13 | 4.62309e-12 | Specific Liver_high |
| Phyhd1                                                                        | 7.21452 | 1.97546 | 5.41243e-13 | 4.63502e-12 | Specific Liver_high |
| Pcolce                                                                        | 7.18746 | 1.75693 | 6.60089e-13 | 5.6423e-12  | Specific Liver_high |
| Trim23                                                                        | 7.18686 | 1.21121 | 6.62991e-13 | 5.66561e-12 | Specific Liver_high |
| AC109619.1                                                                    | 7.17823 | 5.33426 | 7.06178e-13 | 6.02987e-12 | Specific Liver_high |
| Fam57a                                                                        | 7.17082 | 1.24104 | 7.45516e-13 | 6.36241e-12 | Specific Liver_high |
| Gm26542                                                                       | 7.16832 | 1.92277 | 7.59232e-13 | 6.47775e-12 | Specific Liver_high |
| Mindy4                                                                        | 7.16562 | 1.32336 | 7.74341e-13 | 6.60491e-12 | Specific Liver_high |
| Map2k7                                                                        | 7.15491 | 1.02494 | 8.37294e-13 | 7.13247e-12 | Specific Liver_high |
| Gm34455                                                                       | 7.1538  | 2.00999 | 8.4406e-13  | 7.1882e-12  | Specific Liver_high |
| Dpp7                                                                          | 7.13955 | 1.64392 | 9.36338e-13 | 7.96146e-12 | Specific Liver_high |
| Rtnn                                                                          | 7.13717 | 1.09725 | 9.52706e-13 | 8.09637e-12 | Specific Liver_high |
| Prim2                                                                         | 7.13017 | 1.73176 | 1.00248e-12 | 8.51714e-12 | Specific Liver_high |
| Fbxo32                                                                        | 7.12433 | 1.24699 | 1.04585e-12 | 8.88093e-12 | Specific Liver_high |
| Paqr8                                                                         | 7.11744 | 1.54532 | 1.09953e-12 | 9.3294e-12  | Specific Liver_high |
| Fbn1                                                                          | 7.10957 | 2.17279 | 1.16404e-12 | 9.86898e-12 | Specific Liver_high |
| Cln7                                                                          | 7.09619 | 1.18524 | 1.28243e-12 | 1.08385e-11 | Specific Liver_high |
| Abcc9                                                                         | 7.07253 | 1.1443  | 1.52135e-12 | 1.28242e-11 | Specific Liver_high |
| Tk2                                                                           | 7.06375 | 1.27895 | 1.62069e-12 | 1.36545e-11 | Specific Liver_high |
| Zfyve26                                                                       | 7.05991 | 1.14634 | 1.66607e-12 | 1.40295e-11 | Specific Liver_high |
| Capn5                                                                         | 7.05651 | 2.07812 | 1.7074e-12  | 1.43626e-11 | Specific Liver_high |
| Rad18                                                                         | 7.05076 | 1.8668  | 1.77943e-12 | 1.49568e-11 | Specific Liver_high |
| Gm13483                                                                       | 7.02714 | 1.84042 | 2.10808e-12 | 1.7664e-11  | Specific Liver_high |
| A630001G21Rik                                                                 | 7.02032 | 1.92066 | 2.21355e-12 | 1.85237e-11 | Specific Liver_high |
| Cdk5rap2                                                                      | 6.99605 | 1.41219 | 2.63282e-12 | 2.1981e-11  | Specific Liver_high |
| Prkci                                                                         | 6.99117 | 1.30409 | 2.72603e-12 | 2.27474e-11 | Specific Liver_high |
| Zfp367                                                                        | 6.94926 | 1.13928 | 3.67209e-12 | 3.05235e-11 | Specific Liver_high |
| Aim2                                                                          | 6.94887 | 2.64609 | 3.68229e-12 | 3.06005e-11 | Specific Liver_high |
| Alg6                                                                          | 6.94455 | 1.21658 | 3.79666e-12 | 3.15428e-11 | Specific Liver_high |
| Il27ra                                                                        | 6.93164 | 2.70591 | 4.15983e-12 | 3.45156e-11 | Specific Liver_high |
| B630019A10Rik                                                                 | 6.91752 | 1.76206 | 4.59616e-12 | 3.80968e-11 | Specific Liver_high |
| Ackr1                                                                         | 6.91539 | 5.45715 | 4.66568e-12 | 3.86532e-11 | Specific Liver_high |
| 2810410L24Rik                                                                 | 6.90307 | 1.0488  | 5.08891e-12 | 4.21487e-11 | Specific Liver_high |
| Tubgcp4                                                                       | 6.89678 | 1.10238 | 5.31945e-12 | 4.39791e-11 | Specific Liver_high |
| Fgfr1                                                                         | 6.86748 | 1.5071  | 6.53478e-12 | 5.38202e-11 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Mlh3                                                                          | 6.85229 | 1.34354 | 7.26779e-12 | 5.98115e-11 | Specific Liver_high |
| Slc36a1                                                                       | 6.85211 | 2.01117 | 7.27691e-12 | 5.98713e-11 | Specific Liver_high |
| Mthfr                                                                         | 6.84035 | 1.50248 | 7.89991e-12 | 6.48814e-11 | Specific Liver_high |
| Ttbk2                                                                         | 6.82439 | 1.22743 | 8.82967e-12 | 7.24253e-11 | Specific Liver_high |
| Etv5                                                                          | 6.81434 | 1.27686 | 9.47002e-12 | 7.76186e-11 | Specific Liver_high |
| Paip2b                                                                        | 6.80592 | 1.41804 | 1.00403e-11 | 8.2126e-11  | Specific Liver_high |
| Meis2                                                                         | 6.80398 | 1.01713 | 1.01768e-11 | 8.32213e-11 | Specific Liver_high |
| Med23                                                                         | 6.79634 | 1.01003 | 1.0731e-11  | 8.76642e-11 | Specific Liver_high |
| Cxxc4                                                                         | 6.7957  | 1.03079 | 1.07792e-11 | 8.80137e-11 | Specific Liver_high |
| Cit                                                                           | 6.78357 | 1.53891 | 1.17246e-11 | 9.55643e-11 | Specific Liver_high |
| Klhl36                                                                        | 6.78244 | 1.27231 | 1.18166e-11 | 9.62891e-11 | Specific Liver_high |
| Spry2                                                                         | 6.76901 | 1.464   | 1.29663e-11 | 1.05525e-10 | Specific Liver_high |
| Cul4b                                                                         | 6.76754 | 1.13309 | 1.30993e-11 | 1.0658e-10  | Specific Liver_high |
| Gm43813                                                                       | 6.76726 | 1.2003  | 1.31241e-11 | 1.06755e-10 | Specific Liver_high |
| Morc2a                                                                        | 6.73166 | 1.00035 | 1.67743e-11 | 1.35865e-10 | Specific Liver_high |
| Tfpi2                                                                         | 6.72252 | 1.49658 | 1.78606e-11 | 1.44302e-10 | Specific Liver_high |
| Cbx4                                                                          | 6.69796 | 1.0218  | 2.11343e-11 | 1.70538e-10 | Specific Liver_high |
| Tab3                                                                          | 6.69569 | 1.36297 | 2.14664e-11 | 1.73174e-10 | Specific Liver_high |
| Accs                                                                          | 6.68058 | 1.47655 | 2.38002e-11 | 1.91666e-10 | Specific Liver_high |
| Nup93                                                                         | 6.67885 | 1.04421 | 2.40831e-11 | 1.93896e-10 | Specific Liver_high |
| Nln                                                                           | 6.6543  | 1.36476 | 2.84647e-11 | 2.28602e-10 | Specific Liver_high |
| Aldh9a1                                                                       | 6.63882 | 1.24583 | 3.16199e-11 | 2.53627e-10 | Specific Liver_high |
| Car2                                                                          | 6.6257  | 1.85664 | 3.45614e-11 | 2.76877e-10 | Specific Liver_high |
| Armcx2                                                                        | 6.62177 | 1.06361 | 3.54931e-11 | 2.84059e-10 | Specific Liver_high |
| Dnm3os                                                                        | 6.61807 | 2.90704 | 3.63913e-11 | 2.91103e-10 | Specific Liver_high |
| Sox12                                                                         | 6.59815 | 2.23481 | 4.16313e-11 | 3.3195e-10  | Specific Liver_high |
| Chka                                                                          | 6.5663  | 1.40748 | 5.15823e-11 | 4.10687e-10 | Specific Liver_high |
| Mtmr14                                                                        | 6.56462 | 1.09687 | 5.21654e-11 | 4.15124e-10 | Specific Liver_high |
| Adnp2                                                                         | 6.55669 | 1.25458 | 5.50153e-11 | 4.37588e-10 | Specific Liver_high |
| Atg2b                                                                         | 6.55629 | 1.24416 | 5.51616e-11 | 4.38644e-10 | Specific Liver_high |
| Nemp1                                                                         | 6.5374  | 1.39784 | 6.25985e-11 | 4.96315e-10 | Specific Liver_high |
| Selenoi                                                                       | 6.53625 | 1.03394 | 6.3082e-11  | 4.99903e-10 | Specific Liver_high |
| Ltc4s                                                                         | 6.52966 | 1.72658 | 6.59193e-11 | 5.21491e-10 | Specific Liver_high |
| C1qtnf7                                                                       | 6.52657 | 3.45861 | 6.7291e-11  | 5.31821e-10 | Specific Liver_high |
| Tox2                                                                          | 6.51952 | 3.78106 | 7.05347e-11 | 5.56912e-10 | Specific Liver_high |
| Wdr5                                                                          | 6.50738 | 1.021   | 7.64747e-11 | 6.03369e-10 | Specific Liver_high |
| Gm19461                                                                       | 6.50501 | 3.57672 | 7.7687e-11  | 6.12634e-10 | Specific Liver_high |
| Vstm5                                                                         | 6.50485 | 2.47141 | 7.77699e-11 | 6.13138e-10 | Specific Liver_high |
| Ctns                                                                          | 6.495   | 1.38586 | 8.30357e-11 | 6.53855e-10 | Specific Liver_high |
| Rab29                                                                         | 6.4903  | 1.27659 | 8.56648e-11 | 6.7423e-10  | Specific Liver_high |
| 4930554G24Rik                                                                 | 6.49013 | 1.95766 | 8.57642e-11 | 6.74847e-10 | Specific Liver_high |
| Qpct                                                                          | 6.42652 | 2.68387 | 1.30561e-10 | 1.02037e-09 | Specific Liver_high |
| Zfat                                                                          | 6.40085 | 1.97924 | 1.54513e-10 | 1.20465e-09 | Specific Liver_high |
| Armc5                                                                         | 6.3998  | 1.11016 | 1.55582e-10 | 1.21269e-09 | Specific Liver_high |
| Rbbp5                                                                         | 6.39316 | 1.05354 | 1.62497e-10 | 1.26567e-09 | Specific Liver_high |



| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Smim1                                                                         | 6.3626  | 3.35961 | 1.98371e-10 | 1.53952e-09 | Specific Liver_high |
| Enpp5                                                                         | 6.35856 | 1.13918 | 2.03657e-10 | 1.5794e-09  | Specific Liver_high |
| Atm                                                                           | 6.35817 | 1.04841 | 2.0417e-10  | 1.58301e-09 | Specific Liver_high |
| Hs1bp3                                                                        | 6.34879 | 1.20639 | 2.1702e-10  | 1.68142e-09 | Specific Liver_high |
| Gm20186                                                                       | 6.32712 | 1.94764 | 2.49785e-10 | 1.93157e-09 | Specific Liver_high |
| Map3k8                                                                        | 6.32331 | 1.00989 | 2.56021e-10 | 1.97932e-09 | Specific Liver_high |
| Shld2                                                                         | 6.31871 | 1.00656 | 2.6375e-10  | 2.03858e-09 | Specific Liver_high |
| Dzip3                                                                         | 6.31581 | 1.24448 | 2.68755e-10 | 2.07578e-09 | Specific Liver_high |
| Taco1                                                                         | 6.31299 | 1.32801 | 2.73703e-10 | 2.11248e-09 | Specific Liver_high |
| Epg5                                                                          | 6.30028 | 1.03201 | 2.97109e-10 | 2.28984e-09 | Specific Liver_high |
| Ust                                                                           | 6.29732 | 5.12117 | 3.02842e-10 | 2.33292e-09 | Specific Liver_high |
| Pou5f2                                                                        | 6.28894 | 2.43128 | 3.19646e-10 | 2.46178e-09 | Specific Liver_high |
| Kdm4a                                                                         | 6.28804 | 1.07088 | 3.21507e-10 | 2.47552e-09 | Specific Liver_high |
| Ythdc2                                                                        | 6.27703 | 1.13681 | 3.45104e-10 | 2.65404e-09 | Specific Liver_high |
| Nadk2                                                                         | 6.27015 | 1.29471 | 3.607e-10   | 2.77201e-09 | Specific Liver_high |
| Gpat3                                                                         | 6.2602  | 4.34709 | 3.84474e-10 | 2.94979e-09 | Specific Liver_high |
| Tmem104                                                                       | 6.25842 | 1.26747 | 3.88895e-10 | 2.9823e-09  | Specific Liver_high |
| Pter                                                                          | 6.25698 | 1.24582 | 3.92511e-10 | 3.0086e-09  | Specific Liver_high |
| Dhdh                                                                          | 6.24745 | 1.42709 | 4.17217e-10 | 3.19645e-09 | Specific Liver_high |
| Lhx6                                                                          | 6.24723 | 1.65405 | 4.17797e-10 | 3.20014e-09 | Specific Liver_high |
| Ccnj                                                                          | 6.22832 | 1.8197  | 4.71451e-10 | 3.60256e-09 | Specific Liver_high |
| Ccdc152                                                                       | 6.17872 | 1.60067 | 6.46223e-10 | 4.91596e-09 | Specific Liver_high |
| Pprc1                                                                         | 6.16907 | 1.20656 | 6.8691e-10  | 5.22055e-09 | Specific Liver_high |
| Rrm1                                                                          | 6.16456 | 1.01227 | 7.06778e-10 | 5.37028e-09 | Specific Liver_high |
| Naip5                                                                         | 6.15406 | 1.96918 | 7.55236e-10 | 5.73308e-09 | Specific Liver_high |
| Slc26a11                                                                      | 6.15118 | 1.17575 | 7.69094e-10 | 5.8369e-09  | Specific Liver_high |
| Lacc1                                                                         | 6.14364 | 3.77388 | 8.06497e-10 | 6.11646e-09 | Specific Liver_high |
| Gm27003                                                                       | 6.12008 | 1.28776 | 9.35276e-10 | 7.06986e-09 | Specific Liver_high |
| Mthfs                                                                         | 6.11595 | 1.30746 | 9.59845e-10 | 7.24879e-09 | Specific Liver_high |
| Castor2                                                                       | 6.1106  | 1.09457 | 9.92585e-10 | 7.49079e-09 | Specific Liver_high |
| Pus10                                                                         | 6.09188 | 1.16833 | 1.11591e-09 | 8.40385e-09 | Specific Liver_high |
| Aatk                                                                          | 6.05056 | 1.23597 | 1.44343e-09 | 1.08148e-08 | Specific Liver_high |
| Acad11                                                                        | 6.05018 | 1.7668  | 1.44686e-09 | 1.08355e-08 | Specific Liver_high |
| Gm29683                                                                       | 6.04596 | 3.90545 | 1.48527e-09 | 1.11154e-08 | Specific Liver_high |
| Mavs                                                                          | 6.04369 | 1.35415 | 1.50628e-09 | 1.12675e-08 | Specific Liver_high |
| Cul9                                                                          | 6.03369 | 1.02856 | 1.60255e-09 | 1.19792e-08 | Specific Liver_high |
| Pi4k2a                                                                        | 6.0243  | 1.1037  | 1.69839e-09 | 1.2681e-08  | Specific Liver_high |
| Pgm1                                                                          | 6.02236 | 1.30077 | 1.71897e-09 | 1.28257e-08 | Specific Liver_high |
| Pvt1                                                                          | 6.00479 | 2.22989 | 1.91586e-09 | 1.42717e-08 | Specific Liver_high |
| Ttc27                                                                         | 6.00044 | 1.32707 | 1.96784e-09 | 1.4642e-08  | Specific Liver_high |
| Dcun1d4                                                                       | 5.99741 | 1.67463 | 2.00494e-09 | 1.49078e-08 | Specific Liver_high |
| Pex1                                                                          | 5.99725 | 1.60247 | 2.00687e-09 | 1.49186e-08 | Specific Liver_high |
| Zfp944                                                                        | 5.98167 | 1.09402 | 2.20866e-09 | 1.63886e-08 | Specific Liver_high |
| Tlcd2                                                                         | 5.94782 | 3.18477 | 2.71739e-09 | 2.00849e-08 | Specific Liver_high |
| Mgme1                                                                         | 5.94734 | 1.22046 | 2.72531e-09 | 2.01343e-08 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Mast3                                                                         | 5.94368 | 1.96661 | 2.787e-09   | 2.05806e-08 | Specific Liver_high |
| Cd55b                                                                         | 5.94076 | 6.83508 | 2.83703e-09 | 2.09357e-08 | Specific Liver_high |
| Zbtb18                                                                        | 5.94052 | 1.29346 | 2.84128e-09 | 2.09622e-08 | Specific Liver_high |
| Srp54a                                                                        | 5.92292 | 1.40376 | 3.16281e-09 | 2.33078e-08 | Specific Liver_high |
| Wdr41                                                                         | 5.92    | 1.32952 | 3.2194e-09  | 2.37032e-08 | Specific Liver_high |
| Dpy19l3                                                                       | 5.89999 | 2.14569 | 3.63521e-09 | 2.66976e-08 | Specific Liver_high |
| Gpr157                                                                        | 5.82705 | 2.25725 | 5.64175e-09 | 4.12277e-08 | Specific Liver_high |
| Wdr36                                                                         | 5.82332 | 1.01179 | 5.76908e-09 | 4.212e-08   | Specific Liver_high |
| Egfm1                                                                         | 5.81204 | 4.55867 | 6.17157e-09 | 4.5028e-08  | Specific Liver_high |
| Afg3l2                                                                        | 5.79772 | 1.00371 | 6.72238e-09 | 4.8961e-08  | Specific Liver_high |
| E2f7                                                                          | 5.79771 | 2.47304 | 6.72275e-09 | 4.8961e-08  | Specific Liver_high |
| Fut10                                                                         | 5.77746 | 1.13333 | 7.58358e-09 | 5.5168e-08  | Specific Liver_high |
| 4933406l18Rik                                                                 | 5.77045 | 4.88207 | 7.90618e-09 | 5.7489e-08  | Specific Liver_high |
| Mapre3                                                                        | 5.7672  | 1.03941 | 8.06015e-09 | 5.8569e-08  | Specific Liver_high |
| Slc25a23                                                                      | 5.75577 | 2.13188 | 8.62486e-09 | 6.25598e-08 | Specific Liver_high |
| Aco1                                                                          | 5.73824 | 1.16822 | 9.56651e-09 | 6.925e-08   | Specific Liver_high |
| Bnip1                                                                         | 5.72049 | 1.06259 | 1.06217e-08 | 7.66816e-08 | Specific Liver_high |
| Vash1                                                                         | 5.69784 | 1.41843 | 1.21339e-08 | 8.74228e-08 | Specific Liver_high |
| Erbp2                                                                         | 5.677   | 1.3666  | 1.37078e-08 | 9.84551e-08 | Specific Liver_high |
| Cops7b                                                                        | 5.67683 | 1.4166  | 1.37214e-08 | 9.85309e-08 | Specific Liver_high |
| Armcx6                                                                        | 5.66962 | 3.1363  | 1.4311e-08  | 1.02719e-07 | Specific Liver_high |
| Pkdcc                                                                         | 5.66623 | 1.74038 | 1.45971e-08 | 1.04726e-07 | Specific Liver_high |
| Plagl1                                                                        | 5.6441  | 4.25455 | 1.66052e-08 | 1.18711e-07 | Specific Liver_high |
| Rpap2                                                                         | 5.63947 | 1.06899 | 1.70577e-08 | 1.21865e-07 | Specific Liver_high |
| 9630014M24Rik                                                                 | 5.63859 | 1.27328 | 1.71449e-08 | 1.22461e-07 | Specific Liver_high |
| Fkbp14                                                                        | 5.63744 | 1.36264 | 1.72594e-08 | 1.23197e-07 | Specific Liver_high |
| Tmc8                                                                          | 5.63364 | 1.4688  | 1.7645e-08  | 1.25866e-07 | Specific Liver_high |
| Gstcd                                                                         | 5.61748 | 1.37241 | 1.93762e-08 | 1.37986e-07 | Specific Liver_high |
| Efcc1                                                                         | 5.6149  | 4.08499 | 1.96676e-08 | 1.39953e-07 | Specific Liver_high |
| Orai2                                                                         | 5.60814 | 3.01181 | 2.04508e-08 | 1.45399e-07 | Specific Liver_high |
| Zfp618                                                                        | 5.59677 | 1.6681  | 2.18384e-08 | 1.55093e-07 | Specific Liver_high |
| 4933439C10Rik                                                                 | 5.59507 | 1.43171 | 2.20533e-08 | 1.5655e-07  | Specific Liver_high |
| Cep41                                                                         | 5.58946 | 1.69765 | 2.27771e-08 | 1.61582e-07 | Specific Liver_high |
| Pitrm1                                                                        | 5.5642  | 1.0768  | 2.63352e-08 | 1.86005e-07 | Specific Liver_high |
| Rp2                                                                           | 5.53374 | 1.21891 | 3.13475e-08 | 2.20732e-07 | Specific Liver_high |
| Spsb1                                                                         | 5.52347 | 2.23827 | 3.32364e-08 | 2.33625e-07 | Specific Liver_high |
| Sfn                                                                           | 5.51915 | 1.5145  | 3.40651e-08 | 2.39293e-07 | Specific Liver_high |
| Nme7                                                                          | 5.50444 | 1.6732  | 3.70344e-08 | 2.59587e-07 | Specific Liver_high |
| Pcdhgc4                                                                       | 5.49752 | 1.94586 | 3.85163e-08 | 2.69739e-07 | Specific Liver_high |
| Gm11707                                                                       | 5.47809 | 1.18679 | 4.29932e-08 | 3.00302e-07 | Specific Liver_high |
| Vegfb                                                                         | 5.4716  | 1.18494 | 4.45986e-08 | 3.11121e-07 | Specific Liver_high |
| Gm43259                                                                       | 5.44101 | 2.16178 | 5.2978e-08  | 3.68144e-07 | Specific Liver_high |
| BC002059                                                                      | 5.4396  | 1.04263 | 5.33992e-08 | 3.70991e-07 | Specific Liver_high |
| Tcp11l1                                                                       | 5.42315 | 1.64    | 5.85588e-08 | 4.06138e-07 | Specific Liver_high |
| Kyat1                                                                         | 5.40872 | 2.1824  | 6.34755e-08 | 4.39482e-07 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Ccdc77                                                                        | 5.39962 | 1.16187 | 6.67831e-08 | 4.61887e-07 | Specific Liver_high |
| B930095G15Rik                                                                 | 5.39415 | 2.1003  | 6.88471e-08 | 4.75857e-07 | Specific Liver_high |
| Lrrc28                                                                        | 5.38343 | 1.18028 | 7.30797e-08 | 5.04356e-07 | Specific Liver_high |
| Msh3                                                                          | 5.37747 | 1.03886 | 7.55414e-08 | 5.21234e-07 | Specific Liver_high |
| Hoxaas3                                                                       | 5.35212 | 1.1381  | 8.69317e-08 | 5.97655e-07 | Specific Liver_high |
| Adgrg6                                                                        | 5.34535 | 3.76857 | 9.02401e-08 | 6.20005e-07 | Specific Liver_high |
| Thap4                                                                         | 5.32456 | 1.1185  | 1.01199e-07 | 6.93784e-07 | Specific Liver_high |
| Cryzl2                                                                        | 5.31994 | 1.21532 | 1.03802e-07 | 7.11067e-07 | Specific Liver_high |
| Esrra                                                                         | 5.31577 | 1.07927 | 1.06206e-07 | 7.27223e-07 | Specific Liver_high |
| Rai2                                                                          | 5.29584 | 2.24256 | 1.18472e-07 | 8.08296e-07 | Specific Liver_high |
| Ccdc149                                                                       | 5.2767  | 2.00858 | 1.31533e-07 | 8.95329e-07 | Specific Liver_high |
| Rubcnl                                                                        | 5.26072 | 7.59534 | 1.43491e-07 | 9.74467e-07 | Specific Liver_high |
| Maml1                                                                         | 5.25903 | 1.04164 | 1.44815e-07 | 9.83045e-07 | Specific Liver_high |
| Gpsm3                                                                         | 5.2561  | 1.18553 | 1.47144e-07 | 9.98434e-07 | Specific Liver_high |
| Atmin                                                                         | 5.25546 | 1.16176 | 1.47658e-07 | 1.00171e-06 | Specific Liver_high |
| Clcn6                                                                         | 5.24409 | 1.14268 | 1.57059e-07 | 1.06415e-06 | Specific Liver_high |
| Osgin1                                                                        | 5.16766 | 2.04926 | 2.37041e-07 | 1.59269e-06 | Specific Liver_high |
| Serac1                                                                        | 5.12857 | 1.97479 | 2.91948e-07 | 1.9551e-06  | Specific Liver_high |
| Macrod1                                                                       | 5.12826 | 1.82523 | 2.92424e-07 | 1.95788e-06 | Specific Liver_high |
| Igsf23                                                                        | 5.09497 | 4.15962 | 3.48788e-07 | 2.32465e-06 | Specific Liver_high |
| Gm13431                                                                       | 5.0919  | 3.2357  | 3.54496e-07 | 2.36135e-06 | Specific Liver_high |
| 4930578G10Rik                                                                 | 5.08604 | 4.79731 | 3.6562e-07  | 2.43382e-06 | Specific Liver_high |
| Fbf1                                                                          | 5.0562  | 1.23671 | 4.2769e-07  | 2.83823e-06 | Specific Liver_high |
| Il20rb                                                                        | 5.05304 | 1.07056 | 4.34843e-07 | 2.8851e-06  | Specific Liver_high |
| Selp                                                                          | 5.05113 | 3.88834 | 4.39195e-07 | 2.91338e-06 | Specific Liver_high |
| Pdss1                                                                         | 5.04788 | 1.32748 | 4.46732e-07 | 2.96094e-06 | Specific Liver_high |
| Dkk3                                                                          | 5.02026 | 4.44854 | 5.16007e-07 | 3.4082e-06  | Specific Liver_high |
| Entpd7                                                                        | 5.01357 | 1.56696 | 5.34284e-07 | 3.52532e-06 | Specific Liver_high |
| Epm2a                                                                         | 5.01078 | 1.05929 | 5.42098e-07 | 3.57468e-06 | Specific Liver_high |
| Sowahc                                                                        | 5.00939 | 4.36267 | 5.46033e-07 | 3.59989e-06 | Specific Liver_high |
| Aaas                                                                          | 5.00108 | 1.22192 | 5.70102e-07 | 3.75704e-06 | Specific Liver_high |
| Fam122b                                                                       | 4.96813 | 2.5172  | 6.76005e-07 | 4.43775e-06 | Specific Liver_high |
| Mxd1                                                                          | 4.95665 | 1.56892 | 7.17193e-07 | 4.69762e-06 | Specific Liver_high |
| Slc37a3                                                                       | 4.90358 | 1.1976  | 9.41056e-07 | 6.12663e-06 | Specific Liver_high |
| Ccdc126                                                                       | 4.90052 | 1.07173 | 9.55843e-07 | 6.2204e-06  | Specific Liver_high |
| Gm43914                                                                       | 4.89252 | 5.17193 | 9.95526e-07 | 6.47082e-06 | Specific Liver_high |
| Stxbp2                                                                        | 4.88618 | 5.40053 | 1.02811e-06 | 6.67995e-06 | Specific Liver_high |
| Hsf2                                                                          | 4.88226 | 1.12572 | 1.04875e-06 | 6.81128e-06 | Specific Liver_high |
| Thumpd2                                                                       | 4.87678 | 1.2086  | 1.07831e-06 | 6.99763e-06 | Specific Liver_high |
| Dck                                                                           | 4.8763  | 1.35    | 1.08094e-06 | 7.01331e-06 | Specific Liver_high |
| Mcm2                                                                          | 4.8718  | 1.64309 | 1.10584e-06 | 7.16765e-06 | Specific Liver_high |
| Gm43138                                                                       | 4.86523 | 2.82215 | 1.14326e-06 | 7.40423e-06 | Specific Liver_high |
| Sesn2                                                                         | 4.86115 | 2.0671  | 1.16706e-06 | 7.5523e-06  | Specific Liver_high |
| Zfp976                                                                        | 4.85719 | 2.17251 | 1.19065e-06 | 7.7019e-06  | Specific Liver_high |
| Gm1976                                                                        | 4.85128 | 1.33195 | 1.22667e-06 | 7.92856e-06 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Tep1                                                                          | 4.84834 | 1.25025 | 1.24499e-06 | 8.04048e-06 | Specific Liver_high |
| Gm42659                                                                       | 4.84308 | 2.03538 | 1.27842e-06 | 8.2498e-06  | Specific Liver_high |
| Batf                                                                          | 4.84176 | 3.05585 | 1.28692e-06 | 8.30299e-06 | Specific Liver_high |
| Gm45606                                                                       | 4.84111 | 3.70215 | 1.29117e-06 | 8.32878e-06 | Specific Liver_high |
| Gm2a                                                                          | 4.83339 | 1.02862 | 1.34225e-06 | 8.64961e-06 | Specific Liver_high |
| Mccc2                                                                         | 4.82718 | 1.4748  | 1.3848e-06  | 8.91847e-06 | Specific Liver_high |
| Hoxb3os                                                                       | 4.79774 | 2.03536 | 1.60463e-06 | 1.03095e-05 | Specific Liver_high |
| Cenpt                                                                         | 4.79757 | 1.05652 | 1.60599e-06 | 1.03162e-05 | Specific Liver_high |
| Cfap69                                                                        | 4.76879 | 2.91993 | 1.85333e-06 | 1.18602e-05 | Specific Liver_high |
| Aldh16a1                                                                      | 4.76755 | 1.31195 | 1.86482e-06 | 1.1929e-05  | Specific Liver_high |
| Rap2b                                                                         | 4.75127 | 1.0027  | 2.02147e-06 | 1.28928e-05 | Specific Liver_high |
| D6Wsu163e                                                                     | 4.74835 | 1.16218 | 2.05078e-06 | 1.30591e-05 | Specific Liver_high |
| Hs6st3                                                                        | 4.74705 | 4.34387 | 2.06403e-06 | 1.31382e-05 | Specific Liver_high |
| D130062J10Rik                                                                 | 4.73373 | 1.83307 | 2.20433e-06 | 1.40119e-05 | Specific Liver_high |
| Metrn1                                                                        | 4.73268 | 1.16405 | 2.21579e-06 | 1.4082e-05  | Specific Liver_high |
| Kcnj15                                                                        | 4.72122 | 1.49934 | 2.34428e-06 | 1.4884e-05  | Specific Liver_high |
| Pcdhb14                                                                       | 4.71648 | 1.7776  | 2.39961e-06 | 1.52263e-05 | Specific Liver_high |
| Cep57l1                                                                       | 4.71239 | 1.20751 | 2.44824e-06 | 1.55257e-05 | Specific Liver_high |
| Ppargc1b                                                                      | 4.69394 | 3.27384 | 2.67992e-06 | 1.6955e-05  | Specific Liver_high |
| Gga3                                                                          | 4.69027 | 1.12773 | 2.72845e-06 | 1.72485e-05 | Specific Liver_high |
| Mipep                                                                         | 4.68683 | 1.47983 | 2.77469e-06 | 1.75373e-05 | Specific Liver_high |
| Dbn1                                                                          | 4.67573 | 1.80372 | 2.92912e-06 | 1.84917e-05 | Specific Liver_high |
| Ifitm1                                                                        | 4.67302 | 3.36486 | 2.96802e-06 | 1.87263e-05 | Specific Liver_high |
| Gm47121                                                                       | 4.67282 | 1.65869 | 2.97089e-06 | 1.87407e-05 | Specific Liver_high |
| Slc9a6                                                                        | 4.66905 | 1.12733 | 3.02599e-06 | 1.90771e-05 | Specific Liver_high |
| Exog                                                                          | 4.66177 | 1.70305 | 3.13497e-06 | 1.9745e-05  | Specific Liver_high |
| Limd2                                                                         | 4.65686 | 1.37569 | 3.21074e-06 | 2.02064e-05 | Specific Liver_high |
| Ezh2                                                                          | 4.64833 | 1.07828 | 3.3464e-06  | 2.10396e-05 | Specific Liver_high |
| Dapp1                                                                         | 4.64444 | 2.05795 | 3.40995e-06 | 2.14183e-05 | Specific Liver_high |
| Cep152                                                                        | 4.64405 | 1.30427 | 3.41642e-06 | 2.14548e-05 | Specific Liver_high |
| Arid3a                                                                        | 4.63706 | 1.37541 | 3.53401e-06 | 2.21717e-05 | Specific Liver_high |
| Zfp120                                                                        | 4.62844 | 1.16586 | 3.68432e-06 | 2.30923e-05 | Specific Liver_high |
| Zfp626                                                                        | 4.6143  | 1.21287 | 3.94424e-06 | 2.46974e-05 | Specific Liver_high |
| Ercc4                                                                         | 4.60212 | 1.00541 | 4.18209e-06 | 2.6136e-05  | Specific Liver_high |
| Vipr1                                                                         | 4.59287 | 3.98921 | 4.37193e-06 | 2.73066e-05 | Specific Liver_high |
| Ftx                                                                           | 4.59037 | 1.31307 | 4.42453e-06 | 2.76245e-05 | Specific Liver_high |
| Heatr1                                                                        | 4.58973 | 1.26297 | 4.43826e-06 | 2.77048e-05 | Specific Liver_high |
| Dennd4b                                                                       | 4.58341 | 2.03946 | 4.57455e-06 | 2.8539e-05  | Specific Liver_high |
| Rad51b                                                                        | 4.57669 | 2.01518 | 4.72388e-06 | 2.94479e-05 | Specific Liver_high |
| Ppip5k1                                                                       | 4.56904 | 1.11976 | 4.89967e-06 | 3.05084e-05 | Specific Liver_high |
| Dhx35                                                                         | 4.56846 | 1.23981 | 4.91326e-06 | 3.05871e-05 | Specific Liver_high |
| Mitf                                                                          | 4.53864 | 1.33402 | 5.6617e-06  | 3.5138e-05  | Specific Liver_high |
| Gtf2e1                                                                        | 4.53563 | 1.09426 | 5.74307e-06 | 3.56293e-05 | Specific Liver_high |
| 1110018N20Rik                                                                 | 4.5349  | 1.52202 | 5.763e-06   | 3.57461e-05 | Specific Liver_high |
| Cdc14b                                                                        | 4.52719 | 1.02857 | 5.97735e-06 | 3.70259e-05 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Utp20                                                                         | 4.51192 | 1.15979 | 6.42446e-06 | 3.96964e-05 | Specific Liver_high |
| Ctc1                                                                          | 4.48821 | 1.0826  | 7.18249e-06 | 4.43208e-05 | Specific Liver_high |
| 1700109H08Rik                                                                 | 4.4839  | 1.1165  | 7.32926e-06 | 4.52006e-05 | Specific Liver_high |
| Cebpa                                                                         | 4.47011 | 2.06204 | 7.8178e-06  | 4.81032e-05 | Specific Liver_high |
| Unc13d                                                                        | 4.45613 | 4.90746 | 8.34508e-06 | 5.12792e-05 | Specific Liver_high |
| Rgs10                                                                         | 4.45429 | 2.12819 | 8.41715e-06 | 5.17122e-05 | Specific Liver_high |
| Ttc21b                                                                        | 4.45046 | 1.05105 | 8.56854e-06 | 5.26122e-05 | Specific Liver_high |
| Ptprd                                                                         | 4.43964 | 4.20696 | 9.01096e-06 | 5.52343e-05 | Specific Liver_high |
| Plagl2                                                                        | 4.43006 | 1.50747 | 9.42081e-06 | 5.76699e-05 | Specific Liver_high |
| Slc35b4                                                                       | 4.42563 | 1.07065 | 9.61605e-06 | 5.88316e-05 | Specific Liver_high |
| Sele                                                                          | 4.41578 | 5.06169 | 1.00649e-05 | 6.15074e-05 | Specific Liver_high |
| G530011O06Rik                                                                 | 4.40841 | 4.80169 | 1.04134e-05 | 6.35885e-05 | Specific Liver_high |
| Elk1                                                                          | 4.39465 | 1.75747 | 1.1095e-05  | 6.76364e-05 | Specific Liver_high |
| Tbc1d24                                                                       | 4.38292 | 1.06434 | 1.171e-05   | 7.12508e-05 | Specific Liver_high |
| Zbtb5                                                                         | 4.37381 | 1.34855 | 1.22095e-05 | 7.42203e-05 | Specific Liver_high |
| Gm2788                                                                        | 4.36946 | 4.12868 | 1.24555e-05 | 7.56874e-05 | Specific Liver_high |
| Rnf24                                                                         | 4.36859 | 1.44127 | 1.25054e-05 | 7.59619e-05 | Specific Liver_high |
| Flvcr1                                                                        | 4.34493 | 1.03814 | 1.39321e-05 | 8.43899e-05 | Specific Liver_high |
| Adm                                                                           | 4.34157 | 1.49554 | 1.41472e-05 | 8.56605e-05 | Specific Liver_high |
| Vegfa                                                                         | 4.33942 | 1.91086 | 1.42858e-05 | 8.64348e-05 | Specific Liver_high |
| Aldh8a1                                                                       | 4.33813 | 4.59178 | 1.43697e-05 | 8.69265e-05 | Specific Liver_high |
| Bub1b                                                                         | 4.32853 | 3.85969 | 1.50109e-05 | 9.07371e-05 | Specific Liver_high |
| Fhdc1                                                                         | 4.32581 | 1.92406 | 1.51972e-05 | 9.1846e-05  | Specific Liver_high |
| Mtbp                                                                          | 4.32265 | 1.51141 | 1.54166e-05 | 9.312e-05   | Specific Liver_high |
| Megf11                                                                        | 4.3086  | 3.28686 | 1.64288e-05 | 9.91226e-05 | Specific Liver_high |
| Gm10687                                                                       | 4.30001 | 1.00695 | 1.70789e-05 | 0.000102891 | Specific Liver_high |
| Arid3b                                                                        | 4.29943 | 2.06632 | 1.71237e-05 | 0.000103141 | Specific Liver_high |
| Mettl14                                                                       | 4.29348 | 1.09912 | 1.75892e-05 | 0.000105867 | Specific Liver_high |
| Ang                                                                           | 4.28502 | 1.59318 | 1.82724e-05 | 0.000109856 | Specific Liver_high |
| Tmem51os1                                                                     | 4.27637 | 3.38943 | 1.89966e-05 | 0.000114018 | Specific Liver_high |
| Sergef                                                                        | 4.27233 | 1.13491 | 1.93444e-05 | 0.000116041 | Specific Liver_high |
| Ttc7                                                                          | 4.25965 | 2.41842 | 2.04744e-05 | 0.00012266  | Specific Liver_high |
| 4930542D17Rik                                                                 | 4.25652 | 1.54223 | 2.07633e-05 | 0.000124345 | Specific Liver_high |
| Gm16675                                                                       | 4.23497 | 1.50483 | 2.28584e-05 | 0.000136512 | Specific Liver_high |
| Uevld                                                                         | 4.22251 | 1.08804 | 2.41594e-05 | 0.000144095 | Specific Liver_high |
| Sugct                                                                         | 4.22168 | 1.78106 | 2.42486e-05 | 0.0001446   | Specific Liver_high |
| Gm16271                                                                       | 4.21401 | 4.45599 | 2.50876e-05 | 0.000149548 | Specific Liver_high |
| Dusp5                                                                         | 4.21049 | 1.81782 | 2.54822e-05 | 0.000151844 | Specific Liver_high |
| Dbf4                                                                          | 4.20535 | 1.37506 | 2.60675e-05 | 0.00015516  | Specific Liver_high |
| Trim32                                                                        | 4.18579 | 1.38459 | 2.8418e-05  | 0.000168653 | Specific Liver_high |
| Osbp15                                                                        | 4.1855  | 1.4329  | 2.8454e-05  | 0.000168836 | Specific Liver_high |
| Zfp597                                                                        | 4.17962 | 1.03185 | 2.92002e-05 | 0.000173147 | Specific Liver_high |
| Zfp808                                                                        | 4.1796  | 1.6134  | 2.9202e-05  | 0.000173147 | Specific Liver_high |
| Gpc4                                                                          | 4.17779 | 2.28807 | 2.9435e-05  | 0.0001744   | Specific Liver_high |
| Pfkfb2                                                                        | 4.17433 | 1.14563 | 2.98863e-05 | 0.000176912 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Gm42702                                                                       | 4.15639 | 1.25698 | 3.23318e-05 | 0.000191178 | Specific Liver_high |
| Gm42397                                                                       | 4.15453 | 3.84979 | 3.25951e-05 | 0.000192664 | Specific Liver_high |
| Catsperg1                                                                     | 4.14607 | 2.68881 | 3.38231e-05 | 0.000199849 | Specific Liver_high |
| Acot11                                                                        | 4.13557 | 2.78085 | 3.54079e-05 | 0.000209061 | Specific Liver_high |
| Gtpbp10                                                                       | 4.13382 | 1.18114 | 3.5678e-05  | 0.000210579 | Specific Liver_high |
| AW146154                                                                      | 4.13375 | 1.27319 | 3.5689e-05  | 0.000210605 | Specific Liver_high |
| Tars2                                                                         | 4.12788 | 1.12254 | 3.66128e-05 | 0.000215859 | Specific Liver_high |
| Parp3                                                                         | 4.11794 | 2.18305 | 3.82273e-05 | 0.00022509  | Specific Liver_high |
| Prorp                                                                         | 4.11285 | 1.15783 | 3.90797e-05 | 0.000229941 | Specific Liver_high |
| Blcap                                                                         | 4.0988  | 1.03939 | 4.15291e-05 | 0.000244086 | Specific Liver_high |
| Gm43260                                                                       | 4.08857 | 1.47122 | 4.34031e-05 | 0.000254823 | Specific Liver_high |
| Rcl1                                                                          | 4.05234 | 1.07413 | 5.07069e-05 | 0.000296195 | Specific Liver_high |
| Rfx5                                                                          | 4.03921 | 1.31171 | 5.36316e-05 | 0.000312657 | Specific Liver_high |
| Rundc1                                                                        | 4.03552 | 1.14609 | 5.44815e-05 | 0.000317325 | Specific Liver_high |
| Nupl2                                                                         | 4.02674 | 1.2579  | 5.65567e-05 | 0.000329116 | Specific Liver_high |
| Slc17a9                                                                       | 4.01304 | 2.82221 | 5.99422e-05 | 0.000348064 | Specific Liver_high |
| Rab20                                                                         | 4.00512 | 1.36595 | 6.19857e-05 | 0.000358961 | Specific Liver_high |
| Sall2                                                                         | 3.99589 | 1.35852 | 6.44522e-05 | 0.00037271  | Specific Liver_high |
| Gm13816                                                                       | 3.995   | 2.78018 | 6.46953e-05 | 0.000373915 | Specific Liver_high |
| Gm43696                                                                       | 3.99121 | 1.34844 | 6.57364e-05 | 0.000379728 | Specific Liver_high |
| Btbd8                                                                         | 3.98843 | 1.04696 | 6.65111e-05 | 0.000384134 | Specific Liver_high |
| 1700028E10Rik                                                                 | 3.98457 | 2.06513 | 6.76013e-05 | 0.000390221 | Specific Liver_high |
| Fam78a                                                                        | 3.98085 | 2.2811  | 6.86689e-05 | 0.0003961   | Specific Liver_high |
| Extl2                                                                         | 3.97177 | 1.39966 | 7.13394e-05 | 0.000411064 | Specific Liver_high |
| Cd209b                                                                        | 3.97138 | 4.22874 | 7.14583e-05 | 0.000411676 | Specific Liver_high |
| Tbccd1                                                                        | 3.9677  | 1.15867 | 7.2569e-05  | 0.000417851 | Specific Liver_high |
| Lpin3                                                                         | 3.96647 | 1.15347 | 7.29462e-05 | 0.000419798 | Specific Liver_high |
| Gm19951                                                                       | 3.96205 | 1.7136  | 7.43076e-05 | 0.000427252 | Specific Liver_high |
| Zfp629                                                                        | 3.95416 | 1.21638 | 7.68052e-05 | 0.000441141 | Specific Liver_high |
| Zfp141                                                                        | 3.95076 | 1.53264 | 7.79021e-05 | 0.000447123 | Specific Liver_high |
| Cluh                                                                          | 3.93585 | 1.20191 | 8.29043e-05 | 0.00047499  | Specific Liver_high |
| Slc7a8                                                                        | 3.93488 | 4.62968 | 8.32373e-05 | 0.000476812 | Specific Liver_high |
| Ccdc122                                                                       | 3.93145 | 1.55714 | 8.4434e-05  | 0.000483496 | Specific Liver_high |
| Gm32067                                                                       | 3.92137 | 2.83119 | 8.80451e-05 | 0.000503371 | Specific Liver_high |
| Clybl                                                                         | 3.91562 | 1.07255 | 9.01708e-05 | 0.000514977 | Specific Liver_high |
| Gm29488                                                                       | 3.90523 | 1.48814 | 9.41378e-05 | 0.000536778 | Specific Liver_high |
| Mroh7                                                                         | 3.89949 | 4.81103 | 9.63945e-05 | 0.000549355 | Specific Liver_high |
| N4bp2                                                                         | 3.89776 | 1.02677 | 9.70862e-05 | 0.000553199 | Specific Liver_high |
| Kmt5c                                                                         | 3.88727 | 1.09049 | 0.000101377 | 0.000576427 | Specific Liver_high |
| 5830444B04Rik                                                                 | 3.87879 | 1.38799 | 0.00010498  | 0.000596177 | Specific Liver_high |
| Ccdc171                                                                       | 3.87486 | 2.69004 | 0.000106688 | 0.000605455 | Specific Liver_high |
| Gatb                                                                          | 3.87358 | 1.31783 | 0.00010725  | 0.000608428 | Specific Liver_high |
| Zfp280b                                                                       | 3.86715 | 1.52917 | 0.000110113 | 0.000623791 | Specific Liver_high |
| Cdk18                                                                         | 3.86516 | 2.76689 | 0.000111017 | 0.000628804 | Specific Liver_high |
| Cela1                                                                         | 3.86019 | 3.55328 | 0.000113299 | 0.000641615 | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Tmem106c                                                                      | 3.8577  | 1.48781 | 0.000114459 | 0.00064796  | Specific Liver_high |
| A830019P07Rik                                                                 | 3.84293 | 3.23362 | 0.000121573 | 0.000686908 | Specific Liver_high |
| Msi1                                                                          | 3.80898 | 4.54797 | 0.000139538 | 0.000785116 | Specific Liver_high |
| Lrrc1                                                                         | 3.80715 | 1.54013 | 0.000140575 | 0.000790535 | Specific Liver_high |
| Ush1g                                                                         | 3.79538 | 2.70131 | 0.000147416 | 0.000827708 | Specific Liver_high |
| Primpol                                                                       | 3.79308 | 1.36429 | 0.000148793 | 0.000834858 | Specific Liver_high |
| Glb1l                                                                         | 3.77768 | 1.83372 | 0.000158293 | 0.000886929 | Specific Liver_high |
| Hoxa2                                                                         | 3.76534 | 2.42677 | 0.000166324 | 0.000930475 | Specific Liver_high |
| Neil2                                                                         | 3.75371 | 5.33169 | 0.000174238 | 0.000974073 | Specific Liver_high |
| Figl12                                                                        | 3.75142 | 1.21226 | 0.000175833 | 0.000982819 | Specific Liver_high |
| Lysmd1                                                                        | 3.74562 | 1.45415 | 0.000179948 | 0.00100478  | Specific Liver_high |
| Pigg                                                                          | 3.72197 | 1.21388 | 0.000197675 | 0.00109977  | Specific Liver_high |
| Taf4b                                                                         | 3.71297 | 1.09645 | 0.00020484  | 0.00113806  | Specific Liver_high |
| Tmco4                                                                         | 3.70837 | 1.14723 | 0.0002086   | 0.00115815  | Specific Liver_high |
| Ggcx                                                                          | 3.69503 | 1.01954 | 0.000219862 | 0.00121837  | Specific Liver_high |
| Edaradd                                                                       | 3.67205 | 4.00816 | 0.000240611 | 0.00132925  | Specific Liver_high |
| Gpam                                                                          | 3.66452 | 1.41553 | 0.000247806 | 0.00136783  | Specific Liver_high |
| Prrg3                                                                         | 3.66394 | 1.26169 | 0.000248368 | 0.0013707   | Specific Liver_high |
| Phka2                                                                         | 3.62967 | 1.02948 | 0.00028378  | 0.00155946  | Specific Liver_high |
| Slc39a12                                                                      | 3.61577 | 3.24259 | 0.000299451 | 0.00164278  | Specific Liver_high |
| Mms22l                                                                        | 3.61557 | 2.16104 | 0.000299686 | 0.00164323  | Specific Liver_high |
| Aldh4a1                                                                       | 3.61051 | 1.47575 | 0.000305597 | 0.00167451  | Specific Liver_high |
| Incenp                                                                        | 3.60135 | 1.35674 | 0.000316574 | 0.00173201  | Specific Liver_high |
| Gga2                                                                          | 3.60039 | 1.1723  | 0.000317736 | 0.00173778  | Specific Liver_high |
| Elovl6                                                                        | 3.59061 | 1.18745 | 0.000329902 | 0.00180248  | Specific Liver_high |
| Slc29a3                                                                       | 3.58979 | 1.24576 | 0.000330943 | 0.00180756  | Specific Liver_high |
| Gmppa                                                                         | 3.57542 | 1.06727 | 0.000349666 | 0.00190467  | Specific Liver_high |
| Mtx3                                                                          | 3.55952 | 1.70576 | 0.00037154  | 0.00201905  | Specific Liver_high |
| Klhl32                                                                        | 3.55815 | 3.54732 | 0.000373473 | 0.00202921  | Specific Liver_high |
| Gm4924                                                                        | 3.55113 | 3.43845 | 0.000383586 | 0.00208311  | Specific Liver_high |
| Rgs2                                                                          | 3.55051 | 1.38565 | 0.000384481 | 0.00208762  | Specific Liver_high |
| Ddx19b                                                                        | 3.54827 | 1.58596 | 0.000387774 | 0.00210514  | Specific Liver_high |
| Hebp1                                                                         | 3.54358 | 1.33403 | 0.000394737 | 0.00214114  | Specific Liver_high |
| Zfp975                                                                        | 3.50824 | 1.42653 | 0.000451083 | 0.00243492  | Specific Liver_high |
| Fads3                                                                         | 3.50783 | 2.12442 | 0.000451772 | 0.00243782  | Specific Liver_high |
| Trnfai3                                                                       | 3.50294 | 1.00722 | 0.000460144 | 0.00248009  | Specific Liver_high |
| C130026I21Rik                                                                 | 3.49777 | 3.75095 | 0.000469158 | 0.00252699  | Specific Liver_high |
| Amy1                                                                          | 3.49578 | 1.2801  | 0.000472681 | 0.00254511  | Specific Liver_high |
| Gm21860                                                                       | 3.4913  | 3.58388 | 0.000480683 | 0.00258734  | Specific Liver_high |
| Cd27                                                                          | 3.4838  | 1.16401 | 0.000494359 | 0.00265696  | Specific Liver_high |
| Dars2                                                                         | 3.47216 | 1.24092 | 0.00051628  | 0.00277293  | Specific Liver_high |
| B230216N24Rik                                                                 | 3.47041 | 1.69116 | 0.000519666 | 0.00279065  | Specific Liver_high |
| Vva7                                                                          | 3.46655 | 4.21595 | 0.000527184 | 0.00283008  | Specific Liver_high |
| Susd4                                                                         | 3.45686 | 3.20163 | 0.000546511 | 0.00292897  | Specific Liver_high |
| Rab32                                                                         | 3.45047 | 2.04485 | 0.00055962  | 0.00299475  | Specific Liver_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |            |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|------------|---------------------|
| Abcc3                                                                         | 3.44543 | 1.50515 | 0.000570158 | 0.00304811 | Specific Liver_high |
| Plek                                                                          | 3.43099 | 1.25798 | 0.000601394 | 0.00320767 | Specific Liver_high |
| Ccdc162                                                                       | 3.42612 | 3.34085 | 0.000612258 | 0.00326346 | Specific Liver_high |
| 2610021A01Rik                                                                 | 3.42387 | 1.43655 | 0.000617372 | 0.00329017 | Specific Liver_high |
| Gm14964                                                                       | 3.41451 | 3.86289 | 0.000638959 | 0.00340016 | Specific Liver_high |
| Gm48653                                                                       | 3.40001 | 3.56027 | 0.000673821 | 0.00357919 | Specific Liver_high |
| Tafa2                                                                         | 3.38732 | 3.59386 | 0.000705781 | 0.0037428  | Specific Liver_high |
| Dnah8                                                                         | 3.38704 | 3.3972  | 0.000706522 | 0.00374611 | Specific Liver_high |
| E230016M11Rik                                                                 | 3.36282 | 1.92068 | 0.0007715   | 0.00407524 | Specific Liver_high |
| Wnt9b                                                                         | 3.35042 | 3.8845  | 0.000806895 | 0.00425385 | Specific Liver_high |
| Armc9                                                                         | 3.35032 | 1.15718 | 0.000807184 | 0.00425468 | Specific Liver_high |
| Gm12905                                                                       | 3.34998 | 1.9189  | 0.000808188 | 0.00425928 | Specific Liver_high |
| Glipr2                                                                        | 3.33882 | 3.64376 | 0.000841346 | 0.00442536 | Specific Liver_high |
| Usp49                                                                         | 3.33528 | 1.01038 | 0.000852126 | 0.0044806  | Specific Liver_high |
| Tln2                                                                          | 3.31605 | 1.20988 | 0.000912989 | 0.00478581 | Specific Liver_high |
| Ift80                                                                         | 3.30866 | 1.1119  | 0.000937425 | 0.00490833 | Specific Liver_high |
| Rpgrip1l                                                                      | 3.30787 | 1.075   | 0.000940098 | 0.00492153 | Specific Liver_high |
| Pyroxd2                                                                       | 3.30695 | 3.42795 | 0.000943175 | 0.00493523 | Specific Liver_high |
| Gm31458                                                                       | 3.3067  | 3.32713 | 0.000944033 | 0.00493893 | Specific Liver_high |
| Adap2os                                                                       | 3.30575 | 4.86927 | 0.000947234 | 0.00495406 | Specific Liver_high |
| Fntb                                                                          | 3.29731 | 1.23824 | 0.000976168 | 0.00510043 | Specific Liver_high |
| Zip219                                                                        | 3.2932  | 1.28448 | 0.000990532 | 0.00517214 | Specific Liver_high |
| Galm                                                                          | 3.29028 | 1.42222 | 0.00100089  | 0.00522283 | Specific Liver_high |
| Hykk                                                                          | 3.28881 | 1.01717 | 0.00100612  | 0.00524929 | Specific Liver_high |
| Ttf2                                                                          | 3.26021 | 1.35153 | 0.0011133   | 0.00577862 | Specific Liver_high |
| 9530020I12Rik                                                                 | 3.24884 | 5.36955 | 0.00115877  | 0.00600402 | Specific Liver_high |
| Gm553                                                                         | 3.24665 | 1.97643 | 0.00116772  | 0.00604828 | Specific Liver_high |
| Asb1                                                                          | 3.23547 | 1.39744 | 0.00121444  | 0.00628236 | Specific Liver_high |
| Napb                                                                          | 3.22747 | 1.3289  | 0.0012489   | 0.00645753 | Specific Liver_high |
| Cdk20                                                                         | 3.22053 | 1.46578 | 0.00127952  | 0.00660738 | Specific Liver_high |
| Dnah2os                                                                       | 3.2168  | 2.48861 | 0.00129628  | 0.00668751 | Specific Liver_high |
| Slc46a1                                                                       | 3.20974 | 5.21802 | 0.00132853  | 0.00684297 | Specific Liver_high |
| E030013I19Rik                                                                 | 3.1829  | 4.10507 | 0.00145809  | 0.00748045 | Specific Liver_high |
| 3300002I08Rik                                                                 | 3.18283 | 1.04843 | 0.00145845  | 0.00748109 | Specific Liver_high |
| Satb2                                                                         | 3.18001 | 2.04883 | 0.00147272  | 0.00755191 | Specific Liver_high |
| Slc25a35                                                                      | 3.1708  | 1.72475 | 0.0015202   | 0.00778153 | Specific Liver_high |
| Dglucy                                                                        | 3.17076 | 1.17346 | 0.00152039  | 0.00778153 | Specific Liver_high |
| Rmdn2                                                                         | 3.17003 | 1.30543 | 0.00152422  | 0.00779867 | Specific Liver_high |
| Neu3                                                                          | 3.14858 | 1.2194  | 0.00164064  | 0.00837441 | Specific Liver_high |
| Nrxn2                                                                         | 3.13708 | 4.06184 | 0.00170637  | 0.00869477 | Specific Liver_high |
| Pigb                                                                          | 3.12982 | 1.35243 | 0.00174911  | 0.00890274 | Specific Liver_high |
| Gprc5c                                                                        | 3.12048 | 4.26871 | 0.00180558  | 0.00917859 | Specific Liver_high |
| Wdr81                                                                         | 3.10811 | 1.36631 | 0.0018829   | 0.00956111 | Specific Liver_high |
| Epor                                                                          | 3.10714 | 2.18207 | 0.00188905  | 0.00959079 | Specific Liver_high |
| Metrn                                                                         | 3.09475 | 1.60903 | 0.00196976  | 0.00998802 | Specific Liver_high |



| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Itm2a                                                                         | 25.7181 | 5.65058 | 7.3372e-146 | 7.8961e-142 | Specific Brain_high |
| Bsg                                                                           | 25.2902 | 4.69959 | 4.0975e-141 | 3.3072e-137 | Specific Brain_high |
| Slco1a4                                                                       | 24.9522 | 7.57757 | 2.0213e-137 | 1.3052e-133 | Specific Brain_high |
| Cldn5                                                                         | 24.1786 | 3.98766 | 3.7326e-129 | 1.7215e-125 | Specific Brain_high |
| Pltp                                                                          | 24.0325 | 4.25562 | 1.272e-127  | 5.1333e-124 | Specific Brain_high |
| Ptn                                                                           | 23.6289 | 7.26835 | 1.9468e-123 | 6.2854e-120 | Specific Brain_high |
| Spock2                                                                        | 23.3074 | 7.27612 | 3.7282e-120 | 1.003e-116  | Specific Brain_high |
| Slco1c1                                                                       | 22.9521 | 7.25692 | 1.4023e-116 | 3.4825e-113 | Specific Brain_high |
| Abcb1a                                                                        | 21.124  | 5.85278 | 4.7833e-99  | 7.35368e-96 | Specific Brain_high |
| Igf1r                                                                         | 19.8739 | 2.9912  | 6.84582e-88 | 7.89348e-85 | Specific Brain_high |
| Slc6a6                                                                        | 19.5258 | 3.41635 | 6.62355e-85 | 6.48004e-82 | Specific Brain_high |
| Sema3c                                                                        | 18.5134 | 5.76276 | 1.61068e-76 | 1.00001e-73 | Specific Brain_high |
| Slc39a10                                                                      | 18.4264 | 4.26578 | 8.06202e-76 | 4.91099e-73 | Specific Brain_high |
| Slc2a1                                                                        | 18.2796 | 5.68378 | 1.2021e-74  | 6.93033e-72 | Specific Brain_high |
| Gpcpd1                                                                        | 18.0665 | 4.2229  | 5.85023e-73 | 3.25646e-70 | Specific Brain_high |
| Lef1                                                                          | 17.9678 | 4.99883 | 3.47981e-72 | 1.78327e-69 | Specific Brain_high |
| Cxcl12                                                                        | 17.702  | 4.71849 | 4.04467e-70 | 1.92033e-67 | Specific Brain_high |
| Sorbs2                                                                        | 17.5028 | 3.61627 | 1.36391e-68 | 6.11582e-66 | Specific Brain_high |
| Flt1                                                                          | 17.346  | 1.2782  | 2.11524e-67 | 9.1054e-65  | Specific Brain_high |
| Tmsb4x                                                                        | 17.168  | 1.3582  | 4.61041e-66 | 1.9083e-63  | Specific Brain_high |
| Ablim1                                                                        | 17.131  | 3.10928 | 8.70936e-66 | 3.55926e-63 | Specific Brain_high |
| Pglyrp1                                                                       | 16.7372 | 6.38859 | 7.02003e-63 | 2.60508e-60 | Specific Brain_high |
| Abhd2                                                                         | 16.2091 | 4.47176 | 4.35e-59    | 1.44783e-56 | Specific Brain_high |
| Rpl38                                                                         | 16.102  | 1.42484 | 2.46952e-58 | 7.97285e-56 | Specific Brain_high |
| Abcg2                                                                         | 15.9595 | 2.28899 | 2.44869e-57 | 7.67533e-55 | Specific Brain_high |
| Neb1                                                                          | 15.8305 | 4.86847 | 1.91837e-56 | 5.6304e-54  | Specific Brain_high |
| Ccdc141                                                                       | 15.7689 | 6.49731 | 5.0926e-56  | 1.44223e-53 | Specific Brain_high |
| Ly6c1                                                                         | 15.7095 | 2.20165 | 1.30266e-55 | 3.59457e-53 | Specific Brain_high |
| Fn1                                                                           | 15.3343 | 6.20105 | 4.50921e-53 | 1.19328e-50 | Specific Brain_high |
| Jcad                                                                          | 15.1005 | 2.66868 | 1.60622e-51 | 3.92855e-49 | Specific Brain_high |
| Mecom                                                                         | 14.989  | 2.99401 | 8.66211e-51 | 2.04129e-48 | Specific Brain_high |
| Myl6                                                                          | 14.8806 | 1.12451 | 4.40738e-50 | 1.00917e-47 | Specific Brain_high |
| Pcp4l1                                                                        | 14.7424 | 3.11201 | 3.4406e-49  | 7.66068e-47 | Specific Brain_high |
| Itih5                                                                         | 14.5009 | 3.68876 | 1.19626e-47 | 2.50787e-45 | Specific Brain_high |
| Esyt2                                                                         | 14.422  | 2.47091 | 3.76302e-47 | 7.73815e-45 | Specific Brain_high |
| Utrn                                                                          | 14.1313 | 1.57695 | 2.43644e-45 | 4.7673e-43  | Specific Brain_high |
| Prom1                                                                         | 13.911  | 6.00354 | 5.42977e-44 | 1.00747e-41 | Specific Brain_high |
| Tjp1                                                                          | 13.5565 | 1.6175  | 7.25424e-42 | 1.22619e-39 | Specific Brain_high |
| Slc7a1                                                                        | 13.4346 | 4.82219 | 3.79101e-41 | 6.21283e-39 | Specific Brain_high |
| Cobll1                                                                        | 13.0862 | 4.75582 | 3.94764e-39 | 5.81962e-37 | Specific Brain_high |
| Sgms1                                                                         | 12.9093 | 1.82384 | 3.98893e-38 | 5.45689e-36 | Specific Brain_high |
| Kitl                                                                          | 12.8784 | 1.66223 | 5.95896e-38 | 8.04958e-36 | Specific Brain_high |
| Tfrc                                                                          | 12.4579 | 6.27686 | 1.26724e-35 | 1.5266e-33  | Specific Brain_high |
| Fry                                                                           | 12.2546 | 2.28784 | 1.58753e-34 | 1.81108e-32 | Specific Brain_high |
| Tmsb10                                                                        | 12.1004 | 2.1338  | 1.05089e-33 | 1.10155e-31 | Specific Brain_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Atp10a                                                                        | 11.922  | 4.5652  | 9.08936e-33 | 8.81231e-31 | Specific Brain_high |
| Foxq1                                                                         | 11.8553 | 5.67143 | 2.01945e-32 | 1.91758e-30 | Specific Brain_high |
| Rundc3b                                                                       | 11.7721 | 5.06915 | 5.43306e-32 | 5.08424e-30 | Specific Brain_high |
| Tspan13                                                                       | 11.6469 | 2.33761 | 2.37915e-31 | 2.13958e-29 | Specific Brain_high |
| Car4                                                                          | 11.0421 | 2.6897  | 2.3925e-28  | 1.83038e-26 | Specific Brain_high |
| Atox1                                                                         | 11.0387 | 1.1659  | 2.48491e-28 | 1.89658e-26 | Specific Brain_high |
| Sparcl1                                                                       | 10.846  | 2.02057 | 2.0841e-27  | 1.49855e-25 | Specific Brain_high |
| Gng5                                                                          | 10.7685 | 1.07395 | 4.84628e-27 | 3.41621e-25 | Specific Brain_high |
| Frmd5                                                                         | 10.4493 | 6.3195  | 1.47661e-25 | 9.20315e-24 | Specific Brain_high |
| Ly6a                                                                          | 9.97508 | 1.31328 | 1.95947e-23 | 1.08324e-21 | Specific Brain_high |
| Usp53                                                                         | 9.9651  | 4.39945 | 2.16661e-23 | 1.19571e-21 | Specific Brain_high |
| Slc22a8                                                                       | 9.93433 | 6.01905 | 2.95141e-23 | 1.61229e-21 | Specific Brain_high |
| Dnm3                                                                          | 9.87517 | 2.00761 | 5.33447e-23 | 2.85611e-21 | Specific Brain_high |
| Hmcn1                                                                         | 9.77159 | 2.03383 | 1.49091e-22 | 7.8394e-21  | Specific Brain_high |
| Ctsh                                                                          | 9.62441 | 4.87039 | 6.30659e-22 | 3.18636e-20 | Specific Brain_high |
| Maoa                                                                          | 9.55736 | 3.58669 | 1.20803e-21 | 5.9453e-20  | Specific Brain_high |
| Elovl7                                                                        | 9.55595 | 6.01246 | 1.22458e-21 | 6.0176e-20  | Specific Brain_high |
| Gsta4                                                                         | 9.39189 | 5.83727 | 5.89317e-21 | 2.75741e-19 | Specific Brain_high |
| Palmd                                                                         | 9.19631 | 2.06584 | 3.70469e-20 | 1.6362e-18  | Specific Brain_high |
| Apcdd1                                                                        | 9.1524  | 4.85404 | 5.56818e-20 | 2.413e-18   | Specific Brain_high |
| Tsc22d1                                                                       | 9.09394 | 1.15001 | 9.55157e-20 | 4.07361e-18 | Specific Brain_high |
| Dach1                                                                         | 8.97404 | 3.35569 | 2.85827e-19 | 1.16661e-17 | Specific Brain_high |
| Ndnf                                                                          | 8.72715 | 6.10152 | 2.61161e-18 | 9.80417e-17 | Specific Brain_high |
| Hspb1                                                                         | 8.6871  | 1.3115  | 3.71797e-18 | 1.37654e-16 | Specific Brain_high |
| Ocln                                                                          | 8.54631 | 5.8463  | 1.27088e-17 | 4.51878e-16 | Specific Brain_high |
| Vwa1                                                                          | 8.48796 | 2.86906 | 2.10293e-17 | 7.33978e-16 | Specific Brain_high |
| Grb14                                                                         | 8.3467  | 5.39828 | 7.01987e-17 | 2.36573e-15 | Specific Brain_high |
| Ebf1                                                                          | 8.32072 | 1.15577 | 8.74263e-17 | 2.931e-15   | Specific Brain_high |
| St8sia4                                                                       | 8.26503 | 2.39044 | 1.39663e-16 | 4.57306e-15 | Specific Brain_high |
| Srarp                                                                         | 8.24444 | 5.21418 | 1.65941e-16 | 5.38975e-15 | Specific Brain_high |
| Arl4a                                                                         | 8.2402  | 2.57645 | 1.71926e-16 | 5.56324e-15 | Specific Brain_high |
| Mfsd2a                                                                        | 8.14264 | 6.0327  | 3.86736e-16 | 1.20636e-14 | Specific Brain_high |
| 1810037I17Rik                                                                 | 8.06169 | 1.42138 | 7.52469e-16 | 2.28968e-14 | Specific Brain_high |
| Edn1                                                                          | 8.04057 | 4.56596 | 8.9425e-16  | 2.70834e-14 | Specific Brain_high |
| Wfdc1                                                                         | 8.0095  | 4.13347 | 1.15173e-15 | 3.46863e-14 | Specific Brain_high |
| Vim                                                                           | 7.82247 | 1.54802 | 5.17986e-15 | 1.46182e-13 | Specific Brain_high |
| Ndufa7                                                                        | 7.66515 | 1.30614 | 1.78628e-14 | 4.78589e-13 | Specific Brain_high |
| Lsr                                                                           | 7.58169 | 5.63435 | 3.41073e-14 | 8.9452e-13  | Specific Brain_high |
| Mal                                                                           | 7.51509 | 2.36382 | 5.68739e-14 | 1.45728e-12 | Specific Brain_high |
| Slc16a4                                                                       | 7.50042 | 5.37317 | 6.36144e-14 | 1.62099e-12 | Specific Brain_high |
| Paqr5                                                                         | 7.41818 | 5.35604 | 1.18738e-13 | 2.95336e-12 | Specific Brain_high |
| Tspan5                                                                        | 7.26497 | 1.96865 | 3.73113e-13 | 8.83781e-12 | Specific Brain_high |
| Ahnak                                                                         | 7.14616 | 1.18254 | 8.92415e-13 | 2.01903e-11 | Specific Brain_high |
| Id1                                                                           | 7.14151 | 1.28806 | 9.23093e-13 | 2.0826e-11  | Specific Brain_high |
| Slc16a1                                                                       | 7.07353 | 3.34026 | 1.51044e-12 | 3.34692e-11 | Specific Brain_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Slc40a1                                                                       | 7.03025 | 2.17396 | 2.06159e-12 | 4.5247e-11  | Specific Brain_high |
| Tnfrsf19                                                                      | 6.96027 | 6.2165  | 3.39616e-12 | 7.29024e-11 | Specific Brain_high |
| Golim4                                                                        | 6.91258 | 2.00764 | 4.75922e-12 | 1.00426e-10 | Specific Brain_high |
| Sgpp2                                                                         | 6.91122 | 4.78427 | 4.80493e-12 | 1.01258e-10 | Specific Brain_high |
| Adgrl3                                                                        | 6.87364 | 6.41337 | 6.25847e-12 | 1.29689e-10 | Specific Brain_high |
| Foxc1                                                                         | 6.84673 | 3.96579 | 7.55581e-12 | 1.55375e-10 | Specific Brain_high |
| Ldlrad3                                                                       | 6.72189 | 2.74871 | 1.79381e-11 | 3.55514e-10 | Specific Brain_high |
| Slc38a5                                                                       | 6.71784 | 6.50084 | 1.84431e-11 | 3.65074e-10 | Specific Brain_high |
| Plip                                                                          | 6.71265 | 5.73788 | 1.91125e-11 | 3.77861e-10 | Specific Brain_high |
| Col4a3bp                                                                      | 6.65132 | 1.46081 | 2.90471e-11 | 5.63912e-10 | Specific Brain_high |
| Klf4                                                                          | 6.4089  | 1.51459 | 1.46577e-10 | 2.64815e-09 | Specific Brain_high |
| Nxpe4                                                                         | 6.17581 | 1.4366  | 6.58254e-10 | 1.09376e-08 | Specific Brain_high |
| Fam13c                                                                        | 6.13282 | 2.55972 | 8.63329e-10 | 1.42134e-08 | Specific Brain_high |
| Glul                                                                          | 6.1085  | 1.66786 | 1.00574e-09 | 1.6449e-08  | Specific Brain_high |
| Lrp8                                                                          | 6.06236 | 6.12688 | 1.34137e-09 | 2.15239e-08 | Specific Brain_high |
| Tpm1                                                                          | 6.03638 | 1.57374 | 1.5761e-09  | 2.51405e-08 | Specific Brain_high |
| Gpd2                                                                          | 5.99017 | 2.06577 | 2.09621e-09 | 3.29324e-08 | Specific Brain_high |
| Foxf2                                                                         | 5.87413 | 5.71561 | 4.25072e-09 | 6.46931e-08 | Specific Brain_high |
| Slc16a2                                                                       | 5.79413 | 1.96123 | 6.86742e-09 | 1.01938e-07 | Specific Brain_high |
| Synm                                                                          | 5.65664 | 3.16148 | 1.54367e-08 | 2.18585e-07 | Specific Brain_high |
| Cgnl1                                                                         | 5.64387 | 1.92619 | 1.66268e-08 | 2.34614e-07 | Specific Brain_high |
| Net1                                                                          | 5.60732 | 3.9292  | 2.05481e-08 | 2.86688e-07 | Specific Brain_high |
| Zic3                                                                          | 5.59702 | 6.65539 | 2.18066e-08 | 3.02807e-07 | Specific Brain_high |
| Klf12                                                                         | 5.57674 | 1.12812 | 2.45068e-08 | 3.37976e-07 | Specific Brain_high |
| Slc38a3                                                                       | 5.53142 | 5.98534 | 3.17655e-08 | 4.31992e-07 | Specific Brain_high |
| BC028528                                                                      | 5.47246 | 1.37066 | 4.43827e-08 | 5.91616e-07 | Specific Brain_high |
| Mast4                                                                         | 5.43205 | 1.43227 | 5.57108e-08 | 7.3482e-07  | Specific Brain_high |
| Slc30a1                                                                       | 5.42131 | 2.44238 | 5.91639e-08 | 7.7787e-07  | Specific Brain_high |
| Osbp1a                                                                        | 5.23481 | 2.62844 | 1.65158e-07 | 2.05239e-06 | Specific Brain_high |
| Lmntd1                                                                        | 5.19135 | 5.81381 | 2.08774e-07 | 2.55894e-06 | Specific Brain_high |
| Msi2                                                                          | 5.11142 | 1.07489 | 3.19744e-07 | 3.8361e-06  | Specific Brain_high |
| Pdgfb                                                                         | 5.11125 | 1.23068 | 3.20034e-07 | 3.83815e-06 | Specific Brain_high |
| Far2                                                                          | 5.00898 | 5.59066 | 5.47196e-07 | 6.35476e-06 | Specific Brain_high |
| Pard3                                                                         | 4.99423 | 3.38729 | 5.9072e-07  | 6.81852e-06 | Specific Brain_high |
| Slc7a5                                                                        | 4.99094 | 2.7771  | 6.00865e-07 | 6.92571e-06 | Specific Brain_high |
| Efr3b                                                                         | 4.98482 | 1.94409 | 6.20187e-07 | 7.12553e-06 | Specific Brain_high |
| Cp                                                                            | 4.96383 | 4.36472 | 6.91179e-07 | 7.89063e-06 | Specific Brain_high |
| S1pr1                                                                         | 4.89579 | 1.08757 | 9.7913e-07  | 1.09914e-05 | Specific Brain_high |
| Degs2                                                                         | 4.85996 | 5.09397 | 1.17407e-06 | 1.30752e-05 | Specific Brain_high |
| Ddc                                                                           | 4.80122 | 5.56548 | 1.577e-06   | 1.72412e-05 | Specific Brain_high |
| Tgfb2                                                                         | 4.80006 | 2.94734 | 1.58619e-06 | 1.73183e-05 | Specific Brain_high |
| Tbx1                                                                          | 4.7857  | 6.15721 | 1.70391e-06 | 1.85408e-05 | Specific Brain_high |
| Lrrc49                                                                        | 4.77799 | 2.86794 | 1.77052e-06 | 1.92138e-05 | Specific Brain_high |
| Alas1                                                                         | 4.76268 | 2.69348 | 1.91041e-06 | 2.06695e-05 | Specific Brain_high |
| Fzd6                                                                          | 4.73187 | 2.02417 | 2.2246e-06  | 2.38608e-05 | Specific Brain_high |

| Supplementary Table S4: DEG results for common and organ-specific cEC subsets |         |         |             |             |                     |
|-------------------------------------------------------------------------------|---------|---------|-------------|-------------|---------------------|
| Hmgcs2                                                                        | 4.72349 | 5.18714 | 2.3183e-06  | 2.47917e-05 | Specific Brain_high |
| Ptprr                                                                         | 4.70998 | 2.5127  | 2.47744e-06 | 2.63974e-05 | Specific Brain_high |
| Unc13c                                                                        | 4.63772 | 6.91128 | 3.52269e-06 | 3.67701e-05 | Specific Brain_high |
| Vwf                                                                           | 4.60835 | 3.89867 | 4.05884e-06 | 4.20943e-05 | Specific Brain_high |
| Flrt2                                                                         | 4.57882 | 1.71395 | 4.67604e-06 | 4.80783e-05 | Specific Brain_high |
| Edn3                                                                          | 4.52847 | 6.03218 | 5.94123e-06 | 5.99789e-05 | Specific Brain_high |
| Nkd1                                                                          | 4.47273 | 2.44497 | 7.72279e-06 | 7.66227e-05 | Specific Brain_high |
| Stard13                                                                       | 4.45439 | 2.01012 | 8.41322e-06 | 8.30391e-05 | Specific Brain_high |
| Pcdh19                                                                        | 4.36896 | 3.5665  | 1.24838e-05 | 0.000119668 | Specific Brain_high |
| Pdxk                                                                          | 4.35864 | 4.08306 | 1.30873e-05 | 0.000125081 | Specific Brain_high |
| Zic2                                                                          | 4.35597 | 5.97037 | 1.32478e-05 | 0.00012654  | Specific Brain_high |
| Slc19a3                                                                       | 4.30199 | 5.32509 | 1.6927e-05  | 0.000159535 | Specific Brain_high |
| Bche                                                                          | 4.28359 | 6.72254 | 1.83903e-05 | 0.000172346 | Specific Brain_high |
| Stxbp6                                                                        | 4.27068 | 2.56001 | 1.94875e-05 | 0.000181583 | Specific Brain_high |
| Pir                                                                           | 4.2145  | 3.43917 | 2.50328e-05 | 0.000229272 | Specific Brain_high |
| Rassf9                                                                        | 4.19923 | 1.77327 | 2.67826e-05 | 0.000244328 | Specific Brain_high |
| Mbp                                                                           | 4.19399 | 4.64442 | 2.74093e-05 | 0.000249622 | Specific Brain_high |
| Afap1l2                                                                       | 4.15915 | 2.85135 | 3.1944e-05  | 0.000287353 | Specific Brain_high |
| St3gal6                                                                       | 4.08445 | 1.10846 | 4.4182e-05  | 0.000388775 | Specific Brain_high |
| Slc16a9                                                                       | 4.06265 | 4.44405 | 4.85189e-05 | 0.000424163 | Specific Brain_high |
| Isyna1                                                                        | 4.00544 | 2.93021 | 6.19008e-05 | 0.000531507 | Specific Brain_high |
| Slc1a1                                                                        | 4.00299 | 3.17681 | 6.25469e-05 | 0.00053677  | Specific Brain_high |
| Znrf3                                                                         | 3.99012 | 3.83075 | 6.60408e-05 | 0.000564503 | Specific Brain_high |
| Rab11fip1                                                                     | 3.9753  | 5.51494 | 7.02904e-05 | 0.000598135 | Specific Brain_high |
| Prnp                                                                          | 3.94478 | 2.55555 | 7.98724e-05 | 0.000672583 | Specific Brain_high |
| Ifnar1                                                                        | 3.8862  | 1.66626 | 0.000101825 | 0.000838414 | Specific Brain_high |
| Tpd52                                                                         | 3.87589 | 2.27394 | 0.000106236 | 0.000870513 | Specific Brain_high |
| Aqp11                                                                         | 3.84787 | 3.65015 | 0.000119149 | 0.000966275 | Specific Brain_high |
| Polk                                                                          | 3.73827 | 1.59814 | 0.000185295 | 0.0014566   | Specific Brain_high |
| Sgms2                                                                         | 3.7289  | 5.80448 | 0.000192315 | 0.00150628  | Specific Brain_high |
| Ttyh2                                                                         | 3.64303 | 4.60707 | 0.00026945  | 0.00206435  | Specific Brain_high |
| Ptprj                                                                         | 3.54089 | 4.52481 | 0.000398773 | 0.0029733   | Specific Brain_high |
| Wnt5a                                                                         | 3.49724 | 6.69601 | 0.000470105 | 0.00345647  | Specific Brain_high |
| Pop5                                                                          | 3.46317 | 1.43242 | 0.000533842 | 0.00387829  | Specific Brain_high |
| Lmo7                                                                          | 3.45071 | 2.19531 | 0.000559121 | 0.00405099  | Specific Brain_high |
| Synpo2                                                                        | 3.42863 | 4.64174 | 0.000606632 | 0.00437363  | Specific Brain_high |
| Ctsc                                                                          | 3.4178  | 5.24714 | 0.000631301 | 0.00453225  | Specific Brain_high |
| Gm9946                                                                        | 3.38806 | 5.99092 | 0.000703892 | 0.00499784  | Specific Brain_high |
| Akap12                                                                        | 3.38221 | 1.02204 | 0.000719054 | 0.00509317  | Specific Brain_high |
| Tmeff1                                                                        | 3.28184 | 5.34347 | 0.00103133  | 0.00710553  | Specific Brain_high |
| Slc35f2                                                                       | 3.25525 | 5.31398 | 0.00113294  | 0.00774933  | Specific Brain_high |
| Lrrn3                                                                         | 3.25014 | 4.91285 | 0.00115346  | 0.00788138  | Specific Brain_high |
| Axin2                                                                         | 3.21978 | 4.04395 | 0.00128291  | 0.00869409  | Specific Brain_high |

## Supplementary Table S5

| Supplementary Table S5: ORA results for common and organ-specific cEC subsets |                                                        |         |          |                  |            |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                  |
|-------------------------------------------------------------------------------|--------------------------------------------------------|---------|----------|------------------|------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| Gene_set                                                                      | Term                                                   | Overlap | P-value  | Adjusted P-value | Odds Ratio | Combined Score | Genes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | cluster_name     |
| Mouse_vascular                                                                | AMIDE_BIOSYNTHETIC_PROCESS                             | 21/888  | 1.01e-15 | 4.06546e-14      | 20.2544    | 699.4          | Fau;Rps29;Rpl37a;Rpl34;Rpl26;Rps23;Rpl13;Rps16;Rps27;Rpl35a;Rpl30;Rps8;Rps15a;Rps21;Rps20;Rps4x;Rps14;Rps27a;Rpl27a;Rpl23;Rpl38                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Common EC1       |
| Mouse_vascular                                                                | REACTOME_METABOLISM_OF_AMINO_ACIDS_AND_DERIVATIVES     | 21/345  | 2.96e-24 | 3.58082e-22      | 57.025     | 3089.45        | Fau;Rps29;Rpl37a;Rpl34;Rpl26;Rps23;Rpl13;Rps16;Rps27;Rpl35a;Rpl30;Rps8;Rps15a;Rps21;Rps20;Rps4x;Rps14;Rps27a;Rpl27a;Rpl23;Rpl38                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Common EC1       |
| Mouse_vascular                                                                | REACTOME_METABOLISM_OF_RNA                             | 21/670  | 3.2e-18  | 1.93427e-16      | 27.6299    | 1113.05        | Fau;Rps29;Rpl37a;Rpl34;Rpl26;Rps23;Rpl13;Rps16;Rps27;Rpl35a;Rpl30;Rps8;Rps15a;Rps21;Rps20;Rps4x;Rps14;Rps27a;Rpl27a;Rpl23;Rpl38                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Common EC1       |
| Mouse_vascular                                                                | CARBOHYDRATE_DERIVATIVE_BIOSYNTHETIC_PROCESS           | 7/624   | 4.73e-05 | 0.000378399      | 10.1825    | 101.408        | mt-Atp6;mt-Nd1;mt-Nd2;mt-Nd4;mt-Nd5;mt-Nd3;mt-Nd4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Common EC2       |
| Mouse_vascular                                                                | CARBOHYDRATE_DERIVATIVE_METABOLIC_PROCESS              | 7/978   | 0.000782 | 0.0050048        | 6.25353    | 44.7356        | mt-Atp6;mt-Nd1;mt-Nd2;mt-Nd4;mt-Nd5;mt-Nd3;mt-Nd4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Common EC2       |
| Mouse_vascular                                                                | ENERGY_DERIVATION_BY_OXIDATION_OF_ORGANIC_COMPOUNDS    | 12/322  | 1.2e-14  | 3.8367e-13       | 57.8986    | 1855.92        | mt-Atp6;mt-Nd1;mt-Co3;mt-Nd3;mt-Co1;mt-Nd2;mt-Cytb;mt-Nd4;mt-Co2;mt-Nd5;Pomc;mt-Nd4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Common EC2       |
| Mouse_vascular                                                                | GENERATION_OF_PRECURSOR_METABOLITES_AND_ENERGY         | 12/486  | 1.63e-12 | 3.47596e-11      | 37.3112    | 1012.73        | mt-Atp6;mt-Nd1;mt-Co3;mt-Nd3;mt-Co1;mt-Nd2;mt-Cytb;mt-Nd4;mt-Co2;mt-Nd5;Pomc;mt-Nd4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Common EC2       |
| Mouse_vascular                                                                | NUCLEOBASE_CONTAINING_SMALL_MOLECULE_METABOLIC_PROCESS | 7/568   | 2.58e-05 | 0.000235793      | 11.2579    | 118.945        | mt-Atp6;mt-Nd1;mt-Nd2;mt-Nd4;mt-Nd5;mt-Nd3;mt-Nd4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Common EC2       |
| Mouse_vascular                                                                | NUCLEOSIDE_PHOSPHATE_BIOSYNTHETIC_PROCESS              | 7/288   | 2.81e-07 | 3.6005e-06       | 23.0526    | 347.722        | mt-Atp6;mt-Nd1;mt-Nd2;mt-Nd4;mt-Nd5;mt-Nd3;mt-Nd4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Common EC2       |
| Mouse_vascular                                                                | ORGANOPHOSPHATE_METABOLIC_PROCESS                      | 8/932   | 7.75e-05 | 0.00055111       | 8.13283    | 76.9792        | mt-Atp6;mt-Nd1;mt-Nd2;mt-Nd4;Prkg1;mt-Nd5;mt-Nd3;mt-Nd4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Common EC2       |
| Mouse_vascular                                                                | PURINE_CONTAINING_COMPOUND_METABOLIC_PROCESS           | 7/465   | 6.97e-06 | 7.43613e-05      | 13.9217    | 165.302        | mt-Atp6;mt-Nd1;mt-Nd2;mt-Nd4;mt-Nd5;mt-Nd3;mt-Nd4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Common EC2       |
| Mouse_vascular                                                                | GOMF_ACTIVE_TRANSMEMBRANE_TRANSPORTER_ACTIVITY         | 11/441  | 1.92e-11 | 3.07904e-10      | 33.5218    | 827.112        | mt-Nd1;Slc9a9;mt-Co3;mt-Co1;mt-Nd2;mt-Cytb;mt-Nd4;mt-Co2;mt-Nd5;mt-Nd3;mt-Nd4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Common EC2       |
| Mouse_vascular                                                                | KEGG_OXIDATIVE_PHOSPHORYLATION                         | 11/127  | 1.95e-17 | 1.24929e-15      | 127.519    | 4906.31        | mt-Atp6;mt-Nd1;mt-Co3;mt-Co1;mt-Nd2;mt-Cytb;mt-Nd4;mt-Co2;mt-Nd5;mt-Nd3;mt-Nd4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Common EC2       |
| Mouse_vascular                                                                | FRIDMAN_SENESCENCE_UP                                  | 15/75   | 5.97e-05 | 0.00230543       | 3.84038    | 37.3541        | Tnfaip2;Cdkn1a;Nme2;S100a11;Cltb;Igfbp3;Isg15;Esm1;Cited2;Igfbp7;Rras;Sparc;Irf7;Thbs1;Guk1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Specific Thyroid |
| Mouse_vascular                                                                | AMIDE_BIOSYNTHETIC_PROCESS                             | 95/888  | 1.86e-07 | 9.89017e-06      | 1.89598    | 29.3812        | Eef1a1;Eif3i;Rpl8;Rpl6;Gapdh;Rpl15;Mrpl55;Rpl7;Mrps14;Rpl32;Ndufa7;Eef1b2;Rpl35a;Rpl36;Appl1;Rps21;Rps20;Rplp0;St8sia4;St6galnac6;Rps27a;Rpsa;Exosc5;Mrps15;Rplp2;Mrps16;Rpl10a;Mrpl23;Eif5a;Rpl13;Mrpl36;Thbs1;St6galnac4;Mrps21;Rpl37;Rpl19;Mif4gd;Mrps7;Mrpl27;Mrpl4;Mrpl43;Eef2;Rpl27;Rpl24;Eif3k;Tob1;Tmed2;Eef1d;Epha4;Eif4a1;Mrpl18;Rpl34;Mrpl53;Rps5;Hagh;B4galta4;Rps25;Rpl11;Mpv17l2;Gadd45gip1;Rps8;Mrpl34;Rps4x;Rps19;Rpl27a;Rpl23;Mrpl17;Rpl22l1;Elov1;Mex3d;Fau;Eif3f;Rpl3;Aurkaip1;Mrpl33;Rps16;Rps26;Ass1;Mrpl57;Rpl28;Mrps31;Mrpl35;Rps13;Rpl30;Mrps18a;Rps15a;Mrpl32;Rpl7a;Mrps24;Rps7;Pcsk5;Acsc1;Hspb1;Mrpl38;Mrpl42 | Specific Thyroid |
| Mouse_vascular                                                                | BLOOD_VESSEL_ENDOTHELIAL_CELL_MIGRATION                | 24/156  | 4.49e-05 | 0.00190874       | 2.78878    | 27.918         | Rgcc;Hdac9;Tbxa2r;Pik3r3;Mef2c;Nr4a1;Thbs1;Rhoa;Id1;Anxa1;Acvr11;Klf4;Prkd1;Tmsb4x;Scarb1;Clec14a;Gata2;Emp2;Gpx1;Sox18;Hspb1;Efna1;Jup;Pdgb                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Specific Thyroid |

| Supplementary Table S5: ORA results for common and organ-specific cEC subsets |                                                     |        |          |             |         |         |                                                                                                                                                                                                                                                                                                                                                                                                                              |                  |
|-------------------------------------------------------------------------------|-----------------------------------------------------|--------|----------|-------------|---------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| Mouse_vascular                                                                | ENERGY_DERIVATION_BY_OXIDATION_OF_ORGANIC_COMPOUNDS | 49/322 | 7.8e-09  | 5.52401e-07 | 2.79476 | 52.1762 | Cox7c;Cox6b1;Ndufs8;Ndufb9;Mdh2;Ndufv3;Cox6a1;Cox4i1;Cavin3;Cox5b;Sdhb;Mdh1;Ndufs7;Prdm16;Cox7a2;Ndufa11;Ndufa8;Ndufv1;Uqcrcq;Sdhb;Ndufab1;Rhoa;Ndufa12;Park7;Me3;Ndufa4;Cox6c;Ndufc2;Ndufb4;Sdhaf4;Ndufa7;Uqcrcf1;Cox7b;Acadvl;Ndufb7;Uqcrc1;Ndufa13;Uqcrb;Cox5a;Ndufa1;Bloc1s1;Ndufb2;Cox8a;Ndufb10;Chchd2;Ndufs5;Fh1;Ndufb6;Cyc1                                                                                          | Specific Thyroid |
| Mouse_vascular                                                                | GENERATION_OF_PRECURSOR_METABOLITES_AND_ENERGY      | 63/486 | 3.43e-08 | 2.08259e-06 | 2.33079 | 40.0619 | Ucp2;Cyb561;Cox7c;Cox6b1;Ndufs8;Ndufb9;Mdh2;Ndufv3;Cox6a1;Adh5;Cox4i1;Cavin3;Cox5b;Sdhb;Mdh1;Ndufs7;Prdm16;Cox7a2;Gapdh;Aldoa;Ndufa11;Ndufa8;Ndufv1;Thap11;Taldo1;Uqcrcq;Sdhb;Ndufab1;Rhoa;Ndufa12;Park7;Me3;Ndufa4;Cox6c;Ndufc2;Ndufb4;Sdhaf4;Ndufa7;Uqcrcf1;Cox7b;Slc25a4;Acadvl;Ndufb7;Uqcrc1;Oxct1;Cyc1;Ndufa13;Uqcrb;Aldh2;Ndufa1;Cox5a;Bloc1s1;Pfkp;Ndufb2;Cox8a;Acss1;Pgls;Chchd2;Ndufs5;Fh1;Ndufb10;Ndufb6;Fdx1      | Specific Thyroid |
| Mouse_vascular                                                                | KARLSSON_TGFB1_TARGETS_DN                           | 26/190 | 0.000164 | 0.00579731  | 2.42922 | 21.1768 | Tmem59;Mgst1;Dnaja1;Stmn1;Tmem176b;Ctsz;Nudt14;Stmn2;Fut8;Fth1;Id1;Gabarap;Golm1;Crip1;Ly6e;Tle5;Nid2;Itm2b;Vamp8;Id3;Psm2;Slc48a1;Bloc1s1;Ctnnbip1;Dbi;Syne2                                                                                                                                                                                                                                                                | Specific Thyroid |
| Mouse_vascular                                                                | KEGG_OXIDATIVE_PHOSPHORYLATION                      | 36/127 | 7.8e-15  | 1.10553e-12 | 6.14865 | 199.734 | Cox7c;Cox6b1;Ndufs8;Ndufb9;Ndufv3;Cox6a1;Cox4i1;Cox5b;Sdhb;Ndufs7;Atp6v0c;Cox7a2;Ndufa11;Ndufa8;Ndufv1;Uqcrcq;Sdhb;Ndufab1;Ndufa4;Cox6c;Ndufc2;Ndufb4;Ndufa7;Uqcrcf1;Cox7b;Ndufb7;Uqcrc1;Uqcrb;Cox5a;Ndufa1;Ndufb2;Cox8a;Ndufb10;Ndufs5;Ndufb6;Cyc1                                                                                                                                                                          | Specific Thyroid |
| Mouse_vascular                                                                | MOOTHA_MITOCHONDRIA                                 | 64/434 | 1.38e-10 | 1.16992e-08 | 2.72477 | 61.8697 | Ucp2;Mtx2;Cox7c;Cox6b1;Mrps16;Eci1;Ndufs8;Nme2;Mdh2;Vdac2;Slc25a5;Mrpl42;Cox6a1;Tspo;Pam16;Cox4i1;Cox5b;Sdhb;Cox7a2;Mrpl18;Ndufa8;Timm8b;Mrpl33;Sdhb;Ndufab1;Prdx3;Mrps14;Gnas;Cox6c;Ndufc2;Mrpl57;Me3;Ndufb4;Ndufa4;Ndufa7;Timm17b;Mrps31;Uqcrcf1;Mrpl35;Cox7b;Slc25a4;Mrps7;Acadvl;Ndufb6;Ndufb7;Mrpl34;Mrps18a;Uqcrc1;Cyc1;Bex3;Uqcrb;Slc25a17;Aldh2;Ndufa1;Cox5a;Mrpl4;Timm13;Ndufb2;Cox8a;Fh1;Ndufs5;Mrps15;Mrpl17;Fdx1 | Specific Thyroid |
| Mouse_vascular                                                                | REACTOME_ANTIGEN_PROCESSING_CROSS_PRESSENTATION     | 29/96  | 5.6e-13  | 5.94584e-11 | 6.68218 | 188.514 | Psmb1;Psmb2;Psmb8;Psmb5;Psmb3;Psmb10;Psmc3;Sec61b;Psm3;Psmb4;Psmc5;Psm2;Psm1;Psmc4;Psmb6;Sem1;Psmc2;S100a1;Psmb9;Ubb;Vamp8;Psm2;Tap2;Psm2;Rps27a;Psm7;Psm10;Ubc;Psm1                                                                                                                                                                                                                                                         | Specific Thyroid |
| Mouse_vascular                                                                | REACTOME_METABOLISM_OF_AMINO_ACIDS_AND_DERIVATIVES  | 69/345 | 3.82e-18 | 1.62272e-15 | 4.00215 | 160.513 | Smox;Papss2;Psmb1;Rplp2;Oaz1;Rpl10a;Ethe1;Rpl8;Psmb2;Psmb8;Psmb5;Fau;Rpl6;Psmb3;Psmb10;Rpl34;Rpl15;Psmc3;Psm3;Rpl3;Psmb4;Rpl13;Psmc5;Rps16;Rps5;Ndufab1;Psm2;Rpl7;Rps26;Psm1;Psmc4;Ckb;Psmb6;Ass1;Rpl32;Rps25;Rpl37;Rpl11;Rpl28;Rpl19;Rps13;Rpl35a;Rpl36;Sem1;Psmc2;Rps8;Rpl30;Rps15a;Psmb9;Rps20;Oaz2;Rpl7a;Psm2;Rps4x;Rps21;Psm2;Rplp0;Rps27a;Psm7;Rpsa;Psm10;Rps19;Rps7;Rpl27a;Psm1;Rpl23;Rpl27;Rpl24;Rpl22l1             | Specific Thyroid |

| Supplementary Table S5: ORA results for common and organ-specific cEC subsets |                                           |                     |          |             |         |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                    |
|-------------------------------------------------------------------------------|-------------------------------------------|---------------------|----------|-------------|---------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Mouse_vascular                                                                | REACTOME_METABOLISM_OF_RNA                | 100/670             | 1.95e-16 | 4.13513e-14 | 2.86295 | 103.569 | U2af114;Rpl8;Psmb5;Rpl6;Rpl15;Psmb4;Psmc5;Psmc7;Rpl7;Polr2d;Snrpd1;Rpl32;Rpl35a;Rpl36;Rps21;Rps20;Ubb;Psmc2;Rplp0;Syf2;Rps27a;Pop5;Rpsa;Exosc5;Psmc1;Rplp2;Rpl10a;Lsm10;Polr2e;Psmc2;Txnl4a;Psmc3;Rpl13;Polr2h;Rpl37;Rpl19;Psmc2;Cactin;Psmc10;Psmc1;Srsf7;Rpl27;Rpl24;Lsm7;Snrpg;Rpl1;Psmc8;Polr2c;Eif4a1;Psmc10;Rpl34;Psmc3;Rps5;Psmc4;Rps25;Rpl11;Polr2f;Sf3b6;Sem1;Rps8;Srsf9;Psmc9;Lsm3;Rps4x;Psmc2;Ubc;Rps19;Rpl27a;Rpl23;Rpl22l1;Gemin7;Ebna1bp2;Fau;Rtraf;Trmt112;Pop7;Psmc3;Rpl3;Exosc4;Rps16;Rps26;Psmc1;Nop10;Polr2;Psmc6;Phax;Lsm6;Rpl28;Rps13;Rpl30;Rps15a;Snrpb;Rpl7a;U2af1;Wdr18;Psmc7;Tsen15;Rps7;Hspb1;Nxt1 | Specific Thyroid   |
| Mouse_vascular                                                                | ZHANG_PROLIFERATING_VS_QUIESCENT          | 1945-12-01 00:00:00 | 1.59e-05 | 0.00075148  | 5.58356 | 61.6891 | Jun;Gnas;Nme2;Rps19;Gpx1;Dad1;Prdx2;Hspb1;Rpl6;Ndufb7;Rhoa;Dynl1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Specific Thyroid   |
| Mouse_vascular                                                                | DAUER_STAT3_TARGETS_DN                    | 1940-09-01 00:00:00 | 2.28e-05 | 0.00302056  | 7.31616 | 78.1924 | Dnajb4;Herc6;Oasl1;Tnfsf10;Ifi44;Isg15;Ifit3;Irf7;Trim30a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Specific Adrenal 1 |
| Mouse_vascular                                                                | CORONARY_VASCULATURE_DEVELOPMENT          | 1948-10-01 00:00:00 | 1.66e-05 | 0.00302056  | 6.62681 | 72.9532 | Adamts6;Abcc9;Spred1;Ptk7;Dync2h1;Aplnr;Kcnj8;Gata6;Prdm1;Apln                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Specific Adrenal 1 |
| Mouse_vascular                                                                | PETROVA_ENDOTHELIUM_LYMPHATIC_VS_BLOOD_DN | 25/151              | 1.42e-09 | 5.63522e-07 | 5.02998 | 102.476 | Nmt2;Procr;Apbb2;Btg2;Pla2g4a;Emp3;Rhob;Agrn;Nuak1;Itgav;Ccr12;Icam2;Upp1;Itgb5;Flt1;Smad3;Mboat7;Uchl1;Ly75;Gadd45a;Anxa6;Isg15;Icam1;Nisch;Pkia                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Specific Adrenal 1 |
| Mouse_vascular                                                                | ELVIDGE_HYPOXIA_UP                        | 16/169              | 3.78e-06 | 0.000462117 | 4.48008 | 55.9403 | Cavin1;Plin2;Klf6;Cav1;Pdgfb;Tnfaip8;Dst;Ccn1;Pfkp;Nrpe;Egln1;Pxdn;Angptl4;Dusp1;Egr1;mt-Nd5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Specific Adrenal 2 |
| Mouse_vascular                                                                | KEGG_OXIDATIVE_PHOSPHORYLATION            | 14/127              | 2.58e-06 | 0.000462117 | 5.30312 | 68.23   | mt-Atp6;mt-Atp8;mt-Nd1;Ppa1;mt-Co3;Ndufa8;mt-Co1;mt-Nd2;mt-Cytb;mt-Nd4;mt-Co2;mt-Nd5;mt-Nd3;mt-Nd4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Specific Adrenal 2 |
| Mouse_vascular                                                                | MAINA_VHL_TARGETS_UP                      | 2026-04-10 00:00:00 | 6.56e-05 | 0.00601727  | 27.9437 | 269.159 | Adgrg1;Nrep;Filip1;Cdkn1c                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Specific Adrenal 2 |
| Mouse_vascular                                                                | MANALO_HYPOXIA_UP                         | 18/197              | 1.56e-06 | 0.000462117 | 4.31877 | 57.757  | Col4a2;Grk5;Cd200;Cdkn1c;Col4a1;Diaph2;Pdzd2;Filip1;N4bp3;Egln1;Tns1;Mast4;Angptl4;Adora2a;Pparg;Kank3;Sik1;Pdgfb                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Specific Adrenal 2 |
| Mouse_vascular                                                                | ELVIDGE_HIF1A_AND_HIF2A_TARGETS_DN        | 9/104               | 9.58e-07 | 9.09658e-05 | 10.4844 | 145.303 | Limch1;Pdgfb;Igfbp3;Cited2;Egr1;Fos;Rasa4;Vegfc;Igfbp5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Specific Pituitary |
| Mouse_vascular                                                                | ELVIDGE_HIF1A_TARGETS_DN                  | 1991-07-01 00:00:00 | 3.52e-05 | 0.00111545  | 9.1866  | 94.1972 | Pdgfb;Igfbp3;Cited2;Fos;Rasa4;Vegfc;Igfbp5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Specific Pituitary |
| Mouse_vascular                                                                | ELVIDGE_HYPOXIA_BY_DMOG_UP                | 9/132               | 6.99e-06 | 0.000498347 | 8.08658 | 95.9911 | Jun;Limch1;Sat1;Igfbp3;Cited2;Egr1;Fos;Vegfc;Igfbp5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Specific Pituitary |
| Mouse_vascular                                                                | ELVIDGE_HYPOXIA_UP                        | 12/169              | 1.22e-07 | 3.48411e-05 | 8.56551 | 136.339 | Jun;Limch1;Pdgfb;Sat1;Igfbp3;Cited2;Egr1;Fos;Rasa4;Vegfc;Igfbp5;Scarb1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Specific Pituitary |
| Mouse_vascular                                                                | FRIDMAN_SENESCENCE_UP                     | 1975-07-01 00:00:00 | 9.86e-06 | 0.000561986 | 11.349  | 130.821 | Tnfaip2;Filip1;Igfbp3;Gsn;Cited2;Ccn2;Igfbp5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Specific Pituitary |
| Mouse_vascular                                                                | GALIE_TUMOR_ANGIOGENESIS                  | 2026-03-08 00:00:00 | 5.38e-05 | 0.00153227  | 63.9182 | 628.374 | Pdgfa;Angpt2;Ccn2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Specific Pituitary |
| Mouse_vascular                                                                | ENDOTHELIAL_CELL_PROLIFERATION            | 8/187               | 0.000592 | 0.00991929  | 4.90508 | 36.4572 | Col4a3;Col8a1;Apoe;Vegfc;Aplnr;Pdgfb;Lrg1;Scarb1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Specific Pituitary |
| Mouse_vascular                                                                | RENAL_SYSTEM_VASCULATURE_DEVELOPMENT      | 1932-04-01 00:00:00 | 0.000283 | 0.00575302  | 15.9721 | 130.515 | Pdgfa;Angpt2;Egr1;Pdgfb                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Specific Pituitary |
| Mouse_vascular                                                                | REVERSE_CHOLESTEROL_TRANSPORT             | 2026-04-19 00:00:00 | 3.37e-05 | 0.00111545  | 29.4029 | 302.795 | Abca1;Apoe;Lipc;Scarb1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Specific Pituitary |
| Mouse_vascular                                                                | HARRIS_HYPOXIA                            | 1977-06-01 00:00:00 | 0.000121 | 0.00288105  | 9.33205 | 84.1488 | Jun;Sat1;Igfbp3;Angpt2;Fos;Pdgfb                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Specific Pituitary |
| Mouse_vascular                                                                | MANALO_HYPOXIA_UP                         | 9/197               | 0.000164 | 0.00359041  | 5.26646 | 45.9078 | Sorbs2;Pdgfb;Filip1;Itm2a;Igfbp3;Abca1;Cdh2;Vegfc;Limch1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Specific Pituitary |

| Supplementary Table S5: ORA results for common and organ-specific cEC subsets |                                                 |                     |          |             |         |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    |
|-------------------------------------------------------------------------------|-------------------------------------------------|---------------------|----------|-------------|---------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Mouse_vascular                                                                | NABA_COLLAGENS                                  | 1938-04-01 00:00:00 | 0.000554 | 0.00986393  | 13.1871 | 98.8873 | Col4a4;Col15a1;Col4a3;Col8a1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Specific Pituitary |
| Mouse_vascular                                                                | NABA_CORE_MATRISOME                             | 14/256              | 2.66e-07 | 3.7961e-05  | 6.5327  | 98.894  | Col4a4;Col4a3;Slit3;Col8a1;Mmrn1;Mgp;Igfbp3;Sned1;Ccn2;Lrg1;Col15a1;Igfbp5;Ltbp1;Fbln5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Specific Pituitary |
| Mouse_vascular                                                                | NABA_ECM_GLYCOPROTEINS                          | 10/183              | 1.52e-05 | 0.000720475 | 6.39462 | 70.9568 | Slit3;Mmrn1;Mgp;Igfbp3;Sned1;Ccn2;Lrg1;Igfbp5;Ltbp1;Fbln5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Specific Pituitary |
| Mouse_vascular                                                                | NABA_MATRISOME                                  | 22/902              | 8.04e-05 | 0.00208204  | 2.85848 | 26.9526 | Col4a4;Col4a3;Emcn;Igfbp3;Adams9;Lrg1;Igfbp5;Angpt2;Gh;Vegfc;Ccn2;Col8a1;Mgp;Pdga;Sned1;Mmrn1;Fbln5;Sema3d;Slit3;Col15a1;Pdgb;Ltbp1                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Specific Pituitary |
| Mouse_vascular                                                                | WEINMANN_ADAPTATION_TO_HYPOXIA_DN               | 1938-04-01 00:00:00 | 0.000554 | 0.00986393  | 13.1871 | 98.8873 | Igfbp3;Hspa1a;Col15a1;Vegfc                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Specific Pituitary |
| Mouse_vascular                                                                | WINTER_HYPOXIA_METAGENE                         | 11/229              | 1.88e-05 | 0.000767112 | 5.59269 | 60.8454 | Jun;Pdgb;Sat1;Odc1;Igfbp3;Angpt2;Cited2;Egr1;Fos;Vegfc;Igfbp5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Specific Pituitary |
| Mouse_vascular                                                                | ENDOTHELIUM_DEVELOPMENT                         | 9/141               | 5.63e-05 | 0.00817053  | 6.09996 | 59.6818 | Heg1;Nrp1;Sox17;Rdx;Edf1;Col18a1;Plcb1;Fgf1;Fstl1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Specific Kidney    |
| Mouse_vascular                                                                | SANA_TNF_SIGNALING_DN                           | 1982-08-01 00:00:00 | 6.8e-06  | 0.00197304  | 9.68289 | 115.208 | Crip2;Cavin2;Emcn;Ntn4;Gimap6;Palmd;Tm4sf1;Clu                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Specific Kidney    |
| Mouse_vascular                                                                | FULCHER_INFLAMMATORY_RESPONSE_LLECTIN_VS_LPS_DN | 95/405              | 9.5e-08  | 4.43738e-05 | 1.96362 | 31.7502 | Hmox1;Nrip1;Hspa5;Celf1;Kank1;Zfyve26;Npl;Setdb2;Lpar6;Znrf2;Arrdc3;Lyn;Maml2;Slc39a8;Sptlc2;Lgmn;Aff1;Washc4;Gns;Bach1;Plcl2;Abcc5;Pfkfb3;Add3;Arhgap45;Prpr;Snx2;B4galt5;Arhgap12;Lacc1;Rbms1;Mpp1;Tlr4;Rb1;Socs3;Ifitm1;Selenop;Slc26a11;Wls;Ssbp2;Lcp2;Bcl6;Stab1;Fus;Cd302;Fam20a;Tmem241;Hspa1a;Gas7;Plekha2;Scppdh;Zeb2;Dmxl2;Prkacb;Fmrd4a;Prickle1;Mxd1;Itpkb;Scarb2;Rap2b;Agps;Maf;Cxcl10;Arl4c;Cxcl9;Calhm6;Plekha2;Gatm;Snx18;Ccnc152;Dapp1;Fcho2;Ctsd;Aim2;Ap2a2;Wdpcp;Nt5c3;Acap2;Kcnq1;Trim14;Sec24d;Wdr11;Cdk13;Tiparp;Setx;Map3k8;Rufy3;Ap1b1;Gga2;Armxcx1;Gab2;Cd38;Cd84;Cd36;Limd1 | Specific Liver     |
| Mouse_vascular                                                                | CELL_MATRIX_ADHESION                            | 53/227              | 7.46e-05 | 0.00435724  | 1.93023 | 18.3426 | Actn1;Lyve1;Taok2;Fmn1;Ptpkr;Rhod;Adams12;Rcc2;Ptak2;Mkn1;Ppfia1;Sgce;Arhgef7;Adam9;Wdpcp;Itga9;Nf1;Ppfia2;Itga8;Cdk6;Plekha2;Vcam1;Bcr;Emilin1;Macf1;Tsc1;Phldb2;Sdc4;Clasp1;Clasp2;Abi1;Acer2;Mmp14;Vcl;Itga1;Pip5k1a;Vegfa;Ston1;Coro2b;Slk;Slc9a1;Trpm7;Rasa1;Gsk3b;Pik3r1;Bcl2l11;Cdh13;Peak1;Cd36;Hpse;Dlc1;Bcl6;Coro1c                                                                                                                                                                                                                                                                         | Specific Liver     |
| Mouse_vascular                                                                | GLYCOPROTEIN_METABOLIC_PROCESS                  | 77/356              | 3.58e-05 | 0.00278615  | 1.75441 | 17.9611 | Tet2;Golp3;Oga;Hs6st3;Ndst1;Ago2;Man2b1;Ust;Crppa;Slc39a8;Bmp2;Tcf7l2;St3gal3;Man2a2;Gfpt1;C1galt1;B3galt1;Adams12;St6gal1;Tmem106a;B4galt5;Dpy19l3;Ext1;Hexb;Hs2st1;Ogt;Entpd5;Dse;Bace2;Dpagt1;Dpy19l4;Manba;Acer2;Xylt1;Trak1;Sgsh;Hs3st3b1;Soat1;Gpc1;Cela1;Pofut1;Bmpr2;Ugg1;B4galt1;Edem3;Glb1;Srd5a3;Hs6st1;Atp7a;Galnt2;St3gal4;Extl2;Large1;Man1c1;Man2a1;Rpn1;Itm2c;Man1a;Tmtc2;Galnt18;St3gal5;Cog3;Galnt1;Fut10;Chst14;Chst15;Tet3;St3gal1;Chst7;St6galnac3;Aatf;B3gnt3;Mgat5;Alg6;Hpse;Gxytl1;Tnlp1                                                                                      | Specific Liver     |



| Supplementary Table S5: ORA results for common and organ-specific cEC subsets |                                           |          |          |            |         |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                |
|-------------------------------------------------------------------------------|-------------------------------------------|----------|----------|------------|---------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Mouse_vascular                                                                | ORGANONITROGEN_COMPOUND_CATABOLIC_PROCESS | 223/1273 | 6.69e-05 | 0.00435724 | 1.37073 | 13.1758 | Hmox1;Ube4b;Aass;Dpp7;Pde10a;Rlim;Hykk;Psmid14;Al<br>dh8a1;Tet2;Hspa5;Cdc27;Oga;Apobec1;Myli;Nploc4;At<br>p2b4;Snx33;Cblb;Npl;Csnk1d;Stab2;Fbxo11;Cebpa;Vps<br>13a;Znrf2;Scly;Nt5c2;Klhl8;Bckdhb;Mccc1;Acer3;Trim32;<br>Cul4b;Kyat3;Apc;Npepps;Hace1;Rnf115;Mapk9;Pde7b;L<br>gmn;Hmox2;Usp7;Tbl1x;Uba6;Psme4;Cbl;Gns;Atm;Faf1;<br>Rnf217;Fbxw7;Mtm1;Aldh6a1;Asah2;Hipk2;Suctlg2;Lnpe<br>p;Apoe;Rnf216;Sgpl1;Abat;Cnot4;Spopl;Dpysl3;Sh3rf1;R<br>ffl;Pnpla7;Adams12;Got1;Smurf1;Itch;Cul9;Fbxw4;Ext1;<br>Hexb;Gls;Ogt;Fbxo38;Entpd5;Smad7;Lamp2;Kyat1;Rnf1<br>9a;Cln6;Mib1;Gm2a;Ide;Hdc;Smurf2;Ltn1;Sirt2;Glul;Man<br>ba;Tmem106b;Ankib1;Gna12;Usp38;Nsf;Usp9x;Acer2;T<br>nfaip3;Rnf185;Fbxw11;Ubr3;Fyn;Nr1d1;Sgsh;Entpd7;Sp<br>sb1;Lrrk2;Ecpas;Fem1b;Fbxl7;Lrig2;Banp;Peli1;Trip12;G<br>pc1;Fam8a1;Herc3;Vps54;Ube2d1;Cela1;Rnf144a;Atf6;<br>Neil2;Pml;Ptk2;Upp2;Uggt1;Rnf13;Nedd4i;Tnfaip1;Mbd4;<br>Gnpda1;Pde4d;Pde5a;Hspa1a;Znrf1;Cemip2;Dab2;Ede<br>m3;Casp8;Gga3;Prickle1;Tollip;Glb1;Wdr81;Klhl3;Neu3;<br>Sh3d19;Vps35;Pias1;Ndfip1;Snx5;Ambra1;Man1c1;Fbxl<br>4;Slc44a1;Fmo1;Dnajc10;Ubpap1;Klhl20;Appbp2;Gsk3b;<br>Ube2h;Wdr91;Psen1;Rnf144b;Arih2;Man1a;Lyve1;Sec2<br>2b;Fbxl17;Ctsd;Arrb2;Adam9;Wac;Mdm4;Ube3b;Ascc2;<br>Afg1l;Rnf111;Arrb1;Cacul1;Tpp1;Wwp2;Nkd1;Pde4b;Zyg<br>11b;Pnp2;Nhlrc3;Prkn;Tet3;Canx;Pde2a;Rcn3;Rybp;Sel<br>1l;Mccc2;Mthfs;Tiparp;Xpo1;Ddah1;Acadsb;Aldh4a1;Btrc;<br>Wdr26;Lats1;Ripk1;Ctsb;Hibadh;Renbp;Ophn1;Snx9;Her<br>c4;Slc17a9;Galc;Ppt1;Hpse;Ivd | Specific Liver |
| Mouse_vascular                                                                | MANALO_HYPOXIA_UP                         | 50/197   | 1.14e-05 | 0.00159298 | 2.15737 | 24.562  | Zfp395;Trio;Loxl2;Lrrc32;Pgm1;Fam171a1;Bgn;Rhohtb1;<br>Dusp6;P4ha1;Adm;Gls;Fnec3b;Tle1;Pxn;Zhx2;Mtss1;Tm<br>cc1;Atxn1;F8;Creb3l2;Bace2;Chst15;Hes1;Nynrin;Ptpb;<br>Usp47;Tcf7l1;Sec24a;Tnfaip3;Ptgs1;Mxl1;Itp2;Vegfa;Cli<br>p2;Pam;Epor;Atp2c1;Lepr;Smad6;Spsb1;Npr1;Arl4c;Gra<br>md1c;Dkk3;Kdm3a;Gypc;Bcl6;Gpc1;Rnase4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Specific Liver |
| Mouse_vascular                                                                | MILI_PSEUDOPODIA_CHEMOTAXIS_DN            | 89/418   | 1.71e-05 | 0.00159386 | 1.72345 | 18.9209 | Hspa5;Oga;Hmgcs1;Flnb;Zzef1;Emilin1;Scepe1;Man2b1;<br>Slc29a1;Akr1b8;Slc38a10;Lgmn;Usp7;Snx29;Gaa;Gns;A<br>sap1;Pan3;Sgpl1;Abcc5;Pnpla7;Ttc7;Sbno2;Acvr1;Ogt;K<br>hk;Ephb4;Il6st;Socs3;Fgfr1;Mmp14;Snx14;Aqp1;C1ra;Wl<br>s;Cnm2;Ppp6r3;Igf1r;Fus;Pofut1;Nrp2;Trps1;Clcn6;Htt;<br>Lhfp12;Sgms1;Nedd4i;P4ha1;Chka;Nfkbiz;Hacd3;Dcbld1;<br>Ccnd2;Ptgs1;Slc12a9;Vcl;Agfg2;Sfpq;Gsk3b;Sfi1;Rpn1;G<br>gcx;Arm9;Emc1;Txndc5;Galnt18;Mfsd14b;Fam171a1;A<br>p2a2;Pigm;Bcl9;Tubgcp4;P2rx4;Wwp2;Ckap4;Nhlrc3;Slc<br>8b1;lgf3;Rcn3;Sel1l;Slco2a1;Akap1;Plxn2;Cux1;Fads3;<br>Ctsb;Epb41l2;Ppt1;Adnp2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Specific Liver |
| Mouse_vascular                                                                | MILI_PSEUDOPODIA_HAPTOTAXIS_UP            | 99/500   | 0.000122 | 0.00632155 | 1.57096 | 14.1589 | Ythdf3;Fnbp1;Pip4k2a;Zeb1;Csnk1g3;Golp3;Ptp4a2;H<br>mgcs1;Agfg1;Abi2;Stard4;Mbnl1;Vps13a;Znrf2;Cdkal1;<br>Cul4b;Far1;Apc;Rnf115;Nipsnap2;Stag2;Pdss1;Gmfb;Ppp<br>3ca;Vcpip1;Rpe;Togaram1;Tbc1d15;Tcf12;Dylnl2;Vps41;<br>Msantd4;Ccnd2;Mib1;Ltn1;R3hdm1;Stag1;Cavin2;Pafah<br>1b1;Ubr3;Zfr;Kpna3;Tnks2;Fnec3a;Rasa1;Capza1;Ptpn2;<br>Snap23;Mapk8;Rap2c;Tent2;Strn;Cep83;Vps54;Rp2;Pp<br>hln1;Naa15;Tpd52;Trappc8;Camsap2;Naa30;Fbxo32;Ra<br>b8b;Palld;Dmxl1;Pola1;Vps35;Ppp1cb;Snx5;Ankrd13c;S<br>bf2;Dpp8;Erbin;Mbnl2;Yes1;Fam13b;Rpap2;Dcaf5;Ppfia<br>1;Setd7;Armxc3;Tubgcp4;Mpp7;Actr2;Gkap1;Usp24;Phl<br>db2;Zfp277;Rybp;Xpo1;Tomm70a;Nfia;Ncoa2;Wdr26;Ga<br>b2;Ugp2;Herc4;Map2k7;Srp54a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Specific Liver |

| Supplementary Table S5: ORA results for common and organ-specific cEC subsets |                                                             |                     |          |             |         |         |                                                                                                                                                                                                                                                                                                                                                                                                                         |                |
|-------------------------------------------------------------------------------|-------------------------------------------------------------|---------------------|----------|-------------|---------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Mouse_vascular                                                                | REACTOME_GLYCOSAMINOGLYCAN_METABOLISM                       | 36/124              | 8.23e-06 | 0.00159298  | 2.59083 | 30.3335 | Lyve1;Glb1;Abcc5;Slc35b3;B4galt5;Hs6st3;B4galt1;Ext1;Hexb;Ndst1;Hs2st1;B4galt6;Chst14;Prelp;Stab2;Dse;Gpc4;Chst15;Ust;Sdc4;Glb1;Hs6st1;St3gal1;Slc26a2;St3gal4;Sdc3;Gns;Slc9a1;Chst7;Sgsh;St3gal3;Hs3st3b1;B3gn13;Hpse;Bgn;Gpc1                                                                                                                                                                                         | Specific Liver |
| Mouse_vascular                                                                | REACTOME_METABOLISM_OF_CARBOHYDRATES                        | 66/285              | 1.36e-05 | 0.00159298  | 1.91493 | 21.4514 | Lyve1;Glb1;Abcc5;Slc35b3;Plkfb3;B3galt1;Got1;Plkfb2;B4galt5;Nup98;Hs6st3;Pgm1;B4galt1;Ext1;Hexb;Gnpda1;Fut11;Fut10;Ndst1;Epm2a;Pgm2;B4galt6;Prelp;Hs2st1;Khk;Gm49336;Chst14;Cryl1;Stab2;Dse;Prkacb;Gpc4;Slc37a1;Chst15;Ust;Man2b1;Sdc4;Manba;Nup155;Glb1;Hs6st1;St3gal1;Phkb;Slc26a2;St3gal4;Phka2;Nup205;Slc25a12;Nup153;Gaa;Aaas;Sdc3;Gns;Slc9a1;Chst7;Sgsh;Ugp2;St3gal3;Hs3st3b1;B3gnt3;Nup93;Sord;Hpse;Bgn;Rpe;Gpc1 | Specific Liver |
| Mouse_vascular                                                                | AMINO_ACID_TRANSMEMBRANE_TRANSPORT                          | 1999-07-01 00:00:00 | 0.000225 | 0.00604891  | 6.71185 | 56.3837 | Slc1a1;Slc38a5;Slc7a1;Slc38a3;Slc6a6;Slc7a5;Slc16a2                                                                                                                                                                                                                                                                                                                                                                     | Specific Brain |
| Mouse_vascular                                                                | LEUKOCYTE_CHEMOTAXIS                                        | 10/208              | 0.000262 | 0.00606212  | 4.43736 | 36.6022 | S1pr1;Edn1;Bsg;Ptn;Flt1;Tgfb2;Pdgfb;Cxcl12;Edn3;Wnt5a                                                                                                                                                                                                                                                                                                                                                                   | Specific Brain |
| Mouse_vascular                                                                | MONOCARBOXYLIC_ACID_TRANSPORT                               | 9/170               | 0.000263 | 0.00606212  | 4.91324 | 40.5062 | Slco1c1;Slc16a1;Slc16a4;Slc16a2;Slc22a8;Edn1;Slc16a9;Slc2a1;Mfsd2a                                                                                                                                                                                                                                                                                                                                                      | Specific Brain |
| Mouse_vascular                                                                | ORGANIC_ACID_TRANSMEMBRANE_TRANSPORT                        | 11/154              | 3.21e-06 | 0.00033114  | 6.80996 | 86.144  | Slc1a1;Slc16a1;Slc38a5;Slc7a1;Slc38a3;Slc6a6;Abcb1a;Slc16a9;Slc7a5;Slc2a1;Slc16a2                                                                                                                                                                                                                                                                                                                                       | Specific Brain |
| Mouse_vascular                                                                | PHENOL_CONTAINING_COMPOUND_METABOLIC_PROCESS                | 7/109               | 0.000406 | 0.00874044  | 6.05147 | 47.2583 | Slco1c1;Slc1a1;Slc16a2;Ddc;Tgfb2;Maoa;Wnt5a                                                                                                                                                                                                                                                                                                                                                                             | Specific Brain |
| Mouse_vascular                                                                | GOMF_ACTIVE_TRANSMEMBRANE_TRANSPORTER_ACTIVITY              | 16/441              | 0.000112 | 0.00362403  | 3.34044 | 30.3821 | Slc30a1;Slco1c1;Slc1a1;Slc16a1;Slc38a5;Ndufa7;Slc16a4;Slc16a2;Slc38a3;Mfsd2a;Slc6a6;Slc22a8;Abcb1a;Slc16a9;Slc7a5;Slc39a10                                                                                                                                                                                                                                                                                              | Specific Brain |
| Mouse_vascular                                                                | GOMF_MONOCARBOXYLIC_ACID_TRANSMEMBRANE_TRANSPORTER_ACTIVITY | 1957-07-01 00:00:00 | 6.15e-06 | 0.00033114  | 12.3414 | 148.083 | Slco1c1;Slc16a1;Slc16a4;Slc16a2;Slc6a6;Slc16a9;Mfsd2a                                                                                                                                                                                                                                                                                                                                                                   | Specific Brain |
| Mouse_vascular                                                                | GOMF_ORGANIC_ACID_TRANSMEMBRANE_TRANSPORTER_ACTIVITY        | 13/158              | 7.52e-08 | 1.21474e-05 | 8.00858 | 131.364 | Slco1c1;Slc1a1;Slc16a1;Slc38a5;Slc16a4;Slc16a2;Slc7a1;Slc38a3;Slc6a6;Abcb1a;Slc16a9;Slc7a5;Mfsd2a                                                                                                                                                                                                                                                                                                                       | Specific Brain |
| Mouse_vascular                                                                | GOMF_SECONDARY_ACTIVE_TRANSMEMBRANE_TRANSPORTER_ACTIVITY    | 14/277              | 8.52e-06 | 0.000392958 | 4.73576 | 55.2832 | Slc30a1;Slco1c1;Slc1a1;Slc16a1;Slc38a5;Slc16a4;Slc16a2;Slc38a3;Mfsd2a;Slc6a6;Slc22a8;Slc16a9;Slc7a5;Slc39a10                                                                                                                                                                                                                                                                                                            | Specific Brain |
| Mouse_vascular                                                                | HARRIS_HYPOXIA                                              | 1977-08-01 00:00:00 | 4.71e-06 | 0.00033114  | 10.2232 | 125.388 | Vim;Lrp8;Edn1;Cp;Flt1;Slc2a1;Pdgfb;Tfrc                                                                                                                                                                                                                                                                                                                                                                                 | Specific Brain |
| Mouse_vascular                                                                | PID_HIF1_TFPATHWAY                                          | 1964-06-01 00:00:00 | 0.000136 | 0.00400398  | 9.15681 | 81.4977 | Cxcl12;Abcb1a;Edn1;Cp;Slc2a1;Tfrc                                                                                                                                                                                                                                                                                                                                                                                       | Specific Brain |
| Mouse_vascular                                                                | REACTOME_AMINO_ACID_TRANSPORT_ACROSS_THE_PLASMA_MEMBRANE    | 1932-05-01 00:00:00 | 4.22e-05 | 0.00170337  | 16.4052 | 165.256 | Slc38a5;Slc7a1;Slc38a3;Slc6a6;Slc7a5                                                                                                                                                                                                                                                                                                                                                                                    | Specific Brain |
| Mouse_vascular                                                                | REACTOME_SLC_MEDIATED_TRANSMEMBRANE_TRANSPORT               | 16/236              | 3.44e-08 | 1.11263e-05 | 6.57129 | 112.92  | Slc30a1;Slco1c1;Slc1a1;Slc16a1;Slc38a5;Slc7a1;Slc16a2;Slc38a3;Slc6a6;Slc22a8;Bsg;Cp;Slc7a5;Slc2a1;Slc40a1;Slc39a10                                                                                                                                                                                                                                                                                                      | Specific Brain |
| Mouse_vascular                                                                | SEMENZA_HIF1_TARGETS                                        | 1934-05-01 00:00:00 | 5.71e-05 | 0.00205086  | 15.2902 | 149.384 | Edn1;Cp;Flt1;Slc2a1;Tfrc                                                                                                                                                                                                                                                                                                                                                                                                | Specific Brain |
| Mouse_vascular                                                                | WINTER_HYPOXIA_METAGENE                                     | 13/229              | 5.2e-06  | 0.00033114  | 5.34694 | 65.057  | Slc16a1;Vim;Fn1;Tpd52;Slc6a6;Abcb1a;Edn1;Cp;Flt1;Slc2a1;Pdgfb;Tfrc;Slc16a2                                                                                                                                                                                                                                                                                                                                              | Specific Brain |

## Supplementary Table S6

| Supplementary Table S6. Top genes for cNMF modules |           |            |         |        |           |         |               |         |          |         |          |               |               |               |
|----------------------------------------------------|-----------|------------|---------|--------|-----------|---------|---------------|---------|----------|---------|----------|---------------|---------------|---------------|
|                                                    | 1         | 2          | 3       | 4      | 5         | 6       | 7             | 8       | 9        | 10      | 11       | 12            | 13            | 14            |
| 0                                                  | Dnase1l3  | Meis2      | Enpp2   | Tpt1   | Edil3     | Adgrg6  | Pcdh7         | Aqp7    | Slco1a4  | Akr1c21 | Dock2    | Zfp92         | Kif21a        | Cyp3a25       |
| 1                                                  | Clec4g    | Malat1     | Cd24a   | Rplp1  | D5Ert615e | Pcsk5   | Gh            | Lnx1    | Spock2   | Spink1  | Arhgap15 | Frem3         | Kcna1         | C730036E19Rik |
| 2                                                  | Tpbgl     | Fbxl7      | Esm1    | Ppia   | Chst8     | Nrg1    | Pomc          | Slc28a2 | Slco1c1  | Aldob   | Ptprc    | Abcg8         | Kcng4         | Cyp4a12a      |
| 3                                                  | Oit3      | Lrmda      | Mlec    | Rps24  | Inpp4b    | Atp13a3 | Kirrel3       | Timp4   | Ptn      | Slc4a4  | Bank1    | Tktl1         | Klk1b4        | 9030616G12Rik |
| 4                                                  | Bmp2      | Psd3       | Rbp7    | Fau    | Fkbp5     | Kcnn4   | Fos           | Ablim3  | Bsg      | Spp2    | Ikzf3    | Pcsk9         | Cdcpl1        | Abca6         |
| 5                                                  | Fcgr2b    | Ldb2       | Lama3   | Tmsb4x | Npr3      | Pi16    | Chrm3         | Tmem182 | Abcb1a   | Fxyd2   | Ighm     | Acrv1         | Rem2          | Slc17a3       |
| 6                                                  | Lgmn      | Rasal2     | Emp2    | Ifitm2 | Mettl24   | Ctnnb2  | Cga           | Angptl4 | Itm2a    | Miox    | Tmem163  | Vmn1r188      | Gja3          | Onecut2       |
| 7                                                  | Lyve1     | Prkg1      | Nav2    | Rpl37a | Adamts6   | Gja5    | Junb          | Meox2   | Sema3c   | Fabp2   | Pax5     | Kcnmb3        | Csrnp3        | Gm34667       |
| 8                                                  | Aqp1      | mt-Nd1     | Lysmd2  | Rpl35a | Sdk1      | Mecom   | Mmrn1         | C1qtnf9 | Ccdc141  | Ftcd    | Ikzf1    | D130079A08Rik | Tnmd          | 5033403H07Rik |
| 9                                                  | Cd55      | Zbtb20     | Kctd12b | Rps29  | Zbtb16    | Plac8   | Hspa1a        | Pparg   | Lef1     | Otc     | Coro1a   | Astl          | Gm12145       | Gm36173       |
| 10                                                 | Gpr182    | mt-Nd2     | Sparcl1 | Rpl41  | Lmtk3     | Fbln2   | Robo2         | Lpl     | Gpcpd1   | 12.Sep  | Wdfy4    | Gm26737       | 2610016A17Rik | Csrp3         |
| 11                                                 | Ccdc80    | mt-Co1     | Prdm1   | Eef1a1 | AU021092  | Vegfc   | Abca1         | Cd36    | Abhd2    | Gm31583 | Sema4d   | Gm43915       | Gm44983       | Slc22a1       |
| 12                                                 | Slc43a2   | mt-Co2     | Stc1    | Rps8   | Tbxas1    | Fbn1    | AY036118      | Scd1    | Slc39a10 | Gm19619 | Gpr132   | Xkr7          | Parm1         | Mlxipl        |
| 13                                                 | Snx5      | Rbms1      | B3gnt2  | Rpl23  | Hipk2     | Epha6   | Flrt2         | Csf2rb  | Slc2a1   | Apoc4   | Gm26740  | 4933406J10Rik | Gm32926       | Gm29966       |
| 14                                                 | Prkcb     | mt-Atp6    | Rhbdl2  | Rpl13  | Igfbp5    | Gja4    | Nos1ap        | Abcb1b  | Fn1      | Gck     | Gm8369   | Prt3          | Gm28505       | Gm16090       |
| 15                                                 | C5ar2     | Zeb1       | Proser2 | Rps21  | Rsad2     | Sema5a  | Cdh2          | Cfd     | Pglyrp1  | Agmat   | Aff3     | Atp13a5       | Glb1l2        | 5730522E02Rik |
| 16                                                 | Dpp4      | Fmn12      | Gm12002 | Rpl9   | Tnxb      | Dkk2    | Trp53i11      | Lmo1    | Cldn5    | Adra1b  | Iglc2    | Myo7b         | Lonrf2        | Sgk2          |
| 17                                                 | Mrc1      | Macf1      | Map2    | Ifitm3 | Gata6     | Eln     | Prss23        | Tcf15   | Igf1r    | Elov3   | 1.Mar    | Nsun7         | Tmprss13      | Ppfibp2       |
| 18                                                 | Hpgd      | mt-Nd4     | Rtl8a   | Rps12  | Dram1     | Col18a1 | G0s2          | Tpst1   | Tfrc     | Rdh16f2 | Blk      | Pde4c         | Klra7         | Dsc2          |
| 19                                                 | Plxnc1    | mt-Co3     | Sybu    | Rps27a | Cd9       | Serpnb8 | Hspa1b        | Cav1    | Slc7a1   | Gm48633 | Rac2     | Ttc21a        | Pax1          | Slc22a28      |
| 20                                                 | Arhgdib   | Plekhhg1   | Fmo2    | Rps4x  | Ifi44     | Sdc1    | Adamts9       | Car3    | Pltp     | Ttc36   | Lsp1     | Milr1         | Kndc1         | Slc25a21      |
| 21                                                 | Stab2     | mt-Cytb    | Rcan2   | Rpl19  | Tll1      | Col5a2  | Ltbp1         | Enah    | Prom1    | Gpx3    | Arhgap30 | Gm40155       | Gm32151       | Gabbr2        |
| 22                                                 | Tmem106a  | Arl15      | Lamb1   | Rps20  | Boc       | Stmn2   | Hsp90aa1      | Lrrc36  | Esy2     | Asgr2   | Ptprcap  | Gm36283       | Klk1b26       | Reps2         |
| 23                                                 | Gatm      | Peak1      | Ebf3    | Rps14  | Tmem26    | Slc45a4 | Jund          | Kcna5   | Frmd5    | Keg1    | Ptpn22   | Serpine3      | Mesp2         | Cdh18         |
| 24                                                 | Psen2     | Nrp1       | Hey2    | Rpl27a | Itgb5     | Jag1    | 1700001K19Rik | Ehd2    | Cxcl12   | Slc34a1 | Btla     | Slc6a9        | Lin7b         | Cyp3a59       |
| 25                                                 | Gata4     | Prkce      | Sort1   | Rps10  | Fam117b   | Col8a1  | Ccser1        | Gm29007 | Slc6a6   | Cltrn   | Fcmr     | Gm41556       | Klk1b21       | Ddo           |
| 26                                                 | Masp1     | Gm42418    | Jam3    | Rpl28  | Il33      | Fbln5   | Auts2         | Fabp5   | Nebi     | Creb3l3 | Laptn5   | Zc3hav1l      | Klk1b3        | Gm31805       |
| 27                                                 | Cxcl16    | St6galnac3 | Rtl8b   | Rps16  | Pbx1      | Nuak1   | Gas7          | Cxcl9   | Ndnf     | Fbp1    | Mir142hg | Tm4sf20       | Klk1b16       | Ppara         |
| 28                                                 | C1qtnf1   | Fbxl17     | Mgst3   | Rps3a1 | Cmk1r1    | Thsd7a  | Jun           | Hrh2    | Slc22a8  | Gm32872 | Nckap1l  | Gm15952       | Dsg2          | Gm31333       |
| 29                                                 | Serpina3g | Prex2      | Clu     | Rpl30  | Hapln1    | Atp2a3  | Tanc2         | Ebf3    | Cobll1   | Spp1    | Rhoh     | D830024N08Rik | 2610528J11Rik | Inca1         |

| Supplementary Table S6. Top genes for cNMF modules |          |          |          |        |           |          |               |               |          |           |           |               |               |               |
|----------------------------------------------------|----------|----------|----------|--------|-----------|----------|---------------|---------------|----------|-----------|-----------|---------------|---------------|---------------|
| 30                                                 | Aass     | Magi1    | Ackr3    | Rps15a | Cldn15    | Plat     | Hlf           | Tnc           | Atp10a   | Guca2b    | Selplg    | Capn12        | Cldn6         | Nlrp6         |
| 31                                                 | Cotl1    | Tmcc3    | Cxcr4    | Rpl37  | Nup210    | Trpm3    | Tmem200a      | Abca8b        | Foxq1    | Acsn2     | Ptk2b     | Gpr137c       | Spink8        | Abcc2         |
| 32                                                 | Il1a     | Pitpnc1  | Pcdh20   | Rpl26  | Thrb      | Slc27a3  | Fosb          | Mgat4a        | Rundc3b  | Kap       | Hck       | A3galt2       | Cldn8         | Gm43387       |
| 33                                                 | Wnt2     | Sema6a   | Ivns1abp | B2m    | Gimap5    | Sema3g   | Btg2          | Samd5         | Grb14    | Gsta2     | Ms4a6c    | Nanos1        | Chga          | Sel1l3        |
| 34                                                 | Ctsb     | Pard3b   | Lmna     | Actb   | Nav3      | Lmo7     | Cmss1         | Dst           | Sorbs2   | Uox       | Cybb      | Prx           | Prss8         | Pid1          |
| 35                                                 | Cd84     | Prkch    | Mfsd6    | Rps11  | Cacna2d3  | Spon1    | Lbp           | Dach1         | Adgrl3   | Pcbd1     | Ms4a1     | Wdr95         | Adgrg2        | Dlg3          |
| 36                                                 | Tspan7   | Ralgapa2 | Sez6l    | Rpl34  | Dnm3      | Nkx2-3   | Wdr17         | Fabp4         | Elov17   | Atp1b1    | Zfp831    | Nfe2l3        | Klhdc9        | Pcdhb15       |
| 37                                                 | Igfbp4   | Slc9a9   | Foxf1    | Rps19  | Flrt3     | S100a4   | Arhgap6       | Gpr160        | Usp53    | Leap2     | Ms4a4c    | Gm15559       | Fndc5         | Kif22         |
| 38                                                 | Arhgap45 | Rapgef2  | Ar       | Rpl21  | Irx3      | Slit2    | Gm15261       | Adh1          | Apccdd1  | Slc5a2    | Ly86      | Mrnip         | Casr          | Cyp2c54       |
| 39                                                 | Ap1b1    | Ankrd44  | Cpxm2    | Rps27  | Rbfox3    | Sox17    | Kcnj3         | Cdh23         | Itih5    | Ugt2b38   | Ctse      | Gm28198       | Tspoap1       | Hc            |
| 40                                                 | Taok3    | Atrnl1   | Clstn1   | Rpl32  | Mapt      | Erc2     | Ccn2          | Cd247         | Ocln     | Acat3     | Ncf4      | Zswim4        | Cryba2        | Gm31508       |
| 41                                                 | Mmp14    | Oxr1     | Kcnk5    | Rps23  | Sult2b1   | Lrig1    | Odc1          | Retn          | Jcad     | Chchd10   | Tnfrsf13b | Gm14858       | Smim10l2a     | Slc19a2       |
| 42                                                 | Degs1    | Stox2    | Ces2e    | Myl6   | Ifi206    | Slc6a6   | Scn1b         | Cavin1        | Sgms1    | Arg1      | Cd52      | A730049H05Rik | Dnah7b        | Efhc1         |
| 43                                                 | Mt1      | Maml2    | Tmem150c | Ubb    | Hoxb7     | Mannr    | Cited2        | Arhgef28      | Mfsd2a   | Lrp2      | Atp8b4    | Olf156        | Smim22        | Gcgr          |
| 44                                                 | Pdk4     | Sbf2     | Acss1    | Ptma   | Emid1     | St8sia6  | Pbx1          | Spaar         | Gsta4    | Slc47a1   | AB124611  | 1700084C06Rik | Ripk4         | G730013B05Rik |
| 45                                                 | Clec1b   | Tcf4     | Cx3cl1   | Rpl17  | Asph      | Megf6    | Sned1         | Ptger4        | Flt1     | Fut9      | Gm15987   | Xrcc6         | Pax9          | Prox1         |
| 46                                                 | Akr1b8   | B3galt1  | Gzmk     | Rpl18a | Chrm3     | Specc1   | Elmo1         | Nepn          | Ablim1   | Clec2h    | Slamf6    | Gm15336       | Rhou          | Akr1c6        |
| 47                                                 | Adam23   | Zswim6   | Map1lc3a | Rpl8   | Cyp20a1   | Tgfb2    | Meis2         | Kcnc2         | Tjp1     | Tinag     | Cd79a     | Zfp579        | Myl1          | Naaladl2      |
| 48                                                 | Gm12840  | Dlc1     | Bicc1    | Serf2  | Limch1    | Ntn4     | Nectin2       | Gstt1         | Car4     | Serpina1e | Nlrp1b    | Pprc1         | Mal2          | Zkscan7       |
| 49                                                 | Il6st    | Stab2    | Eno1     | Rpl39  | Ptpu      | Wipf3    | Egr1          | Tspan6        | Ctsh     | Mal2      | Fyb       | Egln3         | Tenm3         | Clmn          |
| 50                                                 | Iqgap2   | Tshz2    | Map3k5   | Fth1   | Pmp22     | Bmx      | Nav3          | Hrct1         | Pcp41l   | Pdzk1ip1  | Igic1     | Nup155        | Pkib          | Gprin3        |
| 51                                                 | Hvcn1    | Gnaq     | Hlx      | Rpl13a | Itiprip   | Alpl     | Pdia5         | Prg4          | Fry      | Sds       | Ptpn6     | Plekkg2       | Rbm47         | Ube2c         |
| 52                                                 | Il13ra1  | Dock4    | Chrm2    | Rps5   | Deptor    | Plcg2    | Nceh1         | Coro6         | Slc38a5  | Zfp972    | Spn       | Glp2r         | Pappa         | Dpys          |
| 53                                                 | Sirpa    | Palld    | Ints9    | Rps9   | Hoxb6     | Klf12    | Lipc          | Cdh13         | Paqr5    | Acy3      | Irf4      | Pycard        | F3            | 5033421B08Rik |
| 54                                                 | Fam124a  | Ptprm    | Adam12   | Itm2b  | Cebpb     | Kank4    | Setbp1        | Akap5         | Arl4a    | Gc        | Dusp2     | 9630013A20Rik | Cfap65        | Smyd5         |
| 55                                                 | Maf      | mt-Nd3   | Bmp1     | Eif1   | Slit3     | Eps8l2   | Filip1l       | Fhl1          | Tnfrsf19 | Fam25c    | Csf1r     | D130040H23Rik | Fbln1         | Shroom3       |
| 56                                                 | Hs3st3b1 | Pan3     | Plscr1   | Rps15  | Fgf1      | Abr      | 2610307P16Rik | Vwa3a         | Mecom    | Ass1      | Rnase6    | Ctr9          | Nrtn          | Dglucy        |
| 57                                                 | Dab2     | Apbb2    | Tg       | Rps13  | Tnfrsf11a | Nmnat2   | Creb5         | G630055G22Rik | Lsr      | Prdx5     | Susd3     | Gm36975       | Gata3         | Sfxn5         |
| 58                                                 | Sord     | Ppp3ca   | Ednrb    | Rplp2  | Ephb1     | Arhgap44 | Nfkbiz        | Cas21         | Tspan5   | Ttr       | Ctss      | Pdpr          | Vwa5b2        | Clsn          |
| 59                                                 | Fam107b  | Akt3     | Ahr      | Rpl11  | Pcdh9     | Mgp      | Gsta3         | Mgll          | Slc16a1  | Urah      | Cd2       | Atf3          | Tspan33       | Irs1          |
| 60                                                 | Rgs7bp   | Plpp1    | Sos1     | Rps3   | Bst1      | Glul     | Slc38a2       | Adamts9       | Sgpp2    | Angptl3   | Pik3ap1   | Cep128        | 5730522E02Rik | Piga          |
| 61                                                 | Slc9a3r1 | Exoc4    | Tent5a   | Rpl7   | Gm6213    | Sfrp1    | Col4a3        | Gstt2         | Slc40a1  | Cd63      | Scml4     | Icam1         | Pcyt1b        | Gm44710       |
| 62                                                 | Gns      | Strn3    | Tox3     | Ftl1   | Zfhx3     | Vwf      | Sema3d        | Gm48617       | Lmntd1   | Apoc3     | Ighd      | A430090L17Rik | Tmem8         | Gm30794       |
| 63                                                 | Tpp1     | Asap1    | Mdh1     | Rpl15  | Irx5      | Nebi     | Has3          | Papss2        | Hmcn1    | Dnase1    | Gm2682    | Rbm4b         | Ppp2r2b       | Ptprd         |

| Supplementary Table S6. Top genes for cNMF modules |           |          |          |         |               |          |           |          |          |               |           |               |         |               |
|----------------------------------------------------|-----------|----------|----------|---------|---------------|----------|-----------|----------|----------|---------------|-----------|---------------|---------|---------------|
| 64                                                 | Cxcl9     | F8       | Hspd1    | Rps7    | Phlda1        | Heg1     | Sat1      | Fasn     | Maoa     | Slc6a18       | Spib      | 4930512B01Rik | Rsph9   | Sox6          |
| 65                                                 | Snx8      | Ptprb    | Cfap20   | Rpl6    | Inpp5d        | Sox6     | Gpm6a     | Arhgap18 | Slc16a4  | Bves          | Ms4a6b    | Fbrsl1        | Slain1  | Hook2         |
| 66                                                 | Slc9a9    | Sh3rf1   | Lipe     | Rpsa    | Il15          | Met      | Dnah11    | Themis2  | Plip     | Slc22a6       | Cd86      | Dnajb1        | Gdf15   | Gm31718       |
| 67                                                 | Snx24     | Gphn     | Enpp6    | Rpl10   | Tgfb2         | Timp2    | Pdgfa     | Pkp4     | Dach1    | Slc5a12       | Cd74      | Fbxo30        | Myl6b   | Dnajc12       |
| 68                                                 | Cltc      | Hecw2    | Lrrfp1   | Rpl38   | Ston2         | Sost     | Piezo2    | Ctnnbip1 | Unc13c   | A1cf          | Pou2f2    | Tbxas1        | Ddr1    | Slc35e2       |
| 69                                                 | Snx18     | Sash1    | Alox12   | Rpl18   | Bach2         | Bicd1    | Prl       | Pbld1    | Srarp    | Erbp3         | Rgs1      | Smu1          | Tll10   | Glb1l         |
| 70                                                 | Palld     | Rora     | Tmem255b | Rpl24   | H2-Ab1        | Tspan8   | Foxl2     | Tnfrsf21 | Lrp8     | Itgb8         | Pilrb1    | 3110056K07Rik | Wwc1    | Cenpl         |
| 71                                                 | Anapc15   | Srgap2   | Mcf2l    | Rpl22   | Hoxa7         | Hey1     | Scarb1    | Cdkn1c   | Slc7a5   | Serpina1d     | Ifi214    | Gclc          | Zfp804b | Tc2n          |
| 72                                                 | Hgf       | Syne1    | Fkbp3    | Gnas    | Ramp3         | Gm45304  | Icam1     | Tspan13  | Col4a3bp | Pigr          | Ltb       | Agk           | Krt18   | Gk            |
| 73                                                 | Tfpi      | Numb     | AW112010 | Cd81    | Resf1         | Gkn3     | Me3       | Gfod1    | St8sia4  | Sel1l3        | Sirpb1b   | Syn3          | Scnn1b  | Gm15655       |
| 74                                                 | Hdc       | Mir99ahg | Plscr2   | Rpl29   | Chd9          | Casc4    | Brip1     | Adora2a  | Abcg2    | Tlr12         | Runx1     | Ccnh          | Kcnk1   | Phyh          |
| 75                                                 | Olfm1     | Vav3     | Atg4a    | Rps28   | Prkd1         | Npnt     | Myo5b     | Ablim1   | Vwa1     | Rida          | Adgre1    | Zfp131        | Zbtb8b  | Ipp           |
| 76                                                 | Mb21d2    | Nfia     | Eif4ebp2 | Rps18   | Plaur         | Azin1    | Zfp521    | Pdzd2    | Foxc1    | Slc18a1       | Ccr7      | Ncoa5         | Wfdc2   | Cbr4          |
| 77                                                 | Ralgapa2  | Tcf12    | Gpx8     | Gng11   | Slco3a1       | Kap      | Nkd2      | Plin2    | Wfdc1    | Gm27216       | Gm30211   | Gm12216       | Cxcl14  | Msh5          |
| 78                                                 | Zeb2      | Sntb1    | Smim14   | Rps2    | Lrrc3b        | Pdlim3   | Hspb8     | Lncbate6 | Tspan13  | Nphs2         | Cd300c2   | Gm15261       | Pla2g7  | Stau2         |
| 79                                                 | Stab1     | Adgrl2   | Atp6v0b  | Ndufa4  | Prex1         | S100a6   | Col15a1   | Airn     | Net1     | Slc14a1       | Cd83      | Cse1l         | Syt14   | Igfs5         |
| 80                                                 | Dse       | Ptk2     | Foxp2    | Chchd2  | Chst11        | Ankrd33b | Gm26802   | Depp1    | Slc16a2  | Bhmt2         | Tnfrsf13c | Gm35188       | Gprasp2 | Abcc3         |
| 81                                                 | Pdlim1    | Tbc1d5   | Klf13    | Ly6a    | Tnfrsf11b     | Edn1     | Atf3      | Acot7    | Gpd2     | Apoc2         | Nkg7      | Fanc          | Gcm2    | Cpq           |
| 82                                                 | Kit       | Dock1    | Unc119b  | Calm1   | Ifi213        | Emb      | Krt80     | Unc119   | Utrn     | Cdca8         | H2-Eb2    | 4930517O19Rik | Ank3    | A230072C01Rik |
| 83                                                 | Npl       | Fam172a  | Sema7a   | Rplp0   | Slc44a2       | Rps6ka5  | Hexb      | Cdk14    | Fam13c   | Cdhr2         | Siglecg   | Esrrg         | Bex1    | Bcl6          |
| 84                                                 | Calhm6    | Atxn1    | Bcam     | Rps26   | Ccnd3         | C3       | Pdpn      | Cidec    | Slc19a3  | Aqp3          | Ms4a4b    | Wwp2          | Tenm4   | Dbt           |
| 85                                                 | Ckap4     | Foxn3    | Stmn1    | Sparc   | Aig1          | Gata5    | Abhd17b   | Hoxd9    | Golim4   | Ces2h         | Runx3     | Gm46367       | Epcam   | Gm42699       |
| 86                                                 | Ppp1r15a  | Bcas3    | Endod1   | S100a13 | Oasl2         | Pde3a    | Slc18a2   | Prag1    | Dnm3     | Krt7          | Irf5      | Litaf         | Rab25   | Fuca2         |
| 87                                                 | Emilin1   | Kansl1   | Mlf1     | Fabp4   | Tmem176a      | Tm4sf1   | Syn3      | Epb41l4a | Kitl     | Serpina1c     | Glpr1     | Wdr17         | Cldn9   | C330018D20Rik |
| 88                                                 | Gpr155    | Zeb2     | Ssu2     | Rpl3    | Fcer1g        | Fgfr3    | Rnf220    | Inf2     | Ly6c1    | Klk1          | Cd79b     | Tgfb1         | Pth     | Atpaf2        |
| 89                                                 | Selenop   | Adgrl4   | Crip1    | Ly6e    | 4833403J16Rik | Mgst1    | Ccl21a    | Gpd1     | Mbp      | Clstn3        | Gm43388   | Foxj3         | Padi1   | Slc25a47      |
| 90                                                 | Cd59a     | Cdk8     | Slc12a2  | Rpl36   | Gm12002       | Efh1     | Socs3     | Tmem86a  | Wnt5a    | Napsa         | Gpr183    | Dync1h1       | Agbl4   | Tbc1d24       |
| 91                                                 | Serpina3f | Adam23   | Slc23a2  | Rpl5    | Emp3          | Rnf152   | Lrrc4     | Inka2    | Slc38a3  | Sorl1         | Sh2d2a    | Ccnyl1        | Ildr1   | Gin1          |
| 92                                                 | Gnpda1    | Exoc6b   | Piezo2   | S100a10 | Entpd1        | Prune2   | Stambpl1  | Gpihbp1  | Far2     | Slc16a7       | Klrd1     | Ddx46         | Anpep   | Tmem139       |
| 93                                                 | Cxcl10    | Cyrr1    | B4galt4  | Gpx4    | Gm30382       | Mal      | Ptpru     | Gprn3    | Foxf2    | Gal3st1       | Ccl6      | Sipa1l1       | Wnt4    | Gm15319       |
| 94                                                 | Lamp2     | St3gal4  | Cep85l   | Cox4i1  | Mylk          | Tfcp2l1  | Pard3bos1 | Klhdc7a  | Ldlrad3  | Mup3          | Fcgr3     | Tmem243       | Lrrc38  | Mapk10        |
| 95                                                 | B3galt1   | Nfib     | Mdga2    | Atox1   | Rhob          | Gm6213   | Fbln5     | Ucp1     | Tmsb10   | Sh3rf3        | Plbd1     | Mtf2          | Fbxo2   | Arap1         |
| 96                                                 | Tmem51    | Enox2    | Elmo1    | mt-Co3  | Rarb          | Adgre5   | Dock3     | Gm16565  | Ddc      | Slc22a28      | Il1b      | Kirrel3       | Galnt3  | Mpp6          |
| 97                                                 | Sdc4      | Nbea     | Arhgap18 | Atp5h   | Kalrn         | Adamts16 | Hsp1      | Halr1    | Bche     | 4921539H07Rik | P2ry10    | Ier5l         | Gm37027 | Chac2         |

| Supplementary Table S6. Top genes for cNMF modules |        |      |       |       |       |         |         |         |      |          |       |         |      |       |
|----------------------------------------------------|--------|------|-------|-------|-------|---------|---------|---------|------|----------|-------|---------|------|-------|
| 98                                                 | Snx2   | Bmp6 | Oxct1 | Rps25 | Ednrb | Gcnt1   | Rapgef5 | Tsnax   | Zic3 | BC024386 | Ly6d  | Gm37240 | Krt8 | Oplah |
| 99                                                 | Rab27a | Lpp  | Nr4a1 | Prdx1 | Insr  | Adipor2 | Gm43507 | Gm15984 | Tbx1 | Tmem236  | Cytip | Dlgap4  | Scg5 | Pon3  |

## Supplementary Table S7

| Supplementary Table S7. ORA results for cNMF module gene sets |                                                                      |                     |          |                  |            |                |                                                                                                                                                                                                                                                                                                   |              |
|---------------------------------------------------------------|----------------------------------------------------------------------|---------------------|----------|------------------|------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| Gene_set                                                      | Term                                                                 | Overlap             | P-value  | Adjusted P-value | Odds Ratio | Combined Score | Genes                                                                                                                                                                                                                                                                                             | cluster_name |
| Mouse_vascular                                                | FULCHER_INFLAMMATORY_RESPONSE_LECTIN_VS_LPS_DN                       | 16/405              | 5.64e-08 | 1.36e-05         | 6.48626    | 108.26         | Lgmn;Gatm;Stab1;Gns;Ap1b1;Zeb2;Arhgap45;Cxcl9;Calh m6;Snx18;Snx2;Selenop;Npl;Cxcl10;Cd84;Maf                                                                                                                                                                                                      | Module8      |
| Mouse_vascular                                                | AMINOGLYCAN_CATABOLIC_PROCESS                                        | 1933-03-01 00:00:00 | 0.001995 | 0.036993         | 15.3012    | 95.1257        | Gns;Stab2;Lyve1                                                                                                                                                                                                                                                                                   | Module8      |
| Mouse_vascular                                                | AMINOGLYCAN_METABOLIC_PROCESS                                        | 6/117               | 0.000266 | 0.012525         | 8.00708    | 65.9181        | Lyve1;Gns;Hs3st3b1;Cltc;Dse;Stab2                                                                                                                                                                                                                                                                 | Module8      |
| Mouse_vascular                                                | CARBOHYDRATE_DERIVATIVE_METABOLIC_PROCESSES                          | 16/978              | 0.002723 | 0.044195         | 2.48349    | 14.6671        | Pdk4;Kit;Lyve1;B3galt1;Tmem106a;Gnpda1;Npl;Gns;Hs3st3b1;Cltc;Aass;Dse;Akr1b8;Bmp2;Stab2;Sord                                                                                                                                                                                                      | Module8      |
| Mouse_vascular                                                | HYALURONAN_METABOLIC_PROCESS                                         | 1933-03-01 00:00:00 | 0.001995 | 0.036993         | 15.3012    | 95.1257        | Stab2;Lyve1;Cltc                                                                                                                                                                                                                                                                                  | Module8      |
| Mouse_vascular                                                | LEUKOCYTE_CHEMOTAXIS                                                 | 7/208               | 0.001043 | 0.025146         | 5.13482    | 35.252         | Kit;C5ar2;Lgmn;Dpp4;Cxcl9;Cxcl16;Cxcl10                                                                                                                                                                                                                                                           | Module8      |
| Mouse_vascular                                                | MUCOPOLYSACCHARIDE_METABOLIC_PROCESS                                 | 1989-05-01 00:00:00 | 0.000583 | 0.017553         | 8.85086    | 65.9202        | Lyve1;Gns;Cltc;Dse;Stab2                                                                                                                                                                                                                                                                          | Module8      |
| Mouse_vascular                                                | POSITIVE_REGULATION_OF_VASCULAR_ENDOTHELIAL_GROWTH_FACTOR_PRODUCTION | 2026-03-30 00:00:00 | 0.00151  | 0.033075         | 16.9751    | 110.268        | Il6st;Gata4;Il1a                                                                                                                                                                                                                                                                                  | Module8      |
| Mouse_vascular                                                | NABA_MATRISOME                                                       | 18/902              | 0.000129 | 0.007799         | 3.14403    | 28.1461        | Wnt2;Mmp14;Il1a;Ctsb;Clec4g;Adam23;Emilin1;Sdc4;C1qtnf1;Clec1b;Cxcl9;Hgf;Bmp2;Igfbp4;Masp1;Cxcl10;Oit3;Plxnc1                                                                                                                                                                                     | Module8      |
| Mouse_vascular                                                | NABA_MATRISOME_ASSOCIATED                                            | 15/646              | 9.95e-05 | 0.007799         | 3.62061    | 33.3641        | Wnt2;Mmp14;Il1a;Ctsb;Clec4g;Adam23;C1qtnf1;Sdc4;Clec1b;Cxcl9;Hgf;Bmp2;Masp1;Cxcl10;Plxnc1                                                                                                                                                                                                         | Module8      |
| Mouse_vascular                                                | PETROVA_ENDOTHELIUM_LYMPHATIC_VS_BLOOD_UP                            | 5/126               | 0.002751 | 0.044195         | 6.13473    | 36.1696        | Mrc1;Pdlim1;Iqgap2;Selenop;Maf                                                                                                                                                                                                                                                                    | Module8      |
| Mouse_vascular                                                | REACTOME_GLYCOSAMINOGLYCAN_METABOLISM                                | 6/124               | 0.000364 | 0.012525         | 7.52926    | 59.6233        | Lyve1;Gns;Hs3st3b1;Sdc4;Dse;Stab2                                                                                                                                                                                                                                                                 | Module8      |
| Mouse_vascular                                                | REACTOME_METABOLISM_OF_CARBOHYDRATES                                 | 9/285               | 0.000316 | 0.012525         | 4.83011    | 38.9338        | B3galt1;Lyve1;Gnpda1;Gns;Hs3st3b1;Sdc4;Dse;Stab2;Sord                                                                                                                                                                                                                                             | Module8      |
| Mouse_vascular                                                | RUTELLA_RESPONSE_TO_HGF_VS_CSF2RB_AND_IL4_UP                         | 12/380              | 2.96e-05 | 0.003568         | 4.9209     | 51.3124        | Prkcb;Dab2;Il1a;Gns;Iqgap2;Emilin1;Cxcl9;Tmem51;Npl;Cxcl10;Mt1;Lamp2                                                                                                                                                                                                                              | Module8      |
| Mouse_vascular                                                | YU_MYC_TARGETS_DN                                                    | 1955-04-01 00:00:00 | 0.000807 | 0.021617         | 11.7715    | 83.8343        | Prkcb;Gns;Arhgap45;Olfm1                                                                                                                                                                                                                                                                          | Module8      |
| Mouse_vascular                                                | ENERGY_DERIVATION_BY_OXIDATION_OF_ORGANIC_COMPOUNDS                  | 9/322               | 0.000244 | 0.019047         | 5.04087    | 41.9285        | mt-Co1;mt-Nd2;mt-Nd4;mt-Co3;mt-Nd3;mt-Atp6;mt-Cytb;mt-Co2;mt-Nd1                                                                                                                                                                                                                                  | Module2      |
| Mouse_vascular                                                | GENERATION_OF_PRECURSOR_METABOLITES_AND_ENERGY                       | 11/486              | 0.000304 | 0.019047         | 4.08921    | 33.1171        | mt-Co1;mt-Nd2;Enox2;mt-Nd4;mt-Co3;Zbtb20;mt-Nd3;mt-Atp6;mt-Cytb;mt-Co2;mt-Nd1                                                                                                                                                                                                                     | Module2      |
| Mouse_vascular                                                | KEGG_OXIDATIVE_PHOSPHORYLATION                                       | 9/127               | 1.31e-07 | 2.46e-05         | 13.5784    | 215.207        | mt-Co1;mt-Nd2;mt-Nd4;mt-Co3;mt-Nd3;mt-Atp6;mt-Cytb;mt-Co2;mt-Nd1                                                                                                                                                                                                                                  | Module2      |
| Mouse_vascular                                                | AMIDE_BIOSYNTHETIC_PROCESS                                           | 49/888              | 1.1e-37  | 4.53e-36         | 26.7446    | 2276.09        | Rps5;Rpl37a;Rpl27a;Rpl26;Rpl3;Rpl32;Rplp2;Rps19;Rps14;Rpl6;Rps23;Rps27;Rps15;Rpl22;Rps8;Rps27a;Rpl11;Eef1a1;Rpl23;Rps16;Rpsa;Rpl19;Rpl15;Rps26;Rps7;Rpl28;Rpl8;Rpl7;Rpl37;Rplp0;Rps4x;Rpl13a;Rpl36;Rpl30;Rpl35a;Rps15a;Rps29;Rps9;Rpl34;Rps21;Rps13;Rpl38;Fau;Rps20;Rps18;Rps28;Rpl13;Rpl24;Rps25 | Module1      |
| Mouse_vascular                                                | REACTOME_METABOLISM_OF_AMINO_ACIDS_AND_DERIVATIVES                   | 48/345              | 2.1e-56  | 2.61e-54         | 74.558     | 9558.47        | Rps5;Rpl37a;Rpl27a;Rpl26;Rpl3;Rpl32;Rplp2;Rps19;Rps14;Rpl6;Rps23;Rps27;Rps15;Rpl22;Rps8;Rps27a;Rpl11;Rpl23;Rps16;Rpsa;Rpl19;Rpl15;Rps26;Rps7;Rpl28;Rpl8;Rpl7;Rpl37;Rplp0;Rps4x;Rpl13a;Rpl36;Rpl30;Rpl35a;Rps15a;Rps29;Rps9;Rpl34;Rps21;Rps13;Rpl38;Fau;Rps20;Rps18;Rps28;Rpl13;Rpl24;Rps25        | Module1      |

| Supplementary Table S7. ORA results for cNMF module gene sets |                                                     |                     |          |          |         |         |                                                                                                                                                                                                                                                                                                |         |
|---------------------------------------------------------------|-----------------------------------------------------|---------------------|----------|----------|---------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| Mouse_vascular                                                | REACTOME_METABOLISM_OF_RNA                          | 49/670              | 1.11e-43 | 6.9e-42  | 36.8974 | 3649.28 | Rps5;Rpl37a;Rpl27a;Rpl26;Rpl3;Rpl32;Rplp2;Rps19;Rps14;Rpl6;Rps23;Rps27;Rps15;Rpl22;Rps8;Rps27a;Rpl11;Rpl23;Rps16;Rpsa;Rpl19;Rpl15;Rps26;Rps7;Rpl28;Rpl8;Rpl7;Rpl37;Rplp0;Rps4x;Rpl13a;Rpl36;Rpl30;Rpl35a;Rps15a;Rps29;Rps9;Rpl34;Rps21;Rps13;Rpl38;Fau;Rps20;Rps18;Rps28;Rpl13;Ubb;Rpl24;Rps25 | Module1 |
| Mouse_vascular                                                | POSITIVE_REGULATION_OF_PHOSPHORUS_METABOLIC_PROCESS | 14/693              | 0.00014  | 0.033139 | 3.71679 | 32.9869 | Tgfb2;Ramp3;Ccnd3;Plaur;Prkd1;Slco3a1;Limch1;Mapt;Ilnsr;Il15;Hipk2;Tnfrsf11a;Ednrb;Fgf1                                                                                                                                                                                                        | Module4 |
| Mouse_vascular                                                | ELVIDGE_HYPOXIA_BY_DMOG_UP                          | 6/132               | 0.000342 | 0.006798 | 7.62746 | 60.8674 | Hey1;Vegfc;S100a4;Met;S100a6;Plac8                                                                                                                                                                                                                                                             | Module7 |
| Mouse_vascular                                                | ELVIDGE_HYPOXIA_UP                                  | 6/169               | 0.001257 | 0.016557 | 5.88136 | 39.2838 | Hey1;Vegfc;S100a4;Met;S100a6;Plac8                                                                                                                                                                                                                                                             | Module7 |
| Mouse_vascular                                                | AORTA_MORPHOGENESIS                                 | 1938-03-01 00:00:00 | 0.002437 | 0.028736 | 14.1785 | 85.3092 | Jag1;Tgfb2;Hey1                                                                                                                                                                                                                                                                                | Module7 |
| Mouse_vascular                                                | ARTERY_DEVELOPMENT                                  | 5/107               | 0.000964 | 0.013496 | 7.87556 | 54.6914 | Gja5;Tgfb2;Hey1;Jag1;Edn1                                                                                                                                                                                                                                                                      | Module7 |
| Mouse_vascular                                                | ARTERY_MORPHOGENESIS                                | 1977-05-01 00:00:00 | 0.000211 | 0.00592  | 11.165  | 94.4736 | Gja5;Tgfb2;Hey1;Jag1;Edn1                                                                                                                                                                                                                                                                      | Module7 |
| Mouse_vascular                                                | ENDOTHELIUM_DEVELOPMENT                             | 9/141               | 6.38e-07 | 3.57e-05 | 11.0898 | 158.193 | Gja5;Sox17;Nrg1;Col18a1;Heg1;Hey1;Gja4;Met;Jag1                                                                                                                                                                                                                                                | Module7 |
| Mouse_vascular                                                | NEGATIVE_REGULATION_OF_COAGULATION                  | 1949-03-01 00:00:00 | 0.005034 | 0.049024 | 10.8136 | 57.2212 | Tspan8;Plat;Edn1                                                                                                                                                                                                                                                                               | Module7 |
| Mouse_vascular                                                | POSITIVE_REGULATION_OF_ENDOTHELIAL_CELL_CHEMOTAXIS  | 2026-02-15 00:00:00 | 0.004933 | 0.049024 | 26.3405 | 139.918 | Met;Sema5a                                                                                                                                                                                                                                                                                     | Module7 |
| Mouse_vascular                                                | GOCC_BASEMENT_MEMBRANE                              | 1987-05-01 00:00:00 | 0.000374 | 0.006798 | 9.80269 | 77.3517 | Col18a1;Ntn4;Npnt;Col8a1;Fbn1                                                                                                                                                                                                                                                                  | Module7 |
| Mouse_vascular                                                | KARLSSON_TGFB1_TARGETS_DN                           | 8/190               | 5.82e-05 | 0.001862 | 7.07066 | 68.9513 | Mgst1;Timp2;Glul;Adipor2;Stmn2;Npnt;Met;Plat                                                                                                                                                                                                                                                   | Module7 |
| Mouse_vascular                                                | MANALO_HYPOXIA_UP                                   | 7/197               | 0.000487 | 0.007793 | 5.89004 | 44.9238 | Gja5;Plcg2;Col18a1;Vwf;Vegfc;Nuak1;Edn1                                                                                                                                                                                                                                                        | Module7 |
| Mouse_vascular                                                | NABA_BASEMENT_MEMBRANES                             | 1939-03-01 00:00:00 | 0.002627 | 0.029424 | 13.7888 | 81.931  | Col18a1;Ntn4;Npnt                                                                                                                                                                                                                                                                              | Module7 |
| Mouse_vascular                                                | NABA_COLLAGENS                                      | 1938-03-01 00:00:00 | 0.002437 | 0.028736 | 14.1785 | 85.3092 | Col18a1;Col5a2;Col8a1                                                                                                                                                                                                                                                                          | Module7 |
| Mouse_vascular                                                | NABA_CORE_MATRISOME                                 | 13/256              | 2.58e-08 | 2.89e-06 | 8.99861 | 157.218 | Mgp;Spon1;Slit2;Col18a1;Vwf;Ntn4;Eln;Fbln5;Npnt;Col8a1;Fbln2;Col5a2;Fbn1                                                                                                                                                                                                                       | Module7 |
| Mouse_vascular                                                | NABA_ECM_GLYCOPROTEINS                              | 10/183              | 6.17e-07 | 3.57e-05 | 9.45964 | 135.258 | Mgp;Spon1;Slit2;Vwf;Ntn4;Eln;Fbln5;Npnt;Fbln2;Fbn1                                                                                                                                                                                                                                             | Module7 |
| Mouse_vascular                                                | NABA_MATRISOME                                      | 28/902              | 6.54e-12 | 1.47e-09 | 6.431   | 165.618 | Nrg1;S100a4;Fbln5;Serpinb8;Npnt;Col8a1;Fbn1;Fbln2;Mgp;Slit2;Sema5a;Vegfc;S100a6;Col5a2;Plat;Timp2;Vwf;Ntn4;Eln;Sdc1;Spon1;Sfrp1;Col18a1;Tgfb2;Adamts16;Megf6;Sema3g;Pcsk5                                                                                                                      | Module7 |
| Mouse_vascular                                                | NABA_MATRISOME_ASSOCIATED                           | 15/646              | 4.13e-05 | 0.001541 | 3.95969 | 39.9747 | Nrg1;Sfrp1;Tgfb2;Adamts16;Timp2;Sema5a;Vegfc;Megf6;Sema3g;Sdc1;Serpinb8;S100a4;Pcsk5;S100a6;Plat                                                                                                                                                                                               | Module7 |
| Mouse_vascular                                                | PETROVA_ENDOTHELIUM_LYMPHATIC_VS_BLOOD_DN           | 5/151               | 0.004356 | 0.046462 | 5.48803 | 29.8343 | Vegfc;Adgrg6;Nuak1;Col8a1;Mecom                                                                                                                                                                                                                                                                | Module7 |
| Mouse_vascular                                                | REACTOME_DEGRADATION_OF_THE_EXTRACELLULAR_MATRIX    | 7/129               | 3.49e-05 | 0.001541 | 9.21703 | 94.5952 | Col18a1;Adamts16;Timp2;Eln;Col8a1;Col5a2;Fbn1                                                                                                                                                                                                                                                  | Module7 |
| Mouse_vascular                                                | SANA_TNF_SIGNALING_DN                               | 1982-05-01 00:00:00 | 0.000284 | 0.006798 | 10.4399 | 85.2568 | Thsd7a;Vwf;Ntn4;Tm4sf1;Bmx                                                                                                                                                                                                                                                                     | Module7 |
| Mouse_vascular                                                | WESTON_VEGFA_TARGETS                                | 1988-05-01 00:00:00 | 0.000394 | 0.006798 | 9.6844  | 75.9053 | Mgp;Vwf;Sema5a;Gja4;Eln                                                                                                                                                                                                                                                                        | Module7 |



| Supplementary Table S7. ORA results for cNMF module gene sets |                                                           |                     |          |          |         |         |                                                                          |         |
|---------------------------------------------------------------|-----------------------------------------------------------|---------------------|----------|----------|---------|---------|--------------------------------------------------------------------------|---------|
| Mouse_vascular                                                | WESTON_VEGFA_TARGETS_3HR                                  | 1959-04-01 00:00:00 | 0.0008   | 0.011943 | 11.7933 | 84.0999 | Eln;Vwf;Mgp;Gja4                                                         | Module7 |
| Mouse_vascular                                                | WESTON_VEGFA_TARGETS_6HR                                  | 1949-04-01 00:00:00 | 0.000393 | 0.006798 | 14.3983 | 112.912 | Eln;Mgp;Sema5a;Gja4                                                      | Module7 |
| Mouse_vascular                                                | CHUANG_OXIDATIVE_STRESS_RESPONSE_UP                       | 2026-03-24 00:00:00 | 0.000498 | 0.017438 | 25.4496 | 193.53  | Hspa1a;Egr1;Jun                                                          | Module6 |
| Mouse_vascular                                                | DAUER_STAT3_TARGETS_UP                                    | 1945-06-01 00:00:00 | 4.33e-07 | 0.000106 | 26.8252 | 393.047 | Atf3;Icam1;Lbp;Socs3;Abca1;Jun                                           | Module6 |
| Mouse_vascular                                                | ELVIDGE_HYPOXIA_BY_DMOG_UP                                | 6/132               | 0.000222 | 0.009972 | 8.31003 | 69.9067 | Atf3;Egr1;Cited2;Fos;Sat1;Jun                                            | Module6 |
| Mouse_vascular                                                | ELVIDGE_HYPOXIA_UP                                        | 7/169               | 0.000116 | 0.009958 | 7.55153 | 68.4128 | Atf3;Egr1;Cited2;Fos;Scarb1;Sat1;Jun                                     | Module6 |
| Mouse_vascular                                                | GALIE_TUMOR_ANGIOGENESIS                                  | 2026-02-08 00:00:00 | 0.001161 | 0.035563 | 59.3679 | 401.224 | Ccn2;Pdgfa                                                               | Module6 |
| Mouse_vascular                                                | CELL_CELL_ADHESION_VIA_PLASMA_MEMBRANE_ADHESION_MOLECULES | 7/262               | 0.001615 | 0.035964 | 4.76178 | 30.6116 | Cdh2;Pcdh7;Robo2;Icam1;Kirrel3;Lrrc4;Nectin2                             | Module6 |
| Mouse_vascular                                                | REVERSE_CHOLESTEROL_TRANSPORT                             | 2026-03-19 00:00:00 | 0.000244 | 0.009972 | 33.1767 | 275.945 | Abca1;Scarb1;Lipc                                                        | Module6 |
| Mouse_vascular                                                | HAN_JNK_SINGALING_DN                                      | 1939-03-01 00:00:00 | 0.002096 | 0.042802 | 14.9705 | 92.3306 | Abca1;Lbp;Socs3                                                          | Module6 |
| Mouse_vascular                                                | NABA_CORE_MATRISOME                                       | 7/256               | 0.001414 | 0.035964 | 4.87901 | 32.0138 | Ltbp1;Col15a1;Mmrn1;Sned1;Col4a3;Fbln5;Ccn2                              | Module6 |
| Mouse_vascular                                                | RAFFEL_VEGFA_TARGETS_UP                                   | 2026-02-09 00:00:00 | 0.001487 | 0.035964 | 51.4475 | 334.986 | Cited2;Pbx1                                                              | Module6 |
| Mouse_vascular                                                | WINTER_HYPOXIA_METAGENE                                   | 8/229               | 0.000122 | 0.009958 | 6.34003 | 57.1363 | Hsph1;Egr1;Cited2;Fos;Icam1;Odc1;Sat1;Jun                                | Module6 |
| Mouse_vascular                                                | ZHANG_PROLIFERATING_VS_QUIESCENT                          | 1945-04-01 00:00:00 | 0.000208 | 0.009972 | 17.1645 | 145.509 | Cdh2;Ccn2;Hsp90aa1;Jun                                                   | Module6 |
| Mouse_vascular                                                | ELVIDGE_HIF1A_AND_HIF2A_TARGETS_DN                        | 5/104               | 0.000276 | 0.019599 | 10.5309 | 86.3032 | Cavin1;Dst;Angptl4;Cav1;Plin2                                            | Module5 |
| Mouse_vascular                                                | ELVIDGE_HIF1A_TARGETS_DN                                  | 1991-04-01 00:00:00 | 0.001633 | 0.033958 | 9.64088 | 61.8713 | Cav1;Cavin1;Angptl4;Plin2                                                | Module5 |
| Mouse_vascular                                                | ELVIDGE_HYPOXIA_UP                                        | 5/169               | 0.002463 | 0.040252 | 6.33194 | 38.0316 | Cavin1;Dst;Angptl4;Cav1;Plin2                                            | Module5 |
| Mouse_vascular                                                | CELLULAR_LIPID_METABOLIC_PROCESS                          | 13/945              | 0.001827 | 0.033958 | 2.96022 | 18.6639 | Cd36;Cidec;Gpihbp1;Gpd1;Acot7;Adh1;Lpl;Cav1;Pparg;Mgll;Fasn;Abca8b;Fabp5 | Module5 |
| Mouse_vascular                                                | FATTY_ACID_BIOSYNTHETIC_PROCESS                           | 5/155               | 0.001687 | 0.033958 | 6.92986 | 44.245  | Acot7;Lpl;Mgll;Fasn;Fabp5                                                | Module5 |
| Mouse_vascular                                                | FATTY_ACID_METABOLIC_PROCESS                              | 8/371               | 0.000999 | 0.030562 | 4.58687 | 31.6892 | Cd36;Acot7;Lpl;Cav1;Pparg;Mgll;Fasn;Fabp5                                | Module5 |
| Mouse_vascular                                                | FATTY_ACID_TRANSPORT                                      | 5/113               | 0.000405 | 0.019599 | 9.64941 | 75.3691 | Cd36;Fabp4;Pparg;Plin2;Fabp5                                             | Module5 |
| Mouse_vascular                                                | LONG_CHAIN_FATTY_ACID_TRANSPORT                           | 1967-05-01 00:00:00 | 3.39e-05 | 0.007568 | 16.8218 | 173.113 | Cd36;Fabp4;Pparg;Plin2;Fabp5                                             | Module5 |
| Mouse_vascular                                                | MONOCARBOXYLIC_ACID_METABOLIC_PROCESS                     | 11/578              | 0.000309 | 0.019599 | 4.12625 | 33.3552 | Cd36;Mgat4a;Gpd1;Acot7;Adh1;Lpl;Cav1;Pparg;Mgll;Fasn;Fabp5               | Module5 |
| Mouse_vascular                                                | MONOCARBOXYLIC_ACID_TRANSPORT                             | 5/170               | 0.002527 | 0.040252 | 6.2931  | 37.6372 | Cd36;Fabp4;Pparg;Plin2;Fabp5                                             | Module5 |
| Mouse_vascular                                                | NEUTRAL_LIPID_CATABOLIC_PROCESS                           | 1937-03-01 00:00:00 | 0.001122 | 0.030562 | 18.7886 | 127.626 | Mgll;Lpl;Gpihbp1                                                         | Module5 |
| Mouse_vascular                                                | NEUTRAL_LIPID_METABOLIC_PROCESS                           | 5/131               | 0.000796 | 0.029586 | 8.26276 | 58.9619 | Gpihbp1;Lpl;Cav1;Cidec;Mgll                                              | Module5 |

| Supplementary Table S7. ORA results for cNMF module gene sets |                                                             |                     |          |          |         |         |                                                                                                  |         |
|---------------------------------------------------------------|-------------------------------------------------------------|---------------------|----------|----------|---------|---------|--------------------------------------------------------------------------------------------------|---------|
| Mouse_vascular                                                | ORGANIC_ACID_METABOLIC_PROCESS                              | 13/905              | 0.001233 | 0.030562 | 3.10512 | 20.798  | Cd36;Papss2;Mgat4a;Gpd1;Acot7;Adh1;Lpl;Tpst1;Cav1;Pparg;Mgll;Fasn;Fabp5                          | Module5 |
| Mouse_vascular                                                | POSITIVE_REGULATION_OF_CHOLESTEROL_EFFLUX                   | 2026-03-27 00:00:00 | 0.000439 | 0.019599 | 26.4814 | 204.702 | Cav1;Pparg;Abca8b                                                                                | Module5 |
| Mouse_vascular                                                | KIM_HYPOXIA                                                 | 2026-02-16 00:00:00 | 0.003493 | 0.04869  | 31.4605 | 177.968 | Plin2;Angptl4                                                                                    | Module5 |
| Mouse_vascular                                                | REACTOME_INTEGRATION_OF_ENERGY_METABOLISM                   | 4/105               | 0.002755 | 0.040964 | 8.30049 | 48.9245 | Cd36;Kcnc2;Fasn;Akap5                                                                            | Module5 |
| Mouse_vascular                                                | FULCHER_INFLAMMATORY_RESPONSE_LLECTIN_VS_LPS_UP             | 10/546              | 0.004258 | 0.043821 | 3.04515 | 16.6234 | Lrp8;Sgpp2;Net1;Abhd2;Mfsd2a;Fn1;Wnt5a;Far2;Slc7a1;Slc6a6                                        | Module9 |
| Mouse_vascular                                                | AMINO_ACID_TRANSMEMBRANE_TRANSPORT                          | 1999-06-01 00:00:00 | 6.1e-05  | 0.001883 | 10.6422 | 103.278 | Slc38a3;Slc38a5;Slc16a2;Slc7a1;Slc6a6;Slc7a5                                                     | Module9 |
| Mouse_vascular                                                | L_ALPHA_AMINO_ACID_TRANSMEMBRANE_TRANSPORT                  | 1970-04-01 00:00:00 | 0.001381 | 0.020066 | 10.102  | 66.5211 | Slc7a1;Slc38a5;Slc38a3;Slc7a5                                                                    | Module9 |
| Mouse_vascular                                                | L_AMINO_ACID_TRANSPORT                                      | 1989-04-01 00:00:00 | 0.003331 | 0.0374   | 7.84354 | 44.7429 | Slc38a3;Slc7a1;Slc38a5;Slc7a5                                                                    | Module9 |
| Mouse_vascular                                                | MONOCARBOXYLIC_ACID_TRANSPORT                               | 7/170               | 0.000169 | 0.004394 | 7.07626 | 61.4538 | Slc2a1;Mfsd2a;Slc16a4;Slc16a1;Slco1c1;Slc16a2;Slc22a8                                            | Module9 |
| Mouse_vascular                                                | NEUTRAL_AMINO_ACID_TRANSPORT                                | 1957-04-01 00:00:00 | 0.000637 | 0.013107 | 12.5716 | 92.516  | Slc38a3;Slc6a6;Slc38a5;Slc7a5                                                                    | Module9 |
| Mouse_vascular                                                | ORGANIC_ACID_TRANSMEMBRANE_TRANSPORT                        | 9/154               | 1.08e-06 | 8.85e-05 | 10.3834 | 142.696 | Slc2a1;Abcb1a;Slc38a3;Slc38a5;Slc16a1;Slc16a2;Slc7a1;Slc6a6;Slc7a5                               | Module9 |
| Mouse_vascular                                                | PHENOL_CONTAINING_COMPOUND_METABOLIC_PROCESS                | 5/109               | 0.000933 | 0.015244 | 7.93793 | 55.3851 | Ddc;Wnt5a;Slco1c1;Maoa;Slc16a2                                                                   | Module9 |
| Mouse_vascular                                                | GOMF_ACTIVE_TRANSMEMBRANE_TRANSPORTER_ACTIVITY              | 12/441              | 4.62e-05 | 0.001631 | 4.71412 | 47.0571 | Abcb1a;Slc38a3;Slc38a5;Mfsd2a;Slc39a10;Slc16a4;Slc16a1;Slco1c1;Slc16a2;Slc6a6;Slc22a8;Slc7a5     | Module9 |
| Mouse_vascular                                                | GOMF_CELL_ADHESION_MOLECULE_BINDING                         | 10/536              | 0.003736 | 0.040121 | 3.10594 | 17.3614 | Bsg;Frmf5;Prom1;Tjp1;Cobl1;Ptn;Fn1;Cxcl12;Esys2;Utrn                                             | Module9 |
| Mouse_vascular                                                | GOMF_L_AMINO_ACID_TRANSMEMBRANE_TRANSPORTER_ACTIVITY        | 1964-04-01 00:00:00 | 0.000987 | 0.015244 | 11.11   | 76.8852 | Slc7a1;Slc38a5;Slc38a3;Slc7a5                                                                    | Module9 |
| Mouse_vascular                                                | GOMF_MONOCARBOXYLIC_ACID_TRANSMEMBRANE_TRANSPORTER_ACTIVITY | 1957-06-01 00:00:00 | 2.49e-06 | 0.000121 | 19.3954 | 250.29  | Mfsd2a;Slc16a1;Slco1c1;Slc16a4;Slc16a2;Slc6a6                                                    | Module9 |
| Mouse_vascular                                                | GOMF_ORGANIC_ACID_TRANSMEMBRANE_TRANSPORTER_ACTIVITY        | 11/158              | 1.01e-08 | 1.24e-06 | 12.7694 | 235.142 | Abcb1a;Slc38a3;Slc38a5;Mfsd2a;Slc16a4;Slc16a1;Slco1c1;Slc16a2;Slc7a1;Slc6a6;Slc7a5               | Module9 |
| Mouse_vascular                                                | GOMF_PHOSPHOLIPID_TRANSPORTER_ACTIVITY                      | 1961-04-01 00:00:00 | 0.000824 | 0.015244 | 11.6928 | 83.0369 | Abcb1a;Pltp;Mfsd2a;Atp10a                                                                        | Module9 |
| Mouse_vascular                                                | GOMF_SECONDARY_ACTIVE_TRANSMEMBRANE_TRANSPORTER_ACTIVITY    | 11/277              | 2.93e-06 | 0.000121 | 6.99029 | 89.0525 | Slc38a3;Slc38a5;Mfsd2a;Slc39a10;Slc16a4;Slc16a1;Slco1c1;Slc16a2;Slc6a6;Slc22a8;Slc7a5            | Module9 |
| Mouse_vascular                                                | HARRIS_HYPOXIA                                              | 1977-04-01 00:00:00 | 0.001965 | 0.024187 | 9.13411 | 56.9248 | Slc2a1;Tfrc;Lrp8;Flt1                                                                            | Module9 |
| Mouse_vascular                                                | OHGUCHI_LIVER_HNF4A_TARGETS_UP                              | 1947-04-01 00:00:00 | 0.000303 | 0.006803 | 15.4757 | 125.382 | Pcp4l1;Elowl7;Abcb1a;Prom1                                                                       | Module9 |
| Mouse_vascular                                                | PID_HIF1_TFPATHWAY                                          | 1964-04-01 00:00:00 | 0.000987 | 0.015244 | 11.11   | 76.8852 | Slc2a1;Tfrc;Abcb1a;Cxcl12                                                                        | Module9 |
| Mouse_vascular                                                | REACTOME_AMINO_ACID_TRANSPORT_ACROSS_THE_PLASMA_MEMBRANE    | 1932-05-01 00:00:00 | 2.43e-06 | 0.000121 | 30.3766 | 392.645 | Slc38a3;Slc38a5;Slc7a1;Slc6a6;Slc7a5                                                             | Module9 |
| Mouse_vascular                                                | REACTOME_CELL_SURFACE_INTERACTIONS_AT_THE_VASCULAR_WALL     | 5/124               | 0.001659 | 0.021565 | 6.93202 | 44.3761 | Bsg;Fn1;Slc16a1;Grb14;Slc7a5                                                                     | Module9 |
| Mouse_vascular                                                | REACTOME_SLC_MEDIATED_TRANSMEMBRANE_TRANSPORT               | 13/236              | 7.07e-09 | 1.24e-06 | 10.1285 | 190.091 | Slc40a1;Slc2a1;Bsg;Slc38a3;Slc38a5;Slc39a10;Slc16a1;Slco1c1;Slc16a2;Slc7a1;Slc6a6;Slc22a8;Slc7a5 | Module9 |
| Mouse_vascular                                                | REACTOME_TRANSPORT_OF_ORGANIC_ANIONS                        | 2026-02-10 00:00:00 | 0.002056 | 0.024187 | 42.9704 | 265.85  | Slco1c1;Slc16a2                                                                                  | Module9 |

| Supplementary Table S7. ORA results for cNMF module gene sets |                         |                     |          |          |         |         |                                                    |         |
|---------------------------------------------------------------|-------------------------|---------------------|----------|----------|---------|---------|----------------------------------------------------|---------|
| Mouse_vascular                                                | SEMENZA_HIF1_TARGETS    | 1934-03-01 00:00:00 | 0.001639 | 0.021565 | 16.4169 | 105.291 | Slc2a1;Tfrc;Flt1                                   | Module9 |
| Mouse_vascular                                                | WINTER_HYPOXIA_METAGENE | 8/229               | 0.000178 | 0.004394 | 5.97293 | 51.5728 | Slc2a1;Tfrc;Abcb1a;Flt1;Fn1;Slc16a1;Slc16a2;Slc6a6 | Module9 |

Supplementary Table S8

| Supplementary Table S8: DEG results of cECs by organ. |         |                |             |             |              |
|-------------------------------------------------------|---------|----------------|-------------|-------------|--------------|
| names                                                 | scores  | logfoldchanges | pvals       | pvals_adj   | Organ        |
| Igfbp7                                                | 58.3674 | 3.46112        | 0           | 0           | Thyroid_high |
| Sparcl1                                               | 51.1329 | 4.65523        | 0           | 0           | Thyroid_high |
| Crip1                                                 | 50.2843 | 4.1912         | 0           | 0           | Thyroid_high |
| Cd24a                                                 | 48.9249 | 4.14088        | 0           | 0           | Thyroid_high |
| Calm1                                                 | 46.2733 | 1.93789        | 0           | 0           | Thyroid_high |
| Plvap                                                 | 45.8792 | 3.24609        | 0           | 0           | Thyroid_high |
| AW112010                                              | 44.9893 | 3.24355        | 0           | 0           | Thyroid_high |
| Plscr2                                                | 44.6975 | 3.41369        | 0           | 0           | Thyroid_high |
| Ly6a                                                  | 44.0918 | 2.73333        | 0           | 0           | Thyroid_high |
| Rbp7                                                  | 43.5773 | 5.64142        | 0           | 0           | Thyroid_high |
| Crip2                                                 | 42.62   | 2.18802        | 0           | 0           | Thyroid_high |
| Ly6c1                                                 | 42.1976 | 3.11457        | 0           | 0           | Thyroid_high |
| Hspb1                                                 | 42.0771 | 2.84789        | 0           | 0           | Thyroid_high |
| Sox18                                                 | 41.7011 | 2.31704        | 0           | 0           | Thyroid_high |
| Cst3                                                  | 40.8314 | 2.26493        | 0           | 0           | Thyroid_high |
| Ppia                                                  | 40.8075 | 1.60955        | 0           | 0           | Thyroid_high |
| Emp2                                                  | 40.3373 | 5.00686        | 0           | 0           | Thyroid_high |
| Pcp4l1                                                | 40.2553 | 3.73804        | 0           | 0           | Thyroid_high |
| Ehd4                                                  | 39.8925 | 2.63078        | 0           | 0           | Thyroid_high |
| Ubb                                                   | 39.738  | 1.81841        | 0           | 0           | Thyroid_high |
| Slc9a3r2                                              | 39.735  | 2.15291        | 0           | 0           | Thyroid_high |
| Emcn                                                  | 39.6746 | 2.36655        | 0           | 0           | Thyroid_high |
| Itm2b                                                 | 39.3922 | 1.39356        | 0           | 0           | Thyroid_high |
| Rtl8a                                                 | 38.9959 | 3.29945        | 0           | 0           | Thyroid_high |
| Cd200                                                 | 38.8284 | 2.57682        | 0           | 0           | Thyroid_high |
| Fxyd5                                                 | 38.6766 | 2.51208        | 0           | 0           | Thyroid_high |
| Mgll                                                  | 38.5741 | 2.00276        | 0           | 0           | Thyroid_high |
| Rdx                                                   | 38.4559 | 2.15017        | 0           | 0           | Thyroid_high |
| Cd81                                                  | 38.3032 | 1.71335        | 0           | 0           | Thyroid_high |
| Cav1                                                  | 38.2491 | 2.89071        | 0           | 0           | Thyroid_high |
| Kctd12b                                               | 38.2028 | 2.73074        | 0           | 0           | Thyroid_high |
| Rgcc                                                  | 37.8388 | 2.88404        | 0           | 0           | Thyroid_high |
| Gnas                                                  | 37.6771 | 1.25939        | 0           | 1.0875e-307 | Thyroid_high |
| Tmsb4x                                                | 36.7832 | 1.54389        | 3.4232e-296 | 3.07e-293   | Thyroid_high |
| Plcb1                                                 | 36.1379 | 2.25054        | 5.7548e-286 | 5.0214e-283 | Thyroid_high |
| Col4a2                                                | 36.0221 | 1.8705         | 3.7721e-284 | 3.2048e-281 | Thyroid_high |
| Cd34                                                  | 35.6512 | 2.3299         | 2.2607e-278 | 1.8715e-275 | Thyroid_high |
| Col4a1                                                | 35.545  | 1.59164        | 9.9161e-277 | 7.8083e-274 | Thyroid_high |
| Tg                                                    | 35.2222 | 13.4364        | 9.141e-272  | 7.0266e-269 | Thyroid_high |
| Jam3                                                  | 35.1626 | 2.70404        | 7.4711e-271 | 5.6094e-268 | Thyroid_high |
| Cavin3                                                | 34.8879 | 2.35877        | 1.133e-266  | 8.3134e-264 | Thyroid_high |
| Esm1                                                  | 34.6864 | 3.14667        | 1.2621e-263 | 8.8582e-261 | Thyroid_high |
| Ptma                                                  | 34.3879 | 1.22471        | 3.8191e-259 | 2.6234e-256 | Thyroid_high |
| Col13a1                                               | 34.0659 | 2.0693         | 2.3628e-254 | 1.5257e-251 | Thyroid_high |
| Atox1                                                 | 33.9113 | 1.79919        | 4.5475e-252 | 2.8787e-249 | Thyroid_high |
| Dynll1                                                | 33.6329 | 1.74541        | 5.5515e-248 | 3.4467e-245 | Thyroid_high |
| Mef2c                                                 | 33.6247 | 1.5028         | 7.3028e-248 | 4.4485e-245 | Thyroid_high |
| Car4                                                  | 33.6073 | 3.5732         | 1.3106e-247 | 7.8354e-245 | Thyroid_high |
| Bcam                                                  | 33.528  | 2.68028        | 1.8863e-246 | 1.1073e-243 | Thyroid_high |
| Ednrb                                                 | 33.3517 | 2.37105        | 6.8916e-244 | 3.9732e-241 | Thyroid_high |
| Igfbp3                                                | 33.2633 | 2.78599        | 1.31e-242   | 7.4198e-240 | Thyroid_high |
| Actb                                                  | 33.0369 | 1.17746        | 2.3998e-239 | 1.3358e-236 | Thyroid_high |
| B3gnt2                                                | 33.0259 | 2.19571        | 3.4462e-239 | 1.8857e-236 | Thyroid_high |
| Rpl10                                                 | 32.8903 | 1.58865        | 3.0284e-237 | 1.6295e-234 | Thyroid_high |
| Sparc                                                 | 32.886  | 1.34926        | 3.4885e-237 | 1.8464e-234 | Thyroid_high |
| H3f3a                                                 | 32.7499 | 1.43675        | 3.0443e-235 | 1.5601e-232 | Thyroid_high |
| Flt1                                                  | 32.5647 | 1.2388         | 1.2963e-232 | 6.4384e-230 | Thyroid_high |
| Plpp3                                                 | 32.4859 | 1.35064        | 1.6892e-231 | 8.2631e-229 | Thyroid_high |
| Acvrl1                                                | 31.9059 | 2.35197        | 2.2101e-223 | 1.0493e-220 | Thyroid_high |
| Clu                                                   | 31.8329 | 4.70717        | 2.2671e-222 | 1.0608e-219 | Thyroid_high |
| Map1lc3a                                              | 31.6637 | 2.54054        | 4.9165e-220 | 2.2356e-217 | Thyroid_high |
| Lama3                                                 | 31.4411 | 2.57387        | 5.5565e-217 | 2.4242e-214 | Thyroid_high |
| BC028528                                              | 31.3637 | 2.28468        | 6.3318e-216 | 2.7256e-213 | Thyroid_high |
| Rps11                                                 | 31.3449 | 1.44968        | 1.1408e-215 | 4.8462e-213 | Thyroid_high |

| Supplementary Table S8: DEG results of cECs by organ. |         |         |             |             |              |
|-------------------------------------------------------|---------|---------|-------------|-------------|--------------|
| Myl12a                                                | 31.2102 | 1.62176 | 7.7579e-214 | 3.2528e-211 | Thyroid_high |
| Tspan13                                               | 31.2036 | 2.36229 | 9.5257e-214 | 3.9428e-211 | Thyroid_high |
| Pfn1                                                  | 31.1537 | 1.48165 | 4.523e-213  | 1.8484e-210 | Thyroid_high |
| Srgn                                                  | 31.0685 | 1.45327 | 6.411e-212  | 2.5553e-209 | Thyroid_high |
| Ebf1                                                  | 31.0064 | 2.2222  | 4.42e-211   | 1.7402e-208 | Thyroid_high |
| Gapdh                                                 | 30.9455 | 1.77118 | 2.9241e-210 | 1.1374e-207 | Thyroid_high |
| Thrsp                                                 | 30.8949 | 2.15121 | 1.3978e-209 | 5.3723e-207 | Thyroid_high |
| Pltp                                                  | 30.869  | 2.30599 | 3.1102e-209 | 1.1813e-206 | Thyroid_high |
| Piezo2                                                | 30.6959 | 2.2246  | 6.449e-207  | 2.421e-204  | Thyroid_high |
| Rpl29                                                 | 30.6618 | 1.48242 | 1.8394e-206 | 6.7482e-204 | Thyroid_high |
| Podxl                                                 | 30.5076 | 1.62202 | 2.0663e-204 | 7.4956e-202 | Thyroid_high |
| Rpl21                                                 | 30.132  | 1.3804  | 1.848e-199  | 6.6291e-197 | Thyroid_high |
| Gm12002                                               | 29.9833 | 2.4869  | 1.6211e-197 | 5.6888e-195 | Thyroid_high |
| Elmo1                                                 | 29.9126 | 2.31022 | 1.3476e-196 | 4.6781e-194 | Thyroid_high |
| Cald1                                                 | 29.7808 | 1.47204 | 6.9359e-195 | 2.3822e-192 | Thyroid_high |
| Plscr1                                                | 29.7029 | 2.61498 | 7.0516e-194 | 2.3715e-191 | Thyroid_high |
| Tsc22d1                                               | 29.6341 | 1.76649 | 5.4325e-193 | 1.8081e-190 | Thyroid_high |
| Atp5j                                                 | 29.6197 | 1.56544 | 8.3449e-193 | 2.7491e-190 | Thyroid_high |
| Rtl8b                                                 | 29.4691 | 3.05189 | 7.164e-191  | 2.3363e-188 | Thyroid_high |
| Ppib                                                  | 29.4274 | 1.60083 | 2.4522e-190 | 7.917e-188  | Thyroid_high |
| Mfge8                                                 | 29.4198 | 1.80691 | 3.07e-190   | 9.8132e-188 | Thyroid_high |
| Tagln2                                                | 29.4098 | 1.47218 | 4.1179e-190 | 1.3034e-187 | Thyroid_high |
| Tm4sf1                                                | 29.4037 | 1.61922 | 4.9179e-190 | 1.5415e-187 | Thyroid_high |
| Actg1                                                 | 29.3208 | 1.50731 | 5.6271e-189 | 1.7468e-186 | Thyroid_high |
| Fth1                                                  | 29.2597 | 1.36068 | 3.3828e-188 | 1.0401e-185 | Thyroid_high |
| Rflnb                                                 | 29.2424 | 2.04639 | 5.616e-188  | 1.7105e-185 | Thyroid_high |
| Id3                                                   | 29.1412 | 1.37341 | 1.0799e-186 | 3.2583e-184 | Thyroid_high |
| Tubb4b                                                | 29.0657 | 2.06483 | 9.7365e-186 | 2.8839e-183 | Thyroid_high |
| Ackr3                                                 | 29.0049 | 3.90859 | 5.7109e-185 | 1.6762e-182 | Thyroid_high |
| Eif1                                                  | 28.8641 | 1.28386 | 3.3679e-183 | 9.7082e-181 | Thyroid_high |
| Rpl18                                                 | 28.677  | 1.4231  | 7.3848e-181 | 2.1099e-178 | Thyroid_high |
| Selenom                                               | 28.5795 | 1.77141 | 1.2069e-179 | 3.418e-177  | Thyroid_high |
| Rpl6                                                  | 28.5384 | 1.31828 | 3.9173e-179 | 1.0997e-176 | Thyroid_high |
| Rpl15                                                 | 28.48   | 1.39712 | 2.0706e-178 | 5.7628e-176 | Thyroid_high |
| Klf13                                                 | 28.0539 | 1.54366 | 3.5818e-173 | 9.7999e-171 | Thyroid_high |
| Tspo                                                  | 28.0463 | 1.65626 | 4.4259e-173 | 1.2008e-170 | Thyroid_high |
| Fabp4                                                 | 46.2185 | 3.24882 | 0           | 0           | Adrenal_high |
| Npr3                                                  | 42.8117 | 5.00329 | 0           | 0           | Adrenal_high |
| Rhob                                                  | 41.6661 | 2.36302 | 0           | 0           | Adrenal_high |
| AU021092                                              | 40.7032 | 3.52511 | 0           | 0           | Adrenal_high |
| Edil3                                                 | 39.1756 | 4.66804 | 0           | 0           | Adrenal_high |
| Pbx1                                                  | 39.1584 | 3.20988 | 0           | 0           | Adrenal_high |
| Rsad2                                                 | 38.8257 | 2.69528 | 0           | 0           | Adrenal_high |
| Igfbp5                                                | 38.7972 | 4.1051  | 0           | 0           | Adrenal_high |
| Rgcc                                                  | 38.754  | 2.84598 | 0           | 0           | Adrenal_high |
| Timp3                                                 | 36.6774 | 1.71444 | 1.6764e-294 | 4.5101e-291 | Adrenal_high |
| Tgfr2                                                 | 36.0888 | 2.01781 | 3.404e-285  | 7.8499e-282 | Adrenal_high |
| Limch1                                                | 35.5154 | 2.21397 | 2.8428e-276 | 6.1185e-273 | Adrenal_high |
| Fam117b                                               | 34.4923 | 2.00708 | 1.0482e-260 | 2.115e-257  | Adrenal_high |
| Tshz2                                                 | 34.3482 | 1.63796 | 1.497e-258  | 2.843e-255  | Adrenal_high |
| Ifi44                                                 | 33.8766 | 2.47652 | 1.4748e-251 | 2.6451e-248 | Adrenal_high |
| Jup                                                   | 33.6204 | 1.96748 | 8.4461e-248 | 1.4352e-244 | Adrenal_high |
| Ptprg                                                 | 33.483  | 1.62462 | 8.5275e-246 | 1.3765e-242 | Adrenal_high |
| Ptpru                                                 | 33.2859 | 2.77592 | 6.1708e-243 | 9.4869e-240 | Adrenal_high |
| Ly6e                                                  | 32.5724 | 1.87867 | 1.0079e-232 | 1.4791e-229 | Adrenal_high |
| Insr                                                  | 32.303  | 2.16358 | 6.3556e-229 | 8.9214e-226 | Adrenal_high |
| Chrm3                                                 | 32.2672 | 2.74756 | 2.018e-228  | 2.7147e-225 | Adrenal_high |
| Tcim                                                  | 32.2534 | 1.6786  | 3.1533e-228 | 4.0722e-225 | Adrenal_high |
| Cd9                                                   | 31.6148 | 1.97607 | 2.3142e-219 | 2.8736e-216 | Adrenal_high |
| Gimap4                                                | 31.4868 | 1.62752 | 1.3168e-217 | 1.5746e-214 | Adrenal_high |
| Ednrb                                                 | 31.0547 | 2.12471 | 9.862e-212  | 1.0979e-208 | Adrenal_high |
| Fkbp5                                                 | 30.8981 | 2.78233 | 1.2664e-209 | 1.3628e-206 | Adrenal_high |
| Inpp4b                                                | 30.8536 | 2.28842 | 5.0081e-209 | 5.2157e-206 | Adrenal_high |
| Gimap5                                                | 30.6192 | 2.2118  | 6.7996e-206 | 6.8602e-203 | Adrenal_high |
| Hipk2                                                 | 30.4228 | 1.83507 | 2.7431e-203 | 2.6837e-200 | Adrenal_high |
| D5Ert615e                                             | 30.32   | 4.31158 | 6.2418e-202 | 5.927e-199  | Adrenal_high |
| Irx3                                                  | 30.0768 | 2.70859 | 9.7483e-199 | 8.9921e-196 | Adrenal_high |
| Gimap6                                                | 29.8608 | 1.42118 | 6.3602e-196 | 5.7039e-193 | Adrenal_high |

| Supplementary Table S8: DEG results of cECs by organ. |         |          |             |             |              |
|-------------------------------------------------------|---------|----------|-------------|-------------|--------------|
| S100a6                                                | 29.8527 | 2.31467  | 8.1032e-196 | 7.0706e-193 | Adrenal_high |
| Ebf1                                                  | 29.4013 | 2.05432  | 5.2892e-190 | 4.4937e-187 | Adrenal_high |
| Dnm3                                                  | 29.314  | 2.28033  | 6.8793e-189 | 5.6948e-186 | Adrenal_high |
| Btnl9                                                 | 29.2121 | 1.60506  | 1.3622e-187 | 1.0994e-184 | Adrenal_high |
| Nav3                                                  | 29.1259 | 2.8658   | 1.6894e-186 | 1.2986e-183 | Adrenal_high |
| Thrsp                                                 | 28.7186 | 1.94246  | 2.2371e-181 | 1.605e-178  | Adrenal_high |
| Prkd1                                                 | 28.3813 | 2.06696  | 3.4457e-177 | 2.4183e-174 | Adrenal_high |
| S100a10                                               | 28.291  | 1.5044   | 4.4576e-176 | 3.062e-173  | Adrenal_high |
| Cped1                                                 | 28.1499 | 2.13349  | 2.4016e-174 | 1.6153e-171 | Adrenal_high |
| Cd200                                                 | 28.0491 | 1.86174  | 4.0983e-173 | 2.7003e-170 | Adrenal_high |
| Ccdc85a                                               | 26.8196 | 1.99569  | 1.9069e-158 | 1.1839e-155 | Adrenal_high |
| Mcf2l                                                 | 26.7309 | 1.89248  | 2.057e-157  | 1.2298e-154 | Adrenal_high |
| Tspan15                                               | 26.5959 | 1.7165   | 7.5775e-156 | 4.2919e-153 | Adrenal_high |
| Etl4                                                  | 26.4564 | 1.53563  | 3.0791e-154 | 1.7139e-151 | Adrenal_high |
| Palm                                                  | 26.2972 | 2.27955  | 2.0668e-152 | 1.131e-149  | Adrenal_high |
| Btg1                                                  | 26.0032 | 1.7342   | 4.5516e-149 | 2.3701e-146 | Adrenal_high |
| Slit3                                                 | 25.855  | 2.99575  | 2.14e-147   | 1.0967e-144 | Adrenal_high |
| Ramp3                                                 | 25.3226 | 1.75353  | 1.8027e-141 | 8.5589e-139 | Adrenal_high |
| H2-D1                                                 | 25.0195 | 1.13026  | 3.7548e-138 | 1.7318e-135 | Adrenal_high |
| Ly6c1                                                 | 25.0157 | 2.20459  | 4.1307e-138 | 1.8783e-135 | Adrenal_high |
| Emcn                                                  | 24.576  | 1.66827  | 2.2811e-133 | 9.8193e-131 | Adrenal_high |
| Gm12002                                               | 24.384  | 1.96309  | 2.5291e-131 | 1.0604e-128 | Adrenal_high |
| mt-Nd3                                                | 24.3198 | 1.31408  | 1.2095e-130 | 5.0061e-128 | Adrenal_high |
| Airm                                                  | 24.2046 | 1.81703  | 1.9881e-129 | 8.1248e-127 | Adrenal_high |
| Kank3                                                 | 24.0385 | 1.2617   | 1.1019e-127 | 4.4468e-125 | Adrenal_high |
| Gpihbp1                                               | 23.9341 | 1.42212  | 1.3525e-126 | 5.3908e-124 | Adrenal_high |
| Chst8                                                 | 23.8672 | 4.01832  | 6.711e-126  | 2.5793e-123 | Adrenal_high |
| Lims2                                                 | 23.8193 | 1.44082  | 2.1052e-125 | 7.9032e-123 | Adrenal_high |
| Lmo2                                                  | 23.3099 | 1.4089   | 3.5163e-120 | 1.2614e-117 | Adrenal_high |
| Pcdh17                                                | 23.2044 | 1.37453  | 4.1093e-119 | 1.442e-116  | Adrenal_high |
| Itgb5                                                 | 23.1639 | 2.27324  | 1.0531e-118 | 3.6558e-116 | Adrenal_high |
| Cldn15                                                | 23.0675 | 3.22399  | 9.8135e-118 | 3.3705e-115 | Adrenal_high |
| Tsc22d1                                               | 22.9452 | 1.34264  | 1.6449e-116 | 5.5317e-114 | Adrenal_high |
| Dram1                                                 | 22.7906 | 2.46444  | 5.6837e-115 | 1.8917e-112 | Adrenal_high |
| Kalrn                                                 | 22.7495 | 1.61704  | 1.4505e-114 | 4.7784e-112 | Adrenal_high |
| Chst11                                                | 22.7214 | 1.9135   | 2.7521e-114 | 8.8852e-112 | Adrenal_high |
| Tmem176a                                              | 22.5443 | 1.47353  | 1.5291e-112 | 4.8877e-110 | Adrenal_high |
| Rapgef4                                               | 22.4011 | 1.44233  | 3.844e-111  | 1.2167e-108 | Adrenal_high |
| Dock6                                                 | 22.3859 | 1.32039  | 5.4062e-111 | 1.6945e-108 | Adrenal_high |
| Entpd1                                                | 22.3315 | 1.70048  | 1.8269e-110 | 5.6714e-108 | Adrenal_high |
| Ifitm3                                                | 22.1152 | 1.09967  | 2.2553e-108 | 6.8689e-106 | Adrenal_high |
| H2-Q7                                                 | 22.0632 | 1.34442  | 7.1385e-108 | 2.1539e-105 | Adrenal_high |
| Plpp1                                                 | 21.8608 | 0.827565 | 6.1415e-106 | 1.7704e-103 | Adrenal_high |
| Tmem26                                                | 21.8447 | 3.17623  | 8.7371e-106 | 2.4962e-103 | Adrenal_high |
| Ubc                                                   | 21.5872 | 1.07938  | 2.3672e-103 | 6.6456e-101 | Adrenal_high |
| Lrrc3b                                                | 21.5513 | 2.11233  | 5.15e-103   | 1.4333e-100 | Adrenal_high |
| Tek                                                   | 21.3557 | 0.912281 | 3.4521e-101 | 9.3657e-99  | Adrenal_high |
| Tanc2                                                 | 21.3499 | 1.47075  | 3.9111e-101 | 1.05225e-98 | Adrenal_high |
| Dysf                                                  | 21.1659 | 1.0302   | 1.9695e-99  | 5.25489e-97 | Adrenal_high |
| Laptm4a                                               | 21.146  | 0.93892  | 3.0032e-99  | 7.94746e-97 | Adrenal_high |
| Rpl39                                                 | 21.1393 | 1.02078  | 3.4644e-99  | 9.09345e-97 | Adrenal_high |
| Cd93                                                  | 21.0408 | 1.06874  | 2.77742e-98 | 7.17352e-96 | Adrenal_high |
| Mettl24                                               | 20.9049 | 3.81962  | 4.83288e-97 | 1.21898e-94 | Adrenal_high |
| H2-K1                                                 | 20.8019 | 0.872794 | 4.15637e-96 | 1.03222e-93 | Adrenal_high |
| Egr1                                                  | 20.6739 | 2.67895  | 5.95491e-95 | 1.45647e-92 | Adrenal_high |
| Pdia5                                                 | 20.6544 | 1.63454  | 8.91721e-95 | 2.1646e-92  | Adrenal_high |
| Rpl18a                                                | 20.6516 | 1.01234  | 9.43813e-95 | 2.27396e-92 | Adrenal_high |
| Eef2                                                  | 20.6352 | 1.01683  | 1.32637e-94 | 3.172e-92   | Adrenal_high |
| Ier2                                                  | 20.5877 | 1.67164  | 3.54119e-94 | 8.34505e-92 | Adrenal_high |
| Arhgap26                                              | 20.5702 | 1.13436  | 5.0719e-94  | 1.18657e-91 | Adrenal_high |
| Igfbp3                                                | 20.4371 | 1.61315  | 7.82511e-93 | 1.81751e-90 | Adrenal_high |
| Apobec3                                               | 20.3725 | 1.62509  | 2.93191e-92 | 6.76119e-90 | Adrenal_high |
| Cd34                                                  | 20.3427 | 1.30462  | 5.38348e-92 | 1.23266e-89 | Adrenal_high |
| Flt1                                                  | 20.2328 | 0.771517 | 5.03817e-91 | 1.12177e-88 | Adrenal_high |
| Samd12                                                | 20.2067 | 1.26336  | 8.54594e-91 | 1.87691e-88 | Adrenal_high |
| Sdk1                                                  | 20.1484 | 4.45726  | 2.7808e-90  | 6.06609e-88 | Adrenal_high |
| Rps11                                                 | 20.1118 | 1.01936  | 5.81808e-90 | 1.26065e-87 | Adrenal_high |
| Lmtk3                                                 | 20.1107 | 4.87913  | 5.94745e-90 | 1.28009e-87 | Adrenal_high |

| Supplementary Table S8: DEG results of cECs by organ. |         |          |             |             |                |
|-------------------------------------------------------|---------|----------|-------------|-------------|----------------|
| Gh                                                    | 47.5324 | 16.8806  | 0           | 0           | Pituitary_high |
| Pomc                                                  | 47.0578 | 9.46634  | 0           | 0           | Pituitary_high |
| AY036118                                              | 44.4413 | 5.33276  | 0           | 0           | Pituitary_high |
| Cmss1                                                 | 38.6704 | 3.16275  | 0           | 0           | Pituitary_high |
| Chrm3                                                 | 29.4855 | 3.48275  | 4.4223e-191 | 1.7847e-187 | Pituitary_high |
| Pcdh7                                                 | 29.2777 | 8.67367  | 1.9943e-188 | 7.1538e-185 | Pituitary_high |
| Prss23                                                | 29.2151 | 4.26897  | 1.2456e-187 | 4.0214e-184 | Pituitary_high |
| Cga                                                   | 27.2267 | 31.8022  | 3.1405e-163 | 8.4493e-160 | Pituitary_high |
| Gm42418                                               | 26.6062 | 1.63378  | 5.7614e-156 | 1.24e-152   | Pituitary_high |
| Plvap                                                 | 25.6419 | 2.45373  | 5.2016e-145 | 1.0496e-141 | Pituitary_high |
| Itm2a                                                 | 24.4236 | 3.03467  | 9.6024e-132 | 1.5501e-128 | Pituitary_high |
| Trp53i11                                              | 23.6742 | 2.7233   | 6.6476e-124 | 9.7553e-121 | Pituitary_high |
| Kirrel3                                               | 22.9969 | 5.69018  | 5.0048e-117 | 6.4632e-114 | Pituitary_high |
| Itm2b                                                 | 22.8647 | 1.02361  | 1.0438e-115 | 1.2961e-112 | Pituitary_high |
| Tmsb4x                                                | 22.7696 | 1.18099  | 9.1784e-115 | 1.0583e-111 | Pituitary_high |
| Pbx1                                                  | 22.2322 | 2.43114  | 1.6787e-109 | 1.6937e-106 | Pituitary_high |
| Ltbp1                                                 | 22.1745 | 2.90961  | 6.0585e-109 | 5.7529e-106 | Pituitary_high |
| Malat1                                                | 22.024  | 1.44428  | 1.6966e-107 | 1.565e-104  | Pituitary_high |
| Abca1                                                 | 22.018  | 3.32532  | 1.936e-107  | 1.7362e-104 | Pituitary_high |
| Igfbp3                                                | 21.5746 | 2.42961  | 3.1145e-103 | 2.5782e-100 | Pituitary_high |
| Meis2                                                 | 21.0895 | 1.35911  | 9.9231e-99  | 7.28104e-96 | Pituitary_high |
| Flrt2                                                 | 20.6066 | 3.95275  | 2.3932e-94  | 1.60968e-91 | Pituitary_high |
| Abcg2                                                 | 19.9548 | 1.87245  | 1.3607e-88  | 7.70705e-86 | Pituitary_high |
| Jund                                                  | 19.6878 | 1.74328  | 2.74171e-86 | 1.45108e-83 | Pituitary_high |
| Rpl13                                                 | 19.5051 | 0.898355 | 9.94397e-85 | 5.01626e-82 | Pituitary_high |
| Rflnb                                                 | 19.2299 | 1.85619  | 2.08025e-82 | 9.73348e-80 | Pituitary_high |
| Hspa1a                                                | 19.0081 | 2.5818   | 1.46166e-80 | 6.55413e-78 | Pituitary_high |
| Lmo2                                                  | 18.7098 | 1.81877  | 4.11816e-78 | 1.77273e-75 | Pituitary_high |
| H2-D1                                                 | 18.4348 | 0.916011 | 6.90865e-76 | 2.75365e-73 | Pituitary_high |
| Ehd4                                                  | 18.4279 | 1.65437  | 7.84454e-76 | 3.08855e-73 | Pituitary_high |
| Robo2                                                 | 17.9093 | 7.17358  | 9.98721e-72 | 3.66406e-69 | Pituitary_high |
| Gas7                                                  | 17.5817 | 2.31114  | 3.40229e-69 | 1.18111e-66 | Pituitary_high |
| Auts2                                                 | 17.3458 | 1.8536   | 2.12061e-67 | 7.13166e-65 | Pituitary_high |
| Hsp90ab1                                              | 17.3306 | 0.776025 | 2.76253e-67 | 9.10085e-65 | Pituitary_high |
| Scn1b                                                 | 17.3184 | 2.69252  | 3.41826e-67 | 1.11473e-64 | Pituitary_high |
| Pdia5                                                 | 16.7442 | 2.28378  | 6.24202e-63 | 1.83203e-60 | Pituitary_high |
| Col4a1                                                | 16.6067 | 0.943137 | 6.23671e-62 | 1.75089e-59 | Pituitary_high |
| Smco4                                                 | 16.537  | 1.60834  | 1.9859e-61  | 5.52714e-59 | Pituitary_high |
| Jun                                                   | 16.2615 | 1.54775  | 1.85193e-59 | 4.90078e-57 | Pituitary_high |
| Apoe                                                  | 16.1871 | 1.2786   | 6.21933e-59 | 1.61928e-56 | Pituitary_high |
| Fos                                                   | 16.1123 | 2.86457  | 2.08972e-58 | 5.31234e-56 | Pituitary_high |
| Nos1ap                                                | 16.0966 | 3.57711  | 2.69398e-58 | 6.79493e-56 | Pituitary_high |
| Junb                                                  | 16.0717 | 2.1148   | 4.02579e-58 | 1.00754e-55 | Pituitary_high |
| Ptpru                                                 | 15.926  | 2.08311  | 4.17987e-57 | 1.01464e-54 | Pituitary_high |
| Adamts9                                               | 15.3922 | 2.34282  | 1.84578e-53 | 4.02641e-51 | Pituitary_high |
| Igfbp5                                                | 15.1944 | 1.88698  | 3.85425e-52 | 8.13298e-50 | Pituitary_high |
| Marcks                                                | 15.0379 | 0.833594 | 4.14632e-51 | 8.36649e-49 | Pituitary_high |
| Col4a2                                                | 14.9091 | 1.0629   | 2.87771e-50 | 5.66506e-48 | Pituitary_high |
| Pltp                                                  | 14.8186 | 1.63317  | 1.11057e-49 | 2.17302e-47 | Pituitary_high |
| Elmo1                                                 | 14.5551 | 1.84149  | 5.42164e-48 | 1.00596e-45 | Pituitary_high |
| Vamp5                                                 | 14.4883 | 0.862135 | 1.4357e-47  | 2.60401e-45 | Pituitary_high |
| Lbp                                                   | 14.4303 | 2.69569  | 3.33718e-47 | 5.9856e-45  | Pituitary_high |
| Scarb1                                                | 14.2227 | 1.38302  | 6.62527e-46 | 1.11988e-43 | Pituitary_high |
| Prl                                                   | 14.0039 | 30.3066  | 1.4759e-44  | 2.40654e-42 | Pituitary_high |
| Ctla2a                                                | 14.0021 | 1.17397  | 1.51378e-44 | 2.4559e-42  | Pituitary_high |
| Tnfaip2                                               | 13.9098 | 1.80648  | 5.52677e-44 | 8.87721e-42 | Pituitary_high |
| 2026-09-04 00:00:00                                   | 13.8113 | 1.73953  | 2.1793e-43  | 3.43214e-41 | Pituitary_high |
| Cdk8                                                  | 13.6476 | 1.24508  | 2.08567e-42 | 3.03315e-40 | Pituitary_high |
| Filip1l                                               | 13.4755 | 2.81083  | 2.17882e-41 | 3.00612e-39 | Pituitary_high |
| Sorbs2                                                | 13.3954 | 1.83518  | 6.43097e-41 | 8.61509e-39 | Pituitary_high |
| Tanc2                                                 | 13.3716 | 1.72509  | 8.8575e-41  | 1.17681e-38 | Pituitary_high |
| 2610307P16Rik                                         | 13.2749 | 2.20849  | 3.23772e-40 | 4.19799e-38 | Pituitary_high |
| Myl6                                                  | 13.0446 | 0.55715  | 6.81838e-39 | 8.4666e-37  | Pituitary_high |
| Cavin3                                                | 13.0443 | 1.26068  | 6.84926e-39 | 8.47235e-37 | Pituitary_high |
| Piezo2                                                | 13.0154 | 1.43398  | 9.99989e-39 | 1.23224e-36 | Pituitary_high |
| Nav3                                                  | 12.5425 | 1.9748   | 4.37093e-36 | 4.91691e-34 | Pituitary_high |
| Gng11                                                 | 12.3159 | 0.633324 | 7.43373e-35 | 7.84307e-33 | Pituitary_high |
| Mmrn1                                                 | 12.2794 | 8.16362  | 1.16889e-34 | 1.22128e-32 | Pituitary_high |



| Supplementary Table S8: DEG results of cECs by organ. |         |          |             |             |                |
|-------------------------------------------------------|---------|----------|-------------|-------------|----------------|
| Col15a1                                               | 12.2084 | 1.70215  | 2.80195e-34 | 2.89013e-32 | Pituitary_high |
| H3f3b                                                 | 12.1915 | 0.558495 | 3.45014e-34 | 3.51381e-32 | Pituitary_high |
| Cd81                                                  | 12.1562 | 0.64228  | 5.32058e-34 | 5.36796e-32 | Pituitary_high |
| H2-K1                                                 | 12.1447 | 0.499849 | 6.11774e-34 | 6.153e-32   | Pituitary_high |
| G0s2                                                  | 11.8123 | 7.20711  | 3.37027e-32 | 3.09998e-30 | Pituitary_high |
| Hspa1b                                                | 11.6551 | 1.67386  | 2.1615e-31  | 1.92242e-29 | Pituitary_high |
| Cited2                                                | 11.2039 | 2.79277  | 3.90191e-29 | 3.0576e-27  | Pituitary_high |
| Arhgap6                                               | 10.9444 | 3.60464  | 7.07036e-28 | 5.11808e-26 | Pituitary_high |
| Fth1                                                  | 10.7465 | 0.517841 | 6.15523e-27 | 4.22812e-25 | Pituitary_high |
| Nectin2                                               | 10.7226 | 1.7057   | 7.97384e-27 | 5.43113e-25 | Pituitary_high |
| Rps18                                                 | 10.5619 | 0.546229 | 4.47684e-26 | 2.86208e-24 | Pituitary_high |
| Ccn2                                                  | 10.4615 | 3.39181  | 1.29776e-25 | 8.16729e-24 | Pituitary_high |
| Rapgef5                                               | 10.203  | 0.689169 | 1.92274e-24 | 1.10849e-22 | Pituitary_high |
| Hsp90aa1                                              | 10.1545 | 1.24526  | 3.16308e-24 | 1.79789e-22 | Pituitary_high |
| Rhoj                                                  | 9.97312 | 0.82687  | 1.99849e-23 | 1.08257e-21 | Pituitary_high |
| Aplnr                                                 | 9.88652 | 1.5692   | 4.76284e-23 | 2.50437e-21 | Pituitary_high |
| Ccser1                                                | 9.87118 | 2.49089  | 5.5509e-23  | 2.90927e-21 | Pituitary_high |
| Pard3                                                 | 9.57393 | 3.72964  | 1.02918e-21 | 5.04205e-20 | Pituitary_high |
| Rpl11                                                 | 9.52885 | 0.416501 | 1.59038e-21 | 7.73276e-20 | Pituitary_high |
| Ldb2                                                  | 9.48633 | 0.56507  | 2.39317e-21 | 1.14976e-19 | Pituitary_high |
| Foxl2                                                 | 9.47397 | 5.70379  | 2.69396e-21 | 1.27716e-19 | Pituitary_high |
| Hexb                                                  | 9.42893 | 1.4256   | 4.14301e-21 | 1.9357e-19  | Pituitary_high |
| Vegfc                                                 | 9.39553 | 2.02347  | 5.69288e-21 | 2.62564e-19 | Pituitary_high |
| Me3                                                   | 9.29104 | 3.31288  | 1.52793e-20 | 6.83232e-19 | Pituitary_high |
| Ubb                                                   | 9.289   | 0.469403 | 1.55746e-20 | 6.95473e-19 | Pituitary_high |
| Pdgfb                                                 | 9.26999 | 1.16864  | 1.86155e-20 | 8.27825e-19 | Pituitary_high |
| Lars2                                                 | 9.21335 | 0.970367 | 3.16106e-20 | 1.37355e-18 | Pituitary_high |
| Egfl7                                                 | 9.04739 | 0.314067 | 1.46433e-19 | 6.08441e-18 | Pituitary_high |
| Sema3d                                                | 9.01418 | 2.42483  | 1.98342e-19 | 8.08519e-18 | Pituitary_high |
| B2m                                                   | 9.00637 | 0.299689 | 2.12987e-19 | 8.66032e-18 | Pituitary_high |
| Fbln5                                                 | 8.90832 | 3.39001  | 5.18132e-19 | 2.0375e-17  | Pituitary_high |
| Emcn                                                  | 8.8162  | 1.10987  | 1.18407e-18 | 4.51332e-17 | Pituitary_high |
| Kap                                                   | 42.6624 | 19.3958  | 0           | 0           | Kidney_high    |
| Gpx3                                                  | 36.2626 | 10.438   | 6.2872e-288 | 1.0149e-283 | Kidney_high    |
| Igfbp5                                                | 28.0217 | 4.15232  | 8.8454e-173 | 7.1394e-169 | Kidney_high    |
| Pbx1                                                  | 26.0084 | 3.20312  | 3.9743e-149 | 2.5662e-145 | Kidney_high    |
| Emcn                                                  | 24.2968 | 2.10193  | 2.1184e-130 | 1.1399e-126 | Kidney_high    |
| Plscr2                                                | 24.0516 | 2.59727  | 8.037e-128  | 3.7068e-124 | Kidney_high    |
| Fxyd2                                                 | 21.2925 | 12.571   | 1.3331e-100 | 4.78226e-97 | Kidney_high    |
| Rsad2                                                 | 19.2958 | 2.16513  | 5.82788e-83 | 1.44733e-79 | Kidney_high    |
| Dkk2                                                  | 18.6272 | 4.08776  | 1.93204e-77 | 4.1584e-74  | Kidney_high    |
| Chrm3                                                 | 18.1939 | 2.22373  | 5.7693e-74  | 1.09566e-70 | Kidney_high    |
| Malat1                                                | 17.5991 | 1.30393  | 2.503e-69   | 3.84806e-66 | Kidney_high    |
| AU021092                                              | 17.5763 | 2.27107  | 3.74445e-69 | 5.25607e-66 | Kidney_high    |
| Slc6a6                                                | 16.3198 | 1.91565  | 7.1347e-60  | 6.77482e-57 | Kidney_high    |
| S100a6                                                | 15.9918 | 2.20866  | 1.45745e-57 | 1.27172e-54 | Kidney_high    |
| Limch1                                                | 15.304  | 1.50781  | 7.1874e-53  | 5.15656e-50 | Kidney_high    |
| Ly6c1                                                 | 15.3021 | 1.79577  | 7.40101e-53 | 5.19438e-50 | Kidney_high    |
| Tm4sf1                                                | 14.9167 | 1.19029  | 2.5664e-50  | 1.50648e-47 | Kidney_high    |
| Plat                                                  | 14.6559 | 3.3289   | 1.23519e-48 | 6.75902e-46 | Kidney_high    |
| Cyp4b1                                                | 14.4677 | 1.52244  | 1.93969e-47 | 9.94013e-45 | Kidney_high    |
| Ebf1                                                  | 14.2789 | 1.52288  | 2.96104e-46 | 1.44844e-43 | Kidney_high    |
| Ltbp1                                                 | 14.1957 | 2.00814  | 9.74592e-46 | 4.5601e-43  | Kidney_high    |
| Srgn                                                  | 14.096  | 0.943637 | 4.0211e-45  | 1.77837e-42 | Kidney_high    |
| Cst3                                                  | 14.0855 | 1.15463  | 4.66479e-45 | 2.03517e-42 | Kidney_high    |
| Slc34a1                                               | 14.0482 | 29.7823  | 7.90344e-45 | 3.40217e-42 | Kidney_high    |
| Meis2                                                 | 13.9184 | 1.21363  | 4.89857e-44 | 1.95247e-41 | Kidney_high    |
| Gnas                                                  | 13.6784 | 0.660538 | 1.36638e-42 | 5.01291e-40 | Kidney_high    |
| Sgk1                                                  | 13.6494 | 1.24549  | 2.03572e-42 | 7.22232e-40 | Kidney_high    |
| Smpdl3a                                               | 13.5911 | 1.7007   | 4.52231e-42 | 1.52086e-39 | Kidney_high    |
| Ly6e                                                  | 13.4846 | 1.15677  | 1.92586e-41 | 6.28043e-39 | Kidney_high    |
| Ehd4                                                  | 13.4123 | 1.35745  | 5.11959e-41 | 1.58929e-38 | Kidney_high    |
| Ly6a                                                  | 13.2138 | 1.29323  | 7.3068e-40  | 2.08761e-37 | Kidney_high    |
| Dram1                                                 | 13.0041 | 2.65256  | 1.16015e-38 | 3.09548e-36 | Kidney_high    |
| Fth1                                                  | 12.7922 | 0.931648 | 1.81249e-37 | 4.57158e-35 | Kidney_high    |
| Samd12                                                | 12.5849 | 1.31047  | 2.55649e-36 | 6.02455e-34 | Kidney_high    |
| Laptn4a                                               | 12.4641 | 0.735003 | 1.17178e-35 | 2.68305e-33 | Kidney_high    |
| Heg1                                                  | 12.3487 | 0.930294 | 4.95001e-35 | 1.08715e-32 | Kidney_high    |



| Supplementary Table S8: DEG results of cECs by organ. |         |          |             |             |             |
|-------------------------------------------------------|---------|----------|-------------|-------------|-------------|
| Cd81                                                  | 12.1845 | 0.8624   | 3.76071e-34 | 7.93559e-32 | Kidney_high |
| Mal                                                   | 12.1445 | 2.66591  | 6.13425e-34 | 1.286e-31   | Kidney_high |
| Aopep                                                 | 12.0672 | 0.882653 | 1.57456e-33 | 3.27966e-31 | Kidney_high |
| Tcim                                                  | 12.0236 | 0.959915 | 2.67215e-33 | 5.46015e-31 | Kidney_high |
| S100a10                                               | 12.0063 | 0.967914 | 3.29248e-33 | 6.64361e-31 | Kidney_high |
| Dnm3                                                  | 11.9836 | 1.68827  | 4.33175e-33 | 8.68637e-31 | Kidney_high |
| Tnfaip2                                               | 11.8558 | 1.61763  | 2.00885e-32 | 3.90697e-30 | Kidney_high |
| Rpl21                                                 | 11.6457 | 0.711618 | 2.41323e-31 | 4.45207e-29 | Kidney_high |
| Acsn2                                                 | 11.5234 | 29.2554  | 1.00568e-30 | 1.78398e-28 | Kidney_high |
| Icam2                                                 | 11.4727 | 1.07043  | 1.80902e-30 | 3.14e-28    | Kidney_high |
| Selenom                                               | 11.2396 | 1.15751  | 2.60598e-29 | 4.2492e-27  | Kidney_high |
| Pi16                                                  | 11.2378 | 6.32919  | 2.6604e-29  | 4.31613e-27 | Kidney_high |
| Tmem176b                                              | 11.1487 | 1.16812  | 7.26768e-29 | 1.16157e-26 | Kidney_high |
| Plcb1                                                 | 11.1396 | 1.05206  | 8.04681e-29 | 1.27976e-26 | Kidney_high |
| Rapgef4                                               | 11.095  | 1.18733  | 1.3262e-28  | 2.06842e-26 | Kidney_high |
| Ppia                                                  | 10.9658 | 0.639639 | 5.58335e-28 | 8.34531e-26 | Kidney_high |
| Slc9a3r2                                              | 10.8929 | 0.876172 | 1.24633e-27 | 1.84577e-25 | Kidney_high |
| Hipk2                                                 | 10.8263 | 1.0446   | 2.58265e-27 | 3.72236e-25 | Kidney_high |
| Podxl                                                 | 10.5851 | 0.819964 | 3.49523e-26 | 4.66296e-24 | Kidney_high |
| mt-Nd5                                                | 10.5106 | 1.52903  | 7.72279e-26 | 9.97321e-24 | Kidney_high |
| Txn1                                                  | 10.3627 | 0.754454 | 3.66351e-25 | 4.54909e-23 | Kidney_high |
| Rdx                                                   | 10.3182 | 0.849608 | 5.8315e-25  | 7.15855e-23 | Kidney_high |
| H3f3a                                                 | 10.3041 | 0.593952 | 6.75101e-25 | 8.25592e-23 | Kidney_high |
| Clic5                                                 | 10.0243 | 1.24372  | 1.19176e-23 | 1.34062e-21 | Kidney_high |
| S100a11                                               | 9.90598 | 1.17906  | 3.92111e-23 | 4.32058e-21 | Kidney_high |
| Plac8                                                 | 9.80295 | 4.71069  | 1.09347e-22 | 1.15368e-20 | Kidney_high |
| Aldob                                                 | 9.709   | 8.39295  | 2.76034e-22 | 2.82913e-20 | Kidney_high |
| Gimap5                                                | 9.59155 | 1.30638  | 8.67722e-22 | 8.70012e-20 | Kidney_high |
| Lims2                                                 | 9.51779 | 0.957911 | 1.76909e-21 | 1.71517e-19 | Kidney_high |
| Rpl11                                                 | 9.50966 | 0.554992 | 1.91288e-21 | 1.8435e-19  | Kidney_high |
| Gimap4                                                | 9.48715 | 0.767587 | 2.37443e-21 | 2.268e-19   | Kidney_high |
| Rpl32                                                 | 9.41959 | 0.605004 | 4.52865e-21 | 4.2379e-19  | Kidney_high |
| Inpp4b                                                | 9.40231 | 1.27951  | 5.33802e-21 | 4.96651e-19 | Kidney_high |
| Cd9                                                   | 9.2306  | 1.01515  | 2.69112e-20 | 2.35139e-18 | Kidney_high |
| Exoc3l2                                               | 9.20018 | 0.635886 | 3.57336e-20 | 3.07642e-18 | Kidney_high |
| 3110099E03Rik                                         | 9.10544 | 3.98442  | 8.59165e-20 | 7.2613e-18  | Kidney_high |
| Ptma                                                  | 9.02886 | 0.404078 | 1.73464e-19 | 1.42865e-17 | Kidney_high |
| Myl12b                                                | 8.87563 | 0.689767 | 6.95361e-19 | 5.44897e-17 | Kidney_high |
| Rpl30                                                 | 8.85688 | 0.495491 | 8.22815e-19 | 6.33999e-17 | Kidney_high |
| Plscr1                                                | 8.76616 | 1.55358  | 1.8487e-18  | 1.37842e-16 | Kidney_high |
| Ubb                                                   | 8.71909 | 0.605848 | 2.80451e-18 | 2.05781e-16 | Kidney_high |
| Tspo                                                  | 8.65384 | 0.852919 | 4.97954e-18 | 3.54107e-16 | Kidney_high |
| Ctnna3                                                | 8.59899 | 1.98264  | 8.04232e-18 | 5.62005e-16 | Kidney_high |
| Rps18                                                 | 8.56713 | 0.461393 | 1.06094e-17 | 7.35031e-16 | Kidney_high |
| Lpl                                                   | 8.55923 | 2.8026   | 1.13628e-17 | 7.83865e-16 | Kidney_high |
| Plpp1                                                 | 8.5217  | 0.722548 | 1.57235e-17 | 1.06646e-15 | Kidney_high |
| Gas6                                                  | 8.44482 | 0.805745 | 3.04502e-17 | 1.99005e-15 | Kidney_high |
| Efnb2                                                 | 8.43765 | 0.950818 | 3.23788e-17 | 2.10756e-15 | Kidney_high |
| Cd300lg                                               | 8.42617 | 0.601357 | 3.57155e-17 | 2.30615e-15 | Kidney_high |
| Ifitm3                                                | 8.35832 | 0.474026 | 6.36174e-17 | 4.00368e-15 | Kidney_high |
| Timp3                                                 | 8.26341 | 0.646552 | 1.41573e-16 | 8.54331e-15 | Kidney_high |
| Rpl28                                                 | 8.2298  | 0.510863 | 1.87524e-16 | 1.11087e-14 | Kidney_high |
| Alpl                                                  | 8.18206 | 2.56483  | 2.79031e-16 | 1.63494e-14 | Kidney_high |
| Rpl17                                                 | 8.10828 | 0.492024 | 5.13412e-16 | 2.92337e-14 | Kidney_high |
| Kank4                                                 | 8.10513 | 3.7827   | 5.2691e-16  | 2.99495e-14 | Kidney_high |
| Rpl18                                                 | 8.0987  | 0.529761 | 5.55482e-16 | 3.13527e-14 | Kidney_high |
| Itgb1                                                 | 8.09067 | 0.462347 | 5.93392e-16 | 3.34339e-14 | Kidney_high |
| Gm30382                                               | 8.03204 | 2.93395  | 9.58629e-16 | 5.29955e-14 | Kidney_high |
| Hoxa7                                                 | 7.91086 | 2.71895  | 2.55612e-15 | 1.35731e-13 | Kidney_high |
| Crispld1                                              | 7.90948 | 2.33241  | 2.58458e-15 | 1.37017e-13 | Kidney_high |
| Cox6c                                                 | 7.9045  | 0.61646  | 2.69001e-15 | 1.42139e-13 | Kidney_high |
| Cmss1                                                 | 7.89    | 0.619521 | 3.02195e-15 | 1.5864e-13  | Kidney_high |
| Rpl12                                                 | 7.81524 | 0.484659 | 5.48605e-15 | 2.81138e-13 | Kidney_high |
| Gimap6                                                | 7.81065 | 0.539515 | 5.6896e-15  | 2.91107e-13 | Kidney_high |
| Bsg                                                   | 35.0229 | 5.65322  | 1.0079e-268 | 3.2541e-264 | Brain_high  |
| Itm2a                                                 | 33.8505 | 6.53928  | 3.5715e-251 | 3.8436e-247 | Brain_high  |
| Slco1a4                                               | 33.7317 | 11.248   | 1.9827e-249 | 1.6003e-245 | Brain_high  |
| Cldn5                                                 | 32.0129 | 4.60699  | 7.2215e-225 | 3.3306e-221 | Brain_high  |

| Supplementary Table S8: DEG results of cECs by organ. |         |          |             |             |            |
|-------------------------------------------------------|---------|----------|-------------|-------------|------------|
| Spock2                                                | 31.8691 | 11.2683  | 7.1663e-223 | 2.892e-219  | Brain_high |
| Pltp                                                  | 31.4253 | 4.91431  | 9.1371e-217 | 3.2777e-213 | Brain_high |
| Ptn                                                   | 30.6539 | 10.7194  | 2.3432e-206 | 6.8774e-203 | Brain_high |
| Slco1c1                                               | 30.1301 | 33.5367  | 1.9571e-199 | 5.2653e-196 | Brain_high |
| Flt1                                                  | 28.5315 | 1.96693  | 4.76e-179   | 1.0245e-175 | Brain_high |
| Abcb1a                                                | 28.0138 | 7.27576  | 1.1044e-172 | 1.9809e-169 | Brain_high |
| Igf1r                                                 | 25.6441 | 3.37788  | 4.9229e-145 | 4.9667e-142 | Brain_high |
| Slc6a6                                                | 25.0959 | 3.84315  | 5.5122e-139 | 4.9434e-136 | Brain_high |
| Cxcl12                                                | 24.9611 | 5.752    | 1.6168e-137 | 1.3384e-134 | Brain_high |
| Slc39a10                                              | 23.3309 | 4.82351  | 2.1532e-120 | 1.0223e-117 | Brain_high |
| Sptbn1                                                | 23.2742 | 1.13236  | 8.0859e-120 | 3.7293e-117 | Brain_high |
| Ly6c1                                                 | 22.9197 | 2.74279  | 2.9545e-116 | 1.289e-113  | Brain_high |
| Slc2a1                                                | 22.7972 | 6.93994  | 4.8909e-115 | 2.0507e-112 | Brain_high |
| Gpcpd1                                                | 22.7192 | 4.78829  | 2.8954e-114 | 1.1685e-111 | Brain_high |
| Sema3c                                                | 22.4792 | 6.72546  | 6.6275e-112 | 2.6416e-109 | Brain_high |
| Lef1                                                  | 21.8429 | 5.71355  | 9.0833e-106 | 3.4501e-103 | Brain_high |
| Ablim1                                                | 21.4638 | 3.45447  | 3.3938e-102 | 1.2174e-99  | Brain_high |
| Abhd2                                                 | 21.1882 | 5.26181  | 1.227e-99   | 4.25947e-97 | Brain_high |
| Tmsb4x                                                | 21.1777 | 1.41804  | 1.5328e-99  | 5.26443e-97 | Brain_high |
| Pglyrp1                                               | 20.8281 | 9.89974  | 2.40939e-96 | 7.6262e-94  | Brain_high |
| Sorbs2                                                | 20.5304 | 3.88148  | 1.15319e-93 | 3.51232e-91 | Brain_high |
| Rpl38                                                 | 20.275  | 1.64707  | 2.13763e-91 | 6.21743e-89 | Brain_high |
| Ccdc141                                               | 19.4546 | 11.133   | 2.66228e-84 | 6.27384e-82 | Brain_high |
| Jcad                                                  | 19.1377 | 3.02083  | 1.22597e-81 | 2.711e-79   | Brain_high |
| Fn1                                                   | 18.9202 | 8.74362  | 7.76952e-80 | 1.63947e-77 | Brain_high |
| Neb1                                                  | 18.6714 | 5.53216  | 8.45295e-78 | 1.71637e-75 | Brain_high |
| Abcg2                                                 | 18.3424 | 2.39051  | 3.79822e-75 | 7.34285e-73 | Brain_high |
| Esyt2                                                 | 18.1484 | 2.79572  | 1.3223e-73  | 2.41189e-71 | Brain_high |
| Sgms1                                                 | 18.0966 | 2.21443  | 3.39181e-73 | 6.0836e-71  | Brain_high |
| Tjp1                                                  | 17.7679 | 1.92902  | 1.25286e-70 | 2.07429e-68 | Brain_high |
| Myl6                                                  | 17.7117 | 1.20407  | 3.40848e-70 | 5.55771e-68 | Brain_high |
| Pcp4l1                                                | 17.0237 | 3.31318  | 5.48347e-65 | 7.86817e-63 | Brain_high |
| Slc7a1                                                | 16.2475 | 5.57588  | 2.32582e-59 | 2.67221e-57 | Brain_high |
| Prom1                                                 | 15.9303 | 8.02509  | 3.90233e-57 | 4.15798e-55 | Brain_high |
| Utrn                                                  | 15.6555 | 1.60099  | 3.04509e-55 | 2.97912e-53 | Brain_high |
| Mecom                                                 | 15.3895 | 2.96031  | 1.92578e-53 | 1.77133e-51 | Brain_high |
| Fry                                                   | 15.315  | 2.57331  | 6.06682e-53 | 5.48648e-51 | Brain_high |
| Itih5                                                 | 15.2071 | 3.65316  | 3.17319e-52 | 2.82222e-50 | Brain_high |
| Atox1                                                 | 15.0622 | 1.43492  | 2.87033e-51 | 2.45806e-49 | Brain_high |
| Rpl27a                                                | 15.0184 | 0.907244 | 5.56509e-51 | 4.69109e-49 | Brain_high |
| Tfrc                                                  | 14.9081 | 8.97136  | 2.92042e-50 | 2.35714e-48 | Brain_high |
| Tspan13                                               | 14.8059 | 2.6609   | 1.34169e-49 | 1.0289e-47  | Brain_high |
| Foxq1                                                 | 14.7324 | 8.34436  | 3.99019e-49 | 2.98202e-47 | Brain_high |
| Cobll1                                                | 14.7122 | 5.22239  | 5.38342e-49 | 3.9772e-47  | Brain_high |
| Car4                                                  | 14.634  | 3.1226   | 1.70504e-48 | 1.2398e-46  | Brain_high |
| Kitl                                                  | 14.6017 | 1.70085  | 2.73938e-48 | 1.98298e-46 | Brain_high |
| Gng5                                                  | 14.2938 | 1.38318  | 2.39257e-46 | 1.59595e-44 | Brain_high |
| Rundc3b                                               | 14.0124 | 6.03328  | 1.30874e-44 | 8.20443e-43 | Brain_high |
| Sparcl1                                               | 13.6446 | 2.23882  | 2.17533e-42 | 1.25188e-40 | Brain_high |
| Rps8                                                  | 13.4976 | 0.727067 | 1.61625e-41 | 9.02776e-40 | Brain_high |
| Tmsb10                                                | 13.4772 | 2.27114  | 2.12989e-41 | 1.16945e-39 | Brain_high |
| App                                                   | 13.453  | 0.529374 | 2.95491e-41 | 1.6142e-39  | Brain_high |
| Atp10a                                                | 13.1233 | 4.9322   | 2.42111e-39 | 1.21564e-37 | Brain_high |
| Ly6a                                                  | 12.9894 | 1.41425  | 1.40466e-38 | 6.86072e-37 | Brain_high |
| Actb                                                  | 12.5995 | 0.629825 | 2.12507e-36 | 9.46316e-35 | Brain_high |
| Ptprg                                                 | 11.9064 | 0.991214 | 1.09617e-32 | 4.23831e-31 | Brain_high |
| Tsc22d1                                               | 11.8607 | 1.33831  | 1.89285e-32 | 7.24059e-31 | Brain_high |
| Frmf5                                                 | 11.5855 | 8.54379  | 4.87858e-31 | 1.74424e-29 | Brain_high |
| Slc22a8                                               | 11.4044 | 8.75808  | 3.97408e-30 | 1.34772e-28 | Brain_high |
| Gsta4                                                 | 11.1896 | 9.52052  | 4.58613e-29 | 1.48211e-27 | Brain_high |
| Hmcn1                                                 | 11.1552 | 2.1089   | 6.755e-29   | 2.16354e-27 | Brain_high |
| Usp53                                                 | 10.9223 | 4.7601   | 9.02301e-28 | 2.71996e-26 | Brain_high |
| Rpl13                                                 | 10.8528 | 0.57044  | 1.93397e-27 | 5.72303e-26 | Brain_high |
| Dach1                                                 | 10.7873 | 3.66208  | 3.95073e-27 | 1.15128e-25 | Brain_high |
| Ebf1                                                  | 10.6473 | 1.2783   | 1.79445e-26 | 5.12688e-25 | Brain_high |
| Palmd                                                 | 10.6463 | 2.23148  | 1.81501e-26 | 5.18104e-25 | Brain_high |
| Ctsh                                                  | 10.6158 | 5.49659  | 2.51582e-26 | 7.10613e-25 | Brain_high |
| Apccdd1                                               | 10.4706 | 5.59348  | 1.17912e-25 | 3.20976e-24 | Brain_high |

| Supplementary Table S8: DEG results of cECs by organ. |         |          |             |             |            |
|-------------------------------------------------------|---------|----------|-------------|-------------|------------|
| Vwa1                                                  | 10.4682 | 3.2689   | 1.20958e-25 | 3.28991e-24 | Brain_high |
| Maoa                                                  | 10.4388 | 3.79877  | 1.64799e-25 | 4.44117e-24 | Brain_high |
| Elovl7                                                | 10.4378 | 7.9365   | 1.66699e-25 | 4.48863e-24 | Brain_high |
| Foxp1                                                 | 10.3087 | 0.749963 | 6.43556e-25 | 1.67693e-23 | Brain_high |
| Ocln                                                  | 10.2441 | 10.0763  | 1.25817e-24 | 3.21615e-23 | Brain_high |
| Srarp                                                 | 10.191  | 7.28895  | 2.17506e-24 | 5.44778e-23 | Brain_high |
| Ptma                                                  | 10.0171 | 0.370169 | 1.28248e-23 | 3.08991e-22 | Brain_high |
| Arl4a                                                 | 10.014  | 2.96766  | 1.32357e-23 | 3.18655e-22 | Brain_high |
| Ndnf                                                  | 9.99103 | 9.29283  | 1.66837e-23 | 3.98397e-22 | Brain_high |
| Naca                                                  | 9.92204 | 0.999156 | 3.33856e-23 | 7.80489e-22 | Brain_high |
| Dynll1                                                | 9.91868 | 1.012    | 3.45275e-23 | 8.066e-22   | Brain_high |
| Rps23                                                 | 9.84657 | 0.469785 | 7.09252e-23 | 1.63675e-21 | Brain_high |
| Rps27a                                                | 9.81686 | 0.480348 | 9.52645e-23 | 2.18283e-21 | Brain_high |
| Rps14                                                 | 9.62642 | 0.390962 | 6.1848e-22  | 1.3565e-20  | Brain_high |
| Ndufa7                                                | 9.60251 | 1.59483  | 7.80211e-22 | 1.70082e-20 | Brain_high |
| Wfdc1                                                 | 9.51866 | 4.80651  | 1.75431e-21 | 3.72373e-20 | Brain_high |
| Mfsd2a                                                | 9.51183 | 10.671   | 1.8733e-21  | 3.96847e-20 | Brain_high |
| Ctnnb1                                                | 9.44267 | 0.879981 | 3.63397e-21 | 7.59635e-20 | Brain_high |
| Calm1                                                 | 9.31885 | 0.455197 | 1.17609e-20 | 2.39558e-19 | Brain_high |
| Lsr                                                   | 9.11513 | 9.85837  | 7.85786e-20 | 1.51638e-18 | Brain_high |
| Grb14                                                 | 9.03856 | 6.25912  | 1.58757e-19 | 3.02209e-18 | Brain_high |
| Dnm3                                                  | 9.00371 | 1.83272  | 2.18221e-19 | 4.12969e-18 | Brain_high |
| Rps27                                                 | 8.98449 | 0.468862 | 2.59934e-19 | 4.88757e-18 | Brain_high |
| Zfp36l1                                               | 8.95876 | 0.943293 | 3.2834e-19  | 6.12036e-18 | Brain_high |
| Rpl26                                                 | 8.81031 | 0.361838 | 1.24799e-18 | 2.24715e-17 | Brain_high |
| Rpl9                                                  | 8.79159 | 0.462895 | 1.4746e-18  | 2.64632e-17 | Brain_high |
| Rps3a1                                                | 8.78446 | 0.374864 | 1.57112e-18 | 2.81017e-17 | Brain_high |
| Slc16a1                                               | 8.69766 | 3.79386  | 3.38806e-18 | 5.9383e-17  | Brain_high |
| Maf                                                   | 74.7392 | 6.26226  | 0           | 0           | Liver_high |
| Mrc1                                                  | 71.2253 | 6.94004  | 0           | 0           | Liver_high |
| Stab2                                                 | 70.6412 | 12.8127  | 0           | 0           | Liver_high |
| Plxnc1                                                | 68.6608 | 10.4398  | 0           | 0           | Liver_high |
| Ptpnb                                                 | 68.4635 | 2.25198  | 0           | 0           | Liver_high |
| Dnase1l3                                              | 68.3553 | 14.5779  | 0           | 0           | Liver_high |
| Ralgapa2                                              | 68.148  | 6.111    | 0           | 0           | Liver_high |
| Slc9a9                                                | 66.8363 | 9.29034  | 0           | 0           | Liver_high |
| Cd55                                                  | 66.6812 | 8.86741  | 0           | 0           | Liver_high |
| Fcgr2b                                                | 65.9134 | 13.206   | 0           | 0           | Liver_high |
| Cemip2                                                | 65.8392 | 4.01034  | 0           | 0           | Liver_high |
| Palld                                                 | 65.6254 | 7.99832  | 0           | 0           | Liver_high |
| Dpp4                                                  | 65.3055 | 8.71003  | 0           | 0           | Liver_high |
| Bmp2                                                  | 64.8302 | 6.82758  | 0           | 0           | Liver_high |
| Jak1                                                  | 63.8833 | 3.39086  | 0           | 0           | Liver_high |
| F8                                                    | 63.717  | 4.15975  | 0           | 0           | Liver_high |
| Clec4g                                                | 63.6475 | 33.0549  | 0           | 0           | Liver_high |
| Gata4                                                 | 63.6475 | 32.4095  | 0           | 0           | Liver_high |
| Psd3                                                  | 63.5002 | 4.01481  | 0           | 0           | Liver_high |
| Adam23                                                | 63.1158 | 12.485   | 0           | 0           | Liver_high |
| Il6st                                                 | 62.5412 | 4.10435  | 0           | 0           | Liver_high |
| Tspan7                                                | 62.3025 | 4.48218  | 0           | 0           | Liver_high |
| Ehd3                                                  | 61.8419 | 3.95078  | 0           | 0           | Liver_high |
| Zeb2                                                  | 61.7354 | 6.08528  | 0           | 0           | Liver_high |
| Gatm                                                  | 61.2986 | 5.65138  | 0           | 0           | Liver_high |
| B3galt1                                               | 61.1467 | 6.84178  | 0           | 0           | Liver_high |
| Selenop                                               | 61.0326 | 3.47621  | 0           | 0           | Liver_high |
| Fam124a                                               | 59.2712 | 5.53994  | 0           | 0           | Liver_high |
| Fyn                                                   | 58.9971 | 2.71636  | 0           | 0           | Liver_high |
| Dab2                                                  | 58.9653 | 3.49908  | 0           | 0           | Liver_high |
| Gpr182                                                | 58.9004 | 4.74011  | 0           | 0           | Liver_high |
| Sntb1                                                 | 58.3343 | 4.33785  | 0           | 0           | Liver_high |
| Igfbp4                                                | 58.2943 | 3.64361  | 0           | 0           | Liver_high |
| Lrmda                                                 | 58.2463 | 3.19106  | 0           | 0           | Liver_high |
| Prickle1                                              | 58.0572 | 4.04089  | 0           | 0           | Liver_high |
| Aqp1                                                  | 57.9379 | 4.80005  | 0           | 0           | Liver_high |
| Man2a1                                                | 57.8512 | 3.46957  | 0           | 0           | Liver_high |
| Oit3                                                  | 56.6961 | 5.694    | 0           | 0           | Liver_high |
| Snx24                                                 | 56.6474 | 7.24211  | 0           | 0           | Liver_high |
| Itsn1                                                 | 56.5546 | 4.61219  | 0           | 0           | Liver_high |

| Supplementary Table S8: DEG results of cECs by organ. |         |         |   |   |            |
|-------------------------------------------------------|---------|---------|---|---|------------|
| Aass                                                  | 55.9857 | 13.1003 | 0 | 0 | Liver_high |
| Epb41l2                                               | 55.2706 | 3.14512 | 0 | 0 | Liver_high |
| Itga9                                                 | 55.269  | 3.20308 | 0 | 0 | Liver_high |
| Atrnl1                                                | 54.2188 | 3.1917  | 0 | 0 | Liver_high |
| Plekhg1                                               | 53.8637 | 2.51238 | 0 | 0 | Liver_high |
| Gm42418                                               | 53.7606 | 2.27875 | 0 | 0 | Liver_high |
| Stab1                                                 | 53.6683 | 2.98429 | 0 | 0 | Liver_high |
| Mid1                                                  | 53.5126 | 4.28431 | 0 | 0 | Liver_high |
| Lgmn                                                  | 52.9653 | 5.00369 | 0 | 0 | Liver_high |
| Prkce                                                 | 52.9443 | 2.4952  | 0 | 0 | Liver_high |
| Slc43a2                                               | 52.737  | 6.97797 | 0 | 0 | Liver_high |
| St3gal4                                               | 52.4055 | 2.72027 | 0 | 0 | Liver_high |
| Cnksr3                                                | 52.0871 | 4.12472 | 0 | 0 | Liver_high |
| Rasal2                                                | 51.933  | 2.09583 | 0 | 0 | Liver_high |
| Lifr                                                  | 51.9173 | 2.76717 | 0 | 0 | Liver_high |
| Lamp2                                                 | 51.8985 | 2.4309  | 0 | 0 | Liver_high |
| Iqgap2                                                | 51.8899 | 9.95815 | 0 | 0 | Liver_high |
| Dse                                                   | 51.862  | 4.84749 | 0 | 0 | Liver_high |
| Ap1b1                                                 | 51.836  | 4.47027 | 0 | 0 | Liver_high |
| Arhgap23                                              | 51.5089 | 3.06993 | 0 | 0 | Liver_high |
| Zswim6                                                | 51.5035 | 2.73752 | 0 | 0 | Liver_high |
| Acer3                                                 | 51.3271 | 4.52551 | 0 | 0 | Liver_high |
| Tmcc3                                                 | 51.2448 | 2.71827 | 0 | 0 | Liver_high |
| Camk1d                                                | 51.0513 | 3.23228 | 0 | 0 | Liver_high |
| Nr2f2                                                 | 51.0194 | 3.05006 | 0 | 0 | Liver_high |
| Exoc6                                                 | 50.6519 | 3.30139 | 0 | 0 | Liver_high |
| Mtss1                                                 | 50.3488 | 2.62206 | 0 | 0 | Liver_high |
| Pard3b                                                | 50.3177 | 2.87719 | 0 | 0 | Liver_high |
| Ankrd44                                               | 49.9853 | 2.89947 | 0 | 0 | Liver_high |
| Myo10                                                 | 49.6138 | 2.54961 | 0 | 0 | Liver_high |
| Tfpi                                                  | 49.6074 | 3.57503 | 0 | 0 | Liver_high |
| Lhfpl2                                                | 48.9614 | 3.14431 | 0 | 0 | Liver_high |
| Sh3rf1                                                | 48.8922 | 2.74715 | 0 | 0 | Liver_high |
| Itga8                                                 | 48.8147 | 6.17444 | 0 | 0 | Liver_high |
| Bmp6                                                  | 48.7777 | 3.70196 | 0 | 0 | Liver_high |
| Fam222b                                               | 48.7207 | 3.14126 | 0 | 0 | Liver_high |
| Man1a                                                 | 47.9905 | 3.01833 | 0 | 0 | Liver_high |
| Sash1                                                 | 47.7719 | 2.16832 | 0 | 0 | Liver_high |
| Arhgap45                                              | 47.7439 | 4.57934 | 0 | 0 | Liver_high |
| Mertk                                                 | 47.6535 | 2.77773 | 0 | 0 | Liver_high |
| Ppfia2                                                | 47.4692 | 4.47399 | 0 | 0 | Liver_high |
| Tpbgl                                                 | 47.4102 | 6.43107 | 0 | 0 | Liver_high |
| Raph1                                                 | 47.0886 | 2.87354 | 0 | 0 | Liver_high |
| Gm15675                                               | 47.0306 | 10.6226 | 0 | 0 | Liver_high |
| Msrb3                                                 | 47.0263 | 2.64988 | 0 | 0 | Liver_high |
| Sema6a                                                | 46.9155 | 1.97636 | 0 | 0 | Liver_high |
| Znrf1                                                 | 46.8511 | 2.52132 | 0 | 0 | Liver_high |
| Macf1                                                 | 46.822  | 1.55433 | 0 | 0 | Liver_high |
| Lpp                                                   | 46.5342 | 2.19008 | 0 | 0 | Liver_high |
| Hivep3                                                | 46.5185 | 2.90038 | 0 | 0 | Liver_high |
| Anapc15                                               | 46.3656 | 4.8541  | 0 | 0 | Liver_high |
| Sh3bp5                                                | 46.2972 | 2.05377 | 0 | 0 | Liver_high |
| Ago3                                                  | 46.0788 | 2.84754 | 0 | 0 | Liver_high |
| Masp1                                                 | 45.5662 | 10.9237 | 0 | 0 | Liver_high |
| Mb21d2                                                | 45.2714 | 4.121   | 0 | 0 | Liver_high |
| Cd36                                                  | 44.8699 | 2.99516 | 0 | 0 | Liver_high |
| Ap2a2                                                 | 44.8328 | 2.89044 | 0 | 0 | Liver_high |
| Tmem164                                               | 44.7543 | 2.74964 | 0 | 0 | Liver_high |
| Pitpnc1                                               | 44.5627 | 1.63955 | 0 | 0 | Liver_high |
| Car8                                                  | 44.2803 | 2.97436 | 0 | 0 | Liver_high |

Supplementary Table S9

| Supplementary Table S9: Organotypic pseudobulk DEG results of cECs by organ. |         |                |             |          |
|------------------------------------------------------------------------------|---------|----------------|-------------|----------|
| Gene                                                                         | Organ   | log2FoldChange | padj        | baseMean |
| Sult2b1                                                                      | Adrenal | 5.35152        | 7.4633e-10  | 4.28124  |
| Angptl4                                                                      | Adrenal | 4.82087        | 4.08541e-13 | 5.00258  |
| Aqp7                                                                         | Adrenal | 4.54089        | 4.17303e-05 | 5.94803  |
| Lmtk3                                                                        | Adrenal | 4.20479        | 1.20406e-09 | 6.71205  |
| Timp4                                                                        | Adrenal | 4.01369        | 0.00213715  | 4.84308  |
| Hapln1                                                                       | Adrenal | 3.85657        | 4.44691e-07 | 9.98624  |
| Nup210                                                                       | Adrenal | 3.62647        | 1.87136e-08 | 3.9747   |
| Adamts1                                                                      | Adrenal | 3.59986        | 1.60976e-08 | 7.2773   |
| Sdk1                                                                         | Adrenal | 3.50512        | 3.61428e-07 | 17.8447  |
| Npr3                                                                         | Adrenal | 3.44856        | 9.8079e-07  | 78.47    |
| Gm35533                                                                      | Adrenal | 3.40215        | 2.42378e-08 | 57.5413  |
| Zbtb16                                                                       | Adrenal | 3.35031        | 0.000695128 | 11.1017  |
| Edil3                                                                        | Adrenal | 3.29081        | 0.00197126  | 54.882   |
| Fkbp5                                                                        | Adrenal | 3.23285        | 1.06283e-11 | 35.9776  |
| Rbfox3                                                                       | Adrenal | 3.1526         | 6.77912e-08 | 5.69403  |
| D5Ert615e                                                                    | Adrenal | 3.08441        | 0.000714238 | 44.6248  |
| Chst8                                                                        | Adrenal | 3.04842        | 0.000131863 | 14.111   |
| Sdk2                                                                         | Adrenal | 2.92023        | 2.72548e-14 | 3.35971  |
| Mettl24                                                                      | Adrenal | 2.8618         | 0.000237164 | 14.0145  |
| Igf2bp2                                                                      | Adrenal | 2.85035        | 0.000138123 | 3.76589  |
| Slc28a2                                                                      | Adrenal | 2.78786        | 0.00435837  | 3.75541  |
| C1qtnf9                                                                      | Adrenal | 2.72863        | 1.49183e-06 | 4.45328  |
| Car7                                                                         | Adrenal | 2.69565        | 4.20117e-12 | 8.79898  |
| Tbxas1                                                                       | Adrenal | 2.34799        | 3.14689e-05 | 12.2386  |
| Cmklr1                                                                       | Adrenal | 2.32333        | 0.000330682 | 3.93574  |
| Deptor                                                                       | Adrenal | 2.31194        | 5.68992e-15 | 16.341   |
| Il33                                                                         | Adrenal | 2.30229        | 0.0344329   | 9.0696   |
| Adamts5                                                                      | Adrenal | 2.27347        | 3.642e-05   | 5.50167  |
| Ablim3                                                                       | Adrenal | 2.26367        | 0.0150309   | 14.2789  |
| Adamts6                                                                      | Adrenal | 2.26274        | 1.23123e-07 | 15.8034  |
| Fabp4                                                                        | Adrenal | 2.22386        | 0.00507766  | 1056.61  |
| Thrb                                                                         | Adrenal | 2.20852        | 0.000110729 | 10.9394  |
| Tnxb                                                                         | Adrenal | 2.20683        | 9.84818e-05 | 8.52147  |
| Flrt3                                                                        | Adrenal | 2.18871        | 0.0173297   | 5.79665  |
| Hoxb7                                                                        | Adrenal | 2.15667        | 0.0486823   | 6.84869  |
| Tmem26                                                                       | Adrenal | 2.10567        | 0.0366881   | 16.7035  |
| Pf4                                                                          | Adrenal | 2.08887        | 2.59001e-11 | 5.63419  |
| Gda                                                                          | Adrenal | 2.06761        | 0.00780252  | 15.9691  |
| Zbp1                                                                         | Adrenal | 2.0179         | 0.000106114 | 4.85347  |
| Fcer1g                                                                       | Adrenal | 2.01192        | 0.000672227 | 23.586   |
| Cebpb                                                                        | Adrenal | 1.99039        | 4.73923e-47 | 12.503   |
| Lanc13                                                                       | Adrenal | 1.94167        | 0.00307864  | 5.069    |
| Itiprip                                                                      | Adrenal | 1.92235        | 5.19827e-19 | 8.6965   |
| Itgb3                                                                        | Adrenal | 1.9176         | 1.07719e-08 | 5.11144  |
| Ifi206                                                                       | Adrenal | 1.91649        | 1.21689e-45 | 5.91534  |
| Msmg                                                                         | Adrenal | 1.90916        | 0.00176138  | 5.15475  |
| Pparg                                                                        | Adrenal | 1.90169        | 2.43838e-05 | 15.6198  |
| Fam117b                                                                      | Adrenal | 1.88115        | 1.01383e-09 | 148.756  |
| Insr                                                                         | Adrenal | 1.874          | 3.44825e-13 | 193.58   |
| Apol9b                                                                       | Adrenal | 1.84655        | 0.0102253   | 4.10353  |
| Slit3                                                                        | Adrenal | 1.84323        | 0.0476661   | 39.894   |
| Gprc5b                                                                       | Adrenal | 1.84136        | 3.07186e-05 | 4.6569   |
| Cd14                                                                         | Adrenal | 1.80816        | 0.000302193 | 3.13692  |
| Hipk2                                                                        | Adrenal | 1.78962        | 0.0140393   | 203.025  |
| Ifi44                                                                        | Adrenal | 1.77928        | 9.7173e-09  | 81.9262  |
| Tnfrsf11a                                                                    | Adrenal | 1.77141        | 0.000286952 | 12.1234  |
| Emid1                                                                        | Adrenal | 1.76593        | 0.0313645   | 14.6018  |
| Inpp4b                                                                       | Adrenal | 1.76385        | 0.00528946  | 75.3409  |
| Itgb5                                                                        | Adrenal | 1.7593         | 0.0309169   | 25.1481  |
| Rftn2                                                                        | Adrenal | 1.75786        | 5.5719e-07  | 7.02598  |
| AU021092                                                                     | Adrenal | 1.74186        | 0.00855915  | 94.3791  |
| Pbx1                                                                         | Adrenal | 1.71902        | 0.0365094   | 1167.04  |
| 4833403J16Rik                                                                | Adrenal | 1.71882        | 1.2408e-56  | 15.4608  |
| Ifi213                                                                       | Adrenal | 1.70774        | 6.07377e-23 | 6.71851  |

| Supplementary Table S9: Organotypic pseudobulk DEG results of cECs by organ. |         |         |             |         |
|------------------------------------------------------------------------------|---------|---------|-------------|---------|
| Tshz2                                                                        | Adrenal | 1.68899 | 9.72892e-11 | 380.061 |
| Zdhhc15                                                                      | Adrenal | 1.67982 | 0.000343166 | 3.41316 |
| Etfbkmt                                                                      | Adrenal | 1.65095 | 0.00146092  | 6.40394 |
| Vwa3a                                                                        | Adrenal | 1.6317  | 0.021235    | 9.38897 |
| Neurl1b                                                                      | Adrenal | 1.61915 | 0.00537949  | 7.47892 |
| Lrg1                                                                         | Adrenal | 1.60804 | 0.00398114  | 13.632  |
| Lzts1                                                                        | Adrenal | 1.60329 | 0.000129355 | 3.52707 |
| Fabp5                                                                        | Adrenal | 1.58529 | 0.00297919  | 91.7039 |
| Calml4                                                                       | Adrenal | 1.57719 | 0.00290033  | 12.5207 |
| Serp2                                                                        | Adrenal | 1.55522 | 0.0299314   | 6.0826  |
| Egr1                                                                         | Adrenal | 1.54087 | 0.00611403  | 43.5901 |
| Tpst1                                                                        | Adrenal | 1.53183 | 5.60111e-06 | 8.01383 |
| Gm43813                                                                      | Adrenal | 1.52753 | 0.00543806  | 6.18531 |
| Iil15                                                                        | Adrenal | 1.52307 | 5.14954e-44 | 27.9209 |
| Cecr2                                                                        | Adrenal | 1.50139 | 4.87989e-05 | 9.57399 |
| Rhob                                                                         | Adrenal | 1.45929 | 3.32097e-15 | 197.107 |
| Ddit4                                                                        | Adrenal | 1.45176 | 1.94677e-16 | 10.1168 |
| Fblim1                                                                       | Adrenal | 1.4485  | 0.0402892   | 4.54735 |
| Gpr137b                                                                      | Adrenal | 1.43621 | 4.74333e-08 | 7.53099 |
| Plaur                                                                        | Adrenal | 1.43426 | 0.00176302  | 14.9892 |
| Procr                                                                        | Adrenal | 1.41986 | 5.58695e-05 | 9.05428 |
| Slc52a3                                                                      | Adrenal | 1.41676 | 0.00174958  | 4.86416 |
| Ptk7                                                                         | Adrenal | 1.40778 | 8.60926e-09 | 3.10267 |
| Gdpd5                                                                        | Adrenal | 1.40559 | 4.60827e-09 | 7.7948  |
| Kalrn                                                                        | Adrenal | 1.40406 | 2.85925e-21 | 46.911  |
| Prkd1                                                                        | Adrenal | 1.40098 | 0.00439293  | 75.6333 |
| Rsad2                                                                        | Adrenal | 1.39165 | 0.0404555   | 205.58  |
| Tgfbr2                                                                       | Adrenal | 1.37109 | 2.31725e-18 | 174.687 |
| Btnl9                                                                        | Adrenal | 1.36314 | 0.0239965   | 167.231 |
| Gm4876                                                                       | Adrenal | 1.35043 | 3.04137e-06 | 8.50655 |
| Junos                                                                        | Adrenal | 1.34339 | 1.42334e-07 | 11.5364 |
| Timp3                                                                        | Adrenal | 1.34318 | 8.67634e-09 | 686.297 |
| Phlda1                                                                       | Adrenal | 1.34266 | 0.0129495   | 13.7914 |
| Gimap5                                                                       | Adrenal | 1.34116 | 0.00108291  | 57.3367 |
| Adora2a                                                                      | Adrenal | 1.33239 | 8.03006e-05 | 5.53666 |
| Fgf1                                                                         | Adrenal | 1.33047 | 0.012061    | 26.5298 |
| Arrdc2                                                                       | Adrenal | 1.33013 | 1.95248e-10 | 4.40845 |
| B930036N10Rik                                                                | Adrenal | 1.32761 | 0.0007731   | 4.06499 |
| Asph                                                                         | Adrenal | 1.32264 | 0.0062873   | 19.1443 |
| Cdc42ep4                                                                     | Adrenal | 1.32178 | 2.77453e-39 | 16.8746 |
| Uggt2                                                                        | Adrenal | 1.31664 | 2.46993e-06 | 3.45135 |
| Cxxc5                                                                        | Adrenal | 1.29978 | 1.27922e-06 | 6.25043 |
| Zfhx3                                                                        | Adrenal | 1.28806 | 0.00809355  | 101.633 |
| Pcdh17                                                                       | Adrenal | 1.28786 | 0.0460209   | 218.064 |
| Sult1a1                                                                      | Adrenal | 1.28606 | 2.02336e-38 | 25.8255 |
| Helz2                                                                        | Adrenal | 1.27757 | 2.69431e-08 | 20.3358 |
| Cyp20a1                                                                      | Adrenal | 1.24952 | 2.05018e-05 | 33.1112 |
| Nid2                                                                         | Adrenal | 1.2492  | 0.0164059   | 16.317  |
| Zfp982                                                                       | Adrenal | 1.24573 | 0.00344203  | 3.63235 |
| Col4a4                                                                       | Adrenal | 1.23843 | 0.0329232   | 10.0997 |
| Zfp827                                                                       | Adrenal | 1.23603 | 5.51313e-07 | 5.46477 |
| Ifit3b                                                                       | Adrenal | 1.22374 | 2.88818e-14 | 10.7263 |
| Gimap4                                                                       | Adrenal | 1.22208 | 0.0468941   | 139.279 |
| Rnf122                                                                       | Adrenal | 1.22141 | 4.97956e-13 | 6.91913 |
| Phf11b                                                                       | Adrenal | 1.2214  | 0.000953772 | 6.69095 |
| Tspan15                                                                      | Adrenal | 1.20749 | 8.89069e-05 | 55.2622 |
| Cep126                                                                       | Adrenal | 1.20389 | 0.0172023   | 3.40482 |
| Limch1                                                                       | Adrenal | 1.20058 | 0.00161618  | 196.89  |
| Epha2                                                                        | Adrenal | 1.19595 | 6.61518e-17 | 9.52506 |
| Tead2                                                                        | Adrenal | 1.19411 | 3.16013e-22 | 9.63091 |
| Cd9                                                                          | Adrenal | 1.19382 | 0.000801294 | 101.076 |
| Snn                                                                          | Adrenal | 1.18959 | 0.000117412 | 8.89206 |
| mt-Nd3                                                                       | Adrenal | 1.18894 | 0.0436555   | 120.056 |
| Rph3al                                                                       | Adrenal | 1.18349 | 4.72132e-08 | 10.0871 |
| Airn                                                                         | Adrenal | 1.18234 | 0.00991103  | 72.8903 |
| Nod2                                                                         | Adrenal | 1.18094 | 9.55073e-05 | 3.41643 |
| Fam110a                                                                      | Adrenal | 1.18069 | 0.00459583  | 14.8761 |
| Macrod2                                                                      | Adrenal | 1.17478 | 0.0122276   | 19.0563 |

| Supplementary Table S9: Organotypic pseudobulk DEG results of cECs by organ. |         |          |             |         |
|------------------------------------------------------------------------------|---------|----------|-------------|---------|
| Arhgap26                                                                     | Adrenal | 1.16911  | 4.45274e-08 | 125.324 |
| Tes                                                                          | Adrenal | 1.1666   | 0.00197516  | 12.0291 |
| Cmpk2                                                                        | Adrenal | 1.16228  | 6.65737e-05 | 23.6038 |
| N4bp3                                                                        | Adrenal | 1.16004  | 0.00191107  | 15.4672 |
| Akap17b                                                                      | Adrenal | 1.15926  | 1.22155e-07 | 3.16934 |
| Apobec3                                                                      | Adrenal | 1.14235  | 1.98682e-08 | 33.8693 |
| BC052040                                                                     | Adrenal | 1.13238  | 6.8447e-09  | 17.1959 |
| Inpp5d                                                                       | Adrenal | 1.1302   | 4.69429e-09 | 48.3398 |
| Oasl1                                                                        | Adrenal | 1.12784  | 0.00174371  | 6.49539 |
| 9630014M24Rik                                                                | Adrenal | 1.12175  | 0.028231    | 5.79939 |
| Gm36660                                                                      | Adrenal | 1.11644  | 0.00184831  | 9.18933 |
| Spire1                                                                       | Adrenal | 1.10889  | 7.68529e-08 | 5.26472 |
| Sema4c                                                                       | Adrenal | 1.10017  | 9.63093e-10 | 22.5987 |
| Oasl2                                                                        | Adrenal | 1.09687  | 1.10197e-31 | 37.4945 |
| Oas1a                                                                        | Adrenal | 1.09171  | 3.26829e-09 | 7.01563 |
| Stk32c                                                                       | Adrenal | 1.09044  | 1.29262e-06 | 5.57154 |
| Ltbp3                                                                        | Adrenal | 1.08796  | 0.0351691   | 4.80655 |
| Gba2                                                                         | Adrenal | 1.08448  | 1.54188e-09 | 5.47669 |
| G630016G05Rik                                                                | Adrenal | 1.08136  | 0.000675299 | 5.64206 |
| Upp1                                                                         | Adrenal | 1.07295  | 0.0115907   | 27.6061 |
| Irf7                                                                         | Adrenal | 1.07194  | 0.00748974  | 29.1939 |
| Ift22                                                                        | Adrenal | 1.0685   | 1.47569e-08 | 3.18192 |
| Sema6b                                                                       | Adrenal | 1.06093  | 3.7244e-05  | 11.5167 |
| Bckdha                                                                       | Adrenal | 1.05427  | 0.000529658 | 9.54057 |
| Elf4                                                                         | Adrenal | 1.05329  | 1.73223e-08 | 9.79473 |
| Litaf                                                                        | Adrenal | 1.04748  | 8.33732e-18 | 19.6976 |
| Galnt15                                                                      | Adrenal | 1.04414  | 4.07392e-06 | 20.1561 |
| Csrnp1                                                                       | Adrenal | 1.04095  | 1.79852e-07 | 3.77485 |
| Rps6ka5                                                                      | Adrenal | 1.04084  | 0.000169443 | 15.345  |
| Per1                                                                         | Adrenal | 1.04068  | 0.0186077   | 4.64913 |
| Acsf2                                                                        | Adrenal | 1.03952  | 0.00224655  | 14.9265 |
| F2r                                                                          | Adrenal | 1.03553  | 0.0375964   | 78.5363 |
| Itpr3                                                                        | Adrenal | 1.03265  | 8.5573e-06  | 10.1771 |
| Dock6                                                                        | Adrenal | 1.03082  | 2.04709e-40 | 63.1536 |
| Zfp703                                                                       | Adrenal | 1.02518  | 4.61278e-09 | 4.67285 |
| Cdc14a                                                                       | Adrenal | 1.02012  | 0.000953069 | 74.4078 |
| Pald1                                                                        | Adrenal | 1.0181   | 0.00110393  | 16.6275 |
| 4930481A15Rik                                                                | Adrenal | 1.00754  | 5.37457e-08 | 5.02492 |
| Smim8                                                                        | Adrenal | 1.0046   | 4.5761e-07  | 5.35574 |
| Gpsm1                                                                        | Adrenal | 0.997129 | 6.51385e-05 | 4.98339 |
| Mn1                                                                          | Adrenal | 0.992247 | 0.000430011 | 6.96236 |
| Pola2                                                                        | Adrenal | 0.983928 | 3.09022e-18 | 19.7258 |
| Tmem120b                                                                     | Adrenal | 0.983196 | 5.9582e-16  | 9.25584 |
| F830016B08Rik                                                                | Adrenal | 0.981119 | 0.0118722   | 4.5655  |
| Mmp28                                                                        | Adrenal | 0.979851 | 0.0271904   | 11.5883 |
| Ifit3                                                                        | Adrenal | 0.972026 | 0.0015818   | 25.9476 |
| Ifit1                                                                        | Adrenal | 0.970062 | 0.0091519   | 28.0613 |
| Fscn1                                                                        | Adrenal | 0.963749 | 8.25266e-05 | 34.9848 |
| Jup                                                                          | Adrenal | 0.963403 | 0.0113933   | 113.001 |
| Gstt2                                                                        | Adrenal | 0.960774 | 4.05676e-07 | 12.0402 |
| Gask1b                                                                       | Adrenal | 0.956758 | 0.0218944   | 21.2436 |
| Gm33370                                                                      | Adrenal | 0.949757 | 0.0101283   | 3.0593  |
| Neo1                                                                         | Adrenal | 0.949739 | 3.14242e-06 | 11.9639 |
| Dchs1                                                                        | Adrenal | 0.948376 | 5.8619e-12  | 19.1866 |
| Chchd4                                                                       | Adrenal | 0.947229 | 6.77534e-06 | 4.47003 |
| Ier2                                                                         | Adrenal | 0.94343  | 0.00384359  | 50.9564 |
| Arhgap27                                                                     | Adrenal | 0.943289 | 0.00144471  | 20.9225 |
| Pnp                                                                          | Adrenal | 0.940175 | 2.69568e-13 | 44.8111 |
| Rcsd1                                                                        | Adrenal | 0.933929 | 9.99862e-07 | 45.9539 |
| Nck2                                                                         | Adrenal | 0.925683 | 0.0175893   | 14.1755 |
| Zer1                                                                         | Adrenal | 0.924845 | 1.23652e-06 | 4.92345 |
| Prex1                                                                        | Adrenal | 0.923629 | 0.0110447   | 25.883  |
| Spry1                                                                        | Adrenal | 0.923261 | 0.045182    | 22.3293 |
| Cul7                                                                         | Adrenal | 0.920187 | 4.87989e-05 | 5.71734 |
| Enpep                                                                        | Adrenal | 0.917694 | 0.00991103  | 40.6216 |
| Slc44a2                                                                      | Adrenal | 0.917617 | 6.66531e-08 | 47.6057 |
| Ccnd3                                                                        | Adrenal | 0.917135 | 3.14034e-41 | 40.463  |
| Ptprg                                                                        | Adrenal | 0.915775 | 0.000977033 | 561.157 |



| Supplementary Table S9: Organotypic pseudobulk DEG results of cECs by organ. |         |          |             |         |
|------------------------------------------------------------------------------|---------|----------|-------------|---------|
| Arrdc4                                                                       | Adrenal | 0.91403  | 1.16852e-09 | 10.4576 |
| 2410006H16Rik                                                                | Adrenal | 0.913292 | 0.00114473  | 22.7745 |
| Cables1                                                                      | Adrenal | 0.900886 | 0.0147658   | 5.88113 |
| Mob3a                                                                        | Adrenal | 0.899017 | 3.39197e-05 | 3.08183 |
| Resf1                                                                        | Adrenal | 0.897422 | 3.33457e-13 | 41.9073 |
| Sh2d4b                                                                       | Adrenal | 0.897264 | 0.00413873  | 4.68401 |
| Zc3h12c                                                                      | Adrenal | 0.896837 | 1.06283e-11 | 13.7903 |
| Gramd4                                                                       | Adrenal | 0.895385 | 0.0497002   | 6.66567 |
| Aig1                                                                         | Adrenal | 0.895085 | 0.00820494  | 43.2636 |
| 1600014C10Rik                                                                | Adrenal | 0.894808 | 1.71801e-05 | 5.20558 |
| Svil                                                                         | Adrenal | 0.890376 | 1.73651e-05 | 64.4379 |
| Lpar4                                                                        | Adrenal | 0.885095 | 0.0130553   | 12.139  |
| Bmf                                                                          | Adrenal | 0.881253 | 0.000252427 | 5.09672 |
| Fam149a                                                                      | Adrenal | 0.877876 | 0.0246438   | 3.01659 |
| Pmp22                                                                        | Adrenal | 0.87778  | 0.0104009   | 33.4104 |
| Gm12743                                                                      | Adrenal | 0.876906 | 5.63466e-09 | 6.25863 |
| Tex14                                                                        | Adrenal | 0.871611 | 0.0115899   | 7.3782  |
| Gfod2                                                                        | Adrenal | 0.860891 | 4.95945e-09 | 17.0095 |
| Synpo                                                                        | Adrenal | 0.858212 | 0.036831    | 13.4567 |
| Slc35c2                                                                      | Adrenal | 0.858185 | 0.000145062 | 3.09166 |
| Stxbp4                                                                       | Adrenal | 0.85463  | 0.00084156  | 5.99172 |
| Ppp1r9b                                                                      | Adrenal | 0.851514 | 1.64705e-07 | 23.5413 |
| Gm16759                                                                      | Adrenal | 0.849914 | 0.0462445   | 3.07179 |
| Maml3                                                                        | Adrenal | 0.848806 | 0.0359284   | 108.097 |
| Tle3                                                                         | Adrenal | 0.844767 | 1.40233e-12 | 14.5095 |
| Cep19                                                                        | Adrenal | 0.841817 | 0.00350304  | 3.15568 |
| Klc4                                                                         | Adrenal | 0.839721 | 0.000143801 | 3.73307 |
| Lrwd1                                                                        | Adrenal | 0.839203 | 0.000667145 | 3.06011 |
| Etl4                                                                         | Adrenal | 0.838579 | 0.0275569   | 246.321 |
| Irak2                                                                        | Adrenal | 0.837886 | 6.38498e-12 | 18.5365 |
| Fzd8                                                                         | Adrenal | 0.837465 | 0.00309361  | 5.4984  |
| Adamts7                                                                      | Adrenal | 0.836399 | 4.87989e-05 | 4.143   |
| Phc1                                                                         | Adrenal | 0.836307 | 0.0309169   | 4.11689 |
| Sh2d3c                                                                       | Adrenal | 0.8361   | 2.19531e-10 | 44.3397 |
| Trib1                                                                        | Adrenal | 0.832236 | 0.0259189   | 14.0794 |
| Wdr73                                                                        | Adrenal | 0.830535 | 4.57591e-07 | 6.76673 |
| Lztr1                                                                        | Adrenal | 0.827216 | 0.00363985  | 8.94251 |
| Cep85                                                                        | Adrenal | 0.823184 | 8.26587e-05 | 5.13612 |
| Amn1                                                                         | Adrenal | 0.822216 | 3.90694e-07 | 13.9333 |
| Mboat7                                                                       | Adrenal | 0.816592 | 6.37684e-05 | 4.89448 |
| Pcnx3                                                                        | Adrenal | 0.815752 | 3.44825e-13 | 11.1001 |
| Btg1                                                                         | Adrenal | 0.815367 | 0.0132443   | 81.1393 |
| Ahdc1                                                                        | Adrenal | 0.813369 | 0.00201521  | 9.35538 |
| Colgalt2                                                                     | Adrenal | 0.813353 | 0.0115907   | 37.2772 |
| Ptpk                                                                         | Adrenal | 0.813307 | 0.0142829   | 79.4407 |
| Mknk2                                                                        | Adrenal | 0.812144 | 5.08193e-21 | 24.7762 |
| Gimap6                                                                       | Adrenal | 0.811906 | 0.000296986 | 229.465 |
| Cdkl5                                                                        | Adrenal | 0.809881 | 0.0232175   | 5.87634 |
| Prag1                                                                        | Adrenal | 0.804783 | 6.4914e-05  | 10.4795 |
| Sidt2                                                                        | Adrenal | 0.800471 | 1.73001e-06 | 7.58596 |
| Tmem86a                                                                      | Adrenal | 0.798211 | 0.000318774 | 4.5513  |
| Sox4                                                                         | Adrenal | 0.796618 | 0.00832301  | 66.4954 |
| Bik                                                                          | Adrenal | 0.794161 | 1.00372e-07 | 27.0932 |
| Chchd6                                                                       | Adrenal | 0.793286 | 0.0121755   | 3.44917 |
| Micall1                                                                      | Adrenal | 0.788214 | 0.0495964   | 31.9956 |
| Stom                                                                         | Adrenal | 0.78652  | 0.00566654  | 21.1521 |
| 1110051M20Rik                                                                | Adrenal | 0.786237 | 0.0108203   | 7.44668 |
| Ankrd28                                                                      | Adrenal | 0.784545 | 0.000536214 | 50.1765 |
| Snai2                                                                        | Adrenal | 0.784351 | 0.0241272   | 11.6746 |
| Ppm1j                                                                        | Adrenal | 0.782895 | 0.0233499   | 3.19355 |
| 2610203C22Rik                                                                | Adrenal | 0.781046 | 0.0359284   | 21.4027 |
| Acap3                                                                        | Adrenal | 0.77921  | 1.69265e-06 | 6.62926 |
| Rinl                                                                         | Adrenal | 0.778983 | 2.64953e-08 | 6.59282 |
| Lman2l                                                                       | Adrenal | 0.77895  | 0.00207142  | 5.06855 |
| Trim30a                                                                      | Adrenal | 0.778934 | 4.45274e-08 | 71.6437 |
| Coro2b                                                                       | Adrenal | 0.777288 | 0.0466529   | 26.2872 |
| Prmt7                                                                        | Adrenal | 0.776341 | 5.02192e-06 | 6.00773 |
| Rnf31                                                                        | Adrenal | 0.770381 | 4.40739e-06 | 7.87004 |



| Supplementary Table S9: Organotypic pseudobulk DEG results of cECs by organ. |         |          |             |         |
|------------------------------------------------------------------------------|---------|----------|-------------|---------|
| Grb10                                                                        | Adrenal | 0.769719 | 1.52247e-08 | 66.837  |
| Snhg5                                                                        | Adrenal | 0.763899 | 0.00222655  | 3.14067 |
| 1110065P20Rik                                                                | Adrenal | 0.76299  | 0.038136    | 4.3967  |
| Ppm1f                                                                        | Adrenal | 0.762778 | 4.43835e-27 | 23.4377 |
| Atp9a                                                                        | Adrenal | 0.762623 | 1.6842e-13  | 17.0036 |
| Fgd1                                                                         | Adrenal | 0.762528 | 0.0206929   | 3.12951 |
| Nlrc5                                                                        | Adrenal | 0.761517 | 0.00069545  | 12.4985 |
| Dgka                                                                         | Adrenal | 0.760616 | 2.14e-07    | 12.6107 |
| S100a10                                                                      | Adrenal | 0.759397 | 0.00920465  | 168.794 |
| Tek                                                                          | Adrenal | 0.752703 | 6.04122e-08 | 271.991 |
| Zfp36                                                                        | Adrenal | 0.751762 | 0.00411927  | 32.8894 |
| Gimap8                                                                       | Adrenal | 0.751082 | 2.75386e-08 | 40.5312 |
| Plekha5                                                                      | Adrenal | 0.750254 | 5.97687e-13 | 21.4856 |
| Slc25a25                                                                     | Adrenal | 0.749138 | 2.28583e-05 | 8.37971 |
| Rmnd1                                                                        | Adrenal | 0.747117 | 0.0437577   | 3.59162 |
| Slc25a27                                                                     | Adrenal | 0.746544 | 4.18012e-05 | 8.60521 |
| Stn1                                                                         | Adrenal | 0.745631 | 9.93718e-07 | 10.0156 |
| Man1c1                                                                       | Adrenal | 0.741852 | 0.046713    | 29.1655 |
| Card6                                                                        | Adrenal | 0.741537 | 8.36004e-05 | 5.23956 |
| Ercc1                                                                        | Adrenal | 0.741127 | 0.0112      | 9.35904 |
| Smad5                                                                        | Adrenal | 0.739413 | 7.10227e-07 | 27.43   |
| Kif3c                                                                        | Adrenal | 0.734296 | 0.00489242  | 4.79177 |
| 4930402H24Rik                                                                | Adrenal | 0.731615 | 0.0115496   | 65.7522 |
| E130307A14Rik                                                                | Adrenal | 0.725317 | 0.00689849  | 14.3092 |
| Prdm11                                                                       | Adrenal | 0.723306 | 0.0272433   | 6.772   |
| Notch4                                                                       | Adrenal | 0.721459 | 0.000664018 | 33.3965 |
| Cyth2                                                                        | Adrenal | 0.721339 | 0.00660992  | 15.2811 |
| Cyp4v3                                                                       | Adrenal | 0.720954 | 0.00736615  | 3.48652 |
| Bcl2l1                                                                       | Adrenal | 0.718888 | 0.0020421   | 51.36   |
| Batf2                                                                        | Adrenal | 0.718165 | 0.0226146   | 3.19885 |
| Ano6                                                                         | Adrenal | 0.718144 | 0.00358348  | 41.3586 |
| Kctd17                                                                       | Adrenal | 0.71682  | 0.00100834  | 20.715  |
| Slco1c1                                                                      | Brain   | 12.6079  | 2.1674e-208 | 127.968 |
| Ccdc141                                                                      | Brain   | 10.4551  | 1.5118e-237 | 51.6691 |
| Spock2                                                                       | Brain   | 10.3611  | 2.9953e-157 | 194.62  |
| Pglyrp1                                                                      | Brain   | 9.94075  | 0           | 62.8149 |
| Mfsd2a                                                                       | Brain   | 9.55008  | 5.9344e-101 | 17.4752 |
| Slc38a5                                                                      | Brain   | 9.52339  | 2.4835e-104 | 15.0652 |
| Ndnf                                                                         | Brain   | 9.50256  | 3.9168e-156 | 26.9964 |
| Tfrc                                                                         | Brain   | 9.46914  | 4.4155e-302 | 48.9651 |
| Ptn                                                                          | Brain   | 9.41783  | 6.07549e-19 | 173.325 |
| Ocln                                                                         | Brain   | 9.37028  | 4.9931e-128 | 18.5789 |
| Gsta4                                                                        | Brain   | 9.3512   | 2.52e-127   | 22.9599 |
| Tnfrsf19                                                                     | Brain   | 9.21465  | 2.51482e-98 | 13.1176 |
| Frmd5                                                                        | Brain   | 9.20715  | 3.9894e-234 | 32.5842 |
| Slco1a4                                                                      | Brain   | 9.09008  | 9.08893e-13 | 228.838 |
| Lsr                                                                          | Brain   | 9.07976  | 2.4787e-136 | 16.3185 |
| Zic3                                                                         | Brain   | 8.97361  | 2.70969e-89 | 10.2824 |
| Foxq1                                                                        | Brain   | 8.81304  | 3.04863e-41 | 33.1353 |
| Slc22a8                                                                      | Brain   | 8.76545  | 1.78559e-17 | 22.5756 |
| Lmntd1                                                                       | Brain   | 8.75628  | 8.6595e-109 | 12.1216 |
| Fn1                                                                          | Brain   | 8.68395  | 4.38959e-85 | 57.8708 |
| Foxf2                                                                        | Brain   | 8.67157  | 8.7049e-107 | 12.5013 |
| Edn3                                                                         | Brain   | 8.63536  | 2.80724e-75 | 8.111   |
| Hmgcs2                                                                       | Brain   | 8.6084   | 2.18346e-81 | 10.2679 |
| Zic2                                                                         | Brain   | 8.50185  | 7.28893e-62 | 7.43105 |
| Slc19a3                                                                      | Brain   | 8.47762  | 1.34525e-90 | 8.93307 |
| Far2                                                                         | Brain   | 8.46413  | 3.22573e-85 | 9.52726 |
| Unc13c                                                                       | Brain   | 8.39056  | 1.78529e-73 | 8.14994 |
| Bche                                                                         | Brain   | 8.36824  | 1.16678e-52 | 7.04987 |
| Gm9946                                                                       | Brain   | 8.34961  | 1.3182e-57  | 7.59224 |
| Lrp8                                                                         | Brain   | 8.32833  | 6.1548e-109 | 10.7638 |
| Rab11fip1                                                                    | Brain   | 8.32813  | 4.773e-69   | 8.10981 |
| Wnt5a                                                                        | Brain   | 8.29916  | 8.35225e-34 | 7.0518  |
| Elovl7                                                                       | Brain   | 8.23567  | 3.4007e-53  | 21.9734 |
| Adgrl3                                                                       | Brain   | 8.22164  | 2.87803e-09 | 16.0564 |
| Tbx1                                                                         | Brain   | 8.07628  | 1.49519e-85 | 7.92961 |
| Plip                                                                         | Brain   | 8.05986  | 8.23424e-69 | 14.04   |

| Supplementary Table S9: Organotypic pseudobulk DEG results of cECs by organ. |       |         |             |         |
|------------------------------------------------------------------------------|-------|---------|-------------|---------|
| Lrn3                                                                         | Brain | 7.95278 | 9.99679e-32 | 7.84461 |
| Ddc                                                                          | Brain | 7.95212 | 9.9619e-109 | 9.95132 |
| Srarp                                                                        | Brain | 7.87865 | 1.35016e-51 | 20.1948 |
| Degs2                                                                        | Brain | 7.81878 | 6.71792e-73 | 10.5169 |
| Car5a                                                                        | Brain | 7.81271 | 1.01527e-67 | 6.88606 |
| Sgms2                                                                        | Brain | 7.7822  | 1.01982e-16 | 7.23182 |
| Zic5                                                                         | Brain | 7.76769 | 4.23233e-11 | 4.51839 |
| Prom1                                                                        | Brain | 7.75238 | 1.34107e-29 | 35.8048 |
| Ildr2                                                                        | Brain | 7.73252 | 6.29786e-49 | 5.02382 |
| Tmc7                                                                         | Brain | 7.63749 | 9.78027e-31 | 4.79499 |
| Slc16a4                                                                      | Brain | 7.53887 | 3.2306e-131 | 15.9703 |
| Notum                                                                        | Brain | 7.51222 | 6.04934e-43 | 5.00105 |
| Slc38a3                                                                      | Brain | 7.31368 | 1.34606e-16 | 9.75199 |
| 1700018A04Rik                                                                | Brain | 7.18649 | 2.47071e-16 | 3.33831 |
| Maob                                                                         | Brain | 7.18248 | 3.21468e-40 | 4.06357 |
| Slc35f2                                                                      | Brain | 7.07805 | 9.9786e-18  | 5.48408 |
| Gm609                                                                        | Brain | 6.96516 | 1.878e-13   | 4.03227 |
| Gkn3                                                                         | Brain | 6.81624 | 3.45933e-08 | 11.0183 |
| Tpd52l1                                                                      | Brain | 6.79575 | 1.03896e-70 | 6.54631 |
| Grb14                                                                        | Brain | 6.72515 | 1.6047e-83  | 18.3268 |
| Paqr5                                                                        | Brain | 6.66441 | 4.99997e-12 | 17.2845 |
| Sema3c                                                                       | Brain | 6.52105 | 1.50814e-09 | 79.9654 |
| Slc2a1                                                                       | Brain | 6.5034  | 4.95698e-53 | 68.7198 |
| Tmeff1                                                                       | Brain | 6.31067 | 1.11748e-48 | 5.92645 |
| Sgpp2                                                                        | Brain | 6.29472 | 8.65078e-11 | 17.2494 |
| Abcb1a                                                                       | Brain | 6.21434 | 4.54992e-23 | 110     |
| Kcp                                                                          | Brain | 6.15532 | 3.87807e-41 | 3.56675 |
| Gm5127                                                                       | Brain | 6.1551  | 5.35867e-09 | 4.28362 |
| Rad54b                                                                       | Brain | 6.06131 | 3.22946e-20 | 5.34277 |
| F5                                                                           | Brain | 5.99112 | 2.78253e-15 | 3.08054 |
| Flvcr2                                                                       | Brain | 5.96063 | 1.07891e-17 | 5.20448 |
| Rundc3b                                                                      | Brain | 5.95933 | 4.25154e-14 | 36.3859 |
| Cthrc1                                                                       | Brain | 5.77844 | 1.81248e-14 | 3.45059 |
| Ankrd37                                                                      | Brain | 5.70048 | 6.53883e-36 | 4.02776 |
| Slc7a1                                                                       | Brain | 5.67296 | 8.0987e-129 | 52.7437 |
| Dnah3                                                                        | Brain | 5.65625 | 2.04933e-25 | 4.2381  |
| Bmx                                                                          | Brain | 5.53915 | 9.50087e-25 | 5.04177 |
| Lef1                                                                         | Brain | 5.48468 | 2.65555e-15 | 75.8599 |
| Ttyh2                                                                        | Brain | 5.45211 | 1.10225e-46 | 6.54273 |
| Pdxk                                                                         | Brain | 5.41596 | 1.14317e-73 | 10.7597 |
| Slc16a9                                                                      | Brain | 5.36706 | 5.04717e-22 | 8.5923  |
| Ctsh                                                                         | Brain | 5.35555 | 3.15529e-37 | 24.5093 |
| Abhd2                                                                        | Brain | 5.29726 | 0           | 77.9133 |
| Axin2                                                                        | Brain | 5.23244 | 3.23886e-44 | 7.76224 |
| Apcdd1                                                                       | Brain | 5.21775 | 1.77248e-11 | 23.9838 |
| Usp53                                                                        | Brain | 5.16094 | 5.707e-131  | 29.2901 |
| Cxcl12                                                                       | Brain | 5.12649 | 2.88783e-10 | 247.731 |
| Cp                                                                           | Brain | 5.08262 | 8.82473e-09 | 13.1593 |
| Cobll1                                                                       | Brain | 5.02103 | 3.34314e-31 | 45.0774 |
| Gstm7                                                                        | Brain | 4.95201 | 5.8597e-40  | 5.7158  |
| Bsg                                                                          | Brain | 4.93638 | 0           | 610.583 |
| Foxc1                                                                        | Brain | 4.92654 | 5.85115e-97 | 19.023  |
| Synpo2                                                                       | Brain | 4.91593 | 0.000712687 | 8.20668 |
| Gpcpd1                                                                       | Brain | 4.91393 | 3.19788e-96 | 96.9715 |
| Cdkn2b                                                                       | Brain | 4.85827 | 1.53735e-39 | 4.84558 |
| Atp10a                                                                       | Brain | 4.85715 | 7.6874e-44  | 40.6023 |
| Net1                                                                         | Brain | 4.82541 | 1.01678e-89 | 14.8205 |
| Ptgfrn                                                                       | Brain | 4.77902 | 9.3447e-14  | 4.36049 |
| Aqp11                                                                        | Brain | 4.68081 | 3.90078e-36 | 10.8319 |
| Slc39a10                                                                     | Brain | 4.67361 | 1.0002e-216 | 97.2963 |
| Wfdc1                                                                        | Brain | 4.60794 | 1.20298e-09 | 22.4226 |
| Ulk4                                                                         | Brain | 4.59021 | 8.09414e-28 | 6.02827 |
| Nebl                                                                         | Brain | 4.58586 | 7.15042e-14 | 53.5066 |
| Edn1                                                                         | Brain | 4.53985 | 7.10972e-12 | 24.7874 |
| Itm2a                                                                        | Brain | 4.4831  | 6.46284e-05 | 401.056 |
| Slc16a1                                                                      | Brain | 4.46821 | 1.03214e-33 | 34.1492 |
| Napepld                                                                      | Brain | 4.46567 | 3.06924e-09 | 3.62865 |
| Gm20631                                                                      | Brain | 4.42913 | 6.49472e-11 | 6.09492 |

| Supplementary Table S9: Organotypic pseudobulk DEG results of cECs by organ. |       |         |             |         |
|------------------------------------------------------------------------------|-------|---------|-------------|---------|
| Pcdh19                                                                       | Brain | 4.40208 | 6.42311e-11 | 11.9031 |
| Ggact                                                                        | Brain | 4.36143 | 6.65346e-41 | 6.39201 |
| Vwf                                                                          | Brain | 4.14914 | 1.38175e-06 | 12.462  |
| Synm                                                                         | Brain | 4.07922 | 2.06064e-09 | 21.7002 |
| Pir                                                                          | Brain | 4.03179 | 6.32784e-19 | 11.6826 |
| Cldn5                                                                        | Brain | 3.96549 | 3.29639e-13 | 358.698 |
| Maoa                                                                         | Brain | 3.93121 | 9.71226e-32 | 33.89   |
| Slc7a5                                                                       | Brain | 3.9166  | 0.000104619 | 22.8101 |
| Plekhh2                                                                      | Brain | 3.87985 | 1.3889e-05  | 8.01457 |
| Slc1a1                                                                       | Brain | 3.86893 | 1.17305e-07 | 12.4779 |
| Ccdc152                                                                      | Brain | 3.7947  | 3.88595e-09 | 7.1392  |
| Nkd1                                                                         | Brain | 3.76113 | 6.60074e-06 | 19.2403 |
| Tmem252                                                                      | Brain | 3.65932 | 6.92069e-05 | 8.25837 |
| Arl4a                                                                        | Brain | 3.64422 | 3.14976e-51 | 44.3925 |
| Alas1                                                                        | Brain | 3.62929 | 1.61662e-42 | 21.9668 |
| Kbtbd11                                                                      | Brain | 3.57127 | 0.000218071 | 4.78117 |
| Slc40a1                                                                      | Brain | 3.55644 | 0.00696594  | 44.0787 |
| Myrip                                                                        | Brain | 3.52659 | 5.93112e-13 | 7.55912 |
| Egflam                                                                       | Brain | 3.49857 | 0.000297579 | 3.67462 |
| Osbpl1a                                                                      | Brain | 3.49343 | 1.15723e-31 | 21.6794 |
| Itih5                                                                        | Brain | 3.46134 | 0.00245374  | 78.2973 |
| Pltp                                                                         | Brain | 3.45875 | 1.03499e-07 | 270.688 |
| Lrrc49                                                                       | Brain | 3.44362 | 1.02012e-60 | 16.1041 |
| Reck                                                                         | Brain | 3.44185 | 2.96608e-13 | 12.7233 |
| Tpd52                                                                        | Brain | 3.42449 | 4.58697e-12 | 19.8068 |
| Runx1t1                                                                      | Brain | 3.42363 | 3.08595e-05 | 5.72434 |
| Sorbs2os                                                                     | Brain | 3.39907 | 0.000898316 | 8.25735 |
| Slc30a1                                                                      | Brain | 3.38749 | 5.1024e-162 | 31.9383 |
| Igf1r                                                                        | Brain | 3.35231 | 1.37489e-40 | 203.656 |
| Fendrr                                                                       | Brain | 3.34595 | 0.0295006   | 4.85488 |
| Dach1                                                                        | Brain | 3.30402 | 0.000331442 | 39.8076 |
| 4430402I18Rik                                                                | Brain | 3.29997 | 3.08959e-12 | 4.10132 |
| Ptpr                                                                         | Brain | 3.2864  | 9.28363e-09 | 24.1708 |
| Mob3b                                                                        | Brain | 3.26431 | 1.18342e-24 | 12.9184 |
| Bhlhb9                                                                       | Brain | 3.24673 | 5.18942e-11 | 3.79941 |
| Vwa1                                                                         | Brain | 3.18062 | 1.54288e-07 | 39.8003 |
| Ldlrad3                                                                      | Brain | 3.17824 | 2.32203e-27 | 28.3892 |
| Car4                                                                         | Brain | 3.16635 | 0.0169737   | 101.656 |
| Cd320                                                                        | Brain | 3.16156 | 9.85673e-25 | 9.90349 |
| Isyna1                                                                       | Brain | 3.15975 | 3.94284e-10 | 15.8094 |
| Fam13c                                                                       | Brain | 3.11321 | 2.00886e-06 | 32.0712 |
| Jcad                                                                         | Brain | 3.10319 | 1.1288e-131 | 130.12  |
| Afap1l2                                                                      | Brain | 3.07392 | 3.91233e-06 | 16.001  |
| Prnp                                                                         | Brain | 3.04459 | 1.89582e-11 | 16.8703 |
| Pcp4l1                                                                       | Brain | 3.00755 | 0.000158757 | 96.5406 |
| Sorbs2                                                                       | Brain | 3.00429 | 3.57759e-05 | 109.802 |
| St8sia6                                                                      | Brain | 2.9994  | 8.74416e-05 | 8.8825  |
| St6galnac2                                                                   | Brain | 2.99161 | 0.00159276  | 8.03396 |
| Pard3                                                                        | Brain | 2.96359 | 0.0313337   | 20.2355 |
| AV356131                                                                     | Brain | 2.93008 | 1.93857e-08 | 3.18146 |
| Ly75                                                                         | Brain | 2.92335 | 2.77379e-05 | 6.79899 |
| Esyt2                                                                        | Brain | 2.90499 | 2.7528e-108 | 116.547 |
| Slc16a2                                                                      | Brain | 2.84649 | 1.92303e-12 | 40.2438 |
| Slc6a6                                                                       | Brain | 2.81479 | 2.798e-15   | 244.207 |
| Slc52a2                                                                      | Brain | 2.80329 | 9.50333e-10 | 3.84774 |
| Stxbp6                                                                       | Brain | 2.78308 | 0.00352721  | 23.123  |
| Ablim1                                                                       | Brain | 2.7745  | 1.92217e-08 | 163.348 |
| Sgtb                                                                         | Brain | 2.76667 | 6.79406e-12 | 3.7425  |
| Slc25a42                                                                     | Brain | 2.75805 | 7.64864e-10 | 3.45899 |
| Myh10                                                                        | Brain | 2.75655 | 1.52486e-09 | 13.2874 |
| Prdm5                                                                        | Brain | 2.73429 | 0.000194389 | 11.204  |
| Fzd6                                                                         | Brain | 2.70961 | 4.40903e-43 | 30.3964 |
| AI467606                                                                     | Brain | 2.70321 | 0.00148995  | 5.04649 |
| Glcc1                                                                        | Brain | 2.69208 | 1.39529e-25 | 12.7583 |
| Tgfb2                                                                        | Brain | 2.66201 | 6.21707e-06 | 22.492  |
| Prorp                                                                        | Brain | 2.66123 | 1.67438e-13 | 7.64058 |
| St8sia4                                                                      | Brain | 2.63864 | 3.35141e-13 | 51.8033 |
| Gpd2                                                                         | Brain | 2.63688 | 1.0381e-63  | 38.5144 |

| Supplementary Table S9: Organotypic pseudobulk DEG results of cECs by organ. |       |         |             |         |
|------------------------------------------------------------------------------|-------|---------|-------------|---------|
| Glul                                                                         | Brain | 2.61291 | 3.30853e-15 | 76.9741 |
| Slc31a1                                                                      | Brain | 2.60781 | 1.98828e-09 | 20.6787 |
| Tob1                                                                         | Brain | 2.5892  | 6.74481e-11 | 15.9398 |
| Rpgrip1                                                                      | Brain | 2.58408 | 1.194e-09   | 5.08052 |
| Gm3848                                                                       | Brain | 2.57775 | 0.000572255 | 3.20369 |
| Gm12758                                                                      | Brain | 2.57285 | 0.00421264  | 3.05891 |
| Golim4                                                                       | Brain | 2.57038 | 1.5429e-111 | 57.2075 |
| Tspan13                                                                      | Brain | 2.55659 | 2.23657e-08 | 96.4358 |
| Cyp4f17                                                                      | Brain | 2.55051 | 1.04975e-07 | 3.00724 |
| Pla2g4a                                                                      | Brain | 2.52672 | 0.0156934   | 7.06511 |
| Hmcn1                                                                        | Brain | 2.52052 | 2.83478e-08 | 122.32  |
| E330009J07Rik                                                                | Brain | 2.51925 | 9.25855e-10 | 5.23492 |
| Cacna1a                                                                      | Brain | 2.51921 | 0.00741208  | 7.90195 |
| Lmo7                                                                         | Brain | 2.51709 | 7.586e-13   | 20.8818 |
| Efr3b                                                                        | Brain | 2.51593 | 2.30842e-05 | 39.9204 |
| Polk                                                                         | Brain | 2.50767 | 7.85519e-64 | 39.5785 |
| Sgms1                                                                        | Brain | 2.50698 | 1.63345e-24 | 174.143 |
| Ddah1                                                                        | Brain | 2.49399 | 0.000120992 | 16.4539 |
| Gm16046                                                                      | Brain | 2.47692 | 7.63704e-05 | 5.18302 |
| Gm44686                                                                      | Brain | 2.46939 | 0.00347593  | 3.1198  |
| Cgnl1                                                                        | Brain | 2.46649 | 3.75838e-22 | 44.8848 |
| Tspan5                                                                       | Brain | 2.46207 | 7.14701e-32 | 60.6606 |
| Tmsb10                                                                       | Brain | 2.44192 | 3.14781e-24 | 191.187 |
| Plpp5                                                                        | Brain | 2.42965 | 1.0034e-14  | 6.47641 |
| Adk                                                                          | Brain | 2.42142 | 6.4322e-07  | 18.2826 |
| Hs3st1                                                                       | Brain | 2.42099 | 2.37857e-06 | 8.34445 |
| Fry                                                                          | Brain | 2.42074 | 7.18952e-10 | 109.799 |
| Capg                                                                         | Brain | 2.41474 | 7.57888e-06 | 6.72154 |
| Jag1                                                                         | Brain | 2.39175 | 1.4668e-12  | 12.7608 |
| Mecom                                                                        | Brain | 2.39104 | 3.03198e-09 | 121.746 |
| Nampt                                                                        | Brain | 2.38805 | 8.96294e-32 | 39.6318 |
| Gm16541                                                                      | Brain | 2.37266 | 3.57809e-05 | 4.38608 |
| Actn1                                                                        | Brain | 2.35495 | 8.68022e-14 | 14.2487 |
| Rgs12                                                                        | Brain | 2.3103  | 5.23965e-18 | 27.2439 |
| Xlr                                                                          | Brain | 2.29361 | 9.42967e-05 | 3.58422 |
| Tiam1                                                                        | Brain | 2.28267 | 1.29283e-15 | 31.8596 |
| Per3                                                                         | Brain | 2.2783  | 4.42484e-09 | 4.73866 |
| Akr1c14                                                                      | Brain | 2.2638  | 0.00366847  | 5.51365 |
| Pgm5                                                                         | Brain | 2.26051 | 0.0153901   | 11.0225 |
| Slc25a1                                                                      | Brain | 2.25857 | 7.94905e-11 | 8.5107  |
| Nr4a2                                                                        | Brain | 2.25185 | 1.05771e-07 | 11.6306 |
| Faim                                                                         | Brain | 2.24988 | 1.28521e-16 | 20.1718 |
| Lym1                                                                         | Brain | 2.21369 | 3.5675e-06  | 5.35976 |
| Gm20275                                                                      | Brain | 2.20502 | 8.39111e-05 | 5.57325 |
| Csrp2                                                                        | Brain | 2.19431 | 2.97205e-14 | 37.3662 |
| Unc13b                                                                       | Brain | 2.19051 | 4.82167e-06 | 20.5041 |
| Palmd                                                                        | Brain | 2.1799  | 0.000261735 | 80.2556 |
| Eps8l2                                                                       | Brain | 2.16724 | 0.00148242  | 5.84779 |
| Gm49417                                                                      | Brain | 2.16712 | 5.49111e-12 | 6.41671 |
| Arl2bp                                                                       | Brain | 2.16143 | 5.58807e-25 | 30.4272 |
| Ssx2ip                                                                       | Brain | 2.15296 | 0.00756503  | 8.02982 |
| Rgs5                                                                         | Brain | 2.13807 | 0.00715924  | 22.9435 |
| Mylpf                                                                        | Brain | 2.13369 | 0.00215041  | 3.16456 |
| Fam118a                                                                      | Brain | 2.13142 | 4.13168e-08 | 4.72535 |
| Layn                                                                         | Brain | 2.12139 | 2.65272e-28 | 27.0353 |
| Nrep                                                                         | Brain | 2.11293 | 1.90016e-10 | 23.6236 |
| Tjp1                                                                         | Brain | 2.11198 | 5.06402e-76 | 195.704 |
| Gm11808                                                                      | Brain | 2.11192 | 2.33208e-09 | 16.6165 |
| 2700054A10Rik                                                                | Brain | 2.11031 | 1.2497e-05  | 4.39993 |
| Tmem98                                                                       | Brain | 2.09253 | 1.4668e-12  | 9.74782 |
| Tgfa                                                                         | Brain | 2.08696 | 0.00270007  | 8.00656 |
| Il17rd                                                                       | Brain | 2.08575 | 3.75944e-14 | 9.06007 |
| Ifnar1                                                                       | Brain | 2.07956 | 2.81409e-25 | 35.4559 |
| Tpm1                                                                         | Brain | 2.06907 | 3.93557e-54 | 62.8281 |
| Amd1                                                                         | Brain | 2.06339 | 2.84948e-14 | 10.5353 |
| Shld1                                                                        | Brain | 2.05839 | 5.42855e-18 | 12.6362 |
| Col4a3bp                                                                     | Brain | 2.04981 | 1.13899e-74 | 97.0679 |
| Rbp1                                                                         | Brain | 2.0407  | 4.58997e-16 | 17.3342 |

| Supplementary Table S9: Organotypic pseudobulk DEG results of cECs by organ. |        |         |             |         |
|------------------------------------------------------------------------------|--------|---------|-------------|---------|
| Skida1                                                                       | Brain  | 2.03632 | 0.000167364 | 3.4704  |
| Dipk1a                                                                       | Brain  | 2.03488 | 1.06123e-05 | 14.0575 |
| Noct                                                                         | Brain  | 2.03438 | 2.56384e-05 | 4.68626 |
| Slco2b1                                                                      | Brain  | 2.03278 | 0.00148904  | 16.6783 |
| Def6                                                                         | Brain  | 2.0271  | 0.00172885  | 4.98393 |
| Mllt3                                                                        | Brain  | 2.02699 | 1.08549e-29 | 34.1288 |
| Fut8                                                                         | Brain  | 2.02345 | 3.07974e-13 | 73.4633 |
| Pradc1                                                                       | Brain  | 2.01699 | 4.08667e-06 | 7.62169 |
| Mindy1                                                                       | Brain  | 2.00747 | 7.11275e-24 | 29.8131 |
| 4930517O19Rik                                                                | Brain  | 2.00608 | 0.000689829 | 10.0753 |
| Sestd1                                                                       | Brain  | 2.00544 | 1.53862e-05 | 7.20695 |
| Gnpnat1                                                                      | Brain  | 1.99682 | 1.80305e-07 | 5.70021 |
| Rassf9                                                                       | Brain  | 1.99391 | 0.00125848  | 35.9234 |
| Rnf125                                                                       | Brain  | 1.98578 | 9.30647e-07 | 15.5527 |
| Gm15738                                                                      | Brain  | 1.98522 | 0.00102181  | 11.3396 |
| 9630028H03Rik                                                                | Brain  | 1.98067 | 0.00243887  | 8.59503 |
| Adgra2                                                                       | Brain  | 1.96219 | 0.000923868 | 14.6833 |
| St6gal1                                                                      | Brain  | 1.96184 | 0.0464061   | 16.6319 |
| Wee1                                                                         | Brain  | 1.95665 | 0.00425766  | 4.0511  |
| Stard13                                                                      | Brain  | 1.9536  | 0.000132072 | 30.2411 |
| Mfsd4a                                                                       | Brain  | 1.93998 | 9.39978e-05 | 10.9991 |
| Fbxl6                                                                        | Brain  | 1.93142 | 7.17576e-07 | 5.70954 |
| Dctpp1                                                                       | Brain  | 1.92978 | 4.7243e-07  | 5.84847 |
| Pop5                                                                         | Brain  | 1.89827 | 4.86995e-09 | 41.0235 |
| St3gal6                                                                      | Brain  | 1.89288 | 4.32762e-22 | 74.1475 |
| Abcg2                                                                        | Brain  | 1.89105 | 3.53202e-05 | 194.758 |
| 1700016K05Rik                                                                | Brain  | 1.8898  | 0.00965566  | 4.04648 |
| Tmem216                                                                      | Brain  | 1.88812 | 3.89874e-05 | 5.10419 |
| Gm32250                                                                      | Brain  | 1.88603 | 0.00382285  | 3.65629 |
| Ndufa7                                                                       | Brain  | 1.88483 | 1.0316e-32  | 122.092 |
| Pik3ip1                                                                      | Brain  | 1.8837  | 0.00172482  | 10.9769 |
| Tbc1d14                                                                      | Brain  | 1.88241 | 5.11498e-09 | 13.2687 |
| Nudt12                                                                       | Brain  | 1.88189 | 0.000543809 | 3.02633 |
| Dtwd2                                                                        | Brain  | 1.87891 | 1.59378e-05 | 4.4474  |
| C030006K11Rik                                                                | Brain  | 1.87293 | 0.00187829  | 3.93843 |
| Slc52a3                                                                      | Brain  | 1.86321 | 0.000652205 | 4.86416 |
| Btg3                                                                         | Brain  | 1.86009 | 3.70866e-17 | 33.1695 |
| Nomo1                                                                        | Brain  | 1.85972 | 7.86991e-18 | 15.7113 |
| 1300002E11Rik                                                                | Brain  | 1.84241 | 9.9257e-14  | 13.1509 |
| Tmtc4                                                                        | Brain  | 1.84083 | 1.36853e-07 | 6.40154 |
| Al597479                                                                     | Brain  | 1.84083 | 2.91907e-05 | 4.3306  |
| Rnf144b                                                                      | Brain  | 1.8359  | 1.97155e-08 | 21.1416 |
| 1810037I17Rik                                                                | Brain  | 1.83535 | 5.97071e-29 | 114.72  |
| Tdrp                                                                         | Brain  | 1.82644 | 6.77051e-24 | 23.6386 |
| Fam161a                                                                      | Brain  | 1.8261  | 0.000318736 | 3.27353 |
| Ndufaf7                                                                      | Brain  | 1.82594 | 1.08661e-10 | 9.75901 |
| Gm50240                                                                      | Brain  | 1.81345 | 0.00010611  | 3.84436 |
| Tmem123                                                                      | Brain  | 1.80836 | 2.25406e-35 | 35.2346 |
| Gltp                                                                         | Brain  | 1.80433 | 2.798e-15   | 20.107  |
| Kif1c                                                                        | Brain  | 1.79482 | 4.44484e-21 | 22.3763 |
| 2510002D24Rik                                                                | Brain  | 1.78966 | 1.93304e-08 | 12.7826 |
| Rpl38                                                                        | Brain  | 1.78831 | 3.7149e-169 | 379.46  |
| Dipk2b                                                                       | Brain  | 1.78707 | 0.0130917   | 25.8388 |
| Rbm15                                                                        | Brain  | 1.77523 | 2.10686e-09 | 9.81142 |
| Akap12                                                                       | Brain  | 1.7734  | 1.78593e-13 | 69.108  |
| Ak3                                                                          | Brain  | 1.76897 | 1.01084e-18 | 17.328  |
| Dusp8                                                                        | Brain  | 1.76896 | 0.013771    | 4.16329 |
| Lzts1                                                                        | Brain  | 1.76832 | 0.00530853  | 3.52707 |
| Prkag2                                                                       | Brain  | 1.76183 | 4.81842e-06 | 11.6972 |
| B630019A10Rik                                                                | Brain  | 1.75447 | 0.0246151   | 7.57071 |
| Miox                                                                         | Kidney | 7.98734 | 4.29728e-79 | 6.30768 |
| Spink1                                                                       | Kidney | 7.53605 | 8.74404e-49 | 4.96821 |
| Pi16                                                                         | Kidney | 6.69873 | 2.1275e-231 | 21.6396 |
| Sema5a                                                                       | Kidney | 6.33433 | 4.82711e-11 | 12.7478 |
| Epha6                                                                        | Kidney | 5.84824 | 2.74924e-07 | 16.4843 |
| Olfml2b                                                                      | Kidney | 5.13699 | 5.52884e-38 | 3.66078 |
| Ddit4l                                                                       | Kidney | 4.45901 | 5.35631e-10 | 3.92267 |
| Plac8                                                                        | Kidney | 4.38771 | 3.11576e-08 | 12.1007 |

| Supplementary Table S9: Organotypic pseudobulk DEG results of cECs by organ. |        |         |             |         |
|------------------------------------------------------------------------------|--------|---------|-------------|---------|
| Col18a1                                                                      | Kidney | 4.37228 | 2.4974e-11  | 4.40191 |
| Tspan8                                                                       | Kidney | 4.36605 | 2.06509e-05 | 4.84956 |
| Atp8a2                                                                       | Kidney | 4.21719 | 6.02031e-23 | 5.23398 |
| Dkk2                                                                         | Kidney | 4.0371  | 0.000126621 | 52.108  |
| S100a4                                                                       | Kidney | 4.00204 | 4.05394e-08 | 4.69646 |
| Atp2a3                                                                       | Kidney | 3.98809 | 8.44117e-32 | 3.72256 |
| Kank4                                                                        | Kidney | 3.79674 | 2.71898e-11 | 11.487  |
| 3110099E03Rik                                                                | Kidney | 3.73117 | 0.00163795  | 12.3415 |
| Gm6213                                                                       | Kidney | 3.70087 | 0.00283502  | 13.3176 |
| Plat                                                                         | Kidney | 3.67751 | 3.48703e-10 | 81.642  |
| Gimap3                                                                       | Kidney | 3.35468 | 0.0136511   | 6.34541 |
| Hoxa7                                                                        | Kidney | 3.22597 | 0.0207145   | 12.1046 |
| Gm30382                                                                      | Kidney | 3.1652  | 1.15053e-06 | 18.4453 |
| Specc1                                                                       | Kidney | 3.06217 | 1.04852e-07 | 7.17254 |
| Lpl                                                                          | Kidney | 2.98908 | 0.000430491 | 18.9643 |
| Lypd6                                                                        | Kidney | 2.82307 | 0.000290485 | 3.94258 |
| Zbtb7c                                                                       | Kidney | 2.79563 | 0.000180157 | 4.5973  |
| Arhgef26                                                                     | Kidney | 2.63484 | 0.00222212  | 10.3665 |
| Dram1                                                                        | Kidney | 2.56208 | 0.00455847  | 30.9785 |
| Atp13a3                                                                      | Kidney | 2.54245 | 1.55233e-11 | 23.4089 |
| Mmp11                                                                        | Kidney | 2.52427 | 0.0113298   | 4.06486 |
| Uchl1                                                                        | Kidney | 2.5035  | 0.00417876  | 11.7076 |
| Cacna1a                                                                      | Kidney | 2.49465 | 0.0142518   | 7.90195 |
| Mpped2                                                                       | Kidney | 2.4491  | 0.0198247   | 16.7914 |
| S100a6                                                                       | Kidney | 2.4397  | 0.00712325  | 97.9902 |
| Mapt                                                                         | Kidney | 2.43521 | 0.00095507  | 21.029  |
| Cldn15                                                                       | Kidney | 2.41335 | 0.0209957   | 17.2309 |
| Ifi27l2a                                                                     | Kidney | 2.32931 | 0.000149866 | 17.1539 |
| Ctnna3                                                                       | Kidney | 2.28647 | 0.00160588  | 36.2749 |
| Tbx3                                                                         | Kidney | 2.26581 | 0.0329325   | 19.43   |
| Egln3                                                                        | Kidney | 2.19066 | 0.0119992   | 7.13754 |
| Nupr1                                                                        | Kidney | 2.13045 | 0.0072291   | 6.09911 |
| Serpine2                                                                     | Kidney | 2.11926 | 0.0383678   | 8.95757 |
| Crispld1                                                                     | Kidney | 2.09556 | 0.0233933   | 20.1046 |
| Alpl                                                                         | Kidney | 2.06784 | 0.0202329   | 19.6685 |
| Thsd7a                                                                       | Kidney | 2.06734 | 0.000150477 | 25.7927 |
| Igf1                                                                         | Kidney | 2.06003 | 0.01179     | 13.771  |
| Plaat3                                                                       | Kidney | 2.03899 | 5.28833e-10 | 23.3657 |
| Boc                                                                          | Kidney | 2.01091 | 0.0257679   | 17.4116 |
| Fgd4                                                                         | Kidney | 1.98847 | 0.0437991   | 9.57169 |
| Emp3                                                                         | Kidney | 1.98395 | 1.32526e-08 | 24.5201 |
| Ppm1e                                                                        | Kidney | 1.97864 | 0.000462171 | 17.5698 |
| Cyp4b1                                                                       | Kidney | 1.96501 | 0.0275076   | 78.1398 |
| Rflna                                                                        | Kidney | 1.95151 | 0.00572149  | 11.9999 |
| 4930542D17Rik                                                                | Kidney | 1.90537 | 0.0011328   | 4.38527 |
| Klk8                                                                         | Kidney | 1.90466 | 3.67208e-07 | 12.4545 |
| Rsad2                                                                        | Kidney | 1.84477 | 0.00253066  | 205.58  |
| Itga3                                                                        | Kidney | 1.80779 | 0.00167742  | 10.098  |
| Pdlim2                                                                       | Kidney | 1.79757 | 0.000150477 | 4.07177 |
| Slc27a3                                                                      | Kidney | 1.77011 | 0.0036617   | 3.05187 |
| AU021092                                                                     | Kidney | 1.76778 | 0.00884712  | 94.3791 |
| Cdkl5                                                                        | Kidney | 1.75962 | 1.60003e-05 | 5.87634 |
| Fgfr3                                                                        | Kidney | 1.75191 | 0.000430491 | 3.36818 |
| Ltc4s                                                                        | Kidney | 1.74743 | 0.001449    | 5.87259 |
| Etfbkm1                                                                      | Kidney | 1.70661 | 0.00697151  | 6.40394 |
| 5033406O09Rik                                                                | Kidney | 1.69    | 0.0286797   | 3.00068 |
| Mycn                                                                         | Kidney | 1.67837 | 0.0135149   | 3.03664 |
| Ccrl2                                                                        | Kidney | 1.63637 | 2.63944e-05 | 27.8783 |
| Fgf1                                                                         | Kidney | 1.62439 | 0.00151889  | 26.5298 |
| Sncg                                                                         | Kidney | 1.61293 | 0.0209172   | 22.9515 |
| Plscr1                                                                       | Kidney | 1.60585 | 0.00870062  | 46.4138 |
| Sgk1                                                                         | Kidney | 1.52621 | 1.24284e-09 | 156.014 |
| Coil                                                                         | Kidney | 1.52329 | 3.94754e-08 | 6.54359 |
| 2700033N17Rik                                                                | Kidney | 1.52123 | 9.02006e-05 | 9.29892 |
| Smpd13a                                                                      | Kidney | 1.51937 | 8.1409e-08  | 54.6223 |
| 2900052L18Rik                                                                | Kidney | 1.49194 | 1.15343e-06 | 5.47701 |
| Mylk                                                                         | Kidney | 1.48898 | 0.0061543   | 14.3543 |
| Cacfd1                                                                       | Kidney | 1.47092 | 0.0019912   | 3.38132 |

| Supplementary Table S9: Organotypic pseudobulk DEG results of cECs by organ. |        |         |             |         |
|------------------------------------------------------------------------------|--------|---------|-------------|---------|
| Rtp3                                                                         | Kidney | 1.4586  | 0.0496038   | 10.3967 |
| Inpp4b                                                                       | Kidney | 1.45494 | 0.0431001   | 75.3409 |
| Gimap5                                                                       | Kidney | 1.4537  | 0.000470471 | 57.3367 |
| Gm49767                                                                      | Kidney | 1.45198 | 0.00444665  | 6.22557 |
| Mospd2                                                                       | Kidney | 1.42996 | 1.66186e-07 | 30.8653 |
| Trip6                                                                        | Kidney | 1.37867 | 0.00271427  | 3.91681 |
| Plaur                                                                        | Kidney | 1.37487 | 0.00967518  | 14.9892 |
| Riox1                                                                        | Kidney | 1.36248 | 4.83419e-05 | 5.18852 |
| Maged2                                                                       | Kidney | 1.33675 | 2.71075e-06 | 11.9107 |
| Ankrd33b                                                                     | Kidney | 1.3344  | 0.0003269   | 19.9996 |
| Hoxb2                                                                        | Kidney | 1.31347 | 0.0109983   | 6.82079 |
| 4930554G24Rik                                                                | Kidney | 1.31041 | 0.0246244   | 7.46705 |
| Nuak1                                                                        | Kidney | 1.3059  | 0.000309198 | 22.9137 |
| Rpl10-ps3                                                                    | Kidney | 1.30576 | 0.000375446 | 3.68977 |
| Rab4a                                                                        | Kidney | 1.29289 | 0.000200975 | 9.24716 |
| Fam110a                                                                      | Kidney | 1.29243 | 0.00491151  | 14.8761 |
| Metrl                                                                        | Kidney | 1.29068 | 0.00555596  | 4.63714 |
| C430049B03Rik                                                                | Kidney | 1.29052 | 8.45071e-06 | 14.4617 |
| Tmem237                                                                      | Kidney | 1.28523 | 2.97388e-06 | 7.54106 |
| Phf11b                                                                       | Kidney | 1.27242 | 0.0270235   | 6.69095 |
| Srxn1                                                                        | Kidney | 1.27166 | 0.0088976   | 3.4277  |
| 4930444A19Rik                                                                | Kidney | 1.27088 | 0.00788682  | 4.24489 |
| 9230114K14Rik                                                                | Kidney | 1.26543 | 0.00711328  | 3.19971 |
| 1110051M20Rik                                                                | Kidney | 1.26238 | 0.0015054   | 7.44668 |
| Ldlr                                                                         | Kidney | 1.23544 | 0.000234232 | 6.97163 |
| Mocos                                                                        | Kidney | 1.23119 | 0.00155847  | 3.431   |
| Phlda3                                                                       | Kidney | 1.23014 | 0.0335014   | 5.19205 |
| Bex3                                                                         | Kidney | 1.22036 | 0.00557588  | 14.1048 |
| 2700062C07Rik                                                                | Kidney | 1.21564 | 0.00172409  | 3.57685 |
| Pradc1                                                                       | Kidney | 1.20792 | 0.0307632   | 7.62169 |
| Adgre5                                                                       | Kidney | 1.20782 | 3.05523e-38 | 59.177  |
| Enho                                                                         | Kidney | 1.20342 | 5.84706e-05 | 12.9193 |
| Csf1                                                                         | Kidney | 1.20214 | 1.74543e-06 | 27.2888 |
| Asap2                                                                        | Kidney | 1.19989 | 8.60434e-08 | 44.9    |
| 4930599N23Rik                                                                | Kidney | 1.19935 | 0.000109494 | 13.514  |
| Tmem218                                                                      | Kidney | 1.19916 | 0.0056019   | 4.17033 |
| Gm19522                                                                      | Kidney | 1.19764 | 0.0384007   | 5.22627 |
| Rfisd                                                                        | Kidney | 1.19264 | 0.00257033  | 3.07979 |
| Gchfr                                                                        | Kidney | 1.19073 | 0.00517574  | 17.1405 |
| Ephx1                                                                        | Kidney | 1.18985 | 0.00750443  | 17.9145 |
| Comtd1                                                                       | Kidney | 1.18219 | 0.000441308 | 5.35369 |
| Sox17                                                                        | Kidney | 1.17349 | 2.41943e-05 | 55.3621 |
| Anxa1                                                                        | Kidney | 1.17145 | 0.0120113   | 9.81002 |
| 4930549G23Rik                                                                | Kidney | 1.16269 | 0.00621419  | 3.6584  |
| Hacd4                                                                        | Kidney | 1.16061 | 0.000310227 | 17.1063 |
| Ift57                                                                        | Kidney | 1.15592 | 0.0100334   | 4.59041 |
| C030034I22Rik                                                                | Kidney | 1.1424  | 0.0211407   | 3.14989 |
| Mras                                                                         | Kidney | 1.13923 | 0.0130331   | 3.12918 |
| Surf2                                                                        | Kidney | 1.13468 | 0.00217829  | 5.01938 |
| Zc3h12b                                                                      | Kidney | 1.13204 | 0.0197941   | 7.20402 |
| Tmem71                                                                       | Kidney | 1.12744 | 0.00477594  | 5.57939 |
| Tcim                                                                         | Kidney | 1.12128 | 0.0173074   | 192.12  |
| Ring1                                                                        | Kidney | 1.11586 | 0.000457325 | 6.89267 |
| Mtcp1                                                                        | Kidney | 1.09807 | 0.0153583   | 3.83756 |
| Cmc4                                                                         | Kidney | 1.09727 | 0.000176132 | 8.84133 |
| Gm34574                                                                      | Kidney | 1.09391 | 0.0275076   | 3.33025 |
| S100a11                                                                      | Kidney | 1.09369 | 4.61844e-06 | 75.9177 |
| Rps19bp1                                                                     | Kidney | 1.09042 | 6.2238e-05  | 10.0194 |
| Zfp697                                                                       | Kidney | 1.09022 | 1.48728e-05 | 9.79595 |
| Nthl1                                                                        | Kidney | 1.09008 | 0.0439115   | 3.52954 |
| Tmem86a                                                                      | Kidney | 1.08443 | 0.0117378   | 4.5513  |
| Gnptg                                                                        | Kidney | 1.08086 | 0.014276    | 5.56741 |
| Cdk5rap3                                                                     | Kidney | 1.07291 | 0.0278688   | 5.9937  |
| Ncoa7                                                                        | Kidney | 1.07275 | 0.0009192   | 52.4523 |
| Cyp20a1                                                                      | Kidney | 1.07122 | 0.00705084  | 33.1112 |
| Zdhhc12                                                                      | Kidney | 1.06914 | 0.0181887   | 4.39511 |
| Wdr60                                                                        | Kidney | 1.06301 | 0.0161125   | 3.63417 |
| Hist1h4d                                                                     | Kidney | 1.05954 | 0.0223711   | 4.18588 |

| Supplementary Table S9: Organotypic pseudobulk DEG results of cECs by organ. |        |          |             |         |
|------------------------------------------------------------------------------|--------|----------|-------------|---------|
| Icam2                                                                        | Kidney | 1.05709  | 8.12284e-12 | 111.146 |
| Tmem184c                                                                     | Kidney | 1.05322  | 0.0327531   | 3.80848 |
| Cd9                                                                          | Kidney | 1.04768  | 0.0107769   | 101.076 |
| Abr                                                                          | Kidney | 1.04432  | 0.000368189 | 13.031  |
| Ttc32                                                                        | Kidney | 1.04422  | 0.00114791  | 7.58703 |
| Spryd7                                                                       | Kidney | 1.03784  | 0.0215929   | 9.01992 |
| Qsox2                                                                        | Kidney | 1.03401  | 0.000383692 | 6.99521 |
| Phf11d                                                                       | Kidney | 1.03385  | 0.000728782 | 22.5219 |
| Prr13                                                                        | Kidney | 1.0324   | 0.000878037 | 24.6118 |
| Zkscan14                                                                     | Kidney | 1.03149  | 0.0269493   | 3.30154 |
| Usp50                                                                        | Kidney | 1.03055  | 0.0259212   | 4.5232  |
| Yae1d1                                                                       | Kidney | 1.0296   | 9.42365e-07 | 15.7825 |
| Coq2                                                                         | Kidney | 1.02743  | 1.29129e-06 | 12.7418 |
| Zfp593                                                                       | Kidney | 1.02611  | 0.0150165   | 4.72272 |
| Cbr1                                                                         | Kidney | 1.02551  | 0.00299541  | 12.8425 |
| Malsu1                                                                       | Kidney | 1.02514  | 4.50012e-06 | 18.3973 |
| Gm4070                                                                       | Kidney | 1.02364  | 0.00512551  | 7.82757 |
| Fdps                                                                         | Kidney | 1.02242  | 0.0137034   | 9.33916 |
| Ctsf                                                                         | Kidney | 1.0213   | 0.0100148   | 7.05977 |
| Samd12                                                                       | Kidney | 1.02098  | 1.08389e-06 | 167.589 |
| 1700037H04Rik                                                                | Kidney | 1.02007  | 0.0209172   | 3.51628 |
| 4732440D04Rik                                                                | Kidney | 1.01973  | 0.0374004   | 3.86258 |
| Zdhhc24                                                                      | Kidney | 1.01485  | 0.0290579   | 3.31497 |
| Polr3d                                                                       | Kidney | 1.01455  | 0.00717329  | 5.82902 |
| S100a10                                                                      | Kidney | 1.00746  | 9.70415e-05 | 168.794 |
| Gimap1                                                                       | Kidney | 1.00261  | 3.55647e-06 | 67.24   |
| Apex1                                                                        | Kidney | 0.997585 | 0.0220327   | 3.47266 |
| Cenpt                                                                        | Kidney | 0.996458 | 0.0334684   | 4.78433 |
| Tmed1                                                                        | Kidney | 0.99638  | 0.0408658   | 6.02732 |
| Il10rb                                                                       | Kidney | 0.995308 | 0.000102818 | 62.9048 |
| Traf3ip1                                                                     | Kidney | 0.994441 | 0.0056682   | 4.424   |
| Gngt2                                                                        | Kidney | 0.990701 | 0.0001102   | 83.6779 |
| Cdk5rap1                                                                     | Kidney | 0.989921 | 0.00214163  | 6.09843 |
| G630016G05Rik                                                                | Kidney | 0.989618 | 0.0483327   | 5.64206 |
| Cyb561d2                                                                     | Kidney | 0.986478 | 0.0260348   | 3.9623  |
| Cmpk2                                                                        | Kidney | 0.983131 | 0.0132082   | 23.6038 |
| Kcnrg                                                                        | Kidney | 0.982894 | 0.0355068   | 4.57465 |
| Hint3                                                                        | Kidney | 0.981626 | 0.001108    | 19.6616 |
| Mul1                                                                         | Kidney | 0.981146 | 0.00349757  | 6.05673 |
| Zfp758                                                                       | Kidney | 0.980007 | 0.0193427   | 5.03172 |
| Ifi44                                                                        | Kidney | 0.977638 | 0.0487226   | 81.9262 |
| Bmyc                                                                         | Kidney | 0.977625 | 0.00844174  | 11.1199 |
| Tmem35b                                                                      | Kidney | 0.976743 | 0.0414055   | 3.69869 |
| Mid1ip1                                                                      | Kidney | 0.969297 | 0.0450642   | 8.27978 |
| Pts                                                                          | Kidney | 0.962153 | 0.00349404  | 11.119  |
| Wrap73                                                                       | Kidney | 0.961583 | 0.00928226  | 5.15172 |
| Tmem230                                                                      | Kidney | 0.956614 | 0.00133945  | 6.82138 |
| Wdr46                                                                        | Kidney | 0.95184  | 0.0296855   | 3.64063 |
| Rrp8                                                                         | Kidney | 0.949239 | 0.0335873   | 6.33063 |
| Exoc3l4                                                                      | Kidney | 0.94373  | 0.000775051 | 29.4946 |
| Rpp14                                                                        | Kidney | 0.943028 | 0.000696605 | 7.80786 |
| S100a1                                                                       | Kidney | 0.941489 | 0.0251289   | 58.9026 |
| P4ha2                                                                        | Kidney | 0.940229 | 0.0013097   | 7.55608 |
| Zfp866                                                                       | Kidney | 0.938333 | 0.00712325  | 6.47937 |
| Heg1                                                                         | Kidney | 0.937544 | 4.91699e-23 | 196.1   |
| Aopep                                                                        | Kidney | 0.936918 | 6.83495e-06 | 157.802 |
| Ptpmt1                                                                       | Kidney | 0.930467 | 5.78901e-06 | 13.4941 |
| Znrd2                                                                        | Kidney | 0.929907 | 0.0213707   | 6.76182 |
| Pwwp2b                                                                       | Kidney | 0.923957 | 0.0156424   | 8.57654 |
| Ctp                                                                          | Kidney | 0.922287 | 0.0455913   | 3.48619 |
| Asrgl1                                                                       | Kidney | 0.922077 | 0.0031569   | 5.98645 |
| Smim27                                                                       | Kidney | 0.920829 | 0.00260604  | 11.6505 |
| Ifit3                                                                        | Kidney | 0.918209 | 0.0138409   | 25.9476 |
| Tm2d3                                                                        | Kidney | 0.915563 | 3.82504e-05 | 20.3628 |
| Efnb2                                                                        | Kidney | 0.915551 | 0.00178407  | 101.705 |
| Surf1                                                                        | Kidney | 0.915301 | 0.000705131 | 11.9172 |
| Il2rg                                                                        | Kidney | 0.912607 | 0.000794246 | 11.4022 |
| 6430590A07Rik                                                                | Kidney | 0.912334 | 0.0137034   | 5.40895 |



| Supplementary Table S9: Organotypic pseudobulk DEG results of cECs by organ. |        |          |             |         |
|------------------------------------------------------------------------------|--------|----------|-------------|---------|
| Prex1                                                                        | Kidney | 0.912249 | 0.0363733   | 25.883  |
| Tm4sf1                                                                       | Kidney | 0.909105 | 0.000581283 | 470.426 |
| Pde6d                                                                        | Kidney | 0.908597 | 6.92744e-05 | 16.8468 |
| Ppcdc                                                                        | Kidney | 0.906804 | 0.0389165   | 3.93301 |
| Gadd45a                                                                      | Kidney | 0.905542 | 0.0240968   | 6.46539 |
| Pcbp3                                                                        | Kidney | 0.904942 | 0.00189663  | 16.8782 |
| Nipal3                                                                       | Kidney | 0.903008 | 0.00579245  | 9.29107 |
| Cep63                                                                        | Kidney | 0.902145 | 0.0205974   | 6.85121 |
| Tfdp1                                                                        | Kidney | 0.899095 | 0.0379091   | 5.89402 |
| Igf2r                                                                        | Kidney | 0.894889 | 0.0293249   | 16.021  |
| Hist1h2be                                                                    | Kidney | 0.892896 | 0.0409133   | 4.63102 |
| 1700084C06Rik                                                                | Kidney | 0.891869 | 0.0445466   | 6.4003  |
| Gtpbp8                                                                       | Kidney | 0.891766 | 0.00431183  | 8.33232 |
| Mrpl36                                                                       | Kidney | 0.883314 | 9.66744e-05 | 23.7892 |
| Ubl4a                                                                        | Kidney | 0.881348 | 0.00220253  | 9.70561 |
| Slc48a1                                                                      | Kidney | 0.877968 | 0.0185832   | 18.4234 |
| Bbc3                                                                         | Kidney | 0.87643  | 0.0497169   | 4.54693 |
| A130014A01Rik                                                                | Kidney | 0.876201 | 0.00240747  | 7.59501 |
| Phf7                                                                         | Kidney | 0.875907 | 0.0088302   | 6.13864 |
| Zfp961                                                                       | Kidney | 0.875203 | 0.00737145  | 5.89756 |
| Ncald                                                                        | Kidney | 0.870946 | 0.0420302   | 21.4573 |
| Med30                                                                        | Kidney | 0.870028 | 0.0236421   | 11.4929 |
| Katna1                                                                       | Kidney | 0.868435 | 0.000186679 | 11.4699 |
| 2410006H16Rik                                                                | Kidney | 0.866807 | 0.0234469   | 22.7745 |
| Bin1                                                                         | Kidney | 0.865689 | 0.00126436  | 13.3812 |
| Dhps                                                                         | Kidney | 0.864947 | 0.00228251  | 12.2261 |
| Cep85                                                                        | Kidney | 0.859191 | 0.0386282   | 5.13612 |
| 2810013P06Rik                                                                | Kidney | 0.859115 | 0.00102487  | 11.7807 |
| Ndel1                                                                        | Kidney | 0.85634  | 0.000891864 | 58.7166 |
| Tm2d2                                                                        | Kidney | 0.85039  | 0.00240747  | 24.7761 |
| Tmem170                                                                      | Kidney | 0.845821 | 0.0487226   | 4.22937 |
| Dalrd3                                                                       | Kidney | 0.845404 | 0.0279735   | 5.59774 |
| Gas6                                                                         | Kidney | 0.844933 | 3.55647e-06 | 125.997 |
| Rnf123                                                                       | Kidney | 0.844028 | 0.0109143   | 5.89387 |
| Erg28                                                                        | Kidney | 0.840536 | 0.000445427 | 14.2081 |
| Hist1h1c                                                                     | Kidney | 0.837679 | 0.0132486   | 17.857  |
| U2af1l4                                                                      | Kidney | 0.836453 | 0.0103383   | 12.4421 |
| Ddah2                                                                        | Kidney | 0.835248 | 2.05703e-10 | 41.9045 |
| Tmed4                                                                        | Kidney | 0.834436 | 2.6014e-05  | 19.2415 |
| Tmem175                                                                      | Kidney | 0.833631 | 0.00747871  | 9.73554 |
| Mrpl2                                                                        | Kidney | 0.831288 | 0.00013565  | 16.5967 |
| Endov                                                                        | Kidney | 0.82398  | 0.0432714   | 4.28345 |
| Mtrf1l                                                                       | Kidney | 0.823086 | 0.0254457   | 6.10153 |
| Inpp5k                                                                       | Kidney | 0.822582 | 0.00379128  | 27.8455 |
| Gnl2                                                                         | Kidney | 0.8196   | 0.0168042   | 9.38989 |
| BC052040                                                                     | Kidney | 0.818943 | 0.0288906   | 17.1959 |
| Zfp606                                                                       | Kidney | 0.818528 | 0.0286797   | 5.45001 |
| 2810403D21Rik                                                                | Kidney | 0.817521 | 0.01907     | 7.88203 |
| CAAA01118383.1                                                               | Kidney | 0.817363 | 0.00212025  | 14.1597 |
| Cd274                                                                        | Kidney | 0.814929 | 0.0290903   | 11.4503 |
| Amn1                                                                         | Kidney | 0.811445 | 0.00788682  | 13.9333 |
| Emc4                                                                         | Kidney | 0.81062  | 0.00712325  | 18.8407 |
| Akap9                                                                        | Kidney | 0.810442 | 1.32623e-10 | 48.0223 |
| Gpatch4                                                                      | Kidney | 0.803564 | 0.0317824   | 7.29233 |
| Trerf1                                                                       | Kidney | 0.80305  | 0.0436105   | 18.7278 |
| Tcta                                                                         | Kidney | 0.802139 | 0.00459677  | 8.76881 |
| Pola2                                                                        | Kidney | 0.799927 | 0.0234866   | 19.7258 |
| Spg20                                                                        | Kidney | 0.799173 | 0.0152418   | 8.13421 |
| Eif2b4                                                                       | Kidney | 0.798124 | 0.00441237  | 8.56134 |
| Cep290                                                                       | Kidney | 0.797702 | 0.0494785   | 5.83587 |
| E130102H24Rik                                                                | Kidney | 0.793448 | 0.00189663  | 9.02519 |
| Zmat5                                                                        | Kidney | 0.792936 | 0.00167146  | 16.8962 |
| Ankrd24                                                                      | Kidney | 0.792368 | 0.0383191   | 6.07776 |
| Mrpl58                                                                       | Kidney | 0.788492 | 0.0010275   | 23.5854 |
| Pgrmc2                                                                       | Kidney | 0.785798 | 6.46116e-05 | 21.9973 |
| 2810006K23Rik                                                                | Kidney | 0.783225 | 0.0483266   | 4.59158 |
| Mtch1                                                                        | Kidney | 0.779469 | 0.000246275 | 74.1977 |
| Vdac3                                                                        | Kidney | 0.779299 | 5.57411e-11 | 58.3688 |

| Supplementary Table S9: Organotypic pseudobulk DEG results of cECs by organ. |        |          |             |         |
|------------------------------------------------------------------------------|--------|----------|-------------|---------|
| Tmem219                                                                      | Kidney | 0.778455 | 0.0384007   | 11.2672 |
| Trmt6                                                                        | Kidney | 0.778002 | 0.00238449  | 9.75878 |
| 9430038I01Rik                                                                | Kidney | 0.774646 | 0.0487226   | 6.75682 |
| Zdhhc4                                                                       | Kidney | 0.774503 | 0.01179     | 8.42906 |
| Usp18                                                                        | Kidney | 0.774138 | 0.0156534   | 13.8556 |
| Tmem208                                                                      | Kidney | 0.773215 | 0.00240747  | 31.6887 |
| Mkrm2                                                                        | Kidney | 0.773049 | 0.0126314   | 8.17604 |
| Srgn                                                                         | Kidney | 0.769919 | 4.16013e-05 | 347.26  |
| Xab2                                                                         | Kidney | 0.764752 | 0.0234616   | 6.69632 |
| Pigp                                                                         | Kidney | 0.763182 | 0.000829877 | 24.3331 |
| mt-Cytb                                                                      | Kidney | 0.761232 | 0.000129282 | 1358.49 |
| Otulin                                                                       | Kidney | 0.760298 | 0.000227318 | 19.8962 |
| Ddx27                                                                        | Kidney | 0.759996 | 0.0187638   | 14.0908 |
| Sgf29                                                                        | Kidney | 0.756777 | 0.0141774   | 11.177  |
| Rab11fip2                                                                    | Kidney | 0.756504 | 0.00646035  | 12.3456 |
| Tspo                                                                         | Kidney | 0.755869 | 0.025268    | 127.621 |
| Tbc1d32                                                                      | Kidney | 0.754571 | 0.039076    | 8.75774 |
| Plgrkt                                                                       | Kidney | 0.754506 | 0.000166523 | 35.524  |
| Zranb2                                                                       | Kidney | 0.751842 | 1.80793e-08 | 32.556  |
| Dda1                                                                         | Kidney | 0.750916 | 0.0326237   | 11.8004 |
| Dnase1l3                                                                     | Liver  | 11.788   | 6.4944e-250 | 154.363 |
| Stab2                                                                        | Liver  | 11.5542  | 0           | 288.929 |
| Clec4g                                                                       | Liver  | 11.5222  | 2.2312e-214 | 115.555 |
| Fcgr2b                                                                       | Liver  | 11.2036  | 3.959e-241  | 110.188 |
| Adam23                                                                       | Liver  | 10.7427  | 1.1354e-226 | 82.8348 |
| Gata4                                                                        | Liver  | 10.6893  | 3.9576e-184 | 64.8845 |
| Plxnc1                                                                       | Liver  | 9.66574  | 0           | 92.5714 |
| Aass                                                                         | Liver  | 9.36205  | 3.8429e-151 | 27.7979 |
| Lyve1                                                                        | Liver  | 9.27925  | 9.6322e-170 | 31.1154 |
| Hgf                                                                          | Liver  | 9.02196  | 4.2291e-129 | 20.4394 |
| Msr1                                                                         | Liver  | 8.88381  | 2.6888e-204 | 30.1847 |
| Masp1                                                                        | Liver  | 8.67124  | 4.0004e-134 | 17.8507 |
| Gm15675                                                                      | Liver  | 8.63589  | 3.8703e-142 | 18.6474 |
| Hpgd                                                                         | Liver  | 8.61884  | 3.099e-171  | 22.3181 |
| Slc9a9                                                                       | Liver  | 8.45134  | 0           | 80.2365 |
| Cd55                                                                         | Liver  | 8.37324  | 0           | 70.2169 |
| Iqgap2                                                                       | Liver  | 8.35105  | 4.0568e-200 | 23.2583 |
| Il1a                                                                         | Liver  | 8.12754  | 2.0329e-117 | 12.2578 |
| Robo1                                                                        | Liver  | 8.0317   | 2.8763e-162 | 17.0927 |
| Fmn1                                                                         | Liver  | 8.01748  | 6.7022e-112 | 11.3808 |
| C5ar2                                                                        | Liver  | 7.80692  | 3.244e-104  | 9.52319 |
| Rspo3                                                                        | Liver  | 7.78279  | 8.5831e-106 | 14.2987 |
| 6030498E09Rik                                                                | Liver  | 7.75442  | 1.27899e-97 | 8.82917 |
| Greb1l                                                                       | Liver  | 7.54105  | 3.7523e-103 | 8.74555 |
| Csmd1                                                                        | Liver  | 7.40967  | 3.86617e-88 | 7.72013 |
| Rerg                                                                         | Liver  | 7.32049  | 4.81799e-85 | 6.55929 |
| Wnt2                                                                         | Liver  | 7.31572  | 2.57228e-23 | 23.7907 |
| Palld                                                                        | Liver  | 7.23051  | 9.41599e-32 | 68.0807 |
| Tmem132e                                                                     | Liver  | 7.09712  | 7.43181e-78 | 5.38469 |
| Cd84                                                                         | Liver  | 7.06569  | 2.4836e-161 | 11.593  |
| Tfec                                                                         | Liver  | 6.91669  | 3.3321e-105 | 6.66209 |
| Dpp4                                                                         | Liver  | 6.84723  | 4.61581e-09 | 60.8445 |
| Akr1b8                                                                       | Liver  | 6.81661  | 2.89947e-86 | 5.48095 |
| Slc43a2                                                                      | Liver  | 6.74437  | 2.78517e-37 | 31.4512 |
| Gna14                                                                        | Liver  | 6.73241  | 3.05988e-76 | 4.6325  |
| Mrc1                                                                         | Liver  | 6.72097  | 3.78844e-10 | 155.815 |
| Tnik                                                                         | Liver  | 6.69944  | 7.3593e-285 | 17.9339 |
| Bmp2                                                                         | Liver  | 6.55053  | 2.82079e-31 | 98.0877 |
| Vstm4                                                                        | Liver  | 6.52754  | 2.43502e-76 | 4.18976 |
| Serpina3f                                                                    | Liver  | 6.41477  | 1.81657e-94 | 5.27822 |
| Tpbgl                                                                        | Liver  | 6.33139  | 6.6525e-102 | 26.993  |
| Gm12840                                                                      | Liver  | 6.32181  | 7.222e-132  | 7.26352 |
| 1700047M11Rik                                                                | Liver  | 6.30237  | 3.27055e-62 | 3.10129 |
| Gm12648                                                                      | Liver  | 6.29156  | 1.44806e-65 | 3.91074 |
| Esrrb                                                                        | Liver  | 6.2152   | 5.59211e-62 | 3.03901 |
| Flrt1                                                                        | Liver  | 6.21227  | 9.2919e-78  | 3.96472 |
| Snx24                                                                        | Liver  | 6.18618  | 1.11573e-78 | 32.3929 |
| Egfm1                                                                        | Liver  | 6.18475  | 3.30287e-12 | 5.07165 |

| Supplementary Table S9: Organotypic pseudobulk DEG results of cECs by organ. |       |         |             |         |
|------------------------------------------------------------------------------|-------|---------|-------------|---------|
| Cntfr                                                                        | Liver | 6.16158 | 1.26428e-68 | 3.53926 |
| Npl                                                                          | Liver | 6.12746 | 3.8593e-132 | 6.64997 |
| Frrs1                                                                        | Liver | 6.04643 | 2.45731e-87 | 4.4151  |
| Hpse                                                                         | Liver | 5.91684 | 1.93108e-67 | 3.1694  |
| Rgs7bp                                                                       | Liver | 5.8511  | 2.9302e-284 | 14.6966 |
| Cux2                                                                         | Liver | 5.78237 | 8.43204e-70 | 3.11919 |
| Khdrbs3                                                                      | Liver | 5.60458 | 2.05091e-17 | 10.9335 |
| Maf                                                                          | Liver | 5.57555 | 5.82608e-28 | 246.731 |
| Clec1b                                                                       | Liver | 5.56611 | 1.1892e-221 | 10.9165 |
| Ralgapa2                                                                     | Liver | 5.50262 | 0           | 154.128 |
| B3galt1                                                                      | Liver | 5.48817 | 2.74975e-10 | 69.8927 |
| Itga8                                                                        | Liver | 5.45662 | 2.15716e-14 | 33.6726 |
| Igsf3                                                                        | Liver | 5.37341 | 8.21508e-68 | 3.10224 |
| Scamp5                                                                       | Liver | 5.34246 | 7.61408e-84 | 3.47729 |
| Gm10605                                                                      | Liver | 5.32801 | 1.6911e-117 | 4.92476 |
| C1qtnf1                                                                      | Liver | 5.31345 | 1.5844e-178 | 8.08588 |
| Ackr4                                                                        | Liver | 5.28031 | 1.30376e-75 | 3.1277  |
| Mir100hg                                                                     | Liver | 5.23563 | 2.64087e-21 | 18.1043 |
| Dennd2a                                                                      | Liver | 5.21886 | 4.5182e-124 | 6.43046 |
| Selp                                                                         | Liver | 5.19976 | 8.00101e-20 | 3.97011 |
| Ctnnal1                                                                      | Liver | 5.14621 | 3.13415e-85 | 3.37691 |
| Rasgef1b                                                                     | Liver | 5.14268 | 6.90406e-18 | 19.4764 |
| Adgrg6                                                                       | Liver | 5.14091 | 1.72193e-08 | 8.37759 |
| Oit3                                                                         | Liver | 5.13939 | 3.88253e-09 | 49.1706 |
| Gm30938                                                                      | Liver | 5.051   | 8.71341e-82 | 3.14023 |
| Serpina3g                                                                    | Liver | 5.03964 | 1.802e-10   | 12.2322 |
| Gm30648                                                                      | Liver | 4.94659 | 5.0257e-115 | 4.48757 |
| Gm16083                                                                      | Liver | 4.92857 | 6.12598e-23 | 9.99873 |
| Fam124a                                                                      | Liver | 4.86746 | 1.64817e-90 | 39.8937 |
| Dock7                                                                        | Liver | 4.84631 | 1.20571e-15 | 12.786  |
| Gpr182                                                                       | Liver | 4.75128 | 7.92629e-21 | 99.2464 |
| Dusp10                                                                       | Liver | 4.7255  | 1.3384e-105 | 4.83319 |
| Pde1c                                                                        | Liver | 4.71997 | 3.58707e-09 | 16.4054 |
| Lgmn                                                                         | Liver | 4.71499 | 3.5882e-131 | 44.5793 |
| Zmynd15                                                                      | Liver | 4.68158 | 5.0994e-140 | 5.31462 |
| Col27a1                                                                      | Liver | 4.67147 | 1.161e-80   | 3.16525 |
| Anapc15                                                                      | Liver | 4.56532 | 4.94273e-88 | 24.3606 |
| Dse                                                                          | Liver | 4.53145 | 1.1247e-68  | 30.276  |
| Zfpm2                                                                        | Liver | 4.52125 | 2.94976e-13 | 29.3556 |
| Olfm1                                                                        | Liver | 4.42297 | 2.1109e-210 | 10.0921 |
| N4bp2l1                                                                      | Liver | 4.41176 | 1.12016e-28 | 5.1798  |
| Kit                                                                          | Liver | 4.3934  | 1.81934e-17 | 30.3712 |
| Rab3b                                                                        | Liver | 4.38347 | 1.99119e-25 | 3.39498 |
| Zeb2                                                                         | Liver | 4.33952 | 1.80947e-09 | 69.4235 |
| Susd1                                                                        | Liver | 4.30058 | 1.01512e-12 | 3.3993  |
| Pdk4                                                                         | Liver | 4.29442 | 3.29118e-19 | 8.68148 |
| Arhgap45                                                                     | Liver | 4.24415 | 3.9361e-12  | 23.17   |
| Morrbid                                                                      | Liver | 4.1944  | 0           | 19.7222 |
| Hdc                                                                          | Liver | 4.17079 | 3.12307e-31 | 6.34975 |
| Shisa9                                                                       | Liver | 4.1355  | 2.9744e-10  | 5.17799 |
| Gpr155                                                                       | Liver | 4.12675 | 1.916e-201  | 10.9863 |
| Abat                                                                         | Liver | 4.1157  | 1.97051e-33 | 5.16608 |
| Arrb2                                                                        | Liver | 4.08343 | 1.957e-290  | 11.0018 |
| Itsn1                                                                        | Liver | 4.04474 | 2.4493e-169 | 41.7457 |
| Mical2                                                                       | Liver | 4.04457 | 1.37057e-17 | 5.87385 |
| Acer3                                                                        | Liver | 4.04002 | 1.0313e-174 | 37.1328 |
| Plxdc1                                                                       | Liver | 4.03783 | 1.20584e-49 | 3.6395  |
| Hs3st3b1                                                                     | Liver | 4.03551 | 5.44137e-51 | 23.1584 |
| Tspan7                                                                       | Liver | 4.03336 | 8.3695e-09  | 120.721 |
| Ptch2                                                                        | Liver | 3.967   | 1.95322e-18 | 3.9455  |
| Aqp1                                                                         | Liver | 3.96391 | 9.44427e-14 | 182.432 |
| Tmem106a                                                                     | Liver | 3.96073 | 0           | 23.3689 |
| Cadps2                                                                       | Liver | 3.95518 | 1.00834e-17 | 19.384  |
| Ap1b1                                                                        | Liver | 3.94326 | 4.82965e-58 | 32.244  |
| Mb21d2                                                                       | Liver | 3.85531 | 1.04854e-74 | 27.0659 |
| Gm46565                                                                      | Liver | 3.85172 | 1.18283e-55 | 10.2285 |
| A830082K12Rik                                                                | Liver | 3.83033 | 4.7282e-09  | 7.28134 |
| Lrmp                                                                         | Liver | 3.81791 | 1.65088e-08 | 4.81908 |

| Supplementary Table S9: Organotypic pseudobulk DEG results of cECs by organ. |       |         |             |         |
|------------------------------------------------------------------------------|-------|---------|-------------|---------|
| Loxl2                                                                        | Liver | 3.81548 | 6.1562e-103 | 4.13291 |
| Mid1                                                                         | Liver | 3.78234 | 4.4241e-126 | 52.2325 |
| Cnksr3                                                                       | Liver | 3.74142 | 0           | 45.2237 |
| Sntb1                                                                        | Liver | 3.73864 | 1.5553e-05  | 91.5245 |
| Ppfia2                                                                       | Liver | 3.7269  | 3.18505e-12 | 37.8179 |
| Cxcl9                                                                        | Liver | 3.70413 | 0.000676547 | 17.5562 |
| Cxcl16                                                                       | Liver | 3.70031 | 3.95362e-46 | 16.5745 |
| Gnpda1                                                                       | Liver | 3.69115 | 3.76857e-47 | 6.70635 |
| Agfg2                                                                        | Liver | 3.67629 | 1.02709e-12 | 9.95832 |
| Gsap                                                                         | Liver | 3.67048 | 6.02098e-82 | 4.55316 |
| Gm26885                                                                      | Liver | 3.65906 | 9.48182e-97 | 4.4287  |
| Rab27a                                                                       | Liver | 3.65634 | 2.50395e-43 | 9.48257 |
| Pabpc4l                                                                      | Liver | 3.64663 | 2.91186e-47 | 3.73004 |
| Snx8                                                                         | Liver | 3.63649 | 7.05074e-43 | 17.0817 |
| Ccdc80                                                                       | Liver | 3.59472 | 2.0743e-12  | 19.7261 |
| Fign                                                                         | Liver | 3.5919  | 1.39086e-07 | 8.98112 |
| Lcp2                                                                         | Liver | 3.59093 | 3.54414e-07 | 3.33428 |
| Il6st                                                                        | Liver | 3.53185 | 8.3985e-260 | 112.024 |
| Selenop                                                                      | Liver | 3.5269  | 2.8883e-106 | 610.031 |
| Vcam1                                                                        | Liver | 3.50652 | 5.2107e-10  | 17.2226 |
| Gramd1c                                                                      | Liver | 3.47846 | 2.49339e-14 | 3.01908 |
| Mmp14                                                                        | Liver | 3.46534 | 9.42449e-18 | 16.7747 |
| Meis1                                                                        | Liver | 3.45244 | 4.31562e-22 | 34.7673 |
| Cemip2                                                                       | Liver | 3.44935 | 5.07409e-89 | 138.874 |
| Cxcl10                                                                       | Liver | 3.39953 | 1.42023e-06 | 12.5828 |
| Psd3                                                                         | Liver | 3.39824 | 1.33808e-73 | 196.746 |
| Igfbp4                                                                       | Liver | 3.39096 | 5.12324e-16 | 117.721 |
| Prickle1                                                                     | Liver | 3.38727 | 1.49873e-21 | 129.943 |
| Gatm                                                                         | Liver | 3.37375 | 0.00167143  | 109.129 |
| Hid1                                                                         | Liver | 3.32674 | 4.3906e-10  | 3.95916 |
| Tfpi                                                                         | Liver | 3.29899 | 1.7414e-162 | 47.0683 |
| Cdh4                                                                         | Liver | 3.29217 | 2.47032e-10 | 16.0444 |
| Celf4                                                                        | Liver | 3.27955 | 1.69357e-05 | 7.6721  |
| Sema4b                                                                       | Liver | 3.27239 | 8.12098e-29 | 3.51358 |
| Dmd                                                                          | Liver | 3.27197 | 7.05686e-10 | 32.9384 |
| Cdh13                                                                        | Liver | 3.26044 | 6.5006e-07  | 77.5516 |
| Sirpa                                                                        | Liver | 3.23813 | 0.00088567  | 17.489  |
| F8                                                                           | Liver | 3.23675 | 1.00818e-06 | 153.323 |
| Bmp6                                                                         | Liver | 3.23273 | 7.62755e-33 | 74.9884 |
| Slc38a6                                                                      | Liver | 3.22122 | 2.0237e-184 | 28.1774 |
| Plet1os                                                                      | Liver | 3.19987 | 1.12426e-05 | 10.115  |
| Prelp                                                                        | Liver | 3.18417 | 1.09987e-11 | 4.65859 |
| Klhl3                                                                        | Liver | 3.1596  | 1.5854e-114 | 14.6063 |
| Tmem51                                                                       | Liver | 3.12673 | 1.84242e-07 | 9.96923 |
| Arhgdib                                                                      | Liver | 3.12547 | 1.4607e-130 | 24.3049 |
| Slc39a8                                                                      | Liver | 3.11908 | 5.02393e-05 | 27.0204 |
| Pdlim1                                                                       | Liver | 3.1138  | 5.50612e-05 | 23.7003 |
| B130024G19Rik                                                                | Liver | 3.08887 | 3.10457e-06 | 13.7442 |
| Klhl13                                                                       | Liver | 3.08798 | 4.4727e-22  | 5.65548 |
| Dab2                                                                         | Liver | 3.07176 | 1.08096e-49 | 113.148 |
| Lgals1                                                                       | Liver | 3.06243 | 4.76779e-22 | 24.1594 |
| Adgrg3                                                                       | Liver | 3.04772 | 3.07117e-15 | 16.9272 |
| Jak1                                                                         | Liver | 3.04589 | 3.45095e-54 | 175.064 |
| Xkr6                                                                         | Liver | 3.03259 | 3.0201e-196 | 12.9469 |
| Bmper                                                                        | Liver | 3.0119  | 0.000341168 | 5.40882 |
| Rhod                                                                         | Liver | 3.01131 | 4.85661e-90 | 5.56974 |
| Man2a1                                                                       | Liver | 2.99767 | 1.2216e-283 | 100.438 |
| Cnr2                                                                         | Liver | 2.99648 | 3.77403e-13 | 7.07813 |
| Snx18                                                                        | Liver | 2.9936  | 7.4359e-240 | 15.8536 |
| Wdr59                                                                        | Liver | 2.98034 | 1.79729e-90 | 11.5678 |
| Shroom2                                                                      | Liver | 2.97028 | 1.79593e-18 | 32.4214 |
| Fam49a                                                                       | Liver | 2.95452 | 2.94347e-20 | 6.60434 |
| Ehd3                                                                         | Liver | 2.93952 | 9.70155e-05 | 404.825 |
| Exoc6                                                                        | Liver | 2.93416 | 2.632e-222  | 65.4468 |
| Myzap                                                                        | Liver | 2.91387 | 1.29248e-37 | 9.46292 |
| Itga9                                                                        | Liver | 2.90217 | 3.95098e-31 | 89.1965 |
| Prkn                                                                         | Liver | 2.8833  | 3.98348e-23 | 21.6867 |
| Agpat5                                                                       | Liver | 2.88312 | 2.7742e-134 | 30.3623 |

| Supplementary Table S9: Organotypic pseudobulk DEG results of cECs by organ. |       |         |             |         |
|------------------------------------------------------------------------------|-------|---------|-------------|---------|
| Psen2                                                                        | Liver | 2.87286 | 1.6162e-244 | 17.6513 |
| Tns3                                                                         | Liver | 2.83907 | 1.44553e-16 | 27.8182 |
| Kcnk6                                                                        | Liver | 2.83739 | 2.6173e-125 | 7.76382 |
| Lrmda                                                                        | Liver | 2.82852 | 2.19242e-14 | 355.835 |
| Stab1                                                                        | Liver | 2.82211 | 1.19083e-22 | 110.447 |
| Uap1l1                                                                       | Liver | 2.7875  | 2.54627e-35 | 3.6345  |
| Hmga2                                                                        | Liver | 2.7827  | 0.0143736   | 4.48872 |
| Fam222b                                                                      | Liver | 2.76574 | 8.7961e-220 | 59.7776 |
| Myo7a                                                                        | Liver | 2.76224 | 5.26948e-09 | 16.0264 |
| Dpy19l4                                                                      | Liver | 2.74703 | 8.2122e-161 | 27.6199 |
| Arhgap23                                                                     | Liver | 2.74661 | 9.11102e-97 | 69.4808 |
| Gypc                                                                         | Liver | 2.7463  | 7.54341e-15 | 7.13956 |
| Rnasel                                                                       | Liver | 2.72509 | 5.23466e-09 | 6.18873 |
| Ifi207                                                                       | Liver | 2.71484 | 6.74549e-15 | 11.0953 |
| Creb3l1                                                                      | Liver | 2.71315 | 5.47139e-14 | 3.18258 |
| Slc25a37                                                                     | Liver | 2.70805 | 3.4826e-205 | 12.8158 |
| Smad6                                                                        | Liver | 2.70796 | 3.66336e-18 | 48.9442 |
| Snx5                                                                         | Liver | 2.68632 | 7.0275e-171 | 33.0252 |
| Man1a                                                                        | Liver | 2.67656 | 8.71002e-64 | 77.7288 |
| Mgmt                                                                         | Liver | 2.67382 | 8.0899e-106 | 14.8016 |
| Ccn4                                                                         | Liver | 2.66712 | 4.69287e-07 | 6.42307 |
| Cott1                                                                        | Liver | 2.66652 | 1.66401e-17 | 32.587  |
| P2ry1                                                                        | Liver | 2.65847 | 0.000338726 | 7.34199 |
| Tspan2                                                                       | Liver | 2.65435 | 6.16769e-29 | 9.59374 |
| Clcn5                                                                        | Liver | 2.65422 | 1.53808e-22 | 8.33856 |
| Epb41l2                                                                      | Liver | 2.65035 | 2.70017e-77 | 78.2986 |
| Mertk                                                                        | Liver | 2.64588 | 2.19223e-25 | 79.192  |
| Atrnl1                                                                       | Liver | 2.63936 | 8.1547e-104 | 109.067 |
| Slc7a7                                                                       | Liver | 2.61327 | 3.65589e-85 | 20.8387 |
| Appl2                                                                        | Liver | 2.60915 | 3.29122e-38 | 7.24622 |
| St3gal4                                                                      | Liver | 2.59634 | 8.11746e-31 | 133.257 |
| Arrb1                                                                        | Liver | 2.57844 | 2.21304e-18 | 21.2943 |
| Slco2a1                                                                      | Liver | 2.56735 | 3.28802e-11 | 52.3793 |
| Ifitm10                                                                      | Liver | 2.55959 | 2.70959e-10 | 8.4916  |
| Col5a2                                                                       | Liver | 2.55676 | 4.59695e-24 | 7.5397  |
| Il13ra1                                                                      | Liver | 2.53681 | 5.94537e-45 | 18.4677 |
| Raph1                                                                        | Liver | 2.53606 | 1.17073e-29 | 64.5672 |
| Ikzf2                                                                        | Liver | 2.53558 | 1.50684e-11 | 6.69619 |
| Ap2a2                                                                        | Liver | 2.5226  | 1.84266e-92 | 47.461  |
| Taok3                                                                        | Liver | 2.5203  | 6.7103e-40  | 20.7752 |
| Rfk                                                                          | Liver | 2.51952 | 1.69936e-38 | 30.7331 |
| B4galt6                                                                      | Liver | 2.51438 | 5.13023e-24 | 3.50463 |
| Catspere2                                                                    | Liver | 2.5118  | 6.40663e-62 | 4.5969  |
| Arhgap32                                                                     | Liver | 2.5116  | 2.96697e-40 | 20.1888 |
| Cfh                                                                          | Liver | 2.50584 | 0.00541775  | 23.9477 |
| Armxc4                                                                       | Liver | 2.50448 | 1.43494e-52 | 4.11758 |
| Ago3                                                                         | Liver | 2.50427 | 3.069e-110  | 60.4699 |
| Fam102b                                                                      | Liver | 2.49898 | 6.99647e-18 | 10.1055 |
| Car8                                                                         | Liver | 2.48999 | 1.03704e-07 | 59.6588 |
| Mest                                                                         | Liver | 2.48491 | 5.01286e-14 | 8.61792 |
| Ankrd44                                                                      | Liver | 2.47908 | 1.1222e-20  | 108.015 |
| Lhfpl2                                                                       | Liver | 2.47617 | 1.3784e-19  | 71.5968 |
| Me2                                                                          | Liver | 2.47578 | 6.2734e-133 | 12.2596 |
| Tmcc3                                                                        | Liver | 2.46601 | 1.49467e-11 | 148.776 |
| Hivep3                                                                       | Liver | 2.4659  | 1.71959e-08 | 64.4773 |
| Nr2f1                                                                        | Liver | 2.46583 | 5.05862e-08 | 5.65539 |
| Fbn1                                                                         | Liver | 2.45872 | 2.48196e-14 | 4.42365 |
| Spats2                                                                       | Liver | 2.45023 | 8.4214e-132 | 28.8563 |
| Slc26a10                                                                     | Liver | 2.44765 | 6.70836e-14 | 14.1382 |
| Kyat3                                                                        | Liver | 2.43755 | 2.77819e-69 | 6.34935 |
| Tex2                                                                         | Liver | 2.4359  | 6.89186e-39 | 18.6708 |
| Zswim6                                                                       | Liver | 2.43348 | 2.75608e-34 | 121.503 |
| Tmem164                                                                      | Liver | 2.42641 | 1.79693e-36 | 62.4079 |
| Pnpla7                                                                       | Liver | 2.42442 | 8.23816e-15 | 4.814   |
| Camk1d                                                                       | Liver | 2.41769 | 1.00328e-08 | 141.837 |
| Tmcc2                                                                        | Liver | 2.41616 | 4.96302e-49 | 24.3322 |
| Nr2f2                                                                        | Liver | 2.40883 | 7.24456e-08 | 123.722 |
| Ntng2                                                                        | Liver | 2.40693 | 3.02481e-13 | 15.9541 |

| Supplementary Table S9: Organotypic pseudobulk DEG results of cECs by organ. |           |         |             |         |
|------------------------------------------------------------------------------|-----------|---------|-------------|---------|
| Ern1                                                                         | Liver     | 2.40664 | 1.7681e-38  | 10.1103 |
| Fyn                                                                          | Liver     | 2.37637 | 5.26621e-33 | 161.873 |
| Snx30                                                                        | Liver     | 2.36849 | 2.79874e-20 | 7.09273 |
| Arrdc3                                                                       | Liver     | 2.35733 | 7.78761e-10 | 6.30439 |
| Slc9a3r1                                                                     | Liver     | 2.35278 | 2.38149e-26 | 6.61851 |
| Lonrf1                                                                       | Liver     | 2.34864 | 5.6526e-84  | 6.03108 |
| Ntn4                                                                         | Liver     | 2.34799 | 5.84353e-17 | 76.0861 |
| Lepr                                                                         | Liver     | 2.34673 | 8.97677e-23 | 17.2415 |
| Tbx2                                                                         | Liver     | 2.33953 | 1.53546e-66 | 8.04642 |
| Degs1                                                                        | Liver     | 2.33255 | 1.56551e-20 | 68.8135 |
| Dpysl3                                                                       | Liver     | 2.32905 | 2.2261e-06  | 34.9274 |
| Herc3                                                                        | Liver     | 2.32469 | 1.31384e-89 | 10.1463 |
| Slf2                                                                         | Liver     | 2.32053 | 1.2789e-233 | 26.5801 |
| Gstm2                                                                        | Liver     | 2.3188  | 2.70764e-17 | 12.2706 |
| Rab3il1                                                                      | Liver     | 2.31671 | 7.8595e-119 | 8.59789 |
| Ssx2ip                                                                       | Liver     | 2.30849 | 0.000297365 | 8.02982 |
| Sfi1                                                                         | Liver     | 2.30596 | 1.43633e-41 | 13.6508 |
| Lifr                                                                         | Liver     | 2.30557 | 6.22295e-39 | 137.767 |
| Slc12a5                                                                      | Liver     | 2.30336 | 2.84422e-36 | 4.49943 |
| Trmt9b                                                                       | Liver     | 2.29864 | 2.23021e-07 | 4.54142 |
| Il31ra                                                                       | Liver     | 2.29632 | 1.38064e-08 | 4.59046 |
| Parp8                                                                        | Liver     | 2.28695 | 4.67917e-21 | 16.9716 |
| Sh3rf1                                                                       | Liver     | 2.28492 | 8.49796e-48 | 110.255 |
| Tmem131l                                                                     | Liver     | 2.28223 | 6.27029e-18 | 10.0084 |
| Pard3b                                                                       | Liver     | 2.26933 | 9.99693e-16 | 153.376 |
| St6gal1                                                                      | Liver     | 2.26645 | 0.0050245   | 16.6319 |
| Snx2                                                                         | Liver     | 2.25608 | 9.9462e-147 | 48.7938 |
| Lamp2                                                                        | Liver     | 2.25451 | 2.9332e-26  | 124.289 |
| Nqo2                                                                         | Liver     | 2.24629 | 1.7943e-190 | 21.3186 |
| Apaf1                                                                        | Liver     | 2.23561 | 6.6587e-108 | 25.37   |
| Daam1                                                                        | Liver     | 2.23156 | 5.2063e-106 | 27.3699 |
| Ubp1                                                                         | Liver     | 2.23048 | 7.41903e-20 | 3.1203  |
| Cd59a                                                                        | Liver     | 2.22436 | 7.13117e-16 | 53.6254 |
| Casp4                                                                        | Liver     | 2.22357 | 9.10038e-16 | 11.2416 |
| Znrf1                                                                        | Liver     | 2.22279 | 1.6155e-276 | 95.7058 |
| Slc24a5                                                                      | Liver     | 2.21334 | 6.42047e-08 | 9.87071 |
| Crppa                                                                        | Liver     | 2.21258 | 9.38772e-26 | 5.59653 |
| Enox2                                                                        | Liver     | 2.20931 | 1.18475e-94 | 67.5503 |
| Plekhg1                                                                      | Liver     | 2.20761 | 3.09329e-75 | 210.841 |
| Snx29                                                                        | Liver     | 2.20566 | 2.96883e-11 | 30.6781 |
| Nt5c3                                                                        | Liver     | 2.20141 | 6.48869e-94 | 19.7772 |
| Sox12                                                                        | Liver     | 2.19596 | 1.31252e-11 | 3.14312 |
| Il1r1                                                                        | Liver     | 2.19253 | 4.00851e-18 | 25.1831 |
| Fam189a2                                                                     | Liver     | 2.18619 | 3.84236e-25 | 13.2449 |
| Mbd4                                                                         | Liver     | 2.18012 | 2.68761e-14 | 6.56373 |
| Srgap1                                                                       | Liver     | 2.17833 | 4.70833e-31 | 65.4684 |
| Etv1                                                                         | Liver     | 2.17718 | 5.11287e-10 | 9.96721 |
| Bace2                                                                        | Liver     | 2.16991 | 1.6988e-16  | 34.2031 |
| Cga                                                                          | Pituitary | 10.6708 | 1.1102e-166 | 43.0958 |
| Robo2                                                                        | Pituitary | 7.29126 | 3.38251e-19 | 24.3438 |
| Pcdh7                                                                        | Pituitary | 7.26881 | 4.05392e-21 | 58.0444 |
| Mmrn1                                                                        | Pituitary | 7.02754 | 4.20089e-09 | 12.0697 |
| Gsta3                                                                        | Pituitary | 6.51407 | 3.36501e-28 | 8.07474 |
| G0s2                                                                         | Pituitary | 6.49139 | 3.46957e-14 | 10.6875 |
| Tmem200a                                                                     | Pituitary | 6.06659 | 5.48106e-05 | 6.54134 |
| Gm15261                                                                      | Pituitary | 6.02649 | 1.0557e-14  | 5.51301 |
| Lipc                                                                         | Pituitary | 6.00015 | 1.67011e-58 | 5.75207 |
| Wdr17                                                                        | Pituitary | 5.85873 | 6.78827e-94 | 6.68344 |
| Cdh2                                                                         | Pituitary | 5.65529 | 3.38348e-05 | 8.79716 |
| Gm266                                                                        | Pituitary | 5.42367 | 9.03872e-18 | 3.06121 |
| Kirrel3                                                                      | Pituitary | 5.29909 | 2.04155e-23 | 47.3905 |
| Gm35853                                                                      | Pituitary | 5.26343 | 1.99012e-22 | 4.7988  |
| Rgs4                                                                         | Pituitary | 5.12773 | 0.0002958   | 3.68172 |
| A730049H05Rik                                                                | Pituitary | 5.0061  | 7.79248e-66 | 3.18741 |
| Hspb8                                                                        | Pituitary | 4.21041 | 0.000148792 | 6.56776 |
| Nkd2                                                                         | Pituitary | 4.14989 | 4.08568e-37 | 6.8183  |
| A430090L17Rik                                                                | Pituitary | 4.04675 | 3.22955e-17 | 3.7879  |
| Pard3bos1                                                                    | Pituitary | 3.993   | 1.49368e-11 | 5.29807 |

| Supplementary Table S9: Organotypic pseudobulk DEG results of cECs by organ. |           |         |             |         |
|------------------------------------------------------------------------------|-----------|---------|-------------|---------|
| Krt80                                                                        | Pituitary | 3.973   | 3.37125e-05 | 9.25669 |
| Foxl2                                                                        | Pituitary | 3.94985 | 0.0489053   | 9.28928 |
| Gm43507                                                                      | Pituitary | 3.90434 | 2.02241e-33 | 5.28885 |
| AY036118                                                                     | Pituitary | 3.86964 | 3.10654e-31 | 300.286 |
| Has3                                                                         | Pituitary | 3.84191 | 1.29356e-13 | 6.49057 |
| Robo3                                                                        | Pituitary | 3.81394 | 1.87073e-11 | 6.26838 |
| Slc18a2                                                                      | Pituitary | 3.80651 | 1.25545e-11 | 7.49949 |
| Mapkapk3                                                                     | Pituitary | 3.62666 | 1.05903e-35 | 4.50923 |
| Ttc9                                                                         | Pituitary | 3.57763 | 1.09611e-07 | 4.5244  |
| Gm15563                                                                      | Pituitary | 3.48206 | 6.85618e-15 | 3.05791 |
| 6530409C15Rik                                                                | Pituitary | 3.47239 | 1.27284e-07 | 3.24641 |
| 4931422A03Rik                                                                | Pituitary | 3.4644  | 1.182e-18   | 4.24002 |
| Htra1                                                                        | Pituitary | 3.44106 | 7.81715e-12 | 4.82384 |
| Arhgap6                                                                      | Pituitary | 3.42003 | 3.46957e-14 | 15.8713 |
| Hlf                                                                          | Pituitary | 3.36905 | 2.84152e-10 | 8.86108 |
| Ccn2                                                                         | Pituitary | 3.36879 | 3.5994e-32  | 21.9685 |
| Nos1ap                                                                       | Pituitary | 3.35165 | 1.24655e-26 | 25.9674 |
| Prss23                                                                       | Pituitary | 3.34026 | 0.000168457 | 83.2142 |
| Abca1                                                                        | Pituitary | 3.31203 | 9.52388e-22 | 48.2108 |
| Me3                                                                          | Pituitary | 3.30898 | 1.91334e-05 | 12.0018 |
| Lbp                                                                          | Pituitary | 3.22946 | 1.53684e-11 | 35.1363 |
| Col25a1                                                                      | Pituitary | 3.20798 | 6.82402e-13 | 7.77495 |
| Ppp1r14a                                                                     | Pituitary | 3.18287 | 0.00360587  | 9.39581 |
| Creb5                                                                        | Pituitary | 3.17971 | 5.72229e-08 | 7.19234 |
| Odc1                                                                         | Pituitary | 3.01125 | 6.32035e-71 | 25.5483 |
| Gm12758                                                                      | Pituitary | 3.00781 | 0.000252907 | 3.05891 |
| Stambpl1                                                                     | Pituitary | 3.00236 | 5.63062e-10 | 4.91078 |
| Cited2                                                                       | Pituitary | 2.92054 | 1.88412e-09 | 22.2656 |
| Gm26749                                                                      | Pituitary | 2.91143 | 1.75788e-10 | 4.95648 |
| 1700085D07Rik                                                                | Pituitary | 2.87956 | 5.29613e-10 | 4.63158 |
| Trp53i11                                                                     | Pituitary | 2.8688  | 3.57671e-21 | 79.6968 |
| Klhl23                                                                       | Pituitary | 2.8237  | 4.49378e-16 | 3.89386 |
| Syt15                                                                        | Pituitary | 2.80256 | 1.36743e-05 | 7.26752 |
| Gas7                                                                         | Pituitary | 2.77488 | 2.80865e-09 | 62.692  |
| Zfp667                                                                       | Pituitary | 2.77216 | 2.53127e-21 | 10.6583 |
| Scn1b                                                                        | Pituitary | 2.7646  | 7.17983e-16 | 36.8871 |
| Flrt2                                                                        | Pituitary | 2.75701 | 0.00016394  | 61.3015 |
| Gfpt2                                                                        | Pituitary | 2.67719 | 2.76699e-17 | 3.32754 |
| Sned1                                                                        | Pituitary | 2.6661  | 3.79121e-27 | 14.5943 |
| Fbln5                                                                        | Pituitary | 2.66588 | 5.72229e-08 | 14.0366 |
| Hspa1a                                                                       | Pituitary | 2.62384 | 7.21731e-08 | 92.3346 |
| Ccser1                                                                       | Pituitary | 2.61844 | 1.17078e-15 | 22.89   |
| Lysmd4                                                                       | Pituitary | 2.59656 | 1.89579e-19 | 9.58468 |
| Arhgap28                                                                     | Pituitary | 2.55847 | 1.24334e-06 | 5.2582  |
| Insyn2a                                                                      | Pituitary | 2.55158 | 1.09699e-09 | 4.8653  |
| Egflam                                                                       | Pituitary | 2.54847 | 0.0416691   | 3.67462 |
| Sema3d                                                                       | Pituitary | 2.5288  | 0.00279865  | 19.6307 |
| Cmss1                                                                        | Pituitary | 2.46833 | 7.27405e-11 | 340.859 |
| Tfpi2                                                                        | Pituitary | 2.46067 | 3.44799e-06 | 6.02751 |
| Angpt2                                                                       | Pituitary | 2.43323 | 1.27891e-13 | 10.0116 |
| Adamts9                                                                      | Pituitary | 2.42932 | 2.83343e-17 | 56.4538 |
| Gli3                                                                         | Pituitary | 2.41526 | 0.00996003  | 3.08751 |
| Bhlhe22                                                                      | Pituitary | 2.41324 | 8.1612e-06  | 3.39793 |
| Rasd1                                                                        | Pituitary | 2.37578 | 3.55813e-10 | 8.44465 |
| Col8a1                                                                       | Pituitary | 2.37323 | 6.75768e-05 | 10.0113 |
| Fos                                                                          | Pituitary | 2.34903 | 0.00015326  | 73.3885 |
| Sulf2                                                                        | Pituitary | 2.32636 | 0.0328133   | 7.04378 |
| Ltbp1                                                                        | Pituitary | 2.30454 | 0.00729835  | 90.7125 |
| Filip1l                                                                      | Pituitary | 2.28238 | 2.31274e-07 | 27.4536 |
| Tmem37                                                                       | Pituitary | 2.27684 | 1.72234e-10 | 4.27514 |
| Syn3                                                                         | Pituitary | 2.27537 | 4.31442e-17 | 17.3527 |
| Junb                                                                         | Pituitary | 2.26667 | 8.96532e-51 | 87.3439 |
| Kcnj8                                                                        | Pituitary | 2.2491  | 0.00432292  | 10.0271 |
| Wee1                                                                         | Pituitary | 2.23896 | 6.13889e-05 | 4.0511  |
| Brip1                                                                        | Pituitary | 2.2327  | 1.28545e-06 | 7.90355 |
| Auts2                                                                        | Pituitary | 2.19086 | 0.000325243 | 101.248 |
| Nceh1                                                                        | Pituitary | 2.17391 | 1.05903e-35 | 21.0691 |
| Nectin2                                                                      | Pituitary | 2.15209 | 2.32318e-05 | 37.9255 |

| Supplementary Table S9: Organotypic pseudobulk DEG results of cECs by organ. |           |         |             |         |
|------------------------------------------------------------------------------|-----------|---------|-------------|---------|
| Socs3                                                                        | Pituitary | 2.15161 | 5.73386e-07 | 15.8814 |
| Ccn1                                                                         | Pituitary | 2.15053 | 3.58641e-14 | 15.7429 |
| Apln                                                                         | Pituitary | 2.13313 | 0.0135673   | 6.89322 |
| Gm35188                                                                      | Pituitary | 2.1229  | 5.41537e-07 | 5.29044 |
| Pdgfa                                                                        | Pituitary | 2.12144 | 2.4583e-05  | 14.8147 |
| Gm16599                                                                      | Pituitary | 2.10626 | 2.70187e-06 | 4.21302 |
| Gm47405                                                                      | Pituitary | 2.08712 | 0.0165821   | 5.41155 |
| Mgp                                                                          | Pituitary | 2.07806 | 0.0366134   | 25.4639 |
| Serpnb6b                                                                     | Pituitary | 2.07728 | 2.72877e-05 | 18.4565 |
| 1600010M07Rik                                                                | Pituitary | 2.07697 | 1.74579e-13 | 4.74349 |
| Abi3bp                                                                       | Pituitary | 2.07337 | 0.00161339  | 7.70658 |
| Pdia5                                                                        | Pituitary | 2.06457 | 2.89104e-05 | 60.1517 |
| Hmgn3                                                                        | Pituitary | 2.06151 | 0.00104898  | 20.0659 |
| mt-Atp8                                                                      | Pituitary | 2.0486  | 1.05693e-06 | 9.72252 |
| Rgs5                                                                         | Pituitary | 2.04521 | 0.0141906   | 22.9435 |
| Rnd1                                                                         | Pituitary | 2.01152 | 1.03517e-09 | 7.8137  |
| Phlda3                                                                       | Pituitary | 2.00504 | 1.23134e-08 | 5.19205 |
| Hspa1b                                                                       | Pituitary | 2.00401 | 0.000130001 | 77.8897 |
| Gm15614                                                                      | Pituitary | 1.98659 | 1.7127e-17  | 13.9197 |
| 2610020C07Rik                                                                | Pituitary | 1.9613  | 3.38251e-19 | 6.37523 |
| 2610307P16Rik                                                                | Pituitary | 1.95843 | 0.0188182   | 48.6579 |
| Gm26672                                                                      | Pituitary | 1.94019 | 4.71261e-06 | 5.87309 |
| Tspan3                                                                       | Pituitary | 1.93734 | 1.41002e-11 | 20.5377 |
| 5330438D12Rik                                                                | Pituitary | 1.9333  | 2.84063e-07 | 13.5555 |
| Nlrc3                                                                        | Pituitary | 1.92161 | 0.000816873 | 7.34916 |
| Col4a4                                                                       | Pituitary | 1.90361 | 0.000115984 | 10.0997 |
| Rasa4                                                                        | Pituitary | 1.89919 | 2.91047e-16 | 14.5804 |
| Gm17106                                                                      | Pituitary | 1.8882  | 1.92899e-06 | 7.42149 |
| Col4a3                                                                       | Pituitary | 1.88567 | 0.000252192 | 23.4376 |
| Crnde                                                                        | Pituitary | 1.88183 | 0.0341689   | 5.74935 |
| Chek2                                                                        | Pituitary | 1.87476 | 1.55536e-22 | 8.66962 |
| A4galt                                                                       | Pituitary | 1.87421 | 2.24332e-05 | 10.9298 |
| Gm15283                                                                      | Pituitary | 1.86887 | 0.000511181 | 3.47465 |
| Gm48678                                                                      | Pituitary | 1.86462 | 4.11248e-06 | 13.3085 |
| 2026-09-04 00:00:00                                                          | Pituitary | 1.85997 | 2.86601e-15 | 57.5331 |
| B430010I23Rik                                                                | Pituitary | 1.84768 | 2.84011e-09 | 11.4502 |
| Mafb                                                                         | Pituitary | 1.81145 | 5.29613e-10 | 12.4534 |
| Gmpr                                                                         | Pituitary | 1.78632 | 0.0018798   | 15.9097 |
| Smo                                                                          | Pituitary | 1.78192 | 2.82696e-09 | 6.27988 |
| Gng2                                                                         | Pituitary | 1.77075 | 4.09325e-06 | 34      |
| Jund                                                                         | Pituitary | 1.76822 | 7.31988e-58 | 177.415 |
| Galk1                                                                        | Pituitary | 1.75555 | 2.92597e-19 | 11.0921 |
| Lratd2                                                                       | Pituitary | 1.73613 | 6.05172e-05 | 9.55204 |
| Zfp521                                                                       | Pituitary | 1.73326 | 2.0591e-12  | 35.0066 |
| L3mbtl3                                                                      | Pituitary | 1.73037 | 4.29821e-32 | 22.7877 |
| Jun                                                                          | Pituitary | 1.71764 | 2.71674e-20 | 257.902 |
| Fkbp10                                                                       | Pituitary | 1.71644 | 0.00695715  | 4.39415 |
| Thbs1                                                                        | Pituitary | 1.71202 | 0.0419681   | 3.13195 |
| Btg2                                                                         | Pituitary | 1.71117 | 4.9001e-14  | 60.7157 |
| A930037H05Rik                                                                | Pituitary | 1.69486 | 1.47637e-11 | 6.91486 |
| A030001D20Rik                                                                | Pituitary | 1.69203 | 8.53279e-05 | 5.60676 |
| Tanc2                                                                        | Pituitary | 1.68463 | 0.00106549  | 67.9453 |
| Gja1                                                                         | Pituitary | 1.65345 | 0.000148792 | 64.224  |
| Ptpru                                                                        | Pituitary | 1.6456  | 0.0308846   | 70.1141 |
| Ctps                                                                         | Pituitary | 1.6377  | 2.63122e-07 | 4.5128  |
| Gm16541                                                                      | Pituitary | 1.63325 | 0.0099784   | 4.38608 |
| Rps6ka1                                                                      | Pituitary | 1.63122 | 4.13776e-16 | 7.51232 |
| Fbxl2                                                                        | Pituitary | 1.62734 | 0.0102198   | 6.47122 |
| Gm26724                                                                      | Pituitary | 1.62544 | 0.0101976   | 3.87874 |
| Icam1                                                                        | Pituitary | 1.62516 | 0.00219847  | 24.1309 |
| Ralgps2                                                                      | Pituitary | 1.62307 | 0.0282377   | 34.165  |
| Hsp90aa1                                                                     | Pituitary | 1.60906 | 8.04869e-59 | 94.7201 |
| Egr1                                                                         | Pituitary | 1.60037 | 0.00366567  | 43.5901 |
| Lrg1                                                                         | Pituitary | 1.59716 | 0.00713907  | 13.632  |
| Mfsd4a                                                                       | Pituitary | 1.59516 | 0.00185685  | 10.9991 |
| Nhsl1                                                                        | Pituitary | 1.59438 | 2.04155e-23 | 47.0761 |
| Gm37240                                                                      | Pituitary | 1.59246 | 5.78137e-05 | 18.3732 |
| Usp50                                                                        | Pituitary | 1.58639 | 7.16118e-08 | 4.5232  |



| Supplementary Table S9: Organotypic pseudobulk DEG results of cECs by organ. |           |         |             |         |
|------------------------------------------------------------------------------|-----------|---------|-------------|---------|
| Gm31763                                                                      | Pituitary | 1.58072 | 4.02226e-05 | 5.72924 |
| Nup210l                                                                      | Pituitary | 1.57749 | 1.061e-05   | 3.64773 |
| P2ry10b                                                                      | Pituitary | 1.57467 | 2.89124e-09 | 7.78325 |
| Vegfc                                                                        | Pituitary | 1.57296 | 3.99594e-05 | 33.1026 |
| Pycard                                                                       | Pituitary | 1.57103 | 5.0869e-11  | 6.67418 |
| Sat1                                                                         | Pituitary | 1.56042 | 1.78868e-69 | 50.569  |
| Deup1                                                                        | Pituitary | 1.55468 | 2.09451e-10 | 7.14464 |
| Apoe                                                                         | Pituitary | 1.54674 | 3.47806e-05 | 425.806 |
| Twsq1                                                                        | Pituitary | 1.5366  | 5.61998e-06 | 7.90772 |
| St6galnac4                                                                   | Pituitary | 1.53144 | 0.000355941 | 13.5114 |
| Smco4                                                                        | Pituitary | 1.53061 | 1.45471e-10 | 115.075 |
| Elmo1                                                                        | Pituitary | 1.51971 | 0.0316108   | 75.5809 |
| P3h4                                                                         | Pituitary | 1.5091  | 0.00804201  | 5.08543 |
| Aph1b                                                                        | Pituitary | 1.50829 | 7.8829e-06  | 4.2617  |
| Mxra8                                                                        | Pituitary | 1.50673 | 1.32482e-05 | 25.7555 |
| Lmo2                                                                         | Pituitary | 1.50391 | 2.43765e-07 | 134.131 |
| Sipa1l1                                                                      | Pituitary | 1.49247 | 2.55014e-21 | 32.0245 |
| 9330175M20Rik                                                                | Pituitary | 1.46959 | 0.000157396 | 5.15924 |
| Ckb                                                                          | Pituitary | 1.46549 | 0.00418419  | 25.4321 |
| Spryd3                                                                       | Pituitary | 1.46341 | 6.38837e-07 | 17.5531 |
| Gramd1a                                                                      | Pituitary | 1.45883 | 5.8444e-10  | 11.6482 |
| Mamld1                                                                       | Pituitary | 1.45867 | 0.000538974 | 7.41154 |
| Nudt4                                                                        | Pituitary | 1.45647 | 2.52217e-06 | 28.5018 |
| Ccdc107                                                                      | Pituitary | 1.45201 | 9.57029e-10 | 9.90467 |
| Gramd4                                                                       | Pituitary | 1.44975 | 0.000680373 | 6.66567 |
| Laptm4b                                                                      | Pituitary | 1.44908 | 1.15551e-08 | 23.9238 |
| Scarb1                                                                       | Pituitary | 1.44699 | 3.40588e-05 | 115.305 |
| Lars2                                                                        | Pituitary | 1.43807 | 0.00327985  | 72.5854 |
| Nt5dc3                                                                       | Pituitary | 1.42444 | 3.38993e-05 | 5.08529 |
| Tbl1xr1                                                                      | Pituitary | 1.42099 | 2.85307e-09 | 26.9328 |
| Gm11476                                                                      | Pituitary | 1.41919 | 2.85934e-06 | 5.73289 |
| Rnf220                                                                       | Pituitary | 1.40429 | 0.00037511  | 48.6847 |
| 3110021N24Rik                                                                | Pituitary | 1.39974 | 0.00556351  | 7.44821 |
| Gm46367                                                                      | Pituitary | 1.38981 | 0.000474805 | 11.2349 |
| Adm                                                                          | Pituitary | 1.3895  | 0.0244596   | 3.66341 |
| Taf4b                                                                        | Pituitary | 1.38841 | 7.98011e-05 | 5.4682  |
| Gm15738                                                                      | Pituitary | 1.38458 | 0.0416091   | 11.3396 |
| Frmd6                                                                        | Pituitary | 1.38375 | 0.000196208 | 7.20097 |
| Isca1                                                                        | Pituitary | 1.3809  | 4.92416e-06 | 4.0949  |
| Prp3                                                                         | Pituitary | 1.37283 | 0.00350125  | 23.4352 |
| Ninj1                                                                        | Pituitary | 1.35945 | 4.73832e-09 | 25.2963 |
| Tnfrsf12a                                                                    | Pituitary | 1.35704 | 0.0374364   | 4.5689  |
| Cyp26b1                                                                      | Pituitary | 1.34486 | 0.0418489   | 65.0223 |
| 4930486L24Rik                                                                | Pituitary | 1.33705 | 0.000660945 | 3.07117 |
| 1110038B12Rik                                                                | Pituitary | 1.334   | 1.45743e-07 | 5.74803 |
| Avl9                                                                         | Pituitary | 1.32698 | 1.87073e-11 | 24.7045 |
| Cdk8                                                                         | Pituitary | 1.32439 | 0.00180502  | 88.7434 |
| Plcd1                                                                        | Pituitary | 1.31119 | 0.00170101  | 4.76437 |
| Gm47167                                                                      | Pituitary | 1.30749 | 0.0233905   | 4.94716 |
| Gm11713                                                                      | Pituitary | 1.30209 | 0.00985997  | 5.1937  |
| Stk10                                                                        | Pituitary | 1.30041 | 0.00999449  | 25.9284 |
| 1110008P14Rik                                                                | Pituitary | 1.28919 | 0.027515    | 7.27029 |
| Kcnq1ot1                                                                     | Pituitary | 1.27491 | 1.54857e-13 | 33.4682 |
| Micall1                                                                      | Pituitary | 1.26864 | 0.000118664 | 31.9956 |
| Gm49267                                                                      | Pituitary | 1.26797 | 0.0135585   | 4.13671 |
| Ppat                                                                         | Pituitary | 1.26123 | 3.26311e-07 | 8.05849 |
| 8430429K09Rik                                                                | Pituitary | 1.26098 | 0.000523977 | 3.15821 |
| H2afy2                                                                       | Pituitary | 1.26097 | 0.0246374   | 6.44355 |
| Endog                                                                        | Pituitary | 1.25976 | 0.00113419  | 5.17709 |
| Sh2b2                                                                        | Pituitary | 1.25972 | 0.0374943   | 6.32988 |
| Phlda1                                                                       | Pituitary | 1.25921 | 0.0295935   | 13.7914 |
| Ctsf                                                                         | Pituitary | 1.24485 | 5.78137e-05 | 7.05977 |
| Marcks                                                                       | Pituitary | 1.24257 | 0.0305202   | 259.037 |
| H2-Q7                                                                        | Pituitary | 1.23882 | 0.00104197  | 76.0647 |
| Olfrl56                                                                      | Pituitary | 1.23748 | 0.00104983  | 3.21214 |
| Ipo11                                                                        | Pituitary | 1.23316 | 4.55648e-14 | 61.0509 |
| Nek6                                                                         | Pituitary | 1.23111 | 7.0847e-05  | 5.02494 |
| Pank4                                                                        | Pituitary | 1.22977 | 3.51105e-08 | 6.76248 |

| Supplementary Table S9: Organotypic pseudobulk DEG results of cECs by organ. |           |          |             |         |
|------------------------------------------------------------------------------|-----------|----------|-------------|---------|
| Antxr2                                                                       | Pituitary | 1.22803  | 4.38834e-05 | 6.83172 |
| Tex14                                                                        | Pituitary | 1.22343  | 0.00144089  | 7.3782  |
| Pcdhb14                                                                      | Pituitary | 1.219    | 0.0405629   | 3.07219 |
| B4galt3                                                                      | Pituitary | 1.21888  | 5.10799e-06 | 8.79986 |
| Gm10638                                                                      | Pituitary | 1.21761  | 0.0431426   | 5.17627 |
| H2afx                                                                        | Pituitary | 1.21507  | 9.39055e-05 | 4.84243 |
| Casp12                                                                       | Pituitary | 1.20885  | 1.0222e-06  | 7.51696 |
| Chst2                                                                        | Pituitary | 1.20502  | 0.00071678  | 47.0301 |
| Kctd12                                                                       | Pituitary | 1.20469  | 5.1405e-10  | 60.1852 |
| Pitpnm2                                                                      | Pituitary | 1.20151  | 7.25245e-13 | 53.5883 |
| Gm32688                                                                      | Pituitary | 1.19169  | 0.000290657 | 18.9142 |
| Map1b                                                                        | Pituitary | 1.18424  | 0.000188934 | 34.7787 |
| Cxxc5                                                                        | Pituitary | 1.18063  | 0.0113663   | 6.25043 |
| Gm26632                                                                      | Pituitary | 1.17766  | 0.00192624  | 9.17503 |
| Ier3                                                                         | Pituitary | 1.17715  | 0.000637121 | 23.2762 |
| Abhd8                                                                        | Pituitary | 1.17644  | 0.00296991  | 7.01691 |
| Nubp1                                                                        | Pituitary | 1.16338  | 0.00882094  | 5.24126 |
| Fam57b                                                                       | Pituitary | 1.16102  | 0.018411    | 8.05726 |
| Apol10b                                                                      | Pituitary | 1.15325  | 0.0395676   | 5.68043 |
| Trp53i13                                                                     | Pituitary | 1.1527   | 0.00379122  | 6.037   |
| Hirip3                                                                       | Pituitary | 1.15176  | 0.0071002   | 3.80325 |
| Pde8a                                                                        | Pituitary | 1.14339  | 5.06704e-09 | 61.7018 |
| Nfkbiz                                                                       | Pituitary | 1.14163  | 0.0418906   | 20.9915 |
| Ppp1r14b                                                                     | Pituitary | 1.13988  | 6.46054e-16 | 19.2925 |
| Ldlrap1                                                                      | Pituitary | 1.13508  | 7.81983e-11 | 12.3272 |
| Slc38a2                                                                      | Pituitary | 1.12987  | 2.15091e-15 | 80.1715 |
| Rpl9-ps6                                                                     | Pituitary | 1.12634  | 0.00159327  | 5.50586 |
| Map3k20                                                                      | Pituitary | 1.12497  | 4.99746e-05 | 23.9309 |
| Mtss2                                                                        | Pituitary | 1.12322  | 1.86777e-05 | 21.4805 |
| Sestd1                                                                       | Pituitary | 1.11909  | 0.0373733   | 7.20695 |
| Gm42418                                                                      | Pituitary | 1.11432  | 0.0177149   | 3572.54 |
| Lrpap1                                                                       | Pituitary | 1.11357  | 2.5015e-07  | 29.0525 |
| Pald1                                                                        | Pituitary | 1.10765  | 0.00177152  | 16.6275 |
| Lcp1                                                                         | Pituitary | 1.10224  | 1.02927e-05 | 15.9872 |
| Tmem120a                                                                     | Pituitary | 1.10147  | 0.000941023 | 4.93814 |
| Myo1b                                                                        | Pituitary | 1.09824  | 0.0364061   | 39.3995 |
| Stard6                                                                       | Pituitary | 1.09583  | 0.0049533   | 3.64886 |
| 2700033N17Rik                                                                | Pituitary | 1.09583  | 0.0112831   | 9.29892 |
| Crif2                                                                        | Pituitary | 1.09206  | 0.000159042 | 19.6401 |
| Dbp                                                                          | Pituitary | 1.08554  | 0.00405448  | 3.0342  |
| Rab13                                                                        | Pituitary | 1.08233  | 6.43094e-08 | 28.8645 |
| Mvb12b                                                                       | Pituitary | 1.07848  | 1.87073e-11 | 15.259  |
| Tmem35b                                                                      | Pituitary | 1.07507  | 0.00505991  | 3.69869 |
| Pde5a                                                                        | Pituitary | 1.0637   | 0.0160965   | 8.47799 |
| Slc12a2                                                                      | Pituitary | 1.0562   | 0.0184723   | 16.3361 |
| Snhg12                                                                       | Pituitary | 1.05493  | 0.000256921 | 8.19974 |
| 4930444A19Rik                                                                | Pituitary | 1.05034  | 0.025966    | 4.24489 |
| Cyba                                                                         | Pituitary | 1.04699  | 1.37411e-07 | 79.5568 |
| Bmf                                                                          | Pituitary | 1.04668  | 0.005293    | 5.09672 |
| Xrcc6                                                                        | Pituitary | 1.04634  | 0.00648455  | 4.39052 |
| Itga2b                                                                       | Pituitary | 1.04309  | 0.0318898   | 3.02862 |
| 2310001H17Rik                                                                | Pituitary | 1.04063  | 2.3207e-07  | 9.8437  |
| Gadd45g                                                                      | Pituitary | 1.03464  | 0.00734121  | 17.6015 |
| Pdzd2                                                                        | Pituitary | 1.02963  | 0.000107298 | 48.0665 |
| Vash1                                                                        | Pituitary | 1.029    | 0.0290358   | 5.11794 |
| Tmem101                                                                      | Pituitary | 1.02696  | 0.000184362 | 5.58279 |
| Zswim4                                                                       | Pituitary | 1.0206   | 0.00492044  | 3.76995 |
| Rhoj                                                                         | Pituitary | 1.01992  | 6.1851e-33  | 131.115 |
| Zfp462                                                                       | Pituitary | 1.01504  | 7.01812e-05 | 41.5927 |
| Borcs7                                                                       | Pituitary | 1.01146  | 5.67869e-05 | 5.90536 |
| St6galnac6                                                                   | Pituitary | 1.0104   | 0.0405679   | 6.37402 |
| Sac3d1                                                                       | Pituitary | 1.00792  | 0.0443776   | 3.5488  |
| Prkag2                                                                       | Pituitary | 1.00559  | 0.0236976   | 11.6972 |
| Zc3h12b                                                                      | Pituitary | 1.00553  | 0.0295672   | 7.20402 |
| Sh3d19                                                                       | Pituitary | 1.00057  | 8.95253e-06 | 51.1583 |
| Zfp423                                                                       | Pituitary | 0.99688  | 5.62519e-05 | 18.5022 |
| Etv6                                                                         | Pituitary | 0.993361 | 6.7064e-06  | 83.7513 |
| Nr2c2ap                                                                      | Pituitary | 0.993238 | 0.0011967   | 6.08345 |

| Supplementary Table S9: Organotypic pseudobulk DEG results of cECs by organ. |           |          |             |         |
|------------------------------------------------------------------------------|-----------|----------|-------------|---------|
| Oaz2                                                                         | Pituitary | 0.990482 | 0.000276761 | 100.661 |
| Tbxa2r                                                                       | Pituitary | 0.990472 | 0.0313311   | 62.6742 |
| Atp6v1g2                                                                     | Pituitary | 0.989454 | 0.0119503   | 3.15022 |
| Zfp24                                                                        | Pituitary | 0.988029 | 6.26283e-11 | 14.9994 |
| Tnfaip8l1                                                                    | Pituitary | 0.98749  | 0.00792272  | 13.1039 |
| Kcnj2                                                                        | Pituitary | 0.986143 | 0.0173539   | 3.59709 |
| H2-Q6                                                                        | Pituitary | 0.985279 | 0.000135245 | 30.4347 |
| Fam210a                                                                      | Pituitary | 0.982513 | 0.00993584  | 4.40974 |
| Cpxm2                                                                        | Thyroid   | 6.5883   | 1.46458e-80 | 3.85559 |
| Rbp7                                                                         | Thyroid   | 4.92572  | 1.63485e-06 | 62.6013 |
| Tmem255b                                                                     | Thyroid   | 4.31921  | 9.4113e-18  | 4.54329 |
| Ssu2                                                                         | Thyroid   | 4.23287  | 9.21792e-11 | 5.12936 |
| Ace                                                                          | Thyroid   | 4.13394  | 1.58335e-21 | 4.8695  |
| Foxp2                                                                        | Thyroid   | 3.91212  | 4.9829e-08  | 3.64305 |
| Proser2                                                                      | Thyroid   | 3.68804  | 0.00347856  | 8.18803 |
| Mlf1                                                                         | Thyroid   | 3.4898   | 3.58206e-27 | 3.47107 |
| Chrm2                                                                        | Thyroid   | 3.48119  | 0.00524085  | 4.91695 |
| Sybu                                                                         | Thyroid   | 3.32405  | 0.000162724 | 12.4069 |
| Stc1                                                                         | Thyroid   | 3.243    | 1.26228e-26 | 11.38   |
| Cyb561                                                                       | Thyroid   | 3.20669  | 2.22032e-08 | 4.75353 |
| Fmo2                                                                         | Thyroid   | 3.16948  | 2.59336e-05 | 12.844  |
| Ebf3                                                                         | Thyroid   | 3.1405   | 1.74351e-11 | 9.83206 |
| Dync1i1                                                                      | Thyroid   | 3.1098   | 8.07216e-09 | 3.49296 |
| Ackr3                                                                        | Thyroid   | 3.10153  | 3.5496e-15  | 23.1933 |
| Lysmd2                                                                       | Thyroid   | 3.07454  | 5.41564e-05 | 12.0334 |
| Emp2                                                                         | Thyroid   | 2.97624  | 0.000134119 | 36.3857 |
| Cd24a                                                                        | Thyroid   | 2.90181  | 0.000456837 | 122.479 |
| Foxf1                                                                        | Thyroid   | 2.875    | 0.032276    | 7.41786 |
| Rtl8a                                                                        | Thyroid   | 2.76771  | 3.41484e-65 | 45.511  |
| Msx1                                                                         | Thyroid   | 2.72098  | 1.41069e-06 | 3.7753  |
| Igfbp7                                                                       | Thyroid   | 2.69981  | 6.86e-11    | 926.994 |
| Rcan2                                                                        | Thyroid   | 2.68726  | 0.000522584 | 8.8025  |
| Ccn3                                                                         | Thyroid   | 2.6258   | 0.00117303  | 3.79755 |
| Rhbdl2                                                                       | Thyroid   | 2.62464  | 0.000622724 | 11.6599 |
| Tnfrsf10b                                                                    | Thyroid   | 2.55341  | 1.2939e-10  | 6.03295 |
| Enpp6                                                                        | Thyroid   | 2.45808  | 0.000894533 | 19.9195 |
| Hey1                                                                         | Thyroid   | 2.42633  | 5.56225e-08 | 8.25477 |
| Rtl8b                                                                        | Thyroid   | 2.38195  | 6.26191e-18 | 28.1263 |
| Gm49980                                                                      | Thyroid   | 2.37123  | 1.87951e-07 | 3.639   |
| Crip1                                                                        | Thyroid   | 2.34652  | 6.14036e-08 | 148.513 |
| Magix                                                                        | Thyroid   | 2.29295  | 2.16534e-09 | 5.28885 |
| Eln                                                                          | Thyroid   | 2.23085  | 9.36936e-10 | 15.5222 |
| Mall                                                                         | Thyroid   | 2.22715  | 2.85478e-05 | 4.46069 |
| Tnfrsf1b                                                                     | Thyroid   | 2.19681  | 1.70103e-05 | 3.24215 |
| Fut4                                                                         | Thyroid   | 2.19575  | 0.00436169  | 3.14636 |
| C1qtnf2                                                                      | Thyroid   | 2.19113  | 6.22668e-10 | 3.64558 |
| Gzmk                                                                         | Thyroid   | 2.18102  | 2.51161e-05 | 8.70924 |
| Kctd12b                                                                      | Thyroid   | 2.18041  | 6.53791e-68 | 80.5512 |
| AW112010                                                                     | Thyroid   | 2.17758  | 1.71471e-30 | 107.757 |
| Eno1                                                                         | Thyroid   | 2.16351  | 2.04694e-17 | 25.0265 |
| Lama3                                                                        | Thyroid   | 2.15344  | 4.55144e-19 | 47.4934 |
| Alox12                                                                       | Thyroid   | 2.13837  | 3.91014e-28 | 20.8089 |
| Sh3bgrl2                                                                     | Thyroid   | 2.13283  | 3.99212e-19 | 3.57831 |
| Akr1c14                                                                      | Thyroid   | 2.09774  | 0.00292207  | 5.51365 |
| Ces2e                                                                        | Thyroid   | 2.09734  | 9.27502e-15 | 29.6912 |
| Kcnk5                                                                        | Thyroid   | 2.08315  | 8.88928e-06 | 5.90069 |
| Depp1                                                                        | Thyroid   | 2.05447  | 1.16514e-06 | 12.7786 |
| Sparcl1                                                                      | Thyroid   | 2.02123  | 0.0120188   | 198.473 |
| Pkn3                                                                         | Thyroid   | 1.98553  | 1.41517e-17 | 5.49184 |
| Cmya5                                                                        | Thyroid   | 1.98214  | 2.45997e-05 | 5.23063 |
| Ttc39c                                                                       | Thyroid   | 1.95718  | 0.00118392  | 3.26699 |
| Stmn2                                                                        | Thyroid   | 1.95212  | 0.0195386   | 14.9542 |
| Mfap2                                                                        | Thyroid   | 1.94862  | 0.00880293  | 10.0649 |
| Mgst3                                                                        | Thyroid   | 1.94064  | 1.20949e-06 | 21.0533 |
| Rrad                                                                         | Thyroid   | 1.93506  | 0.00524085  | 3.92545 |
| Enpp3                                                                        | Thyroid   | 1.93111  | 0.0173168   | 6.36049 |
| Lipe                                                                         | Thyroid   | 1.92612  | 1.40086e-31 | 17.4688 |
| Unc119b                                                                      | Thyroid   | 1.89104  | 1.35806e-05 | 14.322  |

| Supplementary Table S9: Organotypic pseudobulk DEG results of cECs by organ. |         |         |             |         |
|------------------------------------------------------------------------------|---------|---------|-------------|---------|
| Hdac9                                                                        | Thyroid | 1.88719 | 5.78046e-07 | 15.3702 |
| Atp8b1                                                                       | Thyroid | 1.87794 | 2.52644e-40 | 6.88486 |
| Gstp1                                                                        | Thyroid | 1.8753  | 1.38953e-09 | 7.95785 |
| Esm1                                                                         | Thyroid | 1.87095 | 0.0190326   | 221.059 |
| Jam3                                                                         | Thyroid | 1.8705  | 0.00048583  | 65.975  |
| Disp1                                                                        | Thyroid | 1.85317 | 1.3479e-15  | 6.11993 |
| Mfsd6                                                                        | Thyroid | 1.84758 | 4.37885e-08 | 14.7526 |
| Col13a1                                                                      | Thyroid | 1.84738 | 0.000530389 | 91.5349 |
| Lamb1                                                                        | Thyroid | 1.83022 | 0.0119181   | 11.5684 |
| Cabp1                                                                        | Thyroid | 1.82942 | 0.0292145   | 3.26058 |
| Bmp1                                                                         | Thyroid | 1.82148 | 0.00198937  | 6.23767 |
| Nav2                                                                         | Thyroid | 1.78067 | 1.69187e-26 | 23.0102 |
| Lmna                                                                         | Thyroid | 1.77834 | 5.12706e-06 | 28.3847 |
| Tcf15                                                                        | Thyroid | 1.76771 | 0.00316838  | 25.6138 |
| Ahr                                                                          | Thyroid | 1.76352 | 8.80223e-09 | 40.5317 |
| Gm28875                                                                      | Thyroid | 1.75514 | 0.00333875  | 3.61088 |
| Plscr2                                                                       | Thyroid | 1.74172 | 0.0218095   | 168.877 |
| B4galt4                                                                      | Thyroid | 1.72737 | 3.72701e-28 | 31.3732 |
| Hlx                                                                          | Thyroid | 1.7126  | 1.24076e-15 | 29.6687 |
| Bcam                                                                         | Thyroid | 1.70911 | 2.68619e-08 | 54.5942 |
| Atg4a                                                                        | Thyroid | 1.681   | 1.01154e-12 | 34.1095 |
| Ints9                                                                        | Thyroid | 1.67702 | 1.24601e-92 | 21.9841 |
| Prdm1                                                                        | Thyroid | 1.67104 | 5.04437e-05 | 22.9459 |
| Adam12                                                                       | Thyroid | 1.66841 | 2.07675e-07 | 28.6122 |
| Slco2b1                                                                      | Thyroid | 1.66826 | 0.00728735  | 16.6783 |
| Rnf152                                                                       | Thyroid | 1.65907 | 0.00221811  | 9.25468 |
| Mgll                                                                         | Thyroid | 1.6587  | 8.01402e-05 | 210.079 |
| Papss2                                                                       | Thyroid | 1.65479 | 0.000737387 | 10.7653 |
| B3gnt2                                                                       | Thyroid | 1.64466 | 9.57383e-21 | 73.6343 |
| Sox18                                                                        | Thyroid | 1.61185 | 1.64242e-27 | 184.136 |
| Tubb6                                                                        | Thyroid | 1.60017 | 0.00122374  | 6.46075 |
| Zfp979                                                                       | Thyroid | 1.58603 | 0.0108023   | 10.3594 |
| Gm13889                                                                      | Thyroid | 1.56425 | 2.27422e-09 | 27.7305 |
| Thrsp                                                                        | Thyroid | 1.56163 | 0.0111888   | 65.8795 |
| Ednrb                                                                        | Thyroid | 1.54856 | 0.0110126   | 122.664 |
| Rab3a                                                                        | Thyroid | 1.54386 | 5.44216e-21 | 5.02648 |
| Map1lc3a                                                                     | Thyroid | 1.53843 | 9.29529e-08 | 51.3644 |
| Olfrl1396                                                                    | Thyroid | 1.53726 | 5.01743e-05 | 9.31847 |
| Hmgn5                                                                        | Thyroid | 1.52889 | 9.19093e-10 | 12.3689 |
| Endod1                                                                       | Thyroid | 1.51581 | 0.0171727   | 28.7573 |
| Sncg                                                                         | Thyroid | 1.51192 | 0.0124382   | 22.9515 |
| Tubb4b                                                                       | Thyroid | 1.50886 | 1.2432e-32  | 56.7548 |
| Thbs1                                                                        | Thyroid | 1.50628 | 0.0395513   | 3.13195 |
| Fbln2                                                                        | Thyroid | 1.48244 | 0.000137227 | 10.7067 |
| Cav1                                                                         | Thyroid | 1.48026 | 0.00187527  | 89.7778 |
| Clstn1                                                                       | Thyroid | 1.47865 | 0.0137279   | 33.7817 |
| Impdh1                                                                       | Thyroid | 1.45838 | 1.91519e-11 | 38.0601 |
| Ptpre                                                                        | Thyroid | 1.45505 | 3.02409e-07 | 19.1318 |
| Hilpda                                                                       | Thyroid | 1.4508  | 8.44768e-08 | 10.2236 |
| Anxa1                                                                        | Thyroid | 1.44445 | 8.30329e-10 | 9.81002 |
| Gm15478                                                                      | Thyroid | 1.44398 | 0.000689427 | 6.10652 |
| Plscr1                                                                       | Thyroid | 1.44385 | 0.00905337  | 46.4138 |
| Fxyd5                                                                        | Thyroid | 1.44115 | 4.56757e-08 | 102.361 |
| Mmp15                                                                        | Thyroid | 1.44065 | 0.00378452  | 20.9926 |
| Ivns1abp                                                                     | Thyroid | 1.42351 | 4.92048e-12 | 98.8238 |
| Agrp                                                                         | Thyroid | 1.4194  | 0.00297599  | 4.47494 |
| Fmc1                                                                         | Thyroid | 1.41572 | 6.08591e-10 | 10.3319 |
| Ntf3                                                                         | Thyroid | 1.40786 | 3.87421e-12 | 31.7636 |
| Plp2                                                                         | Thyroid | 1.40534 | 0.000835792 | 6.16639 |
| Cx3cl1                                                                       | Thyroid | 1.37773 | 0.0497754   | 13.5341 |
| Lrp3                                                                         | Thyroid | 1.35883 | 8.10978e-05 | 6.43053 |
| 4930545L23Rik                                                                | Thyroid | 1.34303 | 0.0392424   | 3.67135 |
| Timeless                                                                     | Thyroid | 1.33969 | 3.93843e-22 | 9.15682 |
| Evl                                                                          | Thyroid | 1.33858 | 0.0100966   | 20.0357 |
| Cnqb1                                                                        | Thyroid | 1.33269 | 0.00240728  | 3.33747 |
| Ar                                                                           | Thyroid | 1.329   | 0.0416691   | 29.6538 |
| Acvr11                                                                       | Thyroid | 1.32782 | 1.77054e-05 | 63.0926 |
| Map3k5                                                                       | Thyroid | 1.31427 | 0.04125     | 23.4911 |

| Supplementary Table S9: Organotypic pseudobulk DEG results of cECs by organ. |         |         |             |         |
|------------------------------------------------------------------------------|---------|---------|-------------|---------|
| Piezo2                                                                       | Thyroid | 1.31297 | 0.0488189   | 126.037 |
| Hspa2                                                                        | Thyroid | 1.31283 | 0.000479492 | 3.5038  |
| Dok4                                                                         | Thyroid | 1.30774 | 5.63274e-06 | 22.7434 |
| Ccdc28b                                                                      | Thyroid | 1.3058  | 1.02513e-07 | 24.1883 |
| Ucp2                                                                         | Thyroid | 1.30478 | 0.0015394   | 51.6371 |
| Eef1akmt1                                                                    | Thyroid | 1.29813 | 3.35699e-07 | 4.18004 |
| Ccdc112                                                                      | Thyroid | 1.29757 | 0.00609372  | 3.64239 |
| Casz1                                                                        | Thyroid | 1.29492 | 0.00446801  | 6.59469 |
| Fam57b                                                                       | Thyroid | 1.29385 | 0.000739467 | 8.05726 |
| Lrrfp1                                                                       | Thyroid | 1.28732 | 3.00707e-12 | 52.3562 |
| Epb41l4a                                                                     | Thyroid | 1.28521 | 5.93142e-05 | 10.3216 |
| Eepd1                                                                        | Thyroid | 1.27741 | 4.27655e-09 | 19.9628 |
| Endou                                                                        | Thyroid | 1.2723  | 1.21214e-18 | 10.7581 |
| Arl6                                                                         | Thyroid | 1.26929 | 9.1599e-05  | 3.60583 |
| Sort1                                                                        | Thyroid | 1.26712 | 2.00845e-12 | 20.2303 |
| Gmn                                                                          | Thyroid | 1.26698 | 3.10344e-11 | 4.37908 |
| Lmcd1                                                                        | Thyroid | 1.26492 | 0.000204049 | 40.3817 |
| Nudt7                                                                        | Thyroid | 1.26448 | 7.55738e-07 | 4.78029 |
| 1110008P14Rik                                                                | Thyroid | 1.26286 | 0.00751475  | 7.27029 |
| Mfge8                                                                        | Thyroid | 1.26278 | 0.00205446  | 84.3965 |
| Nrarp                                                                        | Thyroid | 1.2598  | 1.73065e-24 | 15.0919 |
| Plcb1                                                                        | Thyroid | 1.24936 | 1.25723e-06 | 413.09  |
| Tubb2a                                                                       | Thyroid | 1.2469  | 0.00571008  | 16.5088 |
| Alyref                                                                       | Thyroid | 1.24493 | 1.1535e-15  | 31.2714 |
| Rnf220                                                                       | Thyroid | 1.22968 | 0.00136665  | 48.6847 |
| Gpx8                                                                         | Thyroid | 1.2276  | 0.0318987   | 13.4736 |
| Diaph2                                                                       | Thyroid | 1.21465 | 1.50426e-07 | 67.5346 |
| Cbr3                                                                         | Thyroid | 1.21266 | 6.29238e-05 | 4.56484 |
| Smox                                                                         | Thyroid | 1.20968 | 0.000157837 | 14.9411 |
| S1pr4                                                                        | Thyroid | 1.20712 | 0.000305271 | 7.0014  |
| Mpv17l2                                                                      | Thyroid | 1.20537 | 1.27729e-09 | 4.9848  |
| Cd200                                                                        | Thyroid | 1.20262 | 0.045836    | 196.475 |
| Crip2                                                                        | Thyroid | 1.19319 | 1.14934e-08 | 235.664 |
| 1500011B03Rik                                                                | Thyroid | 1.18333 | 0.000138873 | 4.27001 |
| Bloc1s1                                                                      | Thyroid | 1.17532 | 0.000303974 | 6.31308 |
| Gapdh                                                                        | Thyroid | 1.17358 | 4.71084e-09 | 93.0543 |
| Gask1b                                                                       | Thyroid | 1.17199 | 0.000638641 | 21.2436 |
| Aldh2                                                                        | Thyroid | 1.17196 | 6.07775e-06 | 73.8278 |
| Btln9                                                                        | Thyroid | 1.16313 | 0.0388786   | 167.231 |
| Prickle3                                                                     | Thyroid | 1.15871 | 6.56946e-05 | 7.57803 |
| Fam131a                                                                      | Thyroid | 1.15839 | 0.00263012  | 4.40045 |
| Ehd4                                                                         | Thyroid | 1.15805 | 0.0389174   | 275.132 |
| Psme2                                                                        | Thyroid | 1.15734 | 5.68422e-17 | 62.4446 |
| Rasgrf2                                                                      | Thyroid | 1.15641 | 0.00062362  | 33.3422 |
| Mef2c                                                                        | Thyroid | 1.14752 | 0.000363662 | 297.253 |
| Ifngr1                                                                       | Thyroid | 1.14611 | 3.40313e-05 | 53.5906 |
| Gstm1                                                                        | Thyroid | 1.14532 | 7.78042e-10 | 43.8448 |
| Polr2l                                                                       | Thyroid | 1.14459 | 2.40763e-08 | 6.22232 |
| Cactin                                                                       | Thyroid | 1.13653 | 6.86e-11    | 13.6799 |
| Col4a2                                                                       | Thyroid | 1.13312 | 4.89548e-07 | 225.575 |
| Ceacam1                                                                      | Thyroid | 1.13121 | 4.9406e-22  | 21.5291 |
| Slc48a1                                                                      | Thyroid | 1.13016 | 1.56184e-10 | 18.4234 |
| Slc43a3                                                                      | Thyroid | 1.12801 | 0.0229005   | 113.544 |
| Mea1                                                                         | Thyroid | 1.12777 | 1.18841e-06 | 11.5129 |
| N4bp2os                                                                      | Thyroid | 1.12685 | 1.73521e-08 | 3.67651 |
| Slc27a3                                                                      | Thyroid | 1.1156  | 0.0243311   | 3.05187 |
| Gne                                                                          | Thyroid | 1.11554 | 6.88912e-09 | 13.0318 |
| Dynl1f                                                                       | Thyroid | 1.11398 | 0.00129545  | 4.1599  |
| Lhfp                                                                         | Thyroid | 1.11044 | 1.96523e-09 | 6.12418 |
| Rdx                                                                          | Thyroid | 1.10467 | 6.17097e-06 | 266.476 |
| Fez2                                                                         | Thyroid | 1.1022  | 1.08502e-09 | 52.0451 |
| Slc35b1                                                                      | Thyroid | 1.09893 | 1.80965e-12 | 24.376  |
| Ly6a                                                                         | Thyroid | 1.09193 | 0.00207358  | 730.647 |
| Mcts2                                                                        | Thyroid | 1.08739 | 1.90901e-06 | 3.74357 |
| Lxn                                                                          | Thyroid | 1.08357 | 3.76855e-29 | 16.6058 |
| Nagpa                                                                        | Thyroid | 1.07995 | 1.76165e-12 | 7.21804 |
| Uba52                                                                        | Thyroid | 1.07954 | 0.00398377  | 42.4208 |
| Trim2                                                                        | Thyroid | 1.07834 | 1.77867e-05 | 27.7038 |

| Supplementary Table S9: Organotypic pseudobulk DEG results of cECs by organ. |         |          |             |         |
|------------------------------------------------------------------------------|---------|----------|-------------|---------|
| Fosl2                                                                        | Thyroid | 1.0777   | 5.02209e-14 | 15.7255 |
| Trim47                                                                       | Thyroid | 1.07539  | 3.62336e-08 | 40.761  |
| Nop16                                                                        | Thyroid | 1.07315  | 2.36697e-07 | 5.87029 |
| Cipc                                                                         | Thyroid | 1.06893  | 1.43002e-13 | 6.83809 |
| Calm1                                                                        | Thyroid | 1.06815  | 9.66268e-11 | 601.503 |
| Eef1akmt2                                                                    | Thyroid | 1.06569  | 3.41924e-05 | 5.38384 |
| Cfap20                                                                       | Thyroid | 1.06483  | 1.58425e-05 | 27.2022 |
| Slc9a3r2                                                                     | Thyroid | 1.06461  | 6.14661e-05 | 278.391 |
| Nr4a2                                                                        | Thyroid | 1.05799  | 0.0336434   | 11.6306 |
| Pttg1                                                                        | Thyroid | 1.05238  | 9.44447e-11 | 46.3001 |
| Ehd2                                                                         | Thyroid | 1.05023  | 0.0205754   | 42.5231 |
| Praf2                                                                        | Thyroid | 1.05013  | 1.27871e-07 | 7.02354 |
| Klf13                                                                        | Thyroid | 1.04687  | 1.92689e-20 | 110.753 |
| Tsc22d3                                                                      | Thyroid | 1.04535  | 1.63913e-17 | 53.0591 |
| BC028528                                                                     | Thyroid | 1.04428  | 0.0119024   | 75.0728 |
| Inka1                                                                        | Thyroid | 1.0435   | 0.00516609  | 19.6939 |
| Zfp524                                                                       | Thyroid | 1.0332   | 0.000141002 | 7.00536 |
| Cox6a1                                                                       | Thyroid | 1.03221  | 8.71197e-05 | 69.8266 |
| Smim19                                                                       | Thyroid | 1.02152  | 1.18919e-11 | 12.6861 |
| Sra1                                                                         | Thyroid | 1.02093  | 3.71139e-08 | 17.2205 |
| Tle2                                                                         | Thyroid | 1.01753  | 0.00184035  | 4.00512 |
| Ddx39                                                                        | Thyroid | 1.01297  | 0.000128334 | 11.5445 |
| Myl4                                                                         | Thyroid | 1.01294  | 0.00203994  | 3.55003 |
| Tmem238                                                                      | Thyroid | 1.01175  | 0.0365221   | 9.49876 |
| Hmbox1                                                                       | Thyroid | 1.00947  | 5.70027e-05 | 82.0471 |
| Thbd                                                                         | Thyroid | 1.00775  | 8.61529e-12 | 65.5703 |
| Ethe1                                                                        | Thyroid | 1.00709  | 5.20785e-06 | 8.42091 |
| Trpc3                                                                        | Thyroid | 1.00489  | 0.00635269  | 26.7942 |
| Atp5md                                                                       | Thyroid | 1.00415  | 0.000159897 | 36.111  |
| Tmem88                                                                       | Thyroid | 1.00371  | 2.83533e-10 | 52.4867 |
| Vps51                                                                        | Thyroid | 0.996431 | 1.28054e-05 | 3.6814  |
| Plekho1                                                                      | Thyroid | 0.991483 | 8.57863e-06 | 63.637  |
| Glis2                                                                        | Thyroid | 0.991353 | 0.000404894 | 6.39817 |
| Idi1                                                                         | Thyroid | 0.990789 | 0.00107111  | 3.77995 |
| Slc25a17                                                                     | Thyroid | 0.99064  | 1.43002e-13 | 11.4162 |
| Zdhhc12                                                                      | Thyroid | 0.989942 | 0.000161082 | 4.39511 |
| Ube2l6                                                                       | Thyroid | 0.985833 | 3.01432e-05 | 9.38882 |
| Gm49267                                                                      | Thyroid | 0.981105 | 0.0243617   | 4.13671 |
| Sulf1                                                                        | Thyroid | 0.980265 | 0.0291824   | 3.69056 |
| Etv5                                                                         | Thyroid | 0.976687 | 0.0211608   | 5.52311 |
| Apoo                                                                         | Thyroid | 0.975393 | 0.00929961  | 4.00669 |
| Gipc3                                                                        | Thyroid | 0.967777 | 1.21954e-11 | 7.31671 |
| Col4a1                                                                       | Thyroid | 0.965471 | 5.05057e-07 | 391.149 |
| Prdm16                                                                       | Thyroid | 0.965426 | 0.0168158   | 12.3104 |
| Prps2                                                                        | Thyroid | 0.963868 | 0.000434829 | 4.71757 |
| Sap30                                                                        | Thyroid | 0.961    | 0.000261413 | 5.2634  |
| Anxa4                                                                        | Thyroid | 0.960716 | 1.0256e-05  | 13.5892 |
| Sdhb                                                                         | Thyroid | 0.959312 | 1.37676e-07 | 27.9134 |
| 1110012L19Rik                                                                | Thyroid | 0.958534 | 6.22811e-07 | 6.09865 |
| 2310039H08Rik                                                                | Thyroid | 0.958069 | 6.94647e-07 | 6.6345  |
| Myct1                                                                        | Thyroid | 0.957682 | 1.20949e-06 | 88.2489 |
| Eef1e1                                                                       | Thyroid | 0.954749 | 0.000695884 | 3.50438 |
| Shf                                                                          | Thyroid | 0.953655 | 2.58226e-05 | 5.22266 |
| Pfkp                                                                         | Thyroid | 0.952678 | 9.95734e-10 | 11.5744 |
| 2300009A05Rik                                                                | Thyroid | 0.948778 | 8.52649e-05 | 7.13843 |
| Rnf5                                                                         | Thyroid | 0.944888 | 0.00111881  | 7.68031 |
| Trip10                                                                       | Thyroid | 0.94444  | 2.46143e-07 | 13.4024 |
| Mrpl38                                                                       | Thyroid | 0.942976 | 4.10503e-09 | 9.29964 |
| Cep85l                                                                       | Thyroid | 0.942972 | 8.60229e-07 | 40.2436 |
| Arhgef9                                                                      | Thyroid | 0.939622 | 0.0157475   | 4.31113 |
| Cdk5                                                                         | Thyroid | 0.934389 | 7.18664e-06 | 5.49942 |
| Lpcat1                                                                       | Thyroid | 0.933653 | 6.55481e-09 | 44.8334 |
| Mtx2                                                                         | Thyroid | 0.932917 | 4.77544e-06 | 15.6021 |
| Socs2                                                                        | Thyroid | 0.932419 | 0.00176186  | 26.6237 |
| Gm11713                                                                      | Thyroid | 0.932043 | 0.0407622   | 5.1937  |
| Sh3bp4                                                                       | Thyroid | 0.931609 | 0.0109313   | 9.61481 |
| Tagln2                                                                       | Thyroid | 0.931347 | 1.06444e-23 | 157.746 |
| Sos1                                                                         | Thyroid | 0.931251 | 4.57243e-15 | 38.933  |

| Supplementary Table S9: Organotypic pseudobulk DEG results of cECs by organ. |         |          |             |         |
|------------------------------------------------------------------------------|---------|----------|-------------|---------|
| Znhit3                                                                       | Thyroid | 0.931134 | 0.00146146  | 4.69576 |
| Prim1                                                                        | Thyroid | 0.926278 | 9.49607e-06 | 4.25269 |
| Emcn                                                                         | Thyroid | 0.9247   | 0.0466441   | 1056.33 |
| Ndufb6                                                                       | Thyroid | 0.923797 | 1.48186e-13 | 24.6193 |
| Arhgap29                                                                     | Thyroid | 0.923422 | 2.18787e-35 | 196.844 |
| Tbc1d10a                                                                     | Thyroid | 0.923239 | 0.000451288 | 4.85745 |
| Fkbp3                                                                        | Thyroid | 0.922321 | 4.08213e-05 | 46.7089 |
| Dnase1l1                                                                     | Thyroid | 0.921879 | 3.81106e-07 | 13.1216 |
| Gm16740                                                                      | Thyroid | 0.92163  | 0.00101444  | 4.32561 |
| Card19                                                                       | Thyroid | 0.920762 | 0.00195566  | 24.3868 |
| Mthfs1                                                                       | Thyroid | 0.919035 | 7.86826e-07 | 3.76692 |
| C130074G19Rik                                                                | Thyroid | 0.918218 | 0.0351624   | 33.2414 |
| Syne2                                                                        | Thyroid | 0.912825 | 2.37877e-05 | 61.1089 |
| Cald1                                                                        | Thyroid | 0.909405 | 0.00205446  | 208.703 |
| 0610009B22Rik                                                                | Thyroid | 0.908611 | 1.18829e-05 | 8.16034 |
| Aldoa                                                                        | Thyroid | 0.905488 | 3.54855e-08 | 63.7505 |
| Pik3r3                                                                       | Thyroid | 0.902993 | 4.10221e-05 | 59.3823 |
| Fdps                                                                         | Thyroid | 0.90095  | 0.00365237  | 9.33916 |
| Iitm2b                                                                       | Thyroid | 0.893553 | 4.72443e-05 | 895.015 |
| Tnfsf13                                                                      | Thyroid | 0.893427 | 1.39949e-10 | 15.9377 |
| Sertad3                                                                      | Thyroid | 0.890493 | 6.41144e-06 | 7.13859 |
| Hcfc1r1                                                                      | Thyroid | 0.890451 | 3.27061e-08 | 33.4062 |
| Cycs                                                                         | Thyroid | 0.886268 | 6.87392e-42 | 28.0529 |
| Mterf2                                                                       | Thyroid | 0.884735 | 0.00839449  | 3.24458 |
| Fkbp4                                                                        | Thyroid | 0.88209  | 0.000100572 | 24.2182 |
| Afap1                                                                        | Thyroid | 0.881953 | 0.00213739  | 13.9767 |
| Ube2a                                                                        | Thyroid | 0.880456 | 1.0271e-25  | 18.8515 |
| Pfn1                                                                         | Thyroid | 0.87949  | 2.16773e-55 | 174.867 |
| Stk38l                                                                       | Thyroid | 0.877262 | 0.000564205 | 6.10884 |
| Asna1                                                                        | Thyroid | 0.874499 | 4.16845e-07 | 8.14544 |
| Podxl                                                                        | Thyroid | 0.873412 | 0.000130646 | 217.153 |
| Tsen15                                                                       | Thyroid | 0.871854 | 1.55065e-06 | 10.5269 |
| Dhrs1                                                                        | Thyroid | 0.871518 | 9.63299e-05 | 7.45841 |
| Ciao2b                                                                       | Thyroid | 0.871225 | 0.00037     | 28.9285 |
| Fam89b                                                                       | Thyroid | 0.868594 | 8.11076e-05 | 15.4396 |
| Elof1                                                                        | Thyroid | 0.865236 | 1.30378e-05 | 12.5233 |

## Supplementary Table S10

| Supplementary Table S10. Publicly available human normal datasets used in this study. |                                                                                     |  |
|---------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--|
| Organ                                                                                 | Data                                                                                |  |
| Adrenal Gland                                                                         | GSE167860                                                                           |  |
| Pituitary Glnad                                                                       | GSE142653                                                                           |  |
| Thyroid                                                                               | GSE191288                                                                           |  |
|                                                                                       | GSE193581                                                                           |  |
| Kidney                                                                                | <a href="https://www.vascularcellatlas.org/">https://www.vascularcellatlas.org/</a> |  |
| Brain                                                                                 |                                                                                     |  |
| Liver                                                                                 |                                                                                     |  |



## Supplementary Table S11

| Supplementary Table S11: ORA results for organotypic cEC DEGs (Fig. 5 node terms) |                                                                |                     |           |                  |            |                |                                                                                                           |         |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------|---------------------|-----------|------------------|------------|----------------|-----------------------------------------------------------------------------------------------------------|---------|
| Gene_set                                                                          | Term                                                           | Overlap             | P-value   | Adjusted P-value | Odds Ratio | Combined Score | Genes                                                                                                     | Organ   |
| GO Biological Process 2023                                                        | Positive Regulation Of Vasculature Development                 | 6/104               | 4.862e-05 | 0.0368525        | 10.1751    | 101.054        | LRG1;JUP;PRKD1;FGF1;RHOB;HIPK2                                                                            | Adrenal |
| GO Biological Process 2023                                                        | Positive Regulation Of Transcription By RNA Polymerase II      | 17/938              | 7.541e-05 | 0.0368525        | 3.23941    | 30.7504        | EGR1;ZFHX3;CEBPB;THRB;JUP;FGF1;LITAF;PBX1;HIPK2;HELZ2;RPS6KA5;IRF7;NCK2;PPARG;MAML3;PRKD1;IER2            | Adrenal |
| GO Biological Process 2023                                                        | Positive Regulation Of Angiogenesis                            | 6/119               | 0.000103  | 0.0368525        | 8.81773    | 80.9506        | LRG1;JUP;PRKD1;FGF1;RHOB;HIPK2                                                                            | Adrenal |
| GO Biological Process 2023                                                        | Positive Regulation Of Multicellular Organismal Process        | 10/387              | 0.0001613 | 0.0389669        | 4.49729    | 39.2703        | CEBPB;LRG1;FABP4;FABP5;IL15;ZBTB16;F2R;PPARG;TNFRSF11A;TGFB2                                              | Adrenal |
| GO Biological Process 2023                                                        | Neutrophil Activation                                          | 2026-03-18 00:00:00 | 0.0001816 | 0.0389669        | 32.5574    | 280.443        | PREX1;FCER1G;IL15                                                                                         | Adrenal |
| GO Biological Process 2023                                                        | Positive Regulation Of DNA-templated Transcription             | 19/1243             | 0.0002575 | 0.0401166        | 2.73129    | 22.5728        | EGR1;ZFHX3;CEBPB;THRB;JUP;ZBTB16;F2R;FGF1;LITAF;PBX1;HIPK2;HELZ2;RPS6KA5;IRF7;NCK2;PPARG;MAML3;PRKD1;IER2 | Adrenal |
| GO Biological Process 2023                                                        | Regulation Of Angiogenesis                                     | 7/205               | 0.0003083 | 0.0401166        | 5.89535    | 47.6612        | LRG1;JUP;PPARG;PRKD1;FGF1;HIPK2;RHOB                                                                      | Adrenal |
| GO Biological Process 2023                                                        | Regulation Of Cold-Induced Thermogenesis                       | 6/146               | 0.0003139 | 0.0401166        | 7.10744    | 57.3314        | TLE3;CEBPB;FABP4;FABP5;IL15;NPR3                                                                          | Adrenal |
| GO Biological Process 2023                                                        | Cellular Response To Low-Density Lipoprotein Particle Stimulus | 2026-03-22 00:00:00 | 0.0003365 | 0.0401166        | 25.698     | 205.506        | FCER1G;CD9;PPARG                                                                                          | Adrenal |
| GO Biological Process 2023                                                        | Long-Chain Fatty Acid Transport                                | 2026-03-23 00:00:00 | 0.0003852 | 0.0413317        | 24.4119    | 191.92         | FABP4;FABP5;PPARG                                                                                         | Adrenal |
| GO Biological Process 2023                                                        | Vascular Transport                                             | 1983-12-01 00:00:00 | 1.38e-13  | 1.03502e-10      | 29.6208    | 877.122        | SLCO1C1;SLC7A5;SLC6A6;SLC16A1;TFRC;SLC1A1;SLC2A1;SLC16A2;SLC22A8;SLC7A1;SLC38A5;MFSD2A                    | Brain   |
| GO Biological Process 2023                                                        | Transport Across Blood-Brain Barrier                           | 1985-12-01 00:00:00 | 1.855e-13 | 1.03502e-10      | 28.8064    | 844.482        | SLCO1C1;SLC7A5;SLC6A6;SLC16A1;TFRC;SLC1A1;SLC2A1;SLC16A2;SLC22A8;SLC7A1;SLC38A5;MFSD2A                    | Brain   |
| GO Biological Process 2023                                                        | Carboxylic Acid Transport                                      | 1953-07-01 00:00:00 | 3.818e-08 | 1.42042e-05      | 25.5717    | 436.786        | SLC7A5;SLC6A6;SLC16A1;SLC16A2;SLC7A1;SLC16A4;SLC38A5                                                      | Brain   |
| GO Biological Process 2023                                                        | Amino Acid Import Across Plasma Membrane                       | 2026-05-27 00:00:00 | 6.362e-07 | 0.000170159      | 37.6004    | 536.473        | SLC6A6;SLC7A5;SLC1A1;SLC7A1;SLC38A5                                                                       | Brain   |
| GO Biological Process 2023                                                        | Maintenance Of Blood-Brain Barrier                             | 2026-05-29 00:00:00 | 9.265e-07 | 0.000170159      | 34.4635    | 478.761        | CLDN5;OCLN;SLC1A1;LSR;MFSD2A                                                                              | Brain   |
| GO Biological Process 2023                                                        | Positive Regulation Of Cellular Process                        | 16/594              | 9.347e-07 | 0.000170159      | 4.90067    | 68.0359        | TGFB2;EDN1;LEF1;FN1;PTN;IGF1R;SLC6A6;CLDN5;FRMD5;CXCL12;SPOCK2;PAR3;NAMPT;CTSH;AQP11;MFSD2A               | Brain   |
| GO Biological Process 2023                                                        | Mesenchymal Cell Differentiation                               | 1954-06-01 00:00:00 | 1.067e-06 | 0.000170159      | 20.8267    | 286.375        | FOXC1;TGFB2;SEMA3C;FOXF2;LEF1;SLC39A10                                                                    | Brain   |
| GO Biological Process 2023                                                        | Regulation Of Cell Migration                                   | 13/434              | 3.347e-06 | 0.000464251      | 5.36355    | 67.6212        | EDN1;JAG1;SEMA3C;LEF1;NKD1;IGF1R;CLDN5;FRMD5;CXCL12;DACH1;CTSH;TMSB10;RECK                                | Brain   |
| GO Biological Process 2023                                                        | Import Into Cell                                               | 1938-05-01 00:00:00 | 3.744e-06 | 0.000464251      | 25.053     | 313.047        | SLC6A6;SLC7A5;SLC16A2;SLC7A1;SLC38A5                                                                      | Brain   |
| GO Biological Process 2023                                                        | Amino Acid Transmembrane Transport                             | 1942-05-01 00:00:00 | 6.22e-06  | 0.000694106      | 22.3401    | 267.809        | SLC6A6;SLC7A5;SLC16A2;SLC7A1;SLC38A5                                                                      | Brain   |
| GO Biological Process 2023                                                        | Thyroid Hormone Transport                                      | 2026-03-07 00:00:00 | 8.19e-06  | 0.00083092       | 122.158    | 1430.78        | SLCO1C1;SLC7A5;SLC16A2                                                                                    | Brain   |
| GO Biological Process 2023                                                        | Regulation Of Epithelial Cell Migration                        | 1950-05-01 00:00:00 | 1.488e-05 | 0.00138428       | 18.3611    | 204.087        | PTPRR;TGFB2;CTSH;PTN;GLUL                                                                                 | Brain   |

| Supplementary Table S11: ORA results for organotypic cEC DEGs (Fig. 5 node terms) |                                                                     |                     |           |            |         |         |                                                                      |       |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------|---------------------|-----------|------------|---------|---------|----------------------------------------------------------------------|-------|
| GO Biological Process 2023                                                        | Hormone Transport                                                   | 2026-03-09 00:00:00 | 1.948e-05 | 0.00155766 | 81.4303 | 883.215 | SLCO1C1;SLC7A5;SLC16A2                                               | Brain |
| GO Biological Process 2023                                                        | L-amino Acid Transport                                              | 2026-04-26 00:00:00 | 1.954e-05 | 0.00155766 | 29.8317 | 323.466 | SLC7A5;SLC1A1;SLC7A1;SLC38A5                                         | Brain |
| GO Biological Process 2023                                                        | Intracellular Monoatomic Cation Homeostasis                         | 8/190               | 2.61e-05  | 0.00194188 | 7.39852 | 78.0807 | PRNP;EDN1;CXCL12;TFRC;SLC40A1;SLC39A10;SLC30A1;CP                    | Brain |
| GO Biological Process 2023                                                        | Amide Transport                                                     | 1932-04-01 00:00:00 | 4.566e-05 | 0.00299737 | 23.4321 | 234.188 | SLC1A1;AQP11;PLTP;SLC38A5                                            | Brain |
| GO Biological Process 2023                                                        | Transition Metal Ion Transport                                      | 1932-04-01 00:00:00 | 4.566e-05 | 0.00299737 | 23.4321 | 234.188 | TFRC;SLC31A1;SLC30A1;CP                                              | Brain |
| GO Biological Process 2023                                                        | Neutral Amino Acid Transport                                        | 1935-04-01 00:00:00 | 6.553e-05 | 0.00406262 | 21.1613 | 203.848 | SLC6A6;SLC7A5;SLC1A1;SLC38A5                                         | Brain |
| GO Biological Process 2023                                                        | Monocarboxylic Acid Transport                                       | 1973-05-01 00:00:00 | 9.409e-05 | 0.00552679 | 12.1366 | 112.521 | SLCO1C1;SLC16A1;SLC16A2;SLC16A4;MFSD2A                               | Brain |
| GO Biological Process 2023                                                        | L-alpha-amino Acid Transmembrane Transport                          | 1940-04-01 00:00:00 | 0.0001116 | 0.00622974 | 18.2176 | 165.784 | SLC7A5;SLC1A1;SLC7A1;SLC38A5                                         | Brain |
| GO Biological Process 2023                                                        | Organonitrogen Compound Biosynthetic Process                        | 6/123               | 0.0001236 | 0.00657061 | 8.51454 | 76.615  | ALAS1;SGMS1;DEGS2;ELOVL7;SGPP2;MFSD2A                                | Brain |
| GO Biological Process 2023                                                        | Positive Regulation Of Stem Cell Differentiation                    | 2026-03-17 00:00:00 | 0.000152  | 0.00771099 | 34.8847 | 306.691 | FOXC1;TGFB2;PTN                                                      | Brain |
| GO Biological Process 2023                                                        | Amino Acid Transport                                                | 1946-04-01 00:00:00 | 0.0001937 | 0.00939704 | 15.6104 | 133.459 | SLC6A6;SLC7A5;SLC7A1;SLC38A5                                         | Brain |
| GO Biological Process 2023                                                        | Positive Regulation Of Epithelial To Mesenchymal Transition         | 1947-04-01 00:00:00 | 0.0002107 | 0.00940407 | 15.2466 | 129.066 | FOXC1;TGFB2;JAG1;LEF1                                                | Brain |
| GO Biological Process 2023                                                        | Epithelial To Mesenchymal Transition                                | 1947-04-01 00:00:00 | 0.0002107 | 0.00940407 | 15.2466 | 129.066 | TGFB2;FOXF2;LEF1;SLC39A10                                            | Brain |
| GO Biological Process 2023                                                        | Positive Regulation Of Cell Migration                               | 8/272               | 0.000315  | 0.0135222  | 5.07925 | 40.9532 | TGFB2;EDN1;CXCL12;SEMA3C;LEF1;FN1;CTSH;IGF1R                         | Brain |
| GO Biological Process 2023                                                        | Tight Junction Assembly                                             | 1953-04-01 00:00:00 | 0.000336  | 0.0138881  | 13.3756 | 106.983 | CLDN5;OCLN;PARD3;LSR                                                 | Brain |
| GO Biological Process 2023                                                        | Iron Ion Transport                                                  | 2026-03-24 00:00:00 | 0.0004382 | 0.0171101  | 23.2482 | 179.774 | TFRC;SLC40A1;CP                                                      | Brain |
| GO Biological Process 2023                                                        | Membrane Lipid Biosynthetic Process                                 | 1957-04-01 00:00:00 | 0.0004446 | 0.0171101  | 12.3636 | 95.4262 | SGMS1;ELOVL7;DEGS2;SGPP2                                             | Brain |
| GO Biological Process 2023                                                        | Positive Regulation Of Cell Motility                                | 7/221               | 0.0004842 | 0.0180139  | 5.45014 | 41.6005 | EDN1;CXCL12;SEMA3C;SPOCK2;LEF1;CTSH;IGF1R                            | Brain |
| GO Biological Process 2023                                                        | Negative Regulation Of Neural Precursor Cell Proliferation          | 2026-02-07 00:00:00 | 0.0007972 | 0.0247144  | 64.6179 | 461.007 | PTN;SLC16A2                                                          | Brain |
| GO Biological Process 2023                                                        | Aromatic Amino Acid Transport                                       | 2026-02-07 00:00:00 | 0.0007972 | 0.0247144  | 64.6179 | 461.007 | SLC7A5;SLC38A5                                                       | Brain |
| GO Biological Process 2023                                                        | Response To Auditory Stimulus                                       | 2026-02-07 00:00:00 | 0.0007972 | 0.0247144  | 64.6179 | 461.007 | USP53;PTN                                                            | Brain |
| GO Biological Process 2023                                                        | Positive Regulation Of Cardiac Epithelial To Mesenchymal Transition | 2026-02-07 00:00:00 | 0.0007972 | 0.0247144  | 64.6179 | 461.007 | TGFB2;JAG1                                                           | Brain |
| GO Biological Process 2023                                                        | Dendritic Spine Maintenance                                         | 2026-02-07 00:00:00 | 0.0007972 | 0.0247144  | 64.6179 | 461.007 | PRNP;IGF1R                                                           | Brain |
| GO Biological Process 2023                                                        | Sulfur Amino Acid Transport                                         | 2026-02-07 00:00:00 | 0.0007972 | 0.0247144  | 64.6179 | 461.007 | SLC7A5;SLC1A1                                                        | Brain |
| GO Biological Process 2023                                                        | Positive Regulation Of Cell Population Proliferation                | 10/483              | 0.0009171 | 0.0276608  | 3.56687 | 24.9479 | CLDN5;TGFB2;EDN1;LEF1;NAMPT;FN1;CTSH;AQP11;PTN;IGF1R                 | Brain |
| GO Biological Process 2023                                                        | Regulation Of Cell Population Proliferation                         | 13/766              | 0.0010205 | 0.0299701  | 2.94757 | 20.3013 | TGFB2;EDN1;JAG1;TFRC;FN1;PTN;TOB1;IGF1R;CLDN5;DDAH1;NAMPT;CTSH;AQP11 | Brain |

| Supplementary Table S11: ORA results for organotypic cEC DEGs (Fig. 5 node terms) |                                                                 |                     |            |             |         |         |                                                              |       |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------|---------------------|------------|-------------|---------|---------|--------------------------------------------------------------|-------|
| GO Biological Process 2023                                                        | Integrin Activation                                             | 2026-02-08 00:00:00 | 0.0010 586 | 0.0302933   | 53.8455 | 368.883 | CXCL12;FN1                                                   | Brain |
| GO Biological Process 2023                                                        | Positive Regulation Of Notch Signaling Pathway                  | 1933-03-01 00:00:00 | 0.0011 339 | 0.0316346   | 16.2664 | 110.321 | TGFB2;JAG1;TSPAN5                                            | Brain |
| GO Biological Process 2023                                                        | Sphingolipid Biosynthetic Process                               | 1977-04-01 00:00:00 | 0.0013 838 | 0.0376654   | 8.96728 | 59.0311 | SGMS1;ELOVL7;DEGS2;SGPP2                                     | Brain |
| GO Biological Process 2023                                                        | Negative Regulation Of Cell Motility                            | 5/133               | 0.0014 952 | 0.0397291   | 6.42806 | 41.8178 | CLDN5;FRMD5;DACH1;JAG1;RECK                                  | Brain |
| GO Biological Process 2023                                                        | Acidic Amino Acid Transport                                     | 2026-02-10 00:00:00 | 0.0016 875 | 0.0418502   | 40.3801 | 257.807 | SLC6A6;SLC1A1                                                | Brain |
| GO Biological Process 2023                                                        | Diol Metabolic Process                                          | 2026-02-10 00:00:00 | 0.0016 875 | 0.0418502   | 40.3801 | 257.807 | DEGS2;SGPP2                                                  | Brain |
| GO Biological Process 2023                                                        | Positive Regulation Of Dendrite Development                     | 2026-02-10 00:00:00 | 0.0016 875 | 0.0418502   | 40.3801 | 257.807 | PTN;LRP8                                                     | Brain |
| GO Biological Process 2023                                                        | Negative Regulation Of Vascular Permeability                    | 2026-02-11 00:00:00 | 0.0020 541 | 0.0477575   | 35.8916 | 222.094 | CLDN5;DDAH1                                                  | Brain |
| GO Biological Process 2023                                                        | Podocyte Differentiation                                        | 2026-02-11 00:00:00 | 0.0020 541 | 0.0477575   | 35.8916 | 222.094 | JAG1;PROM1                                                   | Brain |
| GO Biological Process 2023                                                        | Sphingoid Metabolic Process                                     | 2026-02-11 00:00:00 | 0.0020 541 | 0.0477575   | 35.8916 | 222.094 | DEGS2;SGPP2                                                  | Brain |
| GO Biological Process 2023                                                        | Regulation Of Dendrite Development                              | 1941-03-01 00:00:00 | 0.0021 363 | 0.0486544   | 12.8367 | 78.9291 | PTN;LRP8;MFSD2A                                              | Brain |
| GO Biological Process 2023                                                        | Positive Regulation Of Cell Adhesion                            | 1988-04-01 00:00:00 | 0.0022 621 | 0.049811    | 7.78867 | 47.4443 | FRMD5;TGFB2;CXCL12;NDNF                                      | Brain |
| GO Biological Process 2023                                                        | Ceramide Biosynthetic Process                                   | 1942-03-01 00:00:00 | 0.0022 902 | 0.049811    | 12.5069 | 76.0313 | SGMS1;ST8SIA4;DEGS2                                          | Brain |
| GO Biological Process 2023                                                        | Alanine Transport                                               | 2026-02-12 00:00:00 | 0.0024 548 | 0.049811    | 32.3008 | 194.118 | SLC6A6;SLC7A5                                                | Brain |
| GO Biological Process 2023                                                        | Cardiac Right Ventricle Morphogenesis                           | 2026-02-12 00:00:00 | 0.0024 548 | 0.049811    | 32.3008 | 194.118 | TGFB2;JAG1                                                   | Brain |
| GO Biological Process 2023                                                        | Cellular Component Maintenance                                  | 2026-02-12 00:00:00 | 0.0024 548 | 0.049811    | 32.3008 | 194.118 | PRNP;IGF1R                                                   | Brain |
| GO Biological Process 2023                                                        | Eye Photoreceptor Cell Differentiation                          | 2026-02-12 00:00:00 | 0.0024 548 | 0.049811    | 32.3008 | 194.118 | PROM1;NKD1                                                   | Brain |
| GO Biological Process 2023                                                        | Receptor-Mediated Endocytosis                                   | 9/122               | 7.329e-08  | 9.40319e-05 | 13.5687 | 222.917 | DPP4;MSR1;DAB2;MRC1;STAB1;STAB2;ARRB2;FCGR2 B;CXCL16         | Liver |
| GO Biological Process 2023                                                        | Endocytosis                                                     | 9/189               | 2.959e-06  | 0.00189815  | 8.48922 | 108.074 | MSR1;EHD3;DAB2;SNX18;MRC1;STAB1;STAB2;FCGR2 B;CXCL16         | Liver |
| GO Biological Process 2023                                                        | Atrioventricular Valve Morphogenesis                            | 2026-04-19 00:00:00 | 5.241e-06  | 0.00224124  | 43.7686 | 532.185 | OLFM1;BMP2;GATA4;SMAD6                                       | Liver |
| GO Biological Process 2023                                                        | Homophilic Cell Adhesion Via Plasma Membrane Adhesion Molecules | 1960-05-01 00:00:00 | 3.65e-05   | 0.011708    | 15.0152 | 153.427 | CD84;CDH4;PALLD;CDH13;ROBO1                                  | Liver |
| GO Biological Process 2023                                                        | Negative Regulation Of Canonical Wnt Signaling Pathway          | 6/114               | 8.122e-05  | 0.0208417   | 9.22829 | 86.915  | PRKN;BMP2;DAB2;IGFBP4;PRICKLE1;TPBGL                         | Liver |
| GO Biological Process 2023                                                        | Aortic Valve Development                                        | 1940-04-01 00:00:00 | 0.0001 116 | 0.0238732   | 18.2176 | 165.784 | BMP2;GATA4;SMAD6;ROBO1                                       | Liver |
| GO Biological Process 2023                                                        | Epithelial Cell Migration                                       | 1946-04-01 00:00:00 | 0.0001 937 | 0.0339927   | 15.6104 | 133.459 | DPP4;ZEB2;KIT;CDH13                                          | Liver |
| GO Biological Process 2023                                                        | Positive Regulation Of Cell Population Proliferation            | 11/483              | 0.0002 271 | 0.0339927   | 3.96657 | 33.2804 | DPP4;BMP2;MEIS1;ACER3;CDH13;IL6ST;ZFPM2;WNT2; BMP6;AQP1;LGMN | Liver |
| GO Biological Process 2023                                                        | Negative Regulation Of Wnt Signaling Pathway                    | 6/140               | 0.0002 504 | 0.0339927   | 7.42794 | 61.5949 | PRKN;BMP2;DAB2;IGFBP4;PRICKLE1;TPBGL                         | Liver |

| Supplementary Table S11: ORA results for organotypic cEC DEGs (Fig. 5 node terms) |                                                                      |                        |               |           |         |         |                                                                              |       |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------|------------------------|---------------|-----------|---------|---------|------------------------------------------------------------------------------|-------|
| GO Biological Process 2023                                                        | Regulation Of Cell Population Proliferation                          | 14/766                 | 0.0003<br>116 | 0.0339927 | 3.20733 | 25.8956 | CXCL9;SMAD6;BMP6;DPP4;CXCL10;IL1A;BMP2;MEIS1;ACER3;KIT;CDH13;IL6ST;WNT2;LGMN | Liver |
| GO Biological Process 2023                                                        | Regulation Of Canonical Wnt Signaling Pathway                        | 7/207                  | 0.0003<br>269 | 0.0339927 | 5.83581 | 46.8371 | PRKN;BMP2;DAB2;ZEB2;IGFBP4;PRICKLE1;TPBGL                                    | Liver |
| GO Biological Process 2023                                                        | Regulation Of Cell Migration                                         | 10/434                 | 0.0004<br>021 | 0.0339927 | 3.98913 | 31.19   | ADGRG3;BMP2;DAB2;MMP14;HGF;KIT;CDH13;PLXNC1;CXCL16;ROBO1                     | Liver |
| GO Biological Process 2023                                                        | Outflow Tract Septum Morphogenesis                                   | 2026-03-24<br>00:00:00 | 0.0004<br>382 | 0.0339927 | 23.2482 | 179.774 | SMAD6;ZFPM2;ROBO1                                                            | Liver |
| GO Biological Process 2023                                                        | Positive Regulation Of Vascular Endothelial Growth Factor Production | 2026-03-24<br>00:00:00 | 0.0004<br>382 | 0.0339927 | 23.2482 | 179.774 | IL1A;GATA4;IL6ST                                                             | Liver |
| GO Biological Process 2023                                                        | Positive Regulation Of Cell Motility                                 | 7/221                  | 0.0004<br>842 | 0.0339927 | 5.45014 | 41.6005 | BMP2;DAB2;MMP14;HGF;KIT;CDH13;CXCL16                                         | Liver |
| GO Biological Process 2023                                                        | Plasma Membrane Invagination                                         | 2026-03-26<br>00:00:00 | 0.0005<br>578 | 0.0339927 | 21.2245 | 159.003 | MSR1;SNX18;FCGR2B                                                            | Liver |
| GO Biological Process 2023                                                        | Regulation Of Vascular Endothelial Growth Factor Production          | 2026-03-26<br>00:00:00 | 0.0005<br>578 | 0.0339927 | 21.2245 | 159.003 | IL1A;GATA4;IL6ST                                                             | Liver |
| GO Biological Process 2023                                                        | Atrioventricular Valve Formation                                     | 2026-02-06<br>00:00:00 | 0.0005<br>718 | 0.0339927 | 80.7764 | 603.136 | OLFM1;GATA4                                                                  | Liver |
| GO Biological Process 2023                                                        | Cellular Response To Hepatocyte Growth Factor Stimulus               | 2026-02-06<br>00:00:00 | 0.0005<br>718 | 0.0339927 | 80.7764 | 603.136 | HGF;LGMN                                                                     | Liver |
| GO Biological Process 2023                                                        | Response To Hepatocyte Growth Factor                                 | 2026-02-06<br>00:00:00 | 0.0005<br>718 | 0.0339927 | 80.7764 | 603.136 | HGF;LGMN                                                                     | Liver |
| GO Biological Process 2023                                                        | Regulation Of Pathway-Restricted SMAD Protein Phosphorylation        | 1961-04-01<br>00:00:00 | 0.0005<br>762 | 0.0339927 | 11.4937 | 85.7321 | BMP2;DAB2;SMAD6;BMP6                                                         | Liver |
| GO Biological Process 2023                                                        | Cellular Response To Lipid                                           | 7/228                  | 0.0005<br>829 | 0.0339927 | 5.27563 | 39.2904 | CXCL10;IL1A;CXCL9;SIRPA;TFPI;WNT2;AQP1                                       | Liver |
| GO Biological Process 2023                                                        | Cell-Matrix Adhesion                                                 | 5/109                  | 0.0006<br>12  | 0.034141  | 7.92107 | 58.6058 | VCAM1;ITGA8;LYVE1;PPFIA2;ITGA9                                               | Liver |
| GO Biological Process 2023                                                        | Inflammatory Response                                                | 7/236                  | 0.0007<br>145 | 0.0378414 | 5.08926 | 36.8661 | CXCL10;IL1A;BMP2;CXCL9;VCAM1;KIT;FCGR2B                                      | Liver |
| GO Biological Process 2023                                                        | Cell-Cell Adhesion Via Plasma-Membrane Adhesion Molecules            | 6/172                  | 0.0007<br>476 | 0.0378414 | 5.98633 | 43.0935 | CD84;CDH4;VCAM1;PALLD;CDH13;ROBO1                                            | Liver |
| GO Biological Process 2023                                                        | Regulation Of Nitric Oxide Metabolic Process                         | 2026-02-07<br>00:00:00 | 0.0007<br>972 | 0.0378414 | 64.6179 | 461.007 | SIRPA;TMEM106A                                                               | Liver |
| GO Biological Process 2023                                                        | Regulation Of Oxidative Stress-Induced Cell Death                    | 2026-02-07<br>00:00:00 | 0.0007<br>972 | 0.0378414 | 64.6179 | 461.007 | PRKN;GATA4                                                                   | Liver |
| GO Biological Process 2023                                                        | Cellular Response To Molecule Of Bacterial Origin                    | 5/117                  | 0.0008<br>436 | 0.0378414 | 7.35231 | 52.038  | CXCL10;IL1A;CXCL9;SIRPA;FCGR2B                                               | Liver |
| GO Biological Process 2023                                                        | Phagocytosis, Engulfment                                             | 2026-03-30<br>00:00:00 | 0.0008<br>553 | 0.0378414 | 18.0765 | 127.693 | MSR1;FCGR2B;XKR6                                                             | Liver |
| GO Biological Process 2023                                                        | Negative Regulation Of Leukocyte Degranulation                       | 2026-02-08<br>00:00:00 | 0.0010<br>586 | 0.043814  | 53.8455 | 368.883 | CD84;FCGR2B                                                                  | Liver |
| GO Biological Process 2023                                                        | Intestinal Epithelial Cell Differentiation                           | 2026-02-08<br>00:00:00 | 0.0010<br>586 | 0.043814  | 53.8455 | 368.883 | GATA4;IL6ST                                                                  | Liver |
| GO Biological Process 2023                                                        | Negative Regulation Of Macromolecule Metabolic Process               | 6/186                  | 0.0011<br>215 | 0.044108  | 5.51681 | 37.4763 | PRKN;OLFM1;MSR1;BMP2;LGMN;ROBO1                                              | Liver |
| GO Biological Process 2023                                                        | Positive Regulation Of Secretion By Cell                             | 1973-04-01<br>00:00:00 | 0.0011<br>345 | 0.044108  | 9.48904 | 64.3505 | CADPS2;IL1A;BMP2;BMP6                                                        | Liver |
| GO Biological Process 2023                                                        | Cellular Response To Amyloid-Beta                                    | 1934-03-01<br>00:00:00 | 0.0012<br>379 | 0.0462713 | 15.7409 | 105.374 | VCAM1;FCGR2B;LGMN                                                            | Liver |
| GO Biological Process 2023                                                        | Positive Regulation Of Cellular Process                              | 11/594                 | 0.0012<br>623 | 0.0462713 | 3.19298 | 21.3127 | DPP4;BMP2;MMP14;MEIS1;ACER3;IL6ST;FCGR2B;WNT2;BMP6;CXCL16;LGMN               | Liver |

| Supplementary Table S11: ORA results for organotypic cEC DEGs (Fig. 5 node terms) |                                                                                            |                     |           |             |         |         |                                                          |           |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|---------------------|-----------|-------------|---------|---------|----------------------------------------------------------|-----------|
| GO Biological Process 2023                                                        | Transmembrane Receptor Protein Serine/Threonine Kinase Signaling Pathway                   | 5/130               | 0.0013515 | 0.0470044   | 6.58333 | 43.493  | BMP2;HPGD;ARRB2;SMAD6;BMP6                               | Liver     |
| GO Biological Process 2023                                                        | Iron Ion Transmembrane Transport                                                           | 2026-02-09 00:00:00 | 0.0013555 | 0.0470044   | 46.151  | 304.76  | SLC25A37;SLC39A8                                         | Liver     |
| GO Biological Process 2023                                                        | Aortic Valve Morphogenesis                                                                 | 1937-03-01 00:00:00 | 0.0015856 | 0.0498183   | 14.3498 | 92.5098 | GATA4;SMAD6;ROBO1                                        | Liver     |
| GO Biological Process 2023                                                        | Ventricular Septum Development                                                             | 1937-03-01 00:00:00 | 0.0015856 | 0.0498183   | 14.3498 | 92.5098 | GATA4;ZFPM2;ROBO1                                        | Liver     |
| GO Biological Process 2023                                                        | Positive Regulation Of Cell Migration                                                      | 7/272               | 0.0016251 | 0.0498183   | 4.38983 | 28.1924 | BMP2;DAB2;MMP14;HGF;KIT;CDH13;CXCL16                     | Liver     |
| GO Biological Process 2023                                                        | Regulation Of Dendritic Cell Differentiation                                               | 2026-02-10 00:00:00 | 0.0016875 | 0.0498183   | 40.3801 | 257.807 | LGALS1;FCGR2B                                            | Liver     |
| GO Biological Process 2023                                                        | T Cell Chemotaxis                                                                          | 2026-02-10 00:00:00 | 0.0016875 | 0.0498183   | 40.3801 | 257.807 | CXCL10;CXCL16                                            | Liver     |
| GO Biological Process 2023                                                        | Positive Regulation Of Non-Canonical Wnt Signaling Pathway                                 | 2026-02-10 00:00:00 | 0.0016875 | 0.0498183   | 40.3801 | 257.807 | DAB2;RSPO3                                               | Liver     |
| GO Biological Process 2023                                                        | Positive Regulation Of Intracellular Signal Transduction                                   | 10/525              | 0.0017085 | 0.0498183   | 3.26889 | 20.8298 | PRKN;BMP2;DAB2;WDR59;LGALS1;HGF;KIT;CDH13;BM P6;TMEM106A | Liver     |
| GO Biological Process 2023                                                        | Integrated Stress Response Signaling                                                       | 2026-05-29 00:00:00 | 9.265e-07 | 0.000906153 | 34.4635 | 478.761 | JUN;MAFB;MAP3K20;FOS;JUNB                                | Pituitary |
| GO Biological Process 2023                                                        | Positive Regulation Of Steroid Metabolic Process                                           | 2026-03-06 00:00:00 | 4.702e-06 | 0.00229904  | 162.885 | 1998.22 | APOE;CGA;LDLRAP1                                         | Pituitary |
| GO Biological Process 2023                                                        | Regulation Of Protein Modification By Small Protein Conjugation Or Removal                 | 2026-04-29 00:00:00 | 3.06e-05  | 0.00926902  | 26.2479 | 272.837 | EGR1;HSP90AA1;HSPA1B;HSPA1A                              | Pituitary |
| GO Biological Process 2023                                                        | Polyamine Metabolic Process                                                                | 2026-03-11 00:00:00 | 3.791e-05 | 0.00926902  | 61.0666 | 621.676 | ODC1;SAT1;SLC38A2                                        | Pituitary |
| GO Biological Process 2023                                                        | Positive Regulation Of Nitric-Oxide Synthase Activity                                      | 2026-03-17 00:00:00 | 0.000152  | 0.0297329   | 34.8847 | 306.691 | SCARB1;NOS1AP;APOE                                       | Pituitary |
| GO Biological Process 2023                                                        | Positive Regulation Of Vascular Associated Smooth Muscle Cell Proliferation                | 2026-03-20 00:00:00 | 0.0002514 | 0.0342476   | 28.7242 | 238.083 | JUN;GJA1;LDLRAP1                                         | Pituitary |
| GO Biological Process 2023                                                        | Negative Regulation Of Transcription From RNA Polymerase II Promoter In Response To Stress | 2026-02-05 00:00:00 | 0.0003828 | 0.0342476   | 107.707 | 847.451 | JUN;CITED2                                               | Pituitary |
| GO Biological Process 2023                                                        | Cellular Heat Acclimation                                                                  | 2026-02-05 00:00:00 | 0.0003828 | 0.0342476   | 107.707 | 847.451 | HSPA1B;HSPA1A                                            | Pituitary |
| GO Biological Process 2023                                                        | Heat Acclimation                                                                           | 2026-02-05 00:00:00 | 0.0003828 | 0.0342476   | 107.707 | 847.451 | HSPA1B;HSPA1A                                            | Pituitary |
| GO Biological Process 2023                                                        | Positive Regulation Of Tau-Protein Kinase Activity                                         | 2026-02-05 00:00:00 | 0.0003828 | 0.0342476   | 107.707 | 847.451 | EGR1;HSP90AA1                                            | Pituitary |
| GO Biological Process 2023                                                        | Axon Extension                                                                             | 2026-03-23 00:00:00 | 0.0003852 | 0.0342476   | 24.4119 | 191.92  | HSP90AA1;AUTS2;MAP1B                                     | Pituitary |
| GO Biological Process 2023                                                        | Positive Regulation Of Monooxygenase Activity                                              | 2026-03-26 00:00:00 | 0.0005578 | 0.039944    | 21.2245 | 159.003 | SCARB1;NOS1AP;APOE                                       | Pituitary |
| GO Biological Process 2023                                                        | Regulation Of Nucleotide-Binding Oligomerization Domain Containing 2 Signaling Pathway     | 2026-02-06 00:00:00 | 0.0005718 | 0.039944    | 80.7764 | 603.136 | HSPA1B;HSPA1A                                            | Pituitary |
| GO Biological Process 2023                                                        | Polyamine Biosynthetic Process                                                             | 2026-02-06 00:00:00 | 0.0005718 | 0.039944    | 80.7764 | 603.136 | SAT1;SLC38A2                                             | Pituitary |
| GO Biological Process 2023                                                        | Regulation Of Nitric-Oxide Synthase Activity                                               | 2026-03-28 00:00:00 | 0.0006965 | 0.0454108   | 19.5246 | 141.933 | SCARB1;NOS1AP;APOE                                       | Pituitary |
| GO Biological Process 2023                                                        | Spermidine Metabolic Process                                                               | 2026-02-07 00:00:00 | 0.0007972 | 0.0458647   | 64.6179 | 461.007 | SAT1;SLC38A2                                             | Pituitary |
| GO Biological Process 2023                                                        | Positive Regulation Of Microtubule Nucleation                                              | 2026-02-07 00:00:00 | 0.0007972 | 0.0458647   | 64.6179 | 461.007 | HSPA1B;HSPA1A                                            | Pituitary |

| Supplementary Table S11: ORA results for organotypic cEC DEGs (Fig. 5 node terms) |                                                     |                     |           |             |         |         |                                                                  |         |
|-----------------------------------------------------------------------------------|-----------------------------------------------------|---------------------|-----------|-------------|---------|---------|------------------------------------------------------------------|---------|
| GO Biological Process 2023                                                        | Negative Regulation Of Homotypic Cell-Cell Adhesion | 2026-03-10 00:00:00 | 2.77e-05  | 0.0158037   | 69.7939 | 732.429 | CEACAM1;RDX;ALOX12                                               | Thyroid |
| GO Biological Process 2023                                                        | Regulation Of Neuron Death                          | 1958-05-01 00:00:00 | 3.093e-05 | 0.0158037   | 15.5833 | 161.813 | MEF2C;TRIM2;SNCG;CD200;MAP3K5                                    | Thyroid |
| GO Biological Process 2023                                                        | Endodermal Cell Differentiation                     | 1931-04-01 00:00:00 | 4.014e-05 | 0.0158037   | 24.3012 | 246.001 | COL4A2;MMP15;LAMA3;LAMB1                                         | Thyroid |
| GO Biological Process 2023                                                        | Endoderm Formation                                  | 1935-04-01 00:00:00 | 6.553e-05 | 0.0193466   | 21.1613 | 203.848 | COL4A2;MMP15;LAMA3;LAMB1                                         | Thyroid |
| MSigDB Hallmark 2020                                                              | Interferon Gamma Response                           | 10/200              | 5.222e-07 | 1.93217e-05 | 9.00915 | 130.319 | HELZ2;PNP;RSAD2;IL15;IRF7;IFI44;CMPK2;UPP1;IFIT1;IFIT3           | Adrenal |
| MSigDB Hallmark 2020                                                              | Interferon Alpha Response                           | 1997-07-01 00:00:00 | 2.536e-06 | 4.69091e-05 | 13.041  | 168.034 | HELZ2;RSAD2;IL15;IRF7;CMPK2;IFI44;IFIT3                          | Adrenal |
| MSigDB Hallmark 2020                                                              | Epithelial Mesenchymal Transition                   | 9/200               | 4.699e-06 | 5.79511e-05 | 7.99585 | 98.0948 | ITGB5;IL15;PMP22;PLAUR;TIMP3;SLIT3;EDIL3;NID2;RHOB               | Adrenal |
| MSigDB Hallmark 2020                                                              | TNF-alpha Signaling via NF-kB                       | 7/200               | 0.0002654 | 0.00245475  | 6.04962 | 49.8147 | EGR1;CEBPB;PLAUR;PHLDA1;LITAF;IER2;RHOB                          | Adrenal |
| MSigDB Hallmark 2020                                                              | Cholesterol Homeostasis                             | 1974-04-01 00:00:00 | 0.0011936 | 0.00883259  | 9.35301 | 62.9531 | FABP5;PLAUR;CD9;PPARG                                            | Adrenal |
| MSigDB Hallmark 2020                                                              | Mitotic Spindle                                     | 6/199               | 0.0015838 | 0.00976648  | 5.14181 | 33.1542 | PREX1;CDC42EP4;FSCN1;NCK2;ARHGAP27;SYNPO                         | Adrenal |
| MSigDB Hallmark 2020                                                              | UV Response Dn                                      | 5/144               | 0.0021194 | 0.0112024   | 5.91607 | 36.4231 | INPP4B;PMP22;PPARG;KALRN;TGFB2                                   | Adrenal |
| MSigDB Hallmark 2020                                                              | IL-2/STAT5 Signaling                                | 5/199               | 0.0083119 | 0.0348763   | 4.22702 | 20.2477 | CCND3;PNP;PHLDA1;HIPK2;RHOB                                      | Adrenal |
| MSigDB Hallmark 2020                                                              | p53 Pathway                                         | 5/200               | 0.0084834 | 0.0348763   | 4.20513 | 20.057  | CCND3;ZBTB16;F2R;DDIT4;UPP1                                      | Adrenal |
| MSigDB Hallmark 2020                                                              | Estrogen Response Early                             | 10/200              | 5.222e-07 | 2.08884e-05 | 9.00915 | 130.319 | SLC7A5;ABLM1;FOXC1;SLC16A1;CXCL12;ABHD2;SLC1A1;SLC2A1;TOB1;IGF1R | Brain   |
| MSigDB Hallmark 2020                                                              | Estrogen Response Late                              | 9/200               | 4.699e-06 | 9.39747e-05 | 7.99585 | 98.0948 | SLC7A5;FOXC1;SLC16A1;CXCL12;TSPAN13;ABHD2;LSR;HMGCS2;TOB1        | Brain   |
| MSigDB Hallmark 2020                                                              | Wnt-beta Catenin Signaling                          | 1942-03-01 00:00:00 | 0.0022902 | 0.0305356   | 12.5069 | 76.0313 | JAG1;LEF1;NKD1                                                   | Brain   |
| MSigDB Hallmark 2020                                                              | Interferon Alpha Response                           | 1997-08-01 00:00:00 | 1.686e-07 | 5.90075e-06 | 15.201  | 237.071 | PLSCR1;CSF1;RSAD2;CCRL2;CMPK2;IFI44;NCOA7;IFIT3                  | Kidney  |
| MSigDB Hallmark 2020                                                              | Cholesterol Homeostasis                             | 1974-05-01 00:00:00 | 0.0001004 | 0.0017572   | 11.9601 | 110.108 | PLSCR1;PLAUR;LPL;CD9;S100A11                                     | Kidney  |
| MSigDB Hallmark 2020                                                              | Xenobiotic Metabolism                               | 6/200               | 0.0016245 | 0.0189528   | 5.11505 | 32.8516 | CBR1;DDAH2;EPHX1;DHPS;IGF1;PTS                                   | Kidney  |
| MSigDB Hallmark 2020                                                              | IL-6/JAK/STAT3 Signaling                            | 1987-04-01 00:00:00 | 0.0021696 | 0.0189843   | 7.8829  | 48.3474 | CSF1;IL10RB;CD9;IL2RG                                            | Kidney  |
| MSigDB Hallmark 2020                                                              | IL-2/STAT5 Signaling                                | 5/199               | 0.0083119 | 0.0371149   | 4.22702 | 20.2477 | PLSCR1;CSF1;S100A1;SMPDL3A;IGF2R                                 | Kidney  |
| MSigDB Hallmark 2020                                                              | TNF-alpha Signaling via NF-kB                       | 5/200               | 0.0084834 | 0.0371149   | 4.20513 | 20.057  | DRAM1;CSF1;CCRL2;PLAUR;SGK1                                      | Kidney  |
| MSigDB Hallmark 2020                                                              | Interferon Gamma Response                           | 5/200               | 0.0084834 | 0.0371149   | 4.20513 | 20.057  | PLSCR1;RSAD2;IFI44;CMPK2;IFIT3                                   | Kidney  |
| MSigDB Hallmark 2020                                                              | p53 Pathway                                         | 5/200               | 0.0084834 | 0.0371149   | 4.20513 | 20.057  | DRAM1;EPHX1;KLK8;TM4SF1;S100A10                                  | Kidney  |
| MSigDB Hallmark 2020                                                              | Coagulation                                         | 4/138               | 0.0110586 | 0.0430058   | 4.87011 | 21.9376 | S100A1;CD9;PLAT;KLK8                                             | Kidney  |
| MSigDB Hallmark 2020                                                              | Complement                                          | 7/200               | 0.0002654 | 0.0049095   | 6.04962 | 49.8147 | DPP4;MMP14;F8;CDH13;ZFPM2;CD55;LGMN                              | Liver   |

| Supplementary Table S11: ORA results for organotypic cEC DEGs (Fig. 5 node terms) |                                   |        |           |             |         |         |                                                                                  |           |
|-----------------------------------------------------------------------------------|-----------------------------------|--------|-----------|-------------|---------|---------|----------------------------------------------------------------------------------|-----------|
| MSigDB Hallmark 2020                                                              | Inflammatory Response             | 7/200  | 0.0002654 | 0.0049095   | 6.04962 | 49.8147 | CXCL10;MSR1;IL1A;MMP14;CXCL9;STAB1;CD55                                          | Liver     |
| MSigDB Hallmark 2020                                                              | Apical Junction                   | 6/200  | 0.0016245 | 0.0150269   | 5.11505 | 32.8516 | CDH4;VCAM1;ADAM23;SHROOM2;SIRPA;ITGA9                                            | Liver     |
| MSigDB Hallmark 2020                                                              | Epithelial Mesenchymal Transition | 6/200  | 0.0016245 | 0.0150269   | 5.11505 | 32.8516 | DAB2;MMP14;VCAM1;LGALS1;IGFBP4;SNTB1                                             | Liver     |
| MSigDB Hallmark 2020                                                              | UV Response Up                    | 5/158  | 0.0031654 | 0.0221503   | 5.37092 | 30.9122 | OLFM1;BMP2;MMP14;ARRB2;IL6ST                                                     | Liver     |
| MSigDB Hallmark 2020                                                              | Androgen Response                 | 4/100  | 0.0035919 | 0.0221503   | 6.81095 | 38.3393 | MAF;HPGD;SELENOP;IQGAP2                                                          | Liver     |
| MSigDB Hallmark 2020                                                              | TNF-alpha Signaling via NF-kB     | 15/200 | 2.038e-12 | 7.74266e-11 | 14.5135 | 390.693 | ABCA1;EGR1;JUN;BTG2;G0S2;FOS;SAT1;ICAM1;SOCS3;MARCKS;NINJ1;CCN1;PHLDA1;JUNB;IER3 | Pituitary |
| MSigDB Hallmark 2020                                                              | Hypoxia                           | 9/200  | 4.699e-06 | 8.9276e-05  | 7.99585 | 98.0948 | SCARB1;JUN;CITED2;CCN2;FOS;CCN1;CHST2;IER3;GALK1                                 | Pituitary |
| MSigDB Hallmark 2020                                                              | UV Response Dn                    | 7/144  | 3.404e-05 | 0.000357546 | 8.5467  | 87.929  | GJA1;SIPA1L1;CITED2;MAP1B;CCN1;LTBP1;FBLN5                                       | Pituitary |
| MSigDB Hallmark 2020                                                              | Epithelial Mesenchymal Transition | 8/200  | 3.764e-05 | 0.000357546 | 7.00962 | 71.4107 | GJA1;JUN;MGP;VEGFC;CCN2;CCN1;SAT1;FBLN5                                          | Pituitary |
| MSigDB Hallmark 2020                                                              | p53 Pathway                       | 7/200  | 0.0002654 | 0.00201688  | 6.04962 | 49.8147 | JUN;BTG2;NINJ1;PDGFA;FOS;SAT1;IER3                                               | Pituitary |
| MSigDB Hallmark 2020                                                              | Inflammatory Response             | 6/200  | 0.0016245 | 0.0102887   | 5.11505 | 32.8516 | ABCA1;BTG2;PCDH7;CHST2;SCN1B;ICAM1                                               | Pituitary |
| MSigDB Hallmark 2020                                                              | Estrogen Response Early           | 5/200  | 0.0084834 | 0.0358189   | 4.20513 | 20.057  | SCARB1;GJA1;CYP26B1;FOS;PRSS23                                                   | Pituitary |
| MSigDB Hallmark 2020                                                              | Estrogen Response Late            | 5/200  | 0.0084834 | 0.0358189   | 4.20513 | 20.057  | SCARB1;CYP26B1;FOS;CKB;PRSS23                                                    | Pituitary |
| MSigDB Hallmark 2020                                                              | Apical Junction                   | 5/200  | 0.0084834 | 0.0358189   | 4.20513 | 20.057  | CDK8;MAP3K20;LDLRAP1;NECTIN2;ICAM1                                               | Pituitary |
| MSigDB Hallmark 2020                                                              | Adipogenesis                      | 8/200  | 3.764e-05 | 0.00131728  | 7.00962 | 71.4107 | LIPE;ALDH2;IFNGR1;MGST3;UCP2;SPARCL1;SNCG;MGLL                                   | Thyroid   |
| MSigDB Hallmark 2020                                                              | Hypoxia                           | 7/200  | 0.0002654 | 0.00464412  | 6.04962 | 49.8147 | LXN;CAV1;STC1;ACKR3;ENO1;GAPDH;FOSL2                                             | Thyroid   |
| MSigDB Hallmark 2020                                                              | heme Metabolism                   | 6/200  | 0.0016245 | 0.0189528   | 5.11505 | 32.8516 | BCAM;SMOX;MGST3;UCP2;ENDOD1;ATG4A                                                | Thyroid   |
| MSigDB Hallmark 2020                                                              | Estrogen Response Early           | 5/200  | 0.0084834 | 0.0494866   | 4.20513 | 20.057  | AR;ENDOD1;NAV2;PAPSS2;SYBU                                                       | Thyroid   |
| MSigDB Hallmark 2020                                                              | Myogenesis                        | 5/200  | 0.0084834 | 0.0494866   | 4.20513 | 20.057  | MEF2C;COL4A2;ADAM12;IGFBP7;NAV2                                                  | Thyroid   |
| MSigDB Hallmark 2020                                                              | Epithelial Mesenchymal Transition | 5/200  | 0.0084834 | 0.0494866   | 4.20513 | 20.057  | COL4A2;ELN;ADAM12;LAMA3;FBLN2                                                    | Thyroid   |

## Supplementary Table S12

| Supplementary Table S12: Cell-cell interaction results for inflammation→related LR pairs |              |           |          |                 |
|------------------------------------------------------------------------------------------|--------------|-----------|----------|-----------------|
| pair_direction                                                                           | pair_label   | Organ     | lr_means | cellphone_pvals |
| Capillary→T cell                                                                         | Angpt2 Tek   | Adrenal   | 0        | 1               |
| Capillary→T cell                                                                         | Angpt2 Tek   | Pituitary | 0.240469 | 0               |
| Capillary→T cell                                                                         | Angpt2 Tek   | Liver     | 0        | 1               |
| Capillary→T cell                                                                         | Angpt2 Tek   | Kidney    | 0        | 1               |
| Capillary→T cell                                                                         | Angpt2 Tek   | Thyroid   | 0        | 1               |
| Capillary→T cell                                                                         | Angpt2 Tek   | Brain     | 0        | 1               |
| Capillary→T cell                                                                         | Cxcl10 Cxcr3 | Adrenal   | 0        | 1               |
| Capillary→T cell                                                                         | Cxcl10 Cxcr3 | Pituitary | 0        | 1               |
| Capillary→T cell                                                                         | Cxcl10 Cxcr3 | Liver     | 0.291314 | 0               |
| Capillary→T cell                                                                         | Cxcl10 Cxcr3 | Kidney    | 0        | 1               |
| Capillary→T cell                                                                         | Cxcl10 Cxcr3 | Thyroid   | 0        | 1               |
| Capillary→T cell                                                                         | Cxcl10 Cxcr3 | Brain     | 0        | 1               |
| Capillary→T cell                                                                         | Cxcl16 Cxcr6 | Adrenal   | 0        | 1               |
| Capillary→T cell                                                                         | Cxcl16 Cxcr6 | Pituitary | 0        | 1               |
| Capillary→T cell                                                                         | Cxcl16 Cxcr6 | Liver     | 0.712616 | 0               |
| Capillary→T cell                                                                         | Cxcl16 Cxcr6 | Kidney    | 0        | 1               |
| Capillary→T cell                                                                         | Cxcl16 Cxcr6 | Thyroid   | 0        | 1               |
| Capillary→T cell                                                                         | Cxcl16 Cxcr6 | Brain     | 0        | 1               |
| Capillary→T cell                                                                         | Gnai2 Ccr5   | Adrenal   | 1.31031  | 0               |
| Capillary→T cell                                                                         | Gnai2 Ccr5   | Pituitary | 0        | 1               |
| Capillary→T cell                                                                         | Gnai2 Ccr5   | Liver     | 1.02406  | 0               |
| Capillary→T cell                                                                         | Gnai2 Ccr5   | Kidney    | 1.05746  | 0               |
| Capillary→T cell                                                                         | Gnai2 Ccr5   | Thyroid   | 0        | 1               |
| Capillary→T cell                                                                         | Gnai2 Ccr5   | Brain     | 0        | 1               |
| Capillary→T cell                                                                         | Gnai2 Cxcr3  | Adrenal   | 1.24536  | 0               |
| Capillary→T cell                                                                         | Gnai2 Cxcr3  | Pituitary | 0        | 1               |
| Capillary→T cell                                                                         | Gnai2 Cxcr3  | Liver     | 0.86236  | 0               |
| Capillary→T cell                                                                         | Gnai2 Cxcr3  | Kidney    | 0        | 1               |
| Capillary→T cell                                                                         | Gnai2 Cxcr3  | Thyroid   | 0        | 1               |
| Capillary→T cell                                                                         | Gnai2 Cxcr3  | Brain     | 0        | 1               |
| Capillary→T cell                                                                         | Grn Tnfrsf1a | Adrenal   | 0        | 1               |
| Capillary→T cell                                                                         | Grn Tnfrsf1a | Pituitary | 0.301181 | 0               |
| Capillary→T cell                                                                         | Grn Tnfrsf1a | Liver     | 0.452825 | 0               |
| Capillary→T cell                                                                         | Grn Tnfrsf1a | Kidney    | 0        | 1               |
| Capillary→T cell                                                                         | Grn Tnfrsf1a | Thyroid   | 0        | 1               |
| Capillary→T cell                                                                         | Grn Tnfrsf1a | Brain     | 0        | 1               |
| Capillary→T cell                                                                         | Grn Tnfrsf1b | Adrenal   | 0.427367 | 0.001           |
| Capillary→T cell                                                                         | Grn Tnfrsf1b | Pituitary | 0.393468 | 0               |
| Capillary→T cell                                                                         | Grn Tnfrsf1b | Liver     | 0.647539 | 0               |
| Capillary→T cell                                                                         | Grn Tnfrsf1b | Kidney    | 0        | 1               |
| Capillary→T cell                                                                         | Grn Tnfrsf1b | Thyroid   | 0        | 1               |
| Capillary→T cell                                                                         | Grn Tnfrsf1b | Brain     | 0        | 1               |



| Supplementary Table S12: Cell–cell interaction results for inflammation→related LR pairs |                   |           |          |       |
|------------------------------------------------------------------------------------------|-------------------|-----------|----------|-------|
| Capillary→T cell                                                                         | Icam1 Itgam       | Adrenal   | 0.261294 | 0     |
| Capillary→T cell                                                                         | Icam1 Itgam       | Pituitary | 0        | 1     |
| Capillary→T cell                                                                         | Icam1 Itgam       | Liver     | 0        | 1     |
| Capillary→T cell                                                                         | Icam1 Itgam       | Kidney    | 0        | 1     |
| Capillary→T cell                                                                         | Icam1 Itgam       | Thyroid   | 0        | 1     |
| Capillary→T cell                                                                         | Icam1 Itgam       | Brain     | 0        | 1     |
| Capillary→T cell                                                                         | Icam1 Itgax       | Adrenal   | 0.304769 | 0     |
| Capillary→T cell                                                                         | Icam1 Itgax       | Pituitary | 0        | 1     |
| Capillary→T cell                                                                         | Icam1 Itgax       | Liver     | 0.220072 | 0     |
| Capillary→T cell                                                                         | Icam1 Itgax       | Kidney    | 0        | 1     |
| Capillary→T cell                                                                         | Icam1 Itgax       | Thyroid   | 0        | 1     |
| Capillary→T cell                                                                         | Icam1 Itgax       | Brain     | 0        | 1     |
| Capillary→T cell                                                                         | Icam1 Itgb2       | Adrenal   | 0.516303 | 0     |
| Capillary→T cell                                                                         | Icam1 Itgb2       | Pituitary | 0        | 1     |
| Capillary→T cell                                                                         | Icam1 Itgb2       | Liver     | 0.502543 | 0     |
| Capillary→T cell                                                                         | Icam1 Itgb2       | Kidney    | 0.331644 | 0     |
| Capillary→T cell                                                                         | Icam1 Itgb2       | Thyroid   | 0        | 1     |
| Capillary→T cell                                                                         | Icam1 Itgb2       | Brain     | 0        | 1     |
| Capillary→T cell                                                                         | Icam1 Spn         | Adrenal   | 0.413557 | 0     |
| Capillary→T cell                                                                         | Icam1 Spn         | Pituitary | 0        | 1     |
| Capillary→T cell                                                                         | Icam1 Spn         | Liver     | 0.472539 | 0     |
| Capillary→T cell                                                                         | Icam1 Spn         | Kidney    | 0.259657 | 0     |
| Capillary→T cell                                                                         | Icam1 Spn         | Thyroid   | 0        | 1     |
| Capillary→T cell                                                                         | Icam1 Spn         | Brain     | 0        | 1     |
| Capillary→T cell                                                                         | Timp3 Kdr         | Adrenal   | 0        | 1     |
| Capillary→T cell                                                                         | Timp3 Kdr         | Pituitary | 1.18961  | 0     |
| Capillary→T cell                                                                         | Timp3 Kdr         | Liver     | 0        | 1     |
| Capillary→T cell                                                                         | Timp3 Kdr         | Kidney    | 0        | 1     |
| Capillary→T cell                                                                         | Timp3 Kdr         | Thyroid   | 0        | 1     |
| Capillary→T cell                                                                         | Timp3 Kdr         | Brain     | 0        | 1     |
| Capillary→T cell                                                                         | Tnfsf12 Tnfrsf12a | Adrenal   | 0.248583 | 0     |
| Capillary→T cell                                                                         | Tnfsf12 Tnfrsf12a | Pituitary | 0.15132  | 0.002 |
| Capillary→T cell                                                                         | Tnfsf12 Tnfrsf12a | Liver     | 0        | 1     |
| Capillary→T cell                                                                         | Tnfsf12 Tnfrsf12a | Kidney    | 0        | 1     |
| Capillary→T cell                                                                         | Tnfsf12 Tnfrsf12a | Thyroid   | 0        | 1     |
| Capillary→T cell                                                                         | Tnfsf12 Tnfrsf12a | Brain     | 0        | 1     |
| Capillary→T cell                                                                         | Vcam1 Itgb1       | Adrenal   | 0        | 1     |
| Capillary→T cell                                                                         | Vcam1 Itgb1       | Pituitary | 0        | 1     |
| Capillary→T cell                                                                         | Vcam1 Itgb1       | Liver     | 0.735105 | 0     |
| Capillary→T cell                                                                         | Vcam1 Itgb1       | Kidney    | 0        | 1     |
| Capillary→T cell                                                                         | Vcam1 Itgb1       | Thyroid   | 0        | 1     |
| Capillary→T cell                                                                         | Vcam1 Itgb1       | Brain     | 0        | 1     |
| Capillary→T cell                                                                         | Vcam1 Itgb7       | Adrenal   | 0        | 1     |
| Capillary→T cell                                                                         | Vcam1 Itgb7       | Pituitary | 0        | 1     |
| Capillary→T cell                                                                         | Vcam1 Itgb7       | Liver     | 0.601057 | 0     |

| Supplementary Table S12: Cell–cell interaction results for inflammation→related LR pairs |             |           |          |   |
|------------------------------------------------------------------------------------------|-------------|-----------|----------|---|
| Capillary→T cell                                                                         | Vcam1 Itgb7 | Kidney    | 0        | 1 |
| Capillary→T cell                                                                         | Vcam1 Itgb7 | Thyroid   | 0        | 1 |
| Capillary→T cell                                                                         | Vcam1 Itgb7 | Brain     | 0        | 1 |
| T cell→Capillary                                                                         | Ccl5 Ccr12  | Adrenal   | 1.65824  | 0 |
| T cell→Capillary                                                                         | Ccl5 Ccr12  | Pituitary | 0.359763 | 0 |
| T cell→Capillary                                                                         | Ccl5 Ccr12  | Liver     | 0        | 1 |
| T cell→Capillary                                                                         | Ccl5 Ccr12  | Kidney    | 1.01645  | 0 |
| T cell→Capillary                                                                         | Ccl5 Ccr12  | Thyroid   | 0        | 1 |
| T cell→Capillary                                                                         | Ccl5 Ccr12  | Brain     | 0        | 1 |
| T cell→Capillary                                                                         | Ccl5 Dpp4   | Adrenal   | 0        | 1 |
| T cell→Capillary                                                                         | Ccl5 Dpp4   | Pituitary | 0        | 1 |
| T cell→Capillary                                                                         | Ccl5 Dpp4   | Liver     | 1.79396  | 0 |
| T cell→Capillary                                                                         | Ccl5 Dpp4   | Kidney    | 0        | 1 |
| T cell→Capillary                                                                         | Ccl5 Dpp4   | Thyroid   | 0        | 1 |
| T cell→Capillary                                                                         | Ccl5 Dpp4   | Brain     | 0        | 1 |
| T cell→Capillary                                                                         | Ccl5 Sdc4   | Adrenal   | 0        | 1 |
| T cell→Capillary                                                                         | Ccl5 Sdc4   | Pituitary | 0        | 1 |
| T cell→Capillary                                                                         | Ccl5 Sdc4   | Liver     | 0.882775 | 0 |
| T cell→Capillary                                                                         | Ccl5 Sdc4   | Kidney    | 0        | 1 |
| T cell→Capillary                                                                         | Ccl5 Sdc4   | Thyroid   | 0        | 1 |
| T cell→Capillary                                                                         | Ccl5 Sdc4   | Brain     | 0        | 1 |
| T cell→Capillary                                                                         | Cd38 Pecam1 | Adrenal   | 1.27335  | 0 |
| T cell→Capillary                                                                         | Cd38 Pecam1 | Pituitary | 0.911842 | 0 |
| T cell→Capillary                                                                         | Cd38 Pecam1 | Liver     | 0        | 1 |
| T cell→Capillary                                                                         | Cd38 Pecam1 | Kidney    | 0        | 1 |
| T cell→Capillary                                                                         | Cd38 Pecam1 | Thyroid   | 0        | 1 |
| T cell→Capillary                                                                         | Cd38 Pecam1 | Brain     | 0        | 1 |
| T cell→Capillary                                                                         | Egfl Nrp1   | Adrenal   | 0        | 1 |
| T cell→Capillary                                                                         | Egfl Nrp1   | Pituitary | 0        | 1 |
| T cell→Capillary                                                                         | Egfl Nrp1   | Liver     | 0        | 1 |
| T cell→Capillary                                                                         | Egfl Nrp1   | Kidney    | 1.43592  | 0 |
| T cell→Capillary                                                                         | Egfl Nrp1   | Thyroid   | 0        | 1 |
| T cell→Capillary                                                                         | Egfl Nrp1   | Brain     | 0        | 1 |
| T cell→Capillary                                                                         | Fas Fas     | Adrenal   | 0.467606 | 0 |
| T cell→Capillary                                                                         | Fas Fas     | Pituitary | 0        | 1 |
| T cell→Capillary                                                                         | Fas Fas     | Liver     | 0.433162 | 0 |
| T cell→Capillary                                                                         | Fas Fas     | Kidney    | 0.366049 | 0 |
| T cell→Capillary                                                                         | Fas Fas     | Thyroid   | 0        | 1 |
| T cell→Capillary                                                                         | Fas Fas     | Brain     | 0        | 1 |
| T cell→Capillary                                                                         | Fgf1 Nrp1   | Adrenal   | 1.41136  | 0 |
| T cell→Capillary                                                                         | Fgf1 Nrp1   | Pituitary | 0        | 1 |
| T cell→Capillary                                                                         | Fgf1 Nrp1   | Liver     | 0        | 1 |
| T cell→Capillary                                                                         | Fgf1 Nrp1   | Kidney    | 0        | 1 |
| T cell→Capillary                                                                         | Fgf1 Nrp1   | Thyroid   | 0        | 1 |
| T cell→Capillary                                                                         | Fgf1 Nrp1   | Brain     | 0        | 1 |

| Supplementary Table S12: Cell–cell interaction results for inflammation→related LR pairs |              |           |          |   |
|------------------------------------------------------------------------------------------|--------------|-----------|----------|---|
| T cell→Capillary                                                                         | Grn Tnfrsf1a | Adrenal   | 0        | 1 |
| T cell→Capillary                                                                         | Grn Tnfrsf1a | Pituitary | 0.361428 | 0 |
| T cell→Capillary                                                                         | Grn Tnfrsf1a | Liver     | 0        | 1 |
| T cell→Capillary                                                                         | Grn Tnfrsf1a | Kidney    | 0.412297 | 0 |
| T cell→Capillary                                                                         | Grn Tnfrsf1a | Thyroid   | 0        | 1 |
| T cell→Capillary                                                                         | Grn Tnfrsf1a | Brain     | 0        | 1 |
| T cell→Capillary                                                                         | Ifng Ifngr1  | Adrenal   | 0        | 1 |
| T cell→Capillary                                                                         | Ifng Ifngr1  | Pituitary | 0        | 1 |
| T cell→Capillary                                                                         | Ifng Ifngr1  | Liver     | 0.362129 | 0 |
| T cell→Capillary                                                                         | Ifng Ifngr1  | Kidney    | 0        | 1 |
| T cell→Capillary                                                                         | Ifng Ifngr1  | Thyroid   | 0        | 1 |
| T cell→Capillary                                                                         | Ifng Ifngr1  | Brain     | 0        | 1 |
| T cell→Capillary                                                                         | Ifng Ifngr2  | Adrenal   | 0.241938 | 0 |
| T cell→Capillary                                                                         | Ifng Ifngr2  | Pituitary | 0        | 1 |
| T cell→Capillary                                                                         | Ifng Ifngr2  | Liver     | 0        | 1 |
| T cell→Capillary                                                                         | Ifng Ifngr2  | Kidney    | 0        | 1 |
| T cell→Capillary                                                                         | Ifng Ifngr2  | Thyroid   | 0        | 1 |
| T cell→Capillary                                                                         | Ifng Ifngr2  | Brain     | 0        | 1 |
| T cell→Capillary                                                                         | Ltb Tnfrsf1a | Adrenal   | 0.797852 | 0 |
| T cell→Capillary                                                                         | Ltb Tnfrsf1a | Pituitary | 0        | 1 |
| T cell→Capillary                                                                         | Ltb Tnfrsf1a | Liver     | 0.730255 | 0 |
| T cell→Capillary                                                                         | Ltb Tnfrsf1a | Kidney    | 0.777922 | 0 |
| T cell→Capillary                                                                         | Ltb Tnfrsf1a | Thyroid   | 0.752952 | 0 |
| T cell→Capillary                                                                         | Ltb Tnfrsf1a | Brain     | 0        | 1 |
| T cell→Capillary                                                                         | Pigf Flt1    | Adrenal   | 1.6914   | 0 |
| T cell→Capillary                                                                         | Pigf Flt1    | Pituitary | 1.21305  | 0 |
| T cell→Capillary                                                                         | Pigf Flt1    | Liver     | 0        | 1 |
| T cell→Capillary                                                                         | Pigf Flt1    | Kidney    | 1.49623  | 0 |
| T cell→Capillary                                                                         | Pigf Flt1    | Thyroid   | 0        | 1 |
| T cell→Capillary                                                                         | Pigf Flt1    | Brain     | 0        | 1 |
| T cell→Capillary                                                                         | Sema3f Nrp1  | Adrenal   | 0        | 1 |
| T cell→Capillary                                                                         | Sema3f Nrp1  | Pituitary | 0.972843 | 0 |
| T cell→Capillary                                                                         | Sema3f Nrp1  | Liver     | 0        | 1 |
| T cell→Capillary                                                                         | Sema3f Nrp1  | Kidney    | 0        | 1 |
| T cell→Capillary                                                                         | Sema3f Nrp1  | Thyroid   | 0        | 1 |
| T cell→Capillary                                                                         | Sema3f Nrp1  | Brain     | 0        | 1 |
| T cell→Capillary                                                                         | Tnfsf14 Ltbr | Adrenal   | 0.231696 | 0 |
| T cell→Capillary                                                                         | Tnfsf14 Ltbr | Pituitary | 0        | 1 |
| T cell→Capillary                                                                         | Tnfsf14 Ltbr | Liver     | 0        | 1 |
| T cell→Capillary                                                                         | Tnfsf14 Ltbr | Kidney    | 0        | 1 |
| T cell→Capillary                                                                         | Tnfsf14 Ltbr | Thyroid   | 0        | 1 |
| T cell→Capillary                                                                         | Tnfsf14 Ltbr | Brain     | 0        | 1 |
| T cell→Capillary                                                                         | Vegfa Kdr    | Adrenal   | 1.48009  | 0 |
| T cell→Capillary                                                                         | Vegfa Kdr    | Pituitary | 0        | 1 |
| T cell→Capillary                                                                         | Vegfa Kdr    | Liver     | 0        | 1 |

| Supplementary Table S12: Cell–cell interaction results for inflammation→related LR pairs |            |           |          |       |
|------------------------------------------------------------------------------------------|------------|-----------|----------|-------|
| T cell→Capillary                                                                         | Vegfa Kdr  | Kidney    | 1.30073  | 0     |
| T cell→Capillary                                                                         | Vegfa Kdr  | Thyroid   | 0        | 1     |
| T cell→Capillary                                                                         | Vegfa Kdr  | Brain     | 0.690621 | 0     |
| T cell→Capillary                                                                         | Vegfa Nrp1 | Adrenal   | 1.43363  | 0     |
| T cell→Capillary                                                                         | Vegfa Nrp1 | Pituitary | 0        | 1     |
| T cell→Capillary                                                                         | Vegfa Nrp1 | Liver     | 0        | 1     |
| T cell→Capillary                                                                         | Vegfa Nrp1 | Kidney    | 1.39035  | 0     |
| T cell→Capillary                                                                         | Vegfa Nrp1 | Thyroid   | 0        | 1     |
| T cell→Capillary                                                                         | Vegfa Nrp1 | Brain     | 0.453748 | 0.001 |
| T cell→Capillary                                                                         | Vegfa Nrp2 | Adrenal   | 0.660716 | 0     |
| T cell→Capillary                                                                         | Vegfa Nrp2 | Pituitary | 0        | 1     |
| T cell→Capillary                                                                         | Vegfa Nrp2 | Liver     | 0        | 1     |
| T cell→Capillary                                                                         | Vegfa Nrp2 | Kidney    | 0.355718 | 0     |
| T cell→Capillary                                                                         | Vegfa Nrp2 | Thyroid   | 0        | 1     |
| T cell→Capillary                                                                         | Vegfa Nrp2 | Brain     | 0        | 1     |
| T cell→Capillary                                                                         | Vegfb Flt1 | Adrenal   | 0        | 1     |
| T cell→Capillary                                                                         | Vegfb Flt1 | Pituitary | 1.19452  | 0     |
| T cell→Capillary                                                                         | Vegfb Flt1 | Liver     | 0        | 1     |
| T cell→Capillary                                                                         | Vegfb Flt1 | Kidney    | 0        | 1     |
| T cell→Capillary                                                                         | Vegfb Flt1 | Thyroid   | 0        | 1     |
| T cell→Capillary                                                                         | Vegfb Flt1 | Brain     | 0        | 1     |
| T cell→Capillary                                                                         | Vegfc Flt1 | Adrenal   | 1.68492  | 0     |
| T cell→Capillary                                                                         | Vegfc Flt1 | Pituitary | 1.26891  | 0     |
| T cell→Capillary                                                                         | Vegfc Flt1 | Liver     | 0        | 1     |
| T cell→Capillary                                                                         | Vegfc Flt1 | Kidney    | 0        | 1     |
| T cell→Capillary                                                                         | Vegfc Flt1 | Thyroid   | 0        | 1     |
| T cell→Capillary                                                                         | Vegfc Flt1 | Brain     | 0        | 1     |
| T cell→Capillary                                                                         | Vegfc Nrp2 | Adrenal   | 0.651304 | 0     |
| T cell→Capillary                                                                         | Vegfc Nrp2 | Pituitary | 0.892005 | 0     |
| T cell→Capillary                                                                         | Vegfc Nrp2 | Liver     | 0        | 1     |
| T cell→Capillary                                                                         | Vegfc Nrp2 | Kidney    | 0        | 1     |
| T cell→Capillary                                                                         | Vegfc Nrp2 | Thyroid   | 0        | 1     |
| T cell→Capillary                                                                         | Vegfc Nrp2 | Brain     | 0        | 1     |

Supplementary Table S13

| Supplementary Table S13 : DEG for thyroid cEC DEGs in Old vs Young |         |                |             |             |            |
|--------------------------------------------------------------------|---------|----------------|-------------|-------------|------------|
| names                                                              | scores  | logfoldchanges | pvals       | pvals_adj   | comparison |
| IGKC                                                               | 26.4393 | 4.75771        | 4.841e-154  | 1.8689e-149 | Old_high   |
| IGLC2                                                              | 19.5884 | 5.82648        | 1.94194e-85 | 1.87426e-81 | Old_high   |
| IGLC3                                                              | 17.005  | 5.8433         | 7.54687e-65 | 3.23727e-61 | Old_high   |
| IGHG1                                                              | 13.4896 | 4.65365        | 1.80018e-41 | 2.89574e-38 | Old_high   |
| TM4SF1                                                             | 13.2962 | 2.02906        | 2.4358e-40  | 3.61679e-37 | Old_high   |
| IGHG3                                                              | 12.4681 | 4.4373         | 1.11506e-35 | 1.19578e-32 | Old_high   |
| ENSG00000288765                                                    | 11.724  | 1.93983        | 9.60068e-32 | 8.61962e-29 | Old_high   |
| HLA-DQB1                                                           | 11.654  | 2.08085        | 2.19028e-31 | 1.87907e-28 | Old_high   |
| CXCL12                                                             | 10.6372 | 1.7207         | 2.0014e-26  | 1.1707e-23  | Old_high   |
| HLA-DQA1                                                           | 10.5688 | 2.35241        | 4.15618e-26 | 2.30306e-23 | Old_high   |
| IGHA1                                                              | 9.47585 | 3.42981        | 2.646e-21   | 1.0114e-18  | Old_high   |
| CDKN1A                                                             | 9.42534 | 1.59402        | 4.287e-21   | 1.57623e-18 | Old_high   |
| IGHG4                                                              | 9.37101 | 3.17093        | 7.18427e-21 | 2.50061e-18 | Old_high   |
| SIK1                                                               | 8.99997 | 1.81564        | 2.25769e-19 | 6.80942e-17 | Old_high   |
| IGHM                                                               | 8.28036 | 28.35          | 1.22805e-16 | 2.85602e-14 | Old_high   |
| H4C3                                                               | 8.2068  | 1.81377        | 2.27167e-16 | 5.09884e-14 | Old_high   |
| LINC00639                                                          | 8.1413  | 6.29625        | 3.91066e-16 | 8.62714e-14 | Old_high   |
| SPINK5                                                             | 7.77578 | 2.49757        | 7.49807e-15 | 1.44735e-12 | Old_high   |
| IGFBP7                                                             | 7.66107 | 1.6107         | 1.84391e-14 | 3.40603e-12 | Old_high   |
| MIR99AHG                                                           | 6.99083 | 2.35107        | 2.73264e-12 | 4.15339e-10 | Old_high   |
| PNP                                                                | 6.55083 | 1.91407        | 5.72181e-11 | 7.46271e-09 | Old_high   |
| RDH10                                                              | 6.44099 | 2.29937        | 1.18696e-10 | 1.48778e-08 | Old_high   |
| SELE                                                               | 6.065   | 1.5308         | 1.31954e-09 | 1.45134e-07 | Old_high   |
| GADD45A                                                            | 5.82609 | 1.55768        | 5.67393e-09 | 5.71926e-07 | Old_high   |
| C2CD4B                                                             | 5.45788 | 1.54759        | 4.81845e-08 | 4.22775e-06 | Old_high   |
| ARRDC3                                                             | 5.44103 | 1.85592        | 5.29721e-08 | 4.58436e-06 | Old_high   |
| SPSB1                                                              | 5.07238 | 1.51262        | 3.92873e-07 | 2.93371e-05 | Old_high   |
| SEMA4A                                                             | 4.85508 | 1.56683        | 1.20339e-06 | 8.35574e-05 | Old_high   |
| ENSG00000291100                                                    | 4.74379 | 1.52121        | 2.09757e-06 | 0.000141078 | Old_high   |
| FCN3                                                               | 4.71021 | 1.59479        | 2.47458e-06 | 0.000163866 | Old_high   |
| FOSL1                                                              | 4.68188 | 1.69378        | 2.84261e-06 | 0.000186635 | Old_high   |
| ICAM4                                                              | 4.65926 | 1.95091        | 3.17342e-06 | 0.000207298 | Old_high   |
| ADAMTS4                                                            | 4.63093 | 1.58039        | 3.64031e-06 | 0.000234524 | Old_high   |
| PLA1A                                                              | 4.63032 | 1.92645        | 3.65096e-06 | 0.000234524 | Old_high   |
| IL6                                                                | 4.56285 | 3.20375        | 5.04645e-06 | 0.000312718 | Old_high   |
| PLAUR                                                              | 4.52963 | 1.53009        | 5.9086e-06  | 0.000360359 | Old_high   |
| NFIL3                                                              | 4.41476 | 1.91372        | 1.01124e-05 | 0.000595119 | Old_high   |
| TNFAIP3                                                            | 4.27618 | 1.80965        | 1.90129e-05 | 0.00105462  | Old_high   |
| ELOVL7                                                             | 4.08334 | 1.57575        | 4.4392e-05  | 0.00227596  | Old_high   |
| RDH10-AS1                                                          | 3.99406 | 2.13442        | 6.49504e-05 | 0.00320649  | Old_high   |
| IGHGP                                                              | 3.86129 | 3.11375        | 0.00011279  | 0.00518996  | Old_high   |
| CCL2                                                               | 3.8444  | 2.3247         | 0.000120847 | 0.00549522  | Old_high   |
| ENSG00000255202                                                    | 3.83485 | 2.22276        | 0.000125642 | 0.00568645  | Old_high   |
| TMSB15A                                                            | 3.82275 | 2.16008        | 0.000131969 | 0.00595074  | Old_high   |
| TMEM70                                                             | 3.80192 | 1.56115        | 0.000143581 | 0.00638606  | Old_high   |
| SPHK1                                                              | 3.68776 | 1.83106        | 0.000226233 | 0.00948312  | Old_high   |

# Supplementary Table S14

| Supplementary Table S14 : DEG for thyroid cEC DEGs in PTC vs Young |         |                |             |             |            |
|--------------------------------------------------------------------|---------|----------------|-------------|-------------|------------|
| names                                                              | scores  | logfoldchanges | pvals       | pvals_adj   | comparison |
| IGFBP7                                                             | 50.3437 | 5.54302        | 0           | 0           | PTC_high   |
| FN1                                                                | 43.2214 | 8.53215        | 0           | 0           | PTC_high   |
| CLEC3B                                                             | 38.9693 | 5.54251        | 0           | 0           | PTC_high   |
| PFN1                                                               | 38.5708 | 2.80598        | 0           | 0           | PTC_high   |
| MMP2                                                               | 38.264  | 7.28094        | 0           | 0           | PTC_high   |
| LMNA                                                               | 37.8758 | 2.48122        | 0           | 0           | PTC_high   |
| GAPDH                                                              | 36.6685 | 2.15542        | 2.3192e-294 | 3.1977e-291 | PTC_high   |
| ZFP36                                                              | 36.415  | 2.7565         | 2.4691e-290 | 3.287e-287  | PTC_high   |
| SPARC                                                              | 35.7008 | 1.66136        | 3.8418e-279 | 4.4944e-276 | PTC_high   |
| PPIA                                                               | 35.5931 | 2.05781        | 1.7911e-277 | 2.0337e-274 | PTC_high   |
| EEF2                                                               | 35.5855 | 2.15974        | 2.3441e-277 | 2.5857e-274 | PTC_high   |
| MT-ND4L                                                            | 35.3739 | 1.87364        | 4.307e-274  | 4.4939e-271 | PTC_high   |
| PNP                                                                | 34.9633 | 4.24101        | 8.1336e-268 | 7.8502e-265 | PTC_high   |
| ACTB                                                               | 34.8598 | 1.56335        | 3.0271e-266 | 2.8503e-263 | PTC_high   |
| CRIP2                                                              | 34.4254 | 2.04047        | 1.0527e-259 | 8.8349e-257 | PTC_high   |
| FXYD5                                                              | 33.7435 | 2.17177        | 1.3328e-249 | 1.072e-246  | PTC_high   |
| PMEPA1                                                             | 33.4561 | 3.64988        | 2.0975e-245 | 1.5877e-242 | PTC_high   |
| TM4SF1                                                             | 33.3533 | 2.76409        | 6.5322e-244 | 4.7581e-241 | PTC_high   |
| COL4A1                                                             | 33.1188 | 1.68592        | 1.5935e-240 | 1.1185e-237 | PTC_high   |
| IFITM3                                                             | 32.9891 | 1.78745        | 1.1655e-238 | 8.0351e-236 | PTC_high   |
| CFL1                                                               | 32.174  | 1.82344        | 4.0787e-227 | 2.7625e-224 | PTC_high   |
| NR4A1                                                              | 32.1455 | 2.12565        | 1.0207e-226 | 6.7937e-224 | PTC_high   |
| PPP1R15A                                                           | 31.8377 | 2.31906        | 1.9499e-222 | 1.2546e-219 | PTC_high   |
| AQP1                                                               | 31.3791 | 2.41892        | 3.8992e-216 | 2.3894e-213 | PTC_high   |
| ANXA2                                                              | 31.1241 | 1.96209        | 1.1373e-212 | 6.8602e-210 | PTC_high   |
| CACNA1C                                                            | 30.7862 | 3.85964        | 4.0135e-208 | 2.2456e-205 | PTC_high   |
| CD99                                                               | 30.6818 | 2.27122        | 9.9562e-207 | 5.4137e-204 | PTC_high   |
| RPLP0                                                              | 30.561  | 1.76202        | 4.0382e-205 | 2.1653e-202 | PTC_high   |
| RPS3                                                               | 30.3187 | 1.50614        | 6.4962e-202 | 3.3891e-199 | PTC_high   |
| CDKN1A                                                             | 30.183  | 2.78191        | 3.9603e-200 | 2.0386e-197 | PTC_high   |
| SH3BGRL3                                                           | 29.8066 | 2.22939        | 3.2072e-195 | 1.608e-192  | PTC_high   |
| HSPA8                                                              | 29.7173 | 1.7215         | 4.5895e-194 | 2.2428e-191 | PTC_high   |
| LAMB1                                                              | 29.5747 | 3.61274        | 3.1657e-192 | 1.5277e-189 | PTC_high   |
| MIR4435-2HG                                                        | 28.6444 | 2.71254        | 1.8818e-180 | 8.3504e-178 | PTC_high   |
| TAGLN2                                                             | 28.5405 | 1.99158        | 3.6835e-179 | 1.616e-176  | PTC_high   |
| EDIL3                                                              | 28.4061 | 3.43787        | 1.7017e-177 | 7.3815e-175 | PTC_high   |
| TIMP1                                                              | 28.1783 | 2.05769        | 1.0798e-174 | 4.5312e-172 | PTC_high   |
| TALAM1                                                             | 27.0551 | 1.92258        | 3.3247e-161 | 1.2462e-158 | PTC_high   |
| CYTOR                                                              | 26.77   | 3.29833        | 7.2292e-158 | 2.6329e-155 | PTC_high   |
| FOSB                                                               | 26.7421 | 1.66417        | 1.5275e-157 | 5.5114e-155 | PTC_high   |
| PPDPF                                                              | 26.7366 | 2.35913        | 1.7696e-157 | 6.3258e-155 | PTC_high   |
| HTRA1                                                              | 26.6879 | 1.85371        | 6.5035e-157 | 2.2825e-154 | PTC_high   |
| S100A11                                                            | 26.6629 | 1.69896        | 1.2691e-156 | 4.4138e-154 | PTC_high   |
| NFKBIA                                                             | 26.544  | 1.87634        | 3.013e-155  | 1.0386e-152 | PTC_high   |
| RNASE1                                                             | 26.492  | 1.71648        | 1.197e-154  | 4.0537e-152 | PTC_high   |
| S100A6                                                             | 26.4611 | 1.72887        | 2.7168e-154 | 9.1205e-152 | PTC_high   |
| ROBO1                                                              | 26.2836 | 4.43394        | 2.9542e-152 | 9.7478e-150 | PTC_high   |
| BAG3                                                               | 25.8323 | 2.3756         | 3.8435e-147 | 1.2163e-144 | PTC_high   |
| RPL4                                                               | 25.7593 | 1.7042         | 2.5334e-146 | 7.9514e-144 | PTC_high   |
| MT-ND6                                                             | 25.4234 | 2.30266        | 1.39e-142   | 4.1599e-140 | PTC_high   |
| RHOB                                                               | 25.3821 | 2.48891        | 3.9756e-142 | 1.1716e-139 | PTC_high   |
| PPIB                                                               | 25.159  | 1.7077         | 1.1279e-139 | 3.1783e-137 | PTC_high   |
| FLNA                                                               | 25.1067 | 2.30472        | 4.1979e-139 | 1.1744e-136 | PTC_high   |
| MCL1                                                               | 25.1028 | 1.53248        | 4.6314e-139 | 1.2863e-136 | PTC_high   |
| COX4I1                                                             | 25.0338 | 1.6277         | 2.6212e-138 | 7.177e-136  | PTC_high   |
| THY1                                                               | 24.99   | 5.38715        | 7.8476e-138 | 2.1336e-135 | PTC_high   |
| SELENOW                                                            | 24.9789 | 1.98341        | 1.0356e-137 | 2.7958e-135 | PTC_high   |
| HNRNPA1                                                            | 24.9591 | 1.71721        | 1.7025e-137 | 4.5643e-135 | PTC_high   |
| CTSB                                                               | 24.951  | 1.79865        | 2.0823e-137 | 5.544e-135  | PTC_high   |
| IFITM2                                                             | 24.7835 | 1.55786        | 1.3497e-135 | 3.4507e-133 | PTC_high   |
| UPP1                                                               | 24.5853 | 2.51558        | 1.8126e-133 | 4.5736e-131 | PTC_high   |
| SERPINH1                                                           | 24.1457 | 1.83616        | 8.2821e-129 | 2.0109e-126 | PTC_high   |
| CDK2AP1                                                            | 24.0277 | 2.43841        | 1.4274e-127 | 3.4016e-125 | PTC_high   |
| MIF                                                                | 23.7583 | 1.52531        | 9.0287e-125 | 2.0998e-122 | PTC_high   |

| Supplementary Table S14 : DEG for thyroid cEC DEGs in PTC vs Young |         |         |             |             |          |
|--------------------------------------------------------------------|---------|---------|-------------|-------------|----------|
| YWHAH                                                              | 23.7186 | 1.62686 | 2.3179e-124 | 5.3585e-122 | PTC_high |
| EMP1                                                               | 23.7118 | 1.52167 | 2.7262e-124 | 6.2647e-122 | PTC_high |
| SERPINE1                                                           | 23.5842 | 2.8865  | 5.5988e-123 | 1.279e-120  | PTC_high |
| RHOC                                                               | 23.3841 | 1.63423 | 6.2034e-121 | 1.3843e-118 | PTC_high |
| PINK1                                                              | 23.355  | 2.07079 | 1.2251e-120 | 2.7181e-118 | PTC_high |
| MAP1B                                                              | 23.3408 | 3.41218 | 1.7098e-120 | 3.772e-118  | PTC_high |
| ZFP36L1                                                            | 23.3051 | 1.50021 | 3.9379e-120 | 8.6378e-118 | PTC_high |
| ZYX                                                                | 23.1829 | 3.35225 | 6.7724e-119 | 1.4606e-116 | PTC_high |
| SOX4                                                               | 23.1433 | 2.22376 | 1.6986e-118 | 3.5834e-116 | PTC_high |
| NID1                                                               | 23.0633 | 2.64418 | 1.0818e-117 | 2.2576e-115 | PTC_high |
| PLEC                                                               | 22.7481 | 1.85594 | 1.4968e-114 | 3.0255e-112 | PTC_high |
| FSCN1                                                              | 22.7055 | 1.79094 | 3.9555e-114 | 7.9535e-112 | PTC_high |
| AGR1                                                               | 22.6563 | 2.38058 | 1.2082e-113 | 2.4167e-111 | PTC_high |
| GNG5                                                               | 22.653  | 1.70051 | 1.3046e-113 | 2.5962e-111 | PTC_high |
| GNB2                                                               | 22.6517 | 1.83699 | 1.3422e-113 | 2.6573e-111 | PTC_high |
| MARCKSL1                                                           | 22.5373 | 1.63319 | 1.791e-112  | 3.4572e-110 | PTC_high |
| ARPC1B                                                             | 22.4934 | 1.70265 | 4.8118e-112 | 9.242e-110  | PTC_high |
| SQSTM1                                                             | 22.4503 | 1.50051 | 1.2707e-111 | 2.4166e-109 | PTC_high |
| ALDOA                                                              | 22.411  | 5.07738 | 3.0721e-111 | 5.8138e-109 | PTC_high |
| EGR1                                                               | 22.4023 | 1.59528 | 3.7358e-111 | 7.0353e-109 | PTC_high |
| LAMA4                                                              | 22.3333 | 1.58086 | 1.7567e-110 | 3.2295e-108 | PTC_high |
| PCBP1                                                              | 22.2432 | 1.7203  | 1.3117e-109 | 2.3774e-107 | PTC_high |
| TPI1                                                               | 22.16   | 1.61537 | 8.3574e-109 | 1.4937e-106 | PTC_high |
| CST3                                                               | 22.1491 | 1.71202 | 1.0649e-108 | 1.8946e-106 | PTC_high |
| ARID5B                                                             | 22.0385 | 2.38863 | 1.2317e-107 | 2.1517e-105 | PTC_high |
| MPZL2                                                              | 22.0172 | 3.17668 | 1.9699e-107 | 3.4256e-105 | PTC_high |
| HSPB1                                                              | 21.9918 | 1.50948 | 3.4512e-107 | 5.9747e-105 | PTC_high |
| TNFAIP3                                                            | 21.9014 | 3.52153 | 2.5214e-106 | 4.2322e-104 | PTC_high |
| IFI6                                                               | 21.8602 | 1.96685 | 6.2157e-106 | 1.0388e-103 | PTC_high |
| BHLHE40                                                            | 21.7805 | 1.59468 | 3.5521e-105 | 5.8353e-103 | PTC_high |
| ARF5                                                               | 21.73   | 2.53023 | 1.0688e-104 | 1.7337e-102 | PTC_high |
| BGN                                                                | 21.5943 | 5.90806 | 2.0324e-103 | 3.229e-101  | PTC_high |
| NPC2                                                               | 21.5454 | 1.69864 | 5.8439e-103 | 9.2086e-101 | PTC_high |
| SAT1                                                               | 21.4938 | 1.60941 | 1.7801e-102 | 2.7823e-100 | PTC_high |
| SLC29A1                                                            | 21.4356 | 4.21721 | 6.2258e-102 | 9.6527e-100 | PTC_high |
| TAX1BP3                                                            | 21.3469 | 2.52392 | 4.1646e-101 | 6.3549e-99  | PTC_high |
| JUP                                                                | 21.2723 | 2.02463 | 2.0504e-100 | 3.08001e-98 | PTC_high |
| COL6A2                                                             | 21.1525 | 2.12745 | 2.6192e-99  | 3.88915e-97 | PTC_high |
| ATP5MC2                                                            | 21.0649 | 1.51703 | 1.66838e-98 | 2.4678e-96  | PTC_high |
| RAB31                                                              | 20.9588 | 2.48996 | 1.55953e-97 | 2.28925e-95 | PTC_high |
| PEA15                                                              | 20.9148 | 1.7052  | 3.92321e-97 | 5.7371e-95  | PTC_high |
| FOSL2                                                              | 20.7568 | 1.81048 | 1.06455e-95 | 1.52215e-93 | PTC_high |
| MYADM                                                              | 20.6627 | 2.29412 | 7.5125e-95  | 1.06628e-92 | PTC_high |
| PTPRE                                                              | 20.5684 | 1.88304 | 5.26262e-94 | 7.30823e-92 | PTC_high |
| SERPINA1                                                           | 20.5611 | 7.93568 | 6.11787e-94 | 8.46546e-92 | PTC_high |
| KDM6B                                                              | 20.56   | 1.97654 | 6.26844e-94 | 8.64284e-92 | PTC_high |
| CSRNP1                                                             | 20.4649 | 1.9908  | 4.42835e-93 | 6.04102e-91 | PTC_high |
| BDKRB2                                                             | 20.414  | 2.80781 | 1.25487e-92 | 1.69985e-90 | PTC_high |
| GABRD                                                              | 20.1872 | 5.28291 | 1.26878e-90 | 1.6949e-88  | PTC_high |
| PIEZO2                                                             | 20.0002 | 2.29961 | 5.48943e-89 | 7.15963e-87 | PTC_high |
| COL18A1                                                            | 19.9235 | 1.55744 | 2.54448e-88 | 3.28536e-86 | PTC_high |
| SYNPO                                                              | 19.8661 | 1.73935 | 7.99536e-88 | 1.01871e-85 | PTC_high |
| CDH13                                                              | 19.8324 | 1.61991 | 1.56423e-87 | 1.97996e-85 | PTC_high |
| CSNK2B                                                             | 19.7661 | 1.84964 | 5.83318e-87 | 7.35934e-85 | PTC_high |
| NALF1                                                              | 19.7236 | 5.94619 | 1.35221e-86 | 1.69491e-84 | PTC_high |
| BSG                                                                | 19.5703 | 1.56066 | 2.77001e-85 | 3.37348e-83 | PTC_high |
| ARID5A                                                             | 19.5046 | 1.84445 | 1.00252e-84 | 1.20571e-82 | PTC_high |
| CD200                                                              | 19.3643 | 1.57897 | 1.54453e-83 | 1.84607e-81 | PTC_high |
| HIF1A                                                              | 19.3335 | 1.88122 | 2.809e-83   | 3.33674e-81 | PTC_high |
| MMP14                                                              | 19.0279 | 3.70308 | 1.00126e-80 | 1.15043e-78 | PTC_high |
| OAF                                                                | 18.8142 | 2.88038 | 5.77896e-79 | 6.52347e-77 | PTC_high |
| CCN1                                                               | 18.7775 | 2.65719 | 1.15351e-78 | 1.28706e-76 | PTC_high |
| PKM                                                                | 18.7417 | 1.67422 | 2.26107e-78 | 2.51559e-76 | PTC_high |
| ADAMTS1                                                            | 18.6684 | 1.67029 | 8.95097e-78 | 9.81707e-76 | PTC_high |
| TUBB                                                               | 18.6658 | 1.63152 | 9.39705e-78 | 1.02771e-75 | PTC_high |
| MYO1B                                                              | 18.5875 | 2.1805  | 4.05765e-77 | 4.41267e-75 | PTC_high |
| ITGA2                                                              | 18.5239 | 2.4571  | 1.32438e-76 | 1.42421e-74 | PTC_high |
| SLC25A5                                                            | 18.2957 | 1.64021 | 8.94979e-75 | 9.26315e-73 | PTC_high |

| Supplementary Table S14 : DEG for thyroid cEC DEGs in PTC vs Young |         |         |             |             |          |
|--------------------------------------------------------------------|---------|---------|-------------|-------------|----------|
| SLC4A7                                                             | 18.2523 | 2.30363 | 1.98243e-74 | 2.04636e-72 | PTC_high |
| MYO1D                                                              | 18.2207 | 1.61996 | 3.53313e-74 | 3.62766e-72 | PTC_high |
| CDC42EP1                                                           | 18.1758 | 1.91963 | 8.02423e-74 | 8.19533e-72 | PTC_high |
| SEMA6B                                                             | 18.0026 | 2.50168 | 1.85843e-72 | 1.87818e-70 | PTC_high |
| KCNK5                                                              | 17.8763 | 2.36531 | 1.80337e-71 | 1.79435e-69 | PTC_high |
| SNTB1                                                              | 17.84   | 2.00188 | 3.45757e-71 | 3.43143e-69 | PTC_high |
| FSTL1                                                              | 17.8032 | 1.97969 | 6.66849e-71 | 6.60112e-69 | PTC_high |
| HNRNPL                                                             | 17.4569 | 1.60119 | 3.04866e-68 | 2.92051e-66 | PTC_high |
| C11orf96                                                           | 17.3731 | 2.0731  | 1.31935e-67 | 1.25147e-65 | PTC_high |
| UCK2                                                               | 17.3405 | 2.51101 | 2.32782e-67 | 2.1919e-65  | PTC_high |
| LEF1                                                               | 17.3322 | 6.07949 | 2.68964e-67 | 2.52643e-65 | PTC_high |
| ADAM15                                                             | 17.1485 | 1.50396 | 6.44489e-66 | 5.95243e-64 | PTC_high |
| WDR1                                                               | 16.8765 | 1.54996 | 6.69647e-64 | 6.01218e-62 | PTC_high |
| BCL3                                                               | 16.8281 | 1.69625 | 1.51836e-63 | 1.36004e-61 | PTC_high |
| RAB11B                                                             | 16.8174 | 1.7928  | 1.82121e-63 | 1.62754e-61 | PTC_high |
| METRNL                                                             | 16.7962 | 2.42056 | 2.60039e-63 | 2.31849e-61 | PTC_high |
| PTP4A3                                                             | 16.6483 | 1.87165 | 3.11228e-62 | 2.70006e-60 | PTC_high |
| BBLN                                                               | 16.5842 | 1.59539 | 9.06421e-62 | 7.7936e-60  | PTC_high |
| DUSP5                                                              | 16.5415 | 1.59797 | 1.84362e-61 | 1.57815e-59 | PTC_high |
| PPP2R1A                                                            | 16.519  | 1.68824 | 2.67889e-61 | 2.28303e-59 | PTC_high |
| OSBPL3                                                             | 16.5136 | 2.35526 | 2.92851e-61 | 2.49026e-59 | PTC_high |
| SHC1                                                               | 16.4459 | 2.05947 | 8.96823e-61 | 7.55955e-59 | PTC_high |
| RTL8C                                                              | 16.3498 | 2.0554  | 4.36468e-60 | 3.65516e-58 | PTC_high |
| THSD7A                                                             | 16.1963 | 2.16273 | 5.35968e-59 | 4.41185e-57 | PTC_high |
| SNRPD2                                                             | 16.1844 | 1.50132 | 6.50127e-59 | 5.34017e-57 | PTC_high |
| CA2                                                                | 16.1091 | 1.58224 | 2.20035e-58 | 1.79592e-56 | PTC_high |
| CAVIN3                                                             | 16.1062 | 1.72096 | 2.30805e-58 | 1.87985e-56 | PTC_high |
| PTOV1                                                              | 15.958  | 2.17881 | 2.50771e-57 | 1.99613e-55 | PTC_high |
| AP2S1                                                              | 15.8877 | 1.51816 | 7.70728e-57 | 6.06003e-55 | PTC_high |
| NREP                                                               | 15.8174 | 1.89722 | 2.35941e-56 | 1.85137e-54 | PTC_high |
| ANGPT2                                                             | 15.7437 | 2.20355 | 7.58375e-56 | 5.89091e-54 | PTC_high |
| SLC34A2                                                            | 15.7311 | 8.99785 | 9.25384e-56 | 7.17377e-54 | PTC_high |
| APLNR                                                              | 15.7283 | 1.5365  | 9.67413e-56 | 7.48456e-54 | PTC_high |
| SPSB1                                                              | 15.5633 | 2.23075 | 1.2925e-54  | 9.70785e-53 | PTC_high |
| COTL1                                                              | 15.5441 | 1.7349  | 1.74506e-54 | 1.30815e-52 | PTC_high |
| C4orf48                                                            | 15.5355 | 3.63406 | 1.99357e-54 | 1.48866e-52 | PTC_high |
| ANKRD28                                                            | 15.5276 | 1.56324 | 2.25542e-54 | 1.68094e-52 | PTC_high |
| PRRC2A                                                             | 15.3538 | 1.76167 | 3.33911e-53 | 2.44147e-51 | PTC_high |
| AUP1                                                               | 15.338  | 1.70409 | 4.26216e-53 | 3.11049e-51 | PTC_high |
| TRIM28                                                             | 15.2375 | 1.71041 | 1.99354e-52 | 1.43053e-50 | PTC_high |
| HCLS1                                                              | 15.2278 | 2.25041 | 2.31076e-52 | 1.65203e-50 | PTC_high |
| CCDC3                                                              | 15.2095 | 4.8132  | 3.05785e-52 | 2.18209e-50 | PTC_high |
| FOSL1                                                              | 15.208  | 2.4052  | 3.12879e-52 | 2.2286e-50  | PTC_high |
| ADAMTSL2                                                           | 15.1789 | 1.52761 | 4.87607e-52 | 3.44772e-50 | PTC_high |
| ARPC5L                                                             | 15.1555 | 1.67867 | 6.96476e-52 | 4.9066e-50  | PTC_high |
| SCHIP1                                                             | 15.132  | 2.16177 | 9.95716e-52 | 6.93874e-50 | PTC_high |
| GPR4                                                               | 15.1195 | 1.93519 | 1.20396e-51 | 8.37479e-50 | PTC_high |
| TAF10                                                              | 15.0959 | 1.83297 | 1.72321e-51 | 1.19223e-49 | PTC_high |
| PLSCR3                                                             | 15.0061 | 2.1838  | 6.69436e-51 | 4.59862e-49 | PTC_high |
| GPI                                                                | 14.9301 | 1.8     | 2.10002e-50 | 1.42484e-48 | PTC_high |
| NUTF2                                                              | 14.8962 | 2.06607 | 3.49096e-50 | 2.35204e-48 | PTC_high |
| PXDN                                                               | 14.895  | 1.76397 | 3.5506e-50  | 2.38806e-48 | PTC_high |
| CD52                                                               | 14.8786 | 4.93133 | 4.53646e-50 | 3.04582e-48 | PTC_high |
| ENSG00000234961                                                    | 14.8398 | 4.79376 | 8.10269e-50 | 5.42136e-48 | PTC_high |
| DUSP4                                                              | 14.8358 | 2.71082 | 8.59641e-50 | 5.74174e-48 | PTC_high |
| ZNF267                                                             | 14.7953 | 2.06542 | 1.57026e-49 | 1.04161e-47 | PTC_high |
| UBE2S                                                              | 14.7927 | 1.57842 | 1.63294e-49 | 1.08132e-47 | PTC_high |
| CRTAP                                                              | 14.7466 | 1.55028 | 3.23357e-49 | 2.13029e-47 | PTC_high |
| CD55                                                               | 14.7391 | 1.84147 | 3.61705e-49 | 2.3708e-47  | PTC_high |
| PPP4C                                                              | 14.7363 | 1.73165 | 3.77151e-49 | 2.46784e-47 | PTC_high |
| COMT                                                               | 14.7167 | 1.58299 | 5.03597e-49 | 3.2841e-47  | PTC_high |
| ARRDC3                                                             | 14.5434 | 2.19219 | 6.42887e-48 | 4.08885e-46 | PTC_high |
| ODC1                                                               | 14.5157 | 1.76906 | 9.63369e-48 | 6.10703e-46 | PTC_high |
| C1orf54                                                            | 14.493  | 1.80997 | 1.34067e-47 | 8.44336e-46 | PTC_high |
| EPN1                                                               | 14.4103 | 1.55935 | 4.45826e-47 | 2.78504e-45 | PTC_high |
| PGAM1                                                              | 14.3854 | 1.69532 | 6.3933e-47  | 3.96817e-45 | PTC_high |
| ALYREF                                                             | 14.3367 | 2.10515 | 1.29087e-46 | 7.96501e-45 | PTC_high |
| CDA                                                                | 14.2972 | 2.09136 | 2.27918e-46 | 1.39667e-44 | PTC_high |



| Supplementary Table S14 : DEG for thyroid cEC DEGs in PTC vs Young |         |         |             |             |          |
|--------------------------------------------------------------------|---------|---------|-------------|-------------|----------|
| PIM1                                                               | 14.1777 | 2.69236 | 1.25879e-45 | 7.60512e-44 | PTC_high |
| DCHS1                                                              | 14.1498 | 1.51148 | 1.87307e-45 | 1.1246e-43  | PTC_high |
| H4C3                                                               | 14.1303 | 1.7662  | 2.47059e-45 | 1.48105e-43 | PTC_high |
| SYNGR2                                                             | 14.0417 | 1.7107  | 8.66047e-45 | 5.11233e-43 | PTC_high |
| HES4                                                               | 14.0336 | 1.78826 | 9.71433e-45 | 5.72567e-43 | PTC_high |
| STAB1                                                              | 13.9922 | 1.76042 | 1.73946e-44 | 1.02213e-42 | PTC_high |
| SOX17                                                              | 13.9736 | 1.65371 | 2.25921e-44 | 1.3235e-42  | PTC_high |
| UNC5B                                                              | 13.9225 | 2.18384 | 4.62619e-44 | 2.70195e-42 | PTC_high |
| RCAN2                                                              | 13.8033 | 3.89608 | 2.43486e-43 | 1.4009e-41  | PTC_high |
| H2AX                                                               | 13.7878 | 1.77919 | 3.01691e-43 | 1.72805e-41 | PTC_high |
| DBN1                                                               | 13.717  | 1.97145 | 8.02984e-43 | 4.55883e-41 | PTC_high |
| CASC15                                                             | 13.6876 | 2.56627 | 1.20388e-42 | 6.79487e-41 | PTC_high |
| PFKL                                                               | 13.6833 | 1.61506 | 1.2777e-42  | 7.20102e-41 | PTC_high |
| CITED2                                                             | 13.6688 | 1.67606 | 1.55939e-42 | 8.77578e-41 | PTC_high |
| ARHGAP23                                                           | 13.6675 | 1.52922 | 1.58851e-42 | 8.92667e-41 | PTC_high |
| SF3A2                                                              | 13.6336 | 1.97448 | 2.5288e-42  | 1.41283e-40 | PTC_high |
| ADAMTS4                                                            | 13.571  | 1.99126 | 5.95348e-42 | 3.28343e-40 | PTC_high |
| CDC42EP5                                                           | 13.5518 | 2.53803 | 7.73234e-42 | 4.25235e-40 | PTC_high |
| SF3A1                                                              | 13.4706 | 1.70825 | 2.33053e-41 | 1.27259e-39 | PTC_high |
| NFIL3                                                              | 13.4657 | 2.76423 | 2.48833e-41 | 1.35684e-39 | PTC_high |
| ELOVL1                                                             | 13.4484 | 1.8336  | 3.14579e-41 | 1.71051e-39 | PTC_high |
| EFHD2                                                              | 13.4363 | 1.91089 | 3.70512e-41 | 2.00617e-39 | PTC_high |
| MIR22HG                                                            | 13.2391 | 1.85813 | 5.21423e-40 | 2.76132e-38 | PTC_high |
| GNPTG                                                              | 13.2203 | 1.83261 | 6.70288e-40 | 3.53996e-38 | PTC_high |
| APOE                                                               | 13.1636 | 2.94264 | 1.42221e-39 | 7.4499e-38  | PTC_high |
| SNAI1                                                              | 13.1633 | 2.07997 | 1.42648e-39 | 7.46214e-38 | PTC_high |
| TWF2                                                               | 13.0309 | 2.03765 | 8.16017e-39 | 4.18009e-37 | PTC_high |
| STMN1                                                              | 12.9941 | 1.93436 | 1.32197e-38 | 6.74185e-37 | PTC_high |
| PPP1R14B                                                           | 12.9091 | 1.7131  | 4.00044e-38 | 2.00313e-36 | PTC_high |
| PFKFB3                                                             | 12.906  | 1.54762 | 4.16273e-38 | 2.08169e-36 | PTC_high |
| U2AF2                                                              | 12.8562 | 1.85912 | 7.94283e-38 | 3.91623e-36 | PTC_high |
| MEA1                                                               | 12.8269 | 2.1976  | 1.15963e-37 | 5.69574e-36 | PTC_high |
| CDC42EP2                                                           | 12.8241 | 2.02952 | 1.20174e-37 | 5.89509e-36 | PTC_high |
| PLEKHO1                                                            | 12.8138 | 1.57198 | 1.3726e-37  | 6.7247e-36  | PTC_high |
| CTDNBP1                                                            | 12.8092 | 1.78224 | 1.45689e-37 | 7.11057e-36 | PTC_high |
| RTL8A                                                              | 12.6764 | 1.88942 | 7.9933e-37  | 3.82391e-35 | PTC_high |
| SLC22A23                                                           | 12.6695 | 1.64768 | 8.72312e-37 | 4.16788e-35 | PTC_high |
| EHD2                                                               | 12.6393 | 2.55034 | 1.28171e-36 | 6.0938e-35  | PTC_high |
| BAX                                                                | 12.6093 | 1.50067 | 1.87585e-36 | 8.8532e-35  | PTC_high |
| FAP                                                                | 12.5759 | 3.47838 | 2.8656e-36  | 1.33934e-34 | PTC_high |
| CXCL2                                                              | 12.5436 | 4.57788 | 4.30938e-36 | 2.00443e-34 | PTC_high |
| EGR3                                                               | 12.538  | 1.89646 | 4.62709e-36 | 2.14189e-34 | PTC_high |
| SLC1A5                                                             | 12.4795 | 2.11481 | 9.66032e-36 | 4.42929e-34 | PTC_high |
| LDLRAD3                                                            | 12.4263 | 2.32943 | 1.88246e-35 | 8.55999e-34 | PTC_high |
| CFH                                                                | 12.3725 | 2.41081 | 3.68246e-35 | 1.66081e-33 | PTC_high |
| GOLM1                                                              | 12.3638 | 1.60846 | 4.10181e-35 | 1.84778e-33 | PTC_high |
| C2CD4B                                                             | 12.2717 | 1.80247 | 1.28447e-34 | 5.69982e-33 | PTC_high |
| LAPTM5                                                             | 12.2515 | 1.99    | 1.64816e-34 | 7.28851e-33 | PTC_high |
| PLCL1                                                              | 12.2504 | 1.78498 | 1.67206e-34 | 7.38578e-33 | PTC_high |
| PDLIM7                                                             | 12.2413 | 2.23737 | 1.8712e-34  | 8.24654e-33 | PTC_high |
| CKS2                                                               | 12.2249 | 1.76804 | 2.28955e-34 | 1.00558e-32 | PTC_high |
| FBL                                                                | 12.1866 | 1.64854 | 3.66386e-34 | 1.60008e-32 | PTC_high |
| MAP1S                                                              | 12.1497 | 1.88201 | 5.75894e-34 | 2.50371e-32 | PTC_high |
| CDYL2                                                              | 12.0381 | 1.83803 | 2.24022e-33 | 9.56702e-32 | PTC_high |
| NR4A3                                                              | 12.0319 | 1.70687 | 2.41526e-33 | 1.03031e-31 | PTC_high |
| SLC39A8                                                            | 11.9527 | 2.07274 | 6.2884e-33  | 2.64744e-31 | PTC_high |
| CCDC124                                                            | 11.9319 | 1.61442 | 8.07497e-33 | 3.38482e-31 | PTC_high |
| LPCAT2                                                             | 11.9317 | 3.16243 | 8.09349e-33 | 3.38891e-31 | PTC_high |
| NTSE                                                               | 11.8402 | 1.76684 | 2.41933e-32 | 1.00323e-30 | PTC_high |
| ENSG00000273149                                                    | 11.8317 | 7.65377 | 2.67643e-32 | 1.10865e-30 | PTC_high |
| ABLM1                                                              | 11.759  | 2.31179 | 6.34816e-32 | 2.60998e-30 | PTC_high |
| PLAUR                                                              | 11.6782 | 1.97246 | 1.64791e-31 | 6.7038e-30  | PTC_high |
| SEMA4A                                                             | 11.6586 | 1.67815 | 2.07547e-31 | 8.40771e-30 | PTC_high |
| TUBB3                                                              | 11.6141 | 4.21308 | 3.49307e-31 | 1.40766e-29 | PTC_high |
| TICAM1                                                             | 11.5469 | 2.40234 | 7.65546e-31 | 3.05632e-29 | PTC_high |
| FCN3                                                               | 11.3987 | 2.41076 | 4.24315e-30 | 1.66137e-28 | PTC_high |
| C15orf39                                                           | 11.397  | 2.77701 | 4.3282e-30  | 1.69295e-28 | PTC_high |
| FAM118A                                                            | 11.3898 | 1.88722 | 4.69911e-30 | 1.83617e-28 | PTC_high |

| Supplementary Table S14 : DEG for thyroid cEC DEGs in PTC vs Young |         |         |             |             |          |
|--------------------------------------------------------------------|---------|---------|-------------|-------------|----------|
| R3HDM4                                                             | 11.2252 | 2.12319 | 3.06716e-29 | 1.17705e-27 | PTC_high |
| TACSTD2                                                            | 11.2195 | 2.87229 | 3.27084e-29 | 1.25396e-27 | PTC_high |
| CRISPLD1                                                           | 11.1213 | 3.4912  | 9.8836e-29  | 3.72988e-27 | PTC_high |
| VEGFC                                                              | 11.1109 | 2.64723 | 1.11056e-28 | 4.17064e-27 | PTC_high |
| CD109                                                              | 11.0823 | 2.17162 | 1.52965e-28 | 5.72227e-27 | PTC_high |
| MPV17                                                              | 10.9924 | 1.62308 | 4.15821e-28 | 1.53033e-26 | PTC_high |
| ANGPTL2                                                            | 10.7955 | 2.15175 | 3.61605e-27 | 1.30713e-25 | PTC_high |
| ADAMTS5                                                            | 10.7839 | 1.99879 | 4.10019e-27 | 1.47936e-25 | PTC_high |
| PDE1C                                                              | 10.7747 | 1.58413 | 4.53439e-27 | 1.63297e-25 | PTC_high |
| TMEM127                                                            | 10.7487 | 1.50313 | 6.01134e-27 | 2.15482e-25 | PTC_high |
| PLOD1                                                              | 10.7061 | 1.55094 | 9.5264e-27  | 3.37409e-25 | PTC_high |
| CRMP1                                                              | 10.7044 | 2.61352 | 9.70956e-27 | 3.43581e-25 | PTC_high |
| LRATD1                                                             | 10.6671 | 2.0001  | 1.45086e-26 | 5.11525e-25 | PTC_high |
| LGALS9                                                             | 10.6115 | 1.83142 | 2.63572e-26 | 9.20857e-25 | PTC_high |
| PRICKLE1                                                           | 10.6013 | 1.61476 | 2.93818e-26 | 1.0256e-24  | PTC_high |
| CST6                                                               | 10.5803 | 4.81822 | 3.67944e-26 | 1.27972e-24 | PTC_high |
| RASGEF1B                                                           | 10.5617 | 3.45375 | 4.48338e-26 | 1.55373e-24 | PTC_high |
| S100A1                                                             | 10.5087 | 2.94908 | 7.87561e-26 | 2.70503e-24 | PTC_high |
| CD276                                                              | 10.4769 | 4.53868 | 1.103e-25   | 3.75838e-24 | PTC_high |
| RNF167                                                             | 10.4301 | 1.54505 | 1.80741e-25 | 6.13308e-24 | PTC_high |
| CXCR4                                                              | 10.4301 | 2.84244 | 1.80787e-25 | 6.13308e-24 | PTC_high |
| MTA2                                                               | 10.4022 | 2.0616  | 2.42297e-25 | 8.1624e-24  | PTC_high |
| MLXIP                                                              | 10.3875 | 2.08738 | 2.82568e-25 | 9.50245e-24 | PTC_high |
| MET                                                                | 10.3847 | 2.95671 | 2.90948e-25 | 9.76725e-24 | PTC_high |
| MAFK                                                               | 10.2249 | 1.61668 | 1.53388e-24 | 5.0099e-23  | PTC_high |
| ESM1                                                               | 10.1504 | 2.50925 | 3.29993e-24 | 1.06698e-22 | PTC_high |
| SERTAD4-AS1                                                        | 10.121  | 3.75274 | 4.45924e-24 | 1.43342e-22 | PTC_high |
| SLC25A39                                                           | 10.1094 | 1.55755 | 5.02104e-24 | 1.60732e-22 | PTC_high |
| H1-4                                                               | 10.0617 | 3.31524 | 8.15438e-24 | 2.58676e-22 | PTC_high |
| OXA1L                                                              | 10.0542 | 1.59892 | 8.8047e-24  | 2.78618e-22 | PTC_high |
| DHRS4                                                              | 10.0421 | 2.2313  | 9.95314e-24 | 3.1393e-22  | PTC_high |
| MICAL2                                                             | 10.0362 | 2.79067 | 1.05703e-23 | 3.3231e-22  | PTC_high |
| PHLDA1                                                             | 10.0349 | 2.11341 | 1.07026e-23 | 3.36196e-22 | PTC_high |
| TTYH3                                                              | 9.94692 | 2.20422 | 2.60114e-23 | 8.05935e-22 | PTC_high |
| NME1                                                               | 9.93208 | 1.62724 | 3.01888e-23 | 9.32374e-22 | PTC_high |
| IFFO2                                                              | 9.92063 | 1.80612 | 3.38616e-23 | 1.04164e-21 | PTC_high |
| ACOT7                                                              | 9.91714 | 2.17926 | 3.5067e-23  | 1.07701e-21 | PTC_high |
| HCFC1R1                                                            | 9.8892  | 1.60981 | 4.63704e-23 | 1.41628e-21 | PTC_high |
| THBS1                                                              | 9.88019 | 4.69405 | 5.07347e-23 | 1.54591e-21 | PTC_high |
| H19                                                                | 9.85722 | 7.51143 | 6.37928e-23 | 1.93767e-21 | PTC_high |
| SF3B4                                                              | 9.83907 | 1.76924 | 7.64158e-23 | 2.31563e-21 | PTC_high |
| TNFRSF12A                                                          | 9.81199 | 3.49209 | 9.99755e-23 | 3.02008e-21 | PTC_high |
| COPG1                                                              | 9.80295 | 1.51054 | 1.09348e-22 | 3.29548e-21 | PTC_high |
| DOCK8                                                              | 9.73803 | 2.5519  | 2.07531e-22 | 6.18207e-21 | PTC_high |
| H1-0                                                               | 9.67279 | 1.5341  | 3.93514e-22 | 1.15969e-20 | PTC_high |
| TP53INP2                                                           | 9.66311 | 1.54465 | 4.3253e-22  | 1.27176e-20 | PTC_high |
| LRRC59                                                             | 9.62925 | 1.53507 | 6.01651e-22 | 1.75168e-20 | PTC_high |
| SLC25A44                                                           | 9.56361 | 1.82876 | 1.13716e-21 | 3.27131e-20 | PTC_high |
| MDFI                                                               | 9.53369 | 2.8437  | 1.51791e-21 | 4.34721e-20 | PTC_high |
| AJAP1                                                              | 9.519   | 2.9986  | 1.74861e-21 | 4.99312e-20 | PTC_high |
| SH3TC1                                                             | 9.45645 | 2.72094 | 3.18564e-21 | 9.05631e-20 | PTC_high |
| IMPDH2                                                             | 9.4538  | 1.82244 | 3.2676e-21  | 9.26883e-20 | PTC_high |
| ZNF460                                                             | 9.35498 | 1.87186 | 8.36164e-21 | 2.34259e-19 | PTC_high |
| ACKR3                                                              | 9.34008 | 1.85502 | 9.62592e-21 | 2.6851e-19  | PTC_high |
| PAF1                                                               | 9.20942 | 1.56584 | 3.27885e-20 | 8.99668e-19 | PTC_high |
| YIF1B                                                              | 9.17888 | 1.6548  | 4.35605e-20 | 1.18932e-18 | PTC_high |
| MICALL2                                                            | 9.1563  | 2.09978 | 5.37095e-20 | 1.45816e-18 | PTC_high |
| FOLH1                                                              | 9.14975 | 1.87575 | 5.7064e-20  | 1.54273e-18 | PTC_high |
| LINC00486                                                          | 9.12862 | 4.17077 | 6.93757e-20 | 1.86773e-18 | PTC_high |
| MDK                                                                | 9.11074 | 2.04118 | 8.18251e-20 | 2.19829e-18 | PTC_high |
| TCN2                                                               | 9.01093 | 1.51219 | 2.04318e-19 | 5.39159e-18 | PTC_high |
| ENSG00000278996                                                    | 8.92908 | 2.63082 | 4.29559e-19 | 1.11749e-17 | PTC_high |
| AEBP1                                                              | 8.89756 | 1.61298 | 5.70873e-19 | 1.47419e-17 | PTC_high |
| MEDAG                                                              | 8.87688 | 5.4523  | 6.87591e-19 | 1.76967e-17 | PTC_high |
| QPCT                                                               | 8.75578 | 3.53058 | 2.02693e-18 | 5.11784e-17 | PTC_high |
| HYOU1                                                              | 8.74854 | 1.65588 | 2.16138e-18 | 5.43951e-17 | PTC_high |
| NET1                                                               | 8.72457 | 1.7922  | 2.67192e-18 | 6.68084e-17 | PTC_high |
| LY96                                                               | 8.70114 | 1.76455 | 3.28562e-18 | 8.19409e-17 | PTC_high |

| Supplementary Table S14 : DEG for thyroid cEC DEGs in PTC vs Young |         |         |             |             |          |
|--------------------------------------------------------------------|---------|---------|-------------|-------------|----------|
| IL18BP                                                             | 8.66416 | 2.04896 | 4.54844e-18 | 1.12634e-16 | PTC_high |
| S100A4                                                             | 8.6601  | 2.58794 | 4.71355e-18 | 1.16499e-16 | PTC_high |
| GADD45G                                                            | 8.65899 | 3.99875 | 4.7596e-18  | 1.17562e-16 | PTC_high |
| CLDN1                                                              | 8.65067 | 5.60749 | 5.11969e-18 | 1.26375e-16 | PTC_high |
| ELFN1                                                              | 8.63    | 2.03012 | 6.13541e-18 | 1.50869e-16 | PTC_high |
| FJX1                                                               | 8.60442 | 2.07021 | 7.67025e-18 | 1.87654e-16 | PTC_high |
| ADGRA2                                                             | 8.55967 | 1.54282 | 1.13189e-17 | 2.74482e-16 | PTC_high |
| TMEM70                                                             | 8.55174 | 1.56505 | 1.21251e-17 | 2.93113e-16 | PTC_high |
| RAB24                                                              | 8.50006 | 3.79034 | 1.89488e-17 | 4.55503e-16 | PTC_high |
| FHL3                                                               | 8.48778 | 2.51368 | 2.10629e-17 | 5.06007e-16 | PTC_high |
| CNN2                                                               | 8.38325 | 1.64132 | 5.14858e-17 | 1.20757e-15 | PTC_high |
| SMIM29                                                             | 8.32164 | 1.79745 | 8.67556e-17 | 2.00316e-15 | PTC_high |
| PDGFA                                                              | 8.30349 | 4.48726 | 1.01098e-16 | 2.32598e-15 | PTC_high |
| CDK16                                                              | 8.29614 | 1.72412 | 1.07553e-16 | 2.47154e-15 | PTC_high |
| PSMD10                                                             | 8.2881  | 2.20909 | 1.15069e-16 | 2.6411e-15  | PTC_high |
| KCNMA1                                                             | 8.28646 | 5.17844 | 1.1667e-16  | 2.67309e-15 | PTC_high |
| PRKAG2                                                             | 8.25687 | 1.9597  | 1.49544e-16 | 3.4101e-15  | PTC_high |
| UBTD1                                                              | 8.24297 | 2.0604  | 1.67984e-16 | 3.81481e-15 | PTC_high |
| DDAH1                                                              | 8.13156 | 3.20367 | 4.23804e-16 | 9.46209e-15 | PTC_high |
| SHROOM2                                                            | 8.11553 | 2.38933 | 4.83668e-16 | 1.07747e-14 | PTC_high |
| MIR155HG                                                           | 8.09743 | 2.49228 | 5.61332e-16 | 1.24904e-14 | PTC_high |
| ITGB3                                                              | 8.06989 | 2.21251 | 7.0363e-16  | 1.55669e-14 | PTC_high |
| ABRACL                                                             | 8.06743 | 1.85016 | 7.17918e-16 | 1.58467e-14 | PTC_high |
| PPT2                                                               | 8.03939 | 2.0202  | 9.02858e-16 | 1.98156e-14 | PTC_high |
| SFXN3                                                              | 8.03073 | 1.52269 | 9.68963e-16 | 2.12544e-14 | PTC_high |
| RBM15B                                                             | 8.02763 | 1.88291 | 9.93743e-16 | 2.17856e-14 | PTC_high |
| INHBB                                                              | 7.94203 | 1.7163  | 1.98902e-15 | 4.28984e-14 | PTC_high |
| NRCAM                                                              | 7.89219 | 8.05976 | 2.96929e-15 | 6.32978e-14 | PTC_high |
| GJA4                                                               | 7.83004 | 1.79692 | 4.87707e-15 | 1.02719e-13 | PTC_high |
| NINJ1                                                              | 7.81461 | 1.59017 | 5.51338e-15 | 1.15616e-13 | PTC_high |
| TGIF1                                                              | 7.81382 | 1.6512  | 5.54791e-15 | 1.16277e-13 | PTC_high |
| LITAF                                                              | 7.79186 | 1.87566 | 6.60303e-15 | 1.37347e-13 | PTC_high |
| LUCAT1                                                             | 7.78627 | 2.0568  | 6.90163e-15 | 1.43327e-13 | PTC_high |
| TRAF4                                                              | 7.76692 | 1.7104  | 8.04198e-15 | 1.66382e-13 | PTC_high |
| ELF4                                                               | 7.75562 | 1.72307 | 8.79136e-15 | 1.81303e-13 | PTC_high |
| ALAS1                                                              | 7.67807 | 1.65628 | 1.61498e-14 | 3.2971e-13  | PTC_high |
| ZBED6                                                              | 7.66731 | 5.42356 | 1.75637e-14 | 3.57729e-13 | PTC_high |
| P3H1                                                               | 7.57014 | 1.5372  | 3.72823e-14 | 7.51996e-13 | PTC_high |
| RHOBTB3                                                            | 7.54869 | 1.75259 | 4.39662e-14 | 8.84042e-13 | PTC_high |
| NHERF1                                                             | 7.53625 | 1.52653 | 4.83689e-14 | 9.72062e-13 | PTC_high |
| LYPD5                                                              | 7.50811 | 2.43021 | 5.99868e-14 | 1.1993e-12  | PTC_high |
| RASA4                                                              | 7.50735 | 3.8788  | 6.03372e-14 | 1.20506e-12 | PTC_high |
| MYOF                                                               | 7.48256 | 2.44571 | 7.28885e-14 | 1.45123e-12 | PTC_high |
| ENSG00000255202                                                    | 7.46864 | 2.44604 | 8.10273e-14 | 1.60913e-12 | PTC_high |
| ZC3H12A                                                            | 7.4584  | 2.40258 | 8.75768e-14 | 1.73384e-12 | PTC_high |
| CHN2                                                               | 7.42947 | 1.70668 | 1.09034e-13 | 2.13949e-12 | PTC_high |
| EIF4EBP1                                                           | 7.37208 | 1.64556 | 1.67991e-13 | 3.26231e-12 | PTC_high |
| ISYNA1                                                             | 7.35689 | 1.80057 | 1.8824e-13  | 3.6427e-12  | PTC_high |
| CABLES1                                                            | 7.27415 | 1.90976 | 3.48603e-13 | 6.66906e-12 | PTC_high |
| ARHGAP4                                                            | 7.26927 | 1.94966 | 3.61446e-13 | 6.89766e-12 | PTC_high |
| CIAO2A                                                             | 7.26916 | 1.53579 | 3.61733e-13 | 6.89973e-12 | PTC_high |
| SLC10A6                                                            | 7.23273 | 1.57344 | 4.73387e-13 | 8.94108e-12 | PTC_high |
| MCM7                                                               | 7.21219 | 1.51445 | 5.50572e-13 | 1.03584e-11 | PTC_high |
| YRDC                                                               | 7.17158 | 1.5226  | 7.41366e-13 | 1.38669e-11 | PTC_high |
| MMP28                                                              | 7.15929 | 2.69373 | 8.10935e-13 | 1.51168e-11 | PTC_high |
| PLP2                                                               | 7.13575 | 1.92277 | 9.62638e-13 | 1.78671e-11 | PTC_high |
| TMEM14A                                                            | 7.13436 | 1.61772 | 9.72361e-13 | 1.80389e-11 | PTC_high |
| LRRC70                                                             | 7.09426 | 2.64345 | 1.30044e-12 | 2.39412e-11 | PTC_high |
| BMP1                                                               | 7.08484 | 1.78775 | 1.3921e-12  | 2.55798e-11 | PTC_high |
| MFGE8                                                              | 7.03431 | 1.84012 | 2.00254e-12 | 3.64187e-11 | PTC_high |
| HAGLROS                                                            | 7.00857 | 6.0249  | 2.40774e-12 | 4.35582e-11 | PTC_high |
| SH3PXD2B                                                           | 6.92219 | 2.01549 | 4.44716e-12 | 7.89365e-11 | PTC_high |
| CYRIA                                                              | 6.90732 | 2.47397 | 4.93906e-12 | 8.75469e-11 | PTC_high |
| PDLIM4                                                             | 6.90113 | 4.31745 | 5.15898e-12 | 9.14032e-11 | PTC_high |
| IL1B                                                               | 6.86975 | 3.64008 | 6.43128e-12 | 1.13166e-10 | PTC_high |
| TAF45                                                              | 6.83533 | 3.34541 | 8.18193e-12 | 1.42993e-10 | PTC_high |
| TUBB2A                                                             | 6.78797 | 1.932   | 1.13725e-11 | 1.97059e-10 | PTC_high |
| SCD5                                                               | 6.72795 | 2.8628  | 1.72069e-11 | 2.95897e-10 | PTC_high |

| Supplementary Table S14 : DEG for thyroid cEC DEGs in PTC vs Young |         |         |             |             |          |
|--------------------------------------------------------------------|---------|---------|-------------|-------------|----------|
| LDOC1                                                              | 6.72317 | 2.16359 | 1.7781e-11  | 3.05498e-10 | PTC_high |
| CRTC2                                                              | 6.69965 | 1.86594 | 2.08923e-11 | 3.57679e-10 | PTC_high |
| NR4A1AS                                                            | 6.69667 | 2.20737 | 2.13225e-11 | 3.64882e-10 | PTC_high |
| NDN                                                                | 6.68953 | 2.93985 | 2.23888e-11 | 3.82622e-10 | PTC_high |
| LDB1                                                               | 6.65486 | 1.6456  | 2.83564e-11 | 4.81411e-10 | PTC_high |
| SPHK1                                                              | 6.63018 | 1.64769 | 3.35272e-11 | 5.66456e-10 | PTC_high |
| C1QTNF5                                                            | 6.59276 | 26.5128 | 4.31717e-11 | 7.23389e-10 | PTC_high |
| ENSG00000287382                                                    | 6.58179 | 2.14835 | 4.64828e-11 | 7.77857e-10 | PTC_high |
| LCN6                                                               | 6.57908 | 1.60515 | 4.73363e-11 | 7.91111e-10 | PTC_high |
| FBLIM1                                                             | 6.57126 | 3.99774 | 4.989e-11   | 8.33068e-10 | PTC_high |
| SDC4                                                               | 6.56967 | 2.80867 | 5.0428e-11  | 8.41687e-10 | PTC_high |
| MYC                                                                | 6.52706 | 3.45246 | 6.70719e-11 | 1.10752e-09 | PTC_high |
| WDR18                                                              | 6.49045 | 1.63845 | 8.55785e-11 | 1.40529e-09 | PTC_high |
| MRPL37                                                             | 6.46129 | 1.62439 | 1.03813e-10 | 1.69177e-09 | PTC_high |
| KCNJ2                                                              | 6.44203 | 6.35306 | 1.17883e-10 | 1.91138e-09 | PTC_high |
| HOTAIRM1                                                           | 6.36771 | 2.11861 | 1.91876e-10 | 3.07368e-09 | PTC_high |
| ENSG00000225032                                                    | 6.34314 | 2.34348 | 2.25122e-10 | 3.58246e-09 | PTC_high |
| RIMOC1                                                             | 6.3226  | 1.74466 | 2.57199e-10 | 4.0778e-09  | PTC_high |
| TAF6                                                               | 6.31595 | 1.54689 | 2.68507e-10 | 4.25534e-09 | PTC_high |
| RGS5                                                               | 6.24451 | 1.90685 | 4.25142e-10 | 6.63957e-09 | PTC_high |
| GDF15                                                              | 6.22099 | 5.52477 | 4.94017e-10 | 7.67795e-09 | PTC_high |
| CDKN2B                                                             | 6.20886 | 2.00692 | 5.33698e-10 | 8.27467e-09 | PTC_high |
| ENSG00000237356                                                    | 6.19258 | 2.35086 | 5.91862e-10 | 9.13612e-09 | PTC_high |
| BOP1                                                               | 6.19047 | 1.69786 | 5.99838e-10 | 9.25553e-09 | PTC_high |
| LYZ                                                                | 6.1814  | 2.55833 | 6.35338e-10 | 9.76817e-09 | PTC_high |
| UBL7                                                               | 6.18012 | 1.82345 | 6.4054e-10  | 9.84422e-09 | PTC_high |
| P2RY6                                                              | 6.13739 | 3.17214 | 8.3886e-10  | 1.27752e-08 | PTC_high |
| EDIL3-DT                                                           | 6.12723 | 3.46121 | 8.94228e-10 | 1.35862e-08 | PTC_high |
| NBPF1                                                              | 6.12005 | 1.80268 | 9.35432e-10 | 1.41899e-08 | PTC_high |
| NBL1                                                               | 6.08478 | 1.55379 | 1.16652e-09 | 1.76191e-08 | PTC_high |
| ZDHHC13                                                            | 6.0755  | 4.53446 | 1.23605e-09 | 1.86329e-08 | PTC_high |
| KLF16                                                              | 6.06186 | 1.61677 | 1.34554e-09 | 2.01888e-08 | PTC_high |
| MRC2                                                               | 6.01754 | 2.26832 | 1.77084e-09 | 2.62237e-08 | PTC_high |
| SLC35E4                                                            | 5.91327 | 1.72295 | 3.35387e-09 | 4.84579e-08 | PTC_high |
| CPSF1                                                              | 5.91082 | 1.6197  | 3.404e-09   | 4.91638e-08 | PTC_high |
| ARL4C                                                              | 5.8914  | 3.19836 | 3.82939e-09 | 5.51426e-08 | PTC_high |
| DUSP2                                                              | 5.89122 | 3.11037 | 3.83353e-09 | 5.51817e-08 | PTC_high |
| SCAMP5                                                             | 5.86929 | 1.93366 | 4.37658e-09 | 6.27645e-08 | PTC_high |
| SERINC2                                                            | 5.83969 | 3.7107  | 5.22978e-09 | 7.47505e-08 | PTC_high |
| HAPLN3                                                             | 5.81609 | 2.81942 | 6.02384e-09 | 8.57509e-08 | PTC_high |
| SMYD2                                                              | 5.81408 | 1.76592 | 6.0968e-09  | 8.67576e-08 | PTC_high |
| NRGN                                                               | 5.81041 | 1.69226 | 6.232e-09   | 8.85508e-08 | PTC_high |
| ANTXR1                                                             | 5.78517 | 2.65401 | 7.24393e-09 | 1.02402e-07 | PTC_high |
| GLMP                                                               | 5.73507 | 1.56448 | 9.74724e-09 | 1.36549e-07 | PTC_high |
| OIT3                                                               | 5.73506 | 3.82922 | 9.74792e-09 | 1.36549e-07 | PTC_high |
| MYOM3                                                              | 5.72709 | 3.89048 | 1.02171e-08 | 1.42449e-07 | PTC_high |
| DNAAF2                                                             | 5.72492 | 1.72064 | 1.03485e-08 | 1.44229e-07 | PTC_high |
| ENSG00000278607                                                    | 5.72071 | 5.35672 | 1.0608e-08  | 1.47793e-07 | PTC_high |
| TPD52L1                                                            | 5.6912  | 2.24301 | 1.26148e-08 | 1.7468e-07  | PTC_high |
| SH2B2                                                              | 5.68545 | 1.92695 | 1.30471e-08 | 1.80408e-07 | PTC_high |
| CAMK2N1                                                            | 5.68335 | 5.15939 | 1.32082e-08 | 1.82504e-07 | PTC_high |
| PMAIP1                                                             | 5.67298 | 1.57537 | 1.40334e-08 | 1.93077e-07 | PTC_high |
| SFTPB                                                              | 5.66935 | 26.9284 | 1.43343e-08 | 1.97077e-07 | PTC_high |
| THOC3                                                              | 5.65316 | 2.22475 | 1.57522e-08 | 2.15649e-07 | PTC_high |
| TRPT1                                                              | 5.61758 | 1.97473 | 1.93653e-08 | 2.63338e-07 | PTC_high |
| SLC22A4                                                            | 5.5916  | 1.53114 | 2.24989e-08 | 3.04129e-07 | PTC_high |
| FTSJ1                                                              | 5.59093 | 1.62725 | 2.25855e-08 | 3.05193e-07 | PTC_high |
| PDE3A                                                              | 5.58895 | 4.39761 | 2.28443e-08 | 3.08474e-07 | PTC_high |
| VIM-AS1                                                            | 5.58339 | 2.71347 | 2.35879e-08 | 3.18181e-07 | PTC_high |
| SLC38A1                                                            | 5.56402 | 2.53674 | 2.63627e-08 | 3.54372e-07 | PTC_high |
| CXCL8                                                              | 5.56136 | 1.90465 | 2.67674e-08 | 3.59312e-07 | PTC_high |
| EXOSC4                                                             | 5.55445 | 1.80554 | 2.78483e-08 | 3.73562e-07 | PTC_high |
| IGKV4-1                                                            | 5.55398 | 8.3363  | 2.79244e-08 | 3.74453e-07 | PTC_high |
| DOK5                                                               | 5.53697 | 3.17634 | 3.07749e-08 | 4.11162e-07 | PTC_high |
| ADPRH                                                              | 5.53365 | 1.76556 | 3.13643e-08 | 4.18545e-07 | PTC_high |
| GABRB2                                                             | 5.50593 | 3.73678 | 3.67234e-08 | 4.86361e-07 | PTC_high |
| TBC1D22A-DT                                                        | 5.45108 | 1.51767 | 5.00641e-08 | 6.54956e-07 | PTC_high |
| USP12-AS1                                                          | 5.44039 | 2.5144  | 5.31632e-08 | 6.94088e-07 | PTC_high |

| Supplementary Table S14 : DEG for thyroid cEC DEGs in PTC vs Young |         |         |             |             |          |
|--------------------------------------------------------------------|---------|---------|-------------|-------------|----------|
| DCUN1D3                                                            | 5.43683 | 1.94215 | 5.42369e-08 | 7.07389e-07 | PTC_high |
| DUSP10                                                             | 5.43289 | 1.77431 | 5.54501e-08 | 7.22236e-07 | PTC_high |
| CCL4L2                                                             | 5.38997 | 4.14337 | 7.0469e-08  | 9.09266e-07 | PTC_high |
| CRTAC1                                                             | 5.38806 | 4.50693 | 7.12205e-08 | 9.1835e-07  | PTC_high |
| LMNB2                                                              | 5.38774 | 1.87376 | 7.13481e-08 | 9.19196e-07 | PTC_high |
| RELT                                                               | 5.37779 | 2.12664 | 7.54049e-08 | 9.69714e-07 | PTC_high |
| AREG                                                               | 5.3645  | 3.3493  | 8.11719e-08 | 1.0411e-06  | PTC_high |
| NPTX2                                                              | 5.33975 | 8.73438 | 9.30737e-08 | 1.18588e-06 | PTC_high |
| HOXD8                                                              | 5.33939 | 3.60611 | 9.32575e-08 | 1.18782e-06 | PTC_high |
| RBM38                                                              | 5.32868 | 1.66427 | 9.89285e-08 | 1.25757e-06 | PTC_high |
| VARS1                                                              | 5.32587 | 1.63664 | 1.00472e-07 | 1.27634e-06 | PTC_high |
| MMP1                                                               | 5.31705 | 3.6971  | 1.05463e-07 | 1.33799e-06 | PTC_high |
| MFAP2                                                              | 5.30301 | 4.16103 | 1.13908e-07 | 1.44039e-06 | PTC_high |
| CD44                                                               | 5.28829 | 2.07512 | 1.23463e-07 | 1.55409e-06 | PTC_high |
| KRT19                                                              | 5.2856  | 1.93124 | 1.25293e-07 | 1.576e-06   | PTC_high |
| STK17B                                                             | 5.2621  | 1.78328 | 1.4242e-07  | 1.78573e-06 | PTC_high |
| SLC45A4                                                            | 5.19265 | 1.87199 | 2.07326e-07 | 2.56704e-06 | PTC_high |
| IGKV3-20                                                           | 5.18098 | 7.51709 | 2.20724e-07 | 2.72506e-06 | PTC_high |
| ULBP2                                                              | 5.17914 | 2.31443 | 2.22906e-07 | 2.75113e-06 | PTC_high |
| TP53I3                                                             | 5.16986 | 2.26898 | 2.34269e-07 | 2.88675e-06 | PTC_high |
| APCDD1                                                             | 5.16278 | 2.08581 | 2.43307e-07 | 2.99334e-06 | PTC_high |
| PGF                                                                | 5.15952 | 2.04093 | 2.47589e-07 | 3.04214e-06 | PTC_high |
| ZCCHC12                                                            | 5.14344 | 7.34593 | 2.69753e-07 | 3.30186e-06 | PTC_high |
| AKR1C3                                                             | 5.14045 | 1.67227 | 2.74083e-07 | 3.35168e-06 | PTC_high |
| TBX1                                                               | 5.09972 | 3.13583 | 3.40164e-07 | 4.12967e-06 | PTC_high |
| LINC01943                                                          | 5.07091 | 5.5041  | 3.95914e-07 | 4.78093e-06 | PTC_high |
| NAB2                                                               | 5.06332 | 2.09254 | 4.12016e-07 | 4.96141e-06 | PTC_high |
| CHST14                                                             | 5.05047 | 1.6656  | 4.40715e-07 | 5.28886e-06 | PTC_high |
| DDX11                                                              | 5.02969 | 1.72284 | 4.91272e-07 | 5.86821e-06 | PTC_high |
| TYROBP                                                             | 5.02924 | 3.44589 | 4.92434e-07 | 5.88027e-06 | PTC_high |
| SHMT2                                                              | 5.01359 | 2.07777 | 5.34237e-07 | 6.35781e-06 | PTC_high |
| NOP16                                                              | 5.01333 | 2.21328 | 5.34966e-07 | 6.36256e-06 | PTC_high |
| PANX1                                                              | 5.00176 | 1.886   | 5.68103e-07 | 6.72767e-06 | PTC_high |
| CERS6                                                              | 4.98877 | 2.02022 | 6.0766e-07  | 7.17849e-06 | PTC_high |
| MTSS2                                                              | 4.98187 | 1.952   | 6.29738e-07 | 7.43022e-06 | PTC_high |
| ADAMTS3                                                            | 4.95082 | 3.98613 | 7.39005e-07 | 8.66121e-06 | PTC_high |
| KLHL6                                                              | 4.94657 | 1.56391 | 7.55334e-07 | 8.84721e-06 | PTC_high |
| VCAN                                                               | 4.94056 | 4.75896 | 7.78979e-07 | 9.09657e-06 | PTC_high |
| TOP1MT                                                             | 4.9331  | 2.52648 | 8.09341e-07 | 9.44255e-06 | PTC_high |
| ZNF385D                                                            | 4.91511 | 2.53675 | 8.87342e-07 | 1.03245e-05 | PTC_high |
| HAPLN1                                                             | 4.90331 | 4.57323 | 9.42358e-07 | 1.09317e-05 | PTC_high |
| ENSG00000289318                                                    | 4.88848 | 4.1988  | 1.01616e-06 | 1.1756e-05  | PTC_high |
| HOXB2                                                              | 4.88028 | 4.50104 | 1.05933e-06 | 1.22408e-05 | PTC_high |
| PERP                                                               | 4.87959 | 1.95128 | 1.06305e-06 | 1.22801e-05 | PTC_high |
| ARHGAP24                                                           | 4.84882 | 1.55668 | 1.24196e-06 | 1.42446e-05 | PTC_high |
| SYNDIG1                                                            | 4.8325  | 2.69029 | 1.34831e-06 | 1.54094e-05 | PTC_high |
| HOXB4                                                              | 4.81901 | 4.17531 | 1.44275e-06 | 1.644e-05   | PTC_high |
| EXOSC5                                                             | 4.79285 | 1.7921  | 1.6443e-06  | 1.86301e-05 | PTC_high |
| KCNG2                                                              | 4.78314 | 3.68704 | 1.72582e-06 | 1.95044e-05 | PTC_high |
| ARSG                                                               | 4.75446 | 2.30722 | 1.98975e-06 | 2.23238e-05 | PTC_high |
| ABCA1                                                              | 4.75324 | 2.2606  | 2.00187e-06 | 2.24403e-05 | PTC_high |
| HLA-L                                                              | 4.74976 | 1.60211 | 2.03663e-06 | 2.28166e-05 | PTC_high |
| MYD88                                                              | 4.7437  | 1.62695 | 2.09848e-06 | 2.34891e-05 | PTC_high |
| TIAM1                                                              | 4.73002 | 1.69828 | 2.24497e-06 | 2.50707e-05 | PTC_high |
| COL5A2                                                             | 4.70258 | 2.07116 | 2.56901e-06 | 2.84915e-05 | PTC_high |
| APOC1                                                              | 4.686   | 2.53186 | 2.78599e-06 | 3.08094e-05 | PTC_high |
| FBXO32                                                             | 4.65252 | 1.76367 | 3.27898e-06 | 3.60343e-05 | PTC_high |
| ALAD                                                               | 4.63989 | 1.63169 | 3.48594e-06 | 3.81565e-05 | PTC_high |
| EXOC8                                                              | 4.60496 | 1.8129  | 4.12542e-06 | 4.4788e-05  | PTC_high |
| BCAT1                                                              | 4.58462 | 4.66304 | 4.54816e-06 | 4.91866e-05 | PTC_high |
| SIGMAR1                                                            | 4.56865 | 1.91367 | 4.90877e-06 | 5.29351e-05 | PTC_high |
| KIF5C                                                              | 4.56613 | 5.82951 | 4.96799e-06 | 5.35588e-05 | PTC_high |
| BCL10-AS1                                                          | 4.55879 | 1.62842 | 5.14482e-06 | 5.53724e-05 | PTC_high |
| MTHFD2                                                             | 4.5347  | 2.32976 | 5.76861e-06 | 6.16258e-05 | PTC_high |
| LPCAT4                                                             | 4.53348 | 1.99084 | 5.80192e-06 | 6.19439e-05 | PTC_high |
| BNC2                                                               | 4.52961 | 2.49503 | 5.9093e-06  | 6.30379e-05 | PTC_high |
| IGFBP3                                                             | 4.507   | 1.90544 | 6.575e-06   | 6.97731e-05 | PTC_high |
| ABCB4                                                              | 4.50403 | 3.09331 | 6.66753e-06 | 7.07356e-05 | PTC_high |

| Supplementary Table S14 : DEG for thyroid cEC DEGs in PTC vs Young |         |         |             |             |          |
|--------------------------------------------------------------------|---------|---------|-------------|-------------|----------|
| TBC1D7                                                             | 4.50225 | 1.54562 | 6.72388e-06 | 7.13137e-05 | PTC_high |
| PLPP2                                                              | 4.50091 | 1.64349 | 6.76624e-06 | 7.1704e-05  | PTC_high |
| DGKA                                                               | 4.49802 | 1.89144 | 6.85904e-06 | 7.25878e-05 | PTC_high |
| PRICKLE4                                                           | 4.47079 | 2.08409 | 7.79328e-06 | 8.19802e-05 | PTC_high |
| ARHGAP42                                                           | 4.44932 | 3.01451 | 8.61415e-06 | 9.00753e-05 | PTC_high |
| ST8SIA6                                                            | 4.43437 | 1.93396 | 9.23434e-06 | 9.61696e-05 | PTC_high |
| LINC02725                                                          | 4.43041 | 3.29679 | 9.4054e-06  | 9.78456e-05 | PTC_high |
| EPB41L3                                                            | 4.40634 | 3.82896 | 1.05133e-05 | 0.000109019 | PTC_high |
| CYP1B1                                                             | 4.3989  | 2.22977 | 1.088e-05   | 0.000112701 | PTC_high |
| ZEB2                                                               | 4.38943 | 1.57269 | 1.1365e-05  | 0.000117359 | PTC_high |
| RABGGTA                                                            | 4.3839  | 1.87134 | 1.16575e-05 | 0.000120173 | PTC_high |
| APOL4                                                              | 4.36071 | 2.3821  | 1.29643e-05 | 0.0001329   | PTC_high |
| IGF2                                                               | 4.3077  | 7.96535 | 1.64962e-05 | 0.000167109 | PTC_high |
| ZNF574                                                             | 4.29489 | 1.8328  | 1.74782e-05 | 0.000176455 | PTC_high |
| COQ10A                                                             | 4.29411 | 1.50073 | 1.75393e-05 | 0.000176933 | PTC_high |
| GET4                                                               | 4.28476 | 4.74742 | 1.82938e-05 | 0.000184015 | PTC_high |
| TPBG                                                               | 4.27811 | 3.15728 | 1.88488e-05 | 0.000189302 | PTC_high |
| CDK5                                                               | 4.27701 | 2.04408 | 1.89419e-05 | 0.000190187 | PTC_high |
| RUNX1                                                              | 4.27372 | 2.19999 | 1.92236e-05 | 0.000192916 | PTC_high |
| BMAL2                                                              | 4.26122 | 3.70445 | 2.03312e-05 | 0.00020345  | PTC_high |
| ARMCX6                                                             | 4.25653 | 2.80394 | 2.07628e-05 | 0.000207499 | PTC_high |
| CSRNP3                                                             | 4.21616 | 2.0955  | 2.48495e-05 | 0.000245732 | PTC_high |
| CD68                                                               | 4.19395 | 3.27456 | 2.7414e-05  | 0.000269093 | PTC_high |
| HMCN2                                                              | 4.17967 | 2.78973 | 2.9193e-05  | 0.000285034 | PTC_high |
| SH3BP5-AS1                                                         | 4.1767  | 1.63123 | 2.95762e-05 | 0.000288557 | PTC_high |
| PTPRJ                                                              | 4.1538  | 1.75331 | 3.26999e-05 | 0.000317349 | PTC_high |
| CCL4                                                               | 4.13565 | 2.24885 | 3.53951e-05 | 0.000342129 | PTC_high |
| PHLDA2                                                             | 4.13352 | 1.91365 | 3.57254e-05 | 0.000345063 | PTC_high |
| HEPH                                                               | 4.12295 | 3.3748  | 3.74057e-05 | 0.00036039  | PTC_high |
| AFF2                                                               | 4.06005 | 4.20057 | 4.90628e-05 | 0.000466761 | PTC_high |
| SYNM-AS2                                                           | 4.04819 | 6.938   | 5.16153e-05 | 0.00049032  | PTC_high |
| NAGA                                                               | 4.04029 | 1.63424 | 5.33855e-05 | 0.000506637 | PTC_high |
| HEY2                                                               | 4.02464 | 1.89549 | 5.70622e-05 | 0.000540549 | PTC_high |
| ZDHHC16                                                            | 4.02278 | 1.54678 | 5.75147e-05 | 0.000544485 | PTC_high |
| C14orf132                                                          | 4.01053 | 2.38448 | 6.05822e-05 | 0.000572263 | PTC_high |
| RPS4Y1                                                             | 4.00805 | 8.57129 | 6.12215e-05 | 0.000577877 | PTC_high |
| IGSF1                                                              | 4.00528 | 5.10896 | 6.19451e-05 | 0.000584279 | PTC_high |
| MIR31HG                                                            | 3.97284 | 26.2384 | 7.10216e-05 | 0.0006655   | PTC_high |
| PLPPR2                                                             | 3.95997 | 1.65305 | 7.49602e-05 | 0.000700706 | PTC_high |
| GPR183                                                             | 3.9441  | 3.57283 | 8.00986e-05 | 0.000746568 | PTC_high |
| FCER1G                                                             | 3.91465 | 3.42671 | 9.05371e-05 | 0.000836591 | PTC_high |
| PDE5A                                                              | 3.91233 | 1.7027  | 9.14085e-05 | 0.000844238 | PTC_high |
| FN3K                                                               | 3.8995  | 2.13633 | 9.6392e-05  | 0.000886448 | PTC_high |
| RND3                                                               | 3.89156 | 2.75112 | 9.96009e-05 | 0.000913565 | PTC_high |
| NPAS2                                                              | 3.88987 | 3.25278 | 0.000100298 | 0.000919522 | PTC_high |
| GPRIN3                                                             | 3.88507 | 4.08193 | 0.000102302 | 0.000936556 | PTC_high |
| RP1                                                                | 3.88036 | 4.29338 | 0.000104302 | 0.000953513 | PTC_high |
| RTL6                                                               | 3.86022 | 2.18557 | 0.000113285 | 0.00103051  | PTC_high |
| C1QA                                                               | 3.85855 | 3.30484 | 0.000114061 | 0.00103732  | PTC_high |
| HLA-G                                                              | 3.84102 | 2.01687 | 0.000122524 | 0.00110932  | PTC_high |
| CCDC184                                                            | 3.84091 | 2.61456 | 0.000122577 | 0.00110955  | PTC_high |
| DPP3                                                               | 3.82578 | 1.68289 | 0.000130359 | 0.00117585  | PTC_high |
| ENSG00000280441                                                    | 3.81482 | 2.1135  | 0.000136285 | 0.00122644  | PTC_high |
| ENSG00000289412                                                    | 3.80706 | 2.48301 | 0.00014063  | 0.00126377  | PTC_high |
| IRF2BP1                                                            | 3.77201 | 1.71456 | 0.000161939 | 0.00144651  | PTC_high |
| SKIC2                                                              | 3.77131 | 1.53628 | 0.000162396 | 0.00145025  | PTC_high |
| GBA1                                                               | 3.76693 | 2.68993 | 0.000165266 | 0.00147418  | PTC_high |
| HOXB3                                                              | 3.7594  | 3.1002  | 0.000170321 | 0.00151822  | PTC_high |
| CTHRC1                                                             | 3.75857 | 2.30938 | 0.00017089  | 0.00152294  | PTC_high |
| NEK10                                                              | 3.75693 | 2.97376 | 0.000172008 | 0.0015322   | PTC_high |
| PCDHGC3                                                            | 3.71914 | 2.40418 | 0.000199899 | 0.00176638  | PTC_high |
| SAMD5                                                              | 3.69846 | 4.45971 | 0.000216915 | 0.00191018  | PTC_high |
| UCP2                                                               | 3.69169 | 2.64723 | 0.000222772 | 0.00195729  | PTC_high |
| GPX7                                                               | 3.68954 | 1.64074 | 0.000224659 | 0.00197073  | PTC_high |
| ABHD4                                                              | 3.67942 | 2.10204 | 0.000233761 | 0.00204547  | PTC_high |
| STEAP3                                                             | 3.66792 | 3.53272 | 0.000244528 | 0.00213146  | PTC_high |
| UQCRL                                                              | 3.65961 | 3.73113 | 0.000252604 | 0.00219888  | PTC_high |
| CORO1A                                                             | 3.65545 | 3.35741 | 0.000256735 | 0.00223031  | PTC_high |



| Supplementary Table S14 : DEG for thyroid cEC DEGs in PTC vs Young |         |         |             |            |          |
|--------------------------------------------------------------------|---------|---------|-------------|------------|----------|
| RGS2                                                               | 3.65164 | 2.47748 | 0.000260566 | 0.00226309 | PTC_high |
| LMNB1                                                              | 3.64509 | 1.62754 | 0.000267298 | 0.00231894 | PTC_high |
| LCP1                                                               | 3.6048  | 3.57701 | 0.000312395 | 0.00268067 | PTC_high |
| COL1A1                                                             | 3.59712 | 3.2863  | 0.000321756 | 0.00275304 | PTC_high |
| NOX5                                                               | 3.55802 | 3.68377 | 0.000373656 | 0.0031725  | PTC_high |
| RASD1                                                              | 3.5542  | 1.50736 | 0.000379134 | 0.00321195 | PTC_high |
| RNASEH2A                                                           | 3.5518  | 4.10264 | 0.000382602 | 0.00323706 | PTC_high |
| BMAL1                                                              | 3.54905 | 1.55409 | 0.000386624 | 0.00326751 | PTC_high |
| COL13A1                                                            | 3.54326 | 1.74972 | 0.000395216 | 0.00333867 | PTC_high |
| FAM89A                                                             | 3.53815 | 2.68398 | 0.000402948 | 0.00339804 | PTC_high |
| CXCL14                                                             | 3.53129 | 4.77504 | 0.000413533 | 0.00347894 | PTC_high |
| CHAC1                                                              | 3.52661 | 3.01808 | 0.000420917 | 0.00353566 | PTC_high |
| PSPH                                                               | 3.52589 | 1.7574  | 0.000422055 | 0.00354445 | PTC_high |
| LONRF3                                                             | 3.52468 | 1.6825  | 0.000423996 | 0.00355998 | PTC_high |
| LGI2                                                               | 3.52262 | 3.79728 | 0.000427308 | 0.00358623 | PTC_high |
| CCL5                                                               | 3.51919 | 2.14652 | 0.000432874 | 0.003629   | PTC_high |
| NHS                                                                | 3.5146  | 2.78365 | 0.000440422 | 0.00368907 | PTC_high |
| TMEM37                                                             | 3.50819 | 1.88856 | 0.000451174 | 0.00377259 | PTC_high |
| ENSG00000259945                                                    | 3.47053 | 4.5028  | 0.000519438 | 0.00431349 | PTC_high |
| F3                                                                 | 3.46943 | 2.52532 | 0.000521562 | 0.00432927 | PTC_high |
| LINC00324                                                          | 3.45489 | 1.84363 | 0.000550514 | 0.00455392 | PTC_high |
| BOK                                                                | 3.44883 | 1.91274 | 0.000563029 | 0.00464948 | PTC_high |
| LEF1-AS1                                                           | 3.43537 | 5.13302 | 0.000591742 | 0.004872   | PTC_high |
| ZNF703                                                             | 3.43526 | 1.65537 | 0.000591976 | 0.00487289 | PTC_high |
| ENSG00000289293                                                    | 3.43397 | 4.34824 | 0.00059482  | 0.0048936  | PTC_high |
| C1orf198                                                           | 3.42593 | 1.65145 | 0.000612691 | 0.00502839 | PTC_high |
| ZNF513                                                             | 3.41788 | 1.7113  | 0.000631116 | 0.00516643 | PTC_high |
| RITA1                                                              | 3.39528 | 1.63998 | 0.000685579 | 0.00558975 | PTC_high |
| EOLA2                                                              | 3.37543 | 1.80799 | 0.00073701  | 0.00597752 | PTC_high |
| PLEKHA6                                                            | 3.37459 | 1.58289 | 0.000739247 | 0.00599441 | PTC_high |
| SLIT2                                                              | 3.36127 | 2.08758 | 0.000775848 | 0.00627275 | PTC_high |
| CAPN11                                                             | 3.34604 | 2.39326 | 0.000819745 | 0.00660139 | PTC_high |
| ENSG00000288755                                                    | 3.34583 | 1.59162 | 0.00082038  | 0.00660512 | PTC_high |
| LSP1                                                               | 3.33531 | 3.96578 | 0.000852029 | 0.00684424 | PTC_high |
| CCL3                                                               | 3.31458 | 3.09895 | 0.000917813 | 0.00733605 | PTC_high |
| NOVA1                                                              | 3.30668 | 3.0458  | 0.000944095 | 0.00753208 | PTC_high |
| EDN1                                                               | 3.30602 | 3.33789 | 0.000946306 | 0.00754816 | PTC_high |
| IGLV2-14                                                           | 3.29689 | 6.81859 | 0.000977605 | 0.00778013 | PTC_high |
| C1QTNF6                                                            | 3.29557 | 2.43733 | 0.000982219 | 0.00781363 | PTC_high |
| PTPRC                                                              | 3.29189 | 1.97641 | 0.000995171 | 0.00790689 | PTC_high |
| SEPTIN5                                                            | 3.28874 | 1.92251 | 0.00100636  | 0.00798594 | PTC_high |
| TSPYL4                                                             | 3.27141 | 1.50867 | 0.00107011  | 0.00845357 | PTC_high |
| APLN                                                               | 3.26891 | 4.37213 | 0.00107962  | 0.00851998 | PTC_high |
| ENSG00000251143                                                    | 3.24267 | 3.48156 | 0.00118415  | 0.00926349 | PTC_high |
| PROX1                                                              | 3.22316 | 1.84075 | 0.00126784  | 0.00987216 | PTC_high |

## Supplementary Table S15

| Supplementary Table S15: ORA results for thyroid cEC DEGs in Young vs Old |                                                    |                     |            |                  |            |                |                                                                    |              |              |                          |
|---------------------------------------------------------------------------|----------------------------------------------------|---------------------|------------|------------------|------------|----------------|--------------------------------------------------------------------|--------------|--------------|--------------------------|
| Gene_set                                                                  | Term                                               | Overlap             | P-value    | Adjusted P-value | Odds Ratio | Combined Score | Genes                                                              | cluster_name | comparison   | -log10(Adjusted P-value) |
| MSigDB_Hallmark_2020                                                      | TNF-alpha Signaling via NF-kB                      | 11/200              | 7.4534e-13 | 1.93787e-11      | 32.867     | 917.808        | FOSL1;SPSB1;IL6;CDKN1A;NFIL3;GADD45A;SPHK1;PLAUR;TNFAIP3;CCL2;SIK1 | Old          | Young_vs_Old | 10.7127                  |
| GO_Biological_Process_2023                                                | B Cell Receptor Signaling Pathway                  | 1946-07-01 00:00:00 | 1.0561e-11 | 6.94919e-09      | 91.6535    | 2316.44        | IGHG3;IGHM;IGHG4;IGHG1;IGKC;IGLC3;IGHA1                            | Old          | Young_vs_Old | 8.15807                  |
| MSigDB_Hallmark_2020                                                      | Inflammatory Response                              | 7/200               | 3.4629e-07 | 4.5018e-06       | 18.3774    | 273.382        | IL6;CDKN1A;SPHK1;PLAUR;CCL2;ICAM4;SELE                             | Old          | Young_vs_Old | 5.34661                  |
| GO_Biological_Process_2023                                                | Antigen Receptor-Mediated Signaling Pathway        | 7/134               | 2.2282e-08 | 7.33083e-06      | 28.0212    | 493.719        | IGHG3;IGHM;IGHG4;IGHG1;IGKC;IGLC3;IGHA1                            | Old          | Young_vs_Old | 5.13485                  |
| MSigDB_Hallmark_2020                                                      | Interferon Gamma Response                          | 6/200               | 6.2275e-06 | 5.39717e-05      | 15.2784    | 183.134        | IL6;CDKN1A;PNP;TNFAIP3;CCL2;HLA-DQA1                               | Old          | Young_vs_Old | 4.26783                  |
| MSigDB_Hallmark_2020                                                      | Hypoxia                                            | 5/200               | 9.3444e-05 | 0.000485909      | 12.3571    | 114.651        | IL6;CDKN1A;NFIL3;PLAUR;TNFAIP3                                     | Old          | Young_vs_Old | 3.31345                  |
| MSigDB_Hallmark_2020                                                      | Epithelial Mesenchymal Transition                  | 5/200               | 9.3444e-05 | 0.000485909      | 12.3571    | 114.651        | IL6;CXCL12;GADD45A;PLAUR;TNFAIP3                                   | Old          | Young_vs_Old | 3.31345                  |
| MSigDB_Hallmark_2020                                                      | p53 Pathway                                        | 4/200               | 0.00114018 | 0.00494077       | 9.60058    | 65.059         | CDKN1A;GADD45A;SPHK1;TM4SF1                                        | Old          | Young_vs_Old | 2.30621                  |
| GO_Biological_Process_2023                                                | Retina Homeostasis                                 | 1939-03-01 00:00:00 | 9.8192e-05 | 0.0173335        | 38.6008    | 356.231        | IGHG3;IGKC;IGHA1                                                   | Old          | Young_vs_Old | 1.76111                  |
| GO_Biological_Process_2023                                                | Positive Regulation Of T Cell Activation           | 4/107               | 0.00010628 | 0.0173335        | 18.3551    | 167.938        | IL6;PNP;CCL2;HLA-DQA1                                              | Old          | Young_vs_Old | 1.76111                  |
| GO_Biological_Process_2023                                                | Positive Regulation Of Chondrocyte Differentiation | 2026-02-10 00:00:00 | 0.00014846 | 0.0313007        | 142.536    | 1256.48        | ZBTB16;SOX5                                                        | Young        | Young_vs_Old | 1.50445                  |
| GO_Biological_Process_2023                                                | Positive Regulation Of Cartilage Development       | 2026-02-17 00:00:00 | 0.00044503 | 0.0313007        | 75.9924    | 586.461        | ZBTB16;SOX5                                                        | Young        | Young_vs_Old | 1.50445                  |
| GO_Biological_Process_2023                                                | Regulation Of Cartilage Development                | 2026-02-17 00:00:00 | 0.00044503 | 0.0313007        | 75.9924    | 586.461        | ZBTB16;SOX5                                                        | Young        | Young_vs_Old | 1.50445                  |
| MSigDB_Hallmark_2020                                                      | Estrogen Response Early                            | 3/200               | 0.00596044 | 0.0327824        | 8.85309    | 45.3509        | TFF3;PAPSS2;FKBP5                                                  | Young        | Young_vs_Old | 1.48436                  |
| MSigDB_Hallmark_2020                                                      | Estrogen Response Late                             | 3/200               | 0.00596044 | 0.0327824        | 8.85309    | 45.3509        | TFF3;PAPSS2;FKBP5                                                  | Young        | Young_vs_Old | 1.48436                  |
| GO_Biological_Process_2023                                                | Regulation Of Chondrocyte Differentiation          | 2026-02-25 00:00:00 | 0.00097259 | 0.0513041        | 49.5404    | 343.59         | ZBTB16;SOX5                                                        | Young        | Young_vs_Old | 1.28985                  |
| GO_Biological_Process_2023                                                | Regulation Of Dendrite Morphogenesis               | 1931-02-01 00:00:00 | 0.00149702 | 0.0526453        | 39.2788    | 255.48         | HECW2;IL1RAPL1                                                     | Young        | Young_vs_Old | 1.27864                  |
| GO_Biological_Process_2023                                                | Negative Regulation Of Chemotaxis                  | 1931-02-01 00:00:00 | 0.00149702 | 0.0526453        | 39.2788    | 255.48         | ROBO2;SEMA6D                                                       | Young        | Young_vs_Old | 1.27864                  |
| GO_Biological_Process_2023                                                | Connective Tissue Development                      | 1938-02-01 00:00:00 | 0.00224489 | 0.0676674        | 31.6302    | 192.915        | ZBTB16;SOX5                                                        | Young        | Young_vs_Old | 1.16962                  |
| GO_Biological_Process_2023                                                | Regulation Of Synapse Assembly                     | 1951-02-01 00:00:00 | 0.00401043 | 0.0976697        | 23.2233    | 128.166        | ROBO2;IL1RAPL1                                                     | Young        | Young_vs_Old | 1.01024                  |



## Supplementary Table S16

| Supplementary Table S16: ORA results for thyroid cEC DEGs in PTC vs Young |                                   |                     |             |                  |            |                |                                                                                                                                                                                                                                                                                                                                    |              |              |                          |  |
|---------------------------------------------------------------------------|-----------------------------------|---------------------|-------------|------------------|------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|--------------------------|--|
| Gene_set                                                                  | Term                              | Overlap             | P-value     | Adjusted P-value | Odds Ratio | Combined Score | Genes                                                                                                                                                                                                                                                                                                                              | cluster_name | comparison   | -log10(Adjusted P-value) |  |
| MSigDB_Hallmark_2020                                                      | TNF-alpha Signaling via NF-kB     | 54/200              | 2.29698e-34 | 1.07958e-32      | 11.856     | 918.321        | CDKN1A;SERPINE1;TNFAIP3;LITAF;AREG;SAT1;CXCL2;PANX1;ZFP36;MYC;ZC3H12A;PMEPA1;CCN1;PHLDA2;PHLDA1;DUSP4;KDM6B;TGIF1;DUSP5;DUSP2;EDN1;SPHK1;PLAUR;F3;RHO B;TUBB2A;IL1B;NINJ1;FJX1;SQSTM1;CD44;PP1R15A;PFKFB3;SDC4;NFIL3;CCL5;CCL4;MCL1;ABCA1;EGR1;EGR3;FOSL2;FOSL1;NFKBIA;NR4A1;YRDC;PTPRE;SPSB1;NR4A3;GPR183;BHLHE40;BCL3;FOSB;ACKR3 | PTC          | PTC_vs_Young | 31.9667                  |  |
| MSigDB_Hallmark_2020                                                      | Epithelial Mesenchymal Transition | 47/200              | 4.06413e-27 | 9.5507e-26       | 9.7297     | 591.25         | SPARC;CXCL8;SDC4;MCM7;ITGB3;SERPINE1;HTRA1;TNFAIP3;THY1;PLOD1;AREG;FSTL1;SAT1;THBS1;NT5E;SERPINH1;FLNA;PMEPA1;TIMP1;SLIT2;CCN1;EDIL3;PDLIM4;CTHRC1;TNFRSF12A;MMP1;IGFBP3;MMP2;ITGA2;FN1;BGN;PLAUR;P3H1;VEGFC;GPX7;RHOB;COL1A1;MMP14;VCAN;BMP1;FAP;COL4A1;COL6A2;COL5A2;PIB;CD44;SNTB1                                              | PTC          | PTC_vs_Young | 25.02                    |  |
| MSigDB_Hallmark_2020                                                      | Hypoxia                           | 30/200              | 3.01194e-12 | 4.71871e-11      | 5.43206    | 144.104        | PPP1R15A;GPI;CDKN1A;PFKFB3;SDC4;CITED2;SERPINE1;CXCR4;TNFAIP3;ZFP36;NFIL3;PIM1;CCN1;TPI1;ANXA2;CAVIN3;IGFBP3;TPBG;BGN;PLAUR;MIF;F3;PGF;FOSL2;PFKL;BHLHE40;ACKR3;S100A4;ALDOA;GAPDH                                                                                                                                                 | PTC          | PTC_vs_Young | 10.3262                  |  |
| MSigDB_Hallmark_2020                                                      | Coagulation                       | 23/138              | 1.21381e-10 | 1.42623e-09      | 6.1054     | 139.399        | C1QA;SPARC;SERPINA1;CFH;WDR1;S100A1;MMP1;ITGB3;MMP2;ITGA2;SERPINE1;HTRA1;FN1;CRIP2;F3;THBS1;MMP14;BMP1;GNB2;APOC1;TIMP1;SH2B2;CTSB                                                                                                                                                                                                 | PTC          | PTC_vs_Young | 8.84581                  |  |
| MSigDB_Hallmark_2020                                                      | Inflammatory Response             | 24/200              | 4.13973e-08 | 3.89134e-07      | 4.15616    | 70.655         | ABCA1;CDKN1A;EDN1;CXCL8;SPHK1;ITGB3;TPBG;SERPINE1;PLAUR;HIF1A;F3;NFKBIA;PTPRE;MMP14;MYC;GPR183;IL1B;CCL5;STAB1;APLNR;TIMP1;MET;CD55;KCNJ2                                                                                                                                                                                          | PTC          | PTC_vs_Young | 6.4099                   |  |
| MSigDB_Hallmark_2020                                                      | Apoptosis                         | 21/161              | 6.86916e-08 | 5.38084e-07      | 4.55862    | 75.1883        | IFITM3;CDKN1A;EGR3;TNFRSF12A;MMP2;LEF1;BGN;HSPB1;EMP1;SAT1;H1-0;RHOB;IL1B;PEA15;LMNA;PMAIP1;BAX;TIMP1;SQSTM1;CD44;MCL1                                                                                                                                                                                                             | PTC          | PTC_vs_Young | 6.26915                  |  |
| MSigDB_Hallmark_2020                                                      | Complement                        | 23/200              | 1.73271e-07 | 1.01796e-06      | 3.954      | 61.5574        | CDA;DUSP5;C1QA;SERPINA1;FCER1G;CFH;SERPINE1;FN1;PLAUR;TNFAIP3;F3;MMP14;PPP4C;CA2;GNB2;CCL5;APOC1;PIM1;CDH13;TIMP1;PFN1;CD55;CTSB                                                                                                                                                                                                   | PTC          | PTC_vs_Young | 5.99227                  |  |
| MSigDB_Hallmark_2020                                                      | p53 Pathway                       | 23/200              | 1.73271e-07 | 1.01796e-06      | 3.954      | 61.5574        | PPP1R15A;CDKN1A;CDKN2B;STEAP3;ABHD4;SPHK1;DGKA;PDGFA;INHBB;TPD52L1;SAT1;TM4SF1;ZFP36L1;PTPRE;TCN2;TRAF4;PERP;NINJ1;CDH13;BAX;TAX1BP3;S100A4;UPP1                                                                                                                                                                                   | PTC          | PTC_vs_Young | 5.99227                  |  |
| MSigDB_Hallmark_2020                                                      | Estrogen Response Late            | 22/200              | 6.90956e-07 | 2.95227e-06      | 3.75468    | 53.2608        | KCNK5;DUSP2;EGR3;SERPINA1;RNASEH2A;IGSF1;TPBG;MYOF;NAB2;TPD52L1;AREG;CXCL14;TIAM1;KRT19;ZFP36;RAB31;CA2;MDK;PERP;SLC29A1;NBL1;CD44                                                                                                                                                                                                 | PTC          | PTC_vs_Young | 5.52984                  |  |
| MSigDB_Hallmark_2020                                                      | Apical Junction                   | 22/200              | 6.90956e-07 | 2.95227e-06      | 3.75468    | 53.2608        | JUP;SHC1;ITGA2;MMP2;SHROOM2;THY1;ACTB;CNN2;ADAMTS5;VCAN;PTPRC;BMP1;ADAM15;MDK;ZYX;FSCN1;SLIT2;PFN1;CD99;MPZL2;CD276;YWHAH                                                                                                                                                                                                          | PTC          | PTC_vs_Young | 5.52984                  |  |
| GO_Biological_Process_2023                                                | Response To Zinc Ion              | 2026-06-25 00:00:00 | 5.46817e-06 | 0.00499464       | 16.7788    | 203.301        | MT1M;MT1F;MT1G;MT1X;D2HGDH;MT1E                                                                                                                                                                                                                                                                                                    | Young        | PTC_vs_Young | 2.3015                   |  |

| Supplementary Table S16: ORA results for thyroid cEC DEGs in PTC vs Young |                                                                               |                     |             |            |         |         |                                                               |       |              |          |
|---------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------|-------------|------------|---------|---------|---------------------------------------------------------------|-------|--------------|----------|
| GO_Biological_Process_2023                                                | Cellular Response To Zinc Ion                                                 | 2026-05-15 00:00:00 | 5.80434e-06 | 0.00499464 | 26.5068 | 319.589 | MT1M;MT1F;MT1G;MT1X;MT1E                                      | Young | PTC_vs_Young | 2.3015   |
| GO_Biological_Process_2023                                                | Cellular Response To Copper Ion                                               | 2026-05-20 00:00:00 | 2.77377e-05 | 0.0159122  | 17.6667 | 185.371 | MT1M;MT1F;MT1G;MT1X;MT1E                                      | Young | PTC_vs_Young | 1.79827  |
| GO_Biological_Process_2023                                                | Response To Manganese Ion                                                     | 2026-03-05 00:00:00 | 6.35871e-05 | 0.0246072  | 79.125  | 764.593 | PRKN;LRRK2;D2HGDH                                             | Young | PTC_vs_Young | 1.60894  |
| GO_Biological_Process_2023                                                | Response To Copper Ion                                                        | 2026-05-24 00:00:00 | 7.1491e-05  | 0.0246072  | 13.9445 | 133.114 | MT1M;MT1F;MT1G;MT1X;MT1E                                      | Young | PTC_vs_Young | 1.60894  |
| MSigDB_Hallmark_2020                                                      | Fatty Acid Metabolism                                                         | 9/158               | 0.00301971  | 0.0743032  | 3.21421 | 18.6508 | CBR1;HPGD;MAOA;CA4;AQP7;D2HGDH;XIST;CD36;INMT                 | Young | PTC_vs_Young | 1.12899  |
| MSigDB_Hallmark_2020                                                      | Estrogen Response Late                                                        | 10/200              | 0.00461723  | 0.0743032  | 2.80245 | 15.0715 | UNC13B;SCUBE2;PCP4;DNAJC1;SLC24A3;FABP5;TFF3;CKB;PAPSS2;FKBP5 | Young | PTC_vs_Young | 1.12899  |
| MSigDB_Hallmark_2020                                                      | UV Response Dn                                                                | 8/144               | 0.00586604  | 0.0743032  | 3.12374 | 16.0516 | NRP1;PLCB4;NFIB;PRKCE;LDLR;ADGRL2;MT1E;SYNE1                  | Young | PTC_vs_Young | 1.12899  |
| GO_Biological_Process_2023                                                | Immunoglobulin Production Involved In Immunoglobulin-Mediated Immune Response | 2026-04-19 00:00:00 | 0.00037716  | 0.108113   | 14.0952 | 111.111 | SHLD1;HLA-DRA;HLA-DQA2;HLA-DRB1                               | Young | PTC_vs_Young | 0.966121 |
| GO_Biological_Process_2023                                                | Positive Regulation Of Vasculogenesis                                         | 2026-03-09 00:00:00 | 0.000504    | 0.108113   | 26.3696 | 200.168 | CEACAM1;RAPGEF2;RIN2                                          | Young | PTC_vs_Young | 0.966121 |

## Supplementary Table S17

| Supplementary Table S17: Cell-cell interaction results for inflammation-related LR pairs |          |          |           |           |                      |         |           |          |                 |
|------------------------------------------------------------------------------------------|----------|----------|-----------|-----------|----------------------|---------|-----------|----------|-----------------|
| pair_label                                                                               | ligand   | receptor | source    | target    | axis_super           | context | condition | lr_means | cellphone_pvals |
| CXCL12-CXCR4 (Capillary → T cell)                                                        | CXCL12   | CXCR4    | Capillary | T cell    | Infiltration         | PTC     | PTC       | 1.78709  | 0               |
| CXCL12-CXCR4 (Capillary → T cell)                                                        | CXCL12   | CXCR4    | Capillary | T cell    | Infiltration         | PTC     | Old       | 1.61401  | 0               |
| CXCL12-CXCR4 (Capillary → T cell)                                                        | CXCL12   | CXCR4    | Capillary | T cell    | Infiltration         | PTC     | Young     | 1.36846  | 0               |
| HLA_DRA-CD4 (Capillary → T cell)                                                         | HLA_DRA  | CD4      | Capillary | T cell    | Antigen Presentation | Old     | PTC       | 0.520469 | 1               |
| HLA_DRA-CD4 (Capillary → T cell)                                                         | HLA_DRA  | CD4      | Capillary | T cell    | Antigen Presentation | Old     | Old       | 1.03459  | 0               |
| HLA_DRA-CD4 (Capillary → T cell)                                                         | HLA_DRA  | CD4      | Capillary | T cell    | Antigen Presentation | Old     | Young     | 0.829481 | 0               |
| HLA_DRB1-CD4 (Capillary → T cell)                                                        | HLA_DRB1 | CD4      | Capillary | T cell    | Antigen Presentation | Old     | PTC       | 0.556158 | 1               |
| HLA_DRB1-CD4 (Capillary → T cell)                                                        | HLA_DRB1 | CD4      | Capillary | T cell    | Antigen Presentation | Old     | Old       | 1.18321  | 0               |
| HLA_DRB1-CD4 (Capillary → T cell)                                                        | HLA_DRB1 | CD4      | Capillary | T cell    | Antigen Presentation | Old     | Young     | 0.99818  | 0               |
| ICAM1-ITGAL (Capillary → T cell)                                                         | ICAM1    | ITGAL    | Capillary | T cell    | Retention            | Old     | PTC       | 0.81448  | 0               |
| ICAM1-ITGAL (Capillary → T cell)                                                         | ICAM1    | ITGAL    | Capillary | T cell    | Retention            | Old     | Old       | 0.886497 | 0               |
| ICAM1-ITGAL (Capillary → T cell)                                                         | ICAM1    | ITGAL    | Capillary | T cell    | Retention            | Old     | Young     | 0.615665 | 0               |
| MIF-ACKR3 (T cell → Capillary)                                                           | MIF      | ACKR3    | T cell    | Capillary | Angiogenesis         | PTC     | PTC       | 0.898445 | 0               |
| MIF-ACKR3 (T cell → Capillary)                                                           | MIF      | ACKR3    | T cell    | Capillary | Angiogenesis         | PTC     | Old       | 0.692784 | 1               |
| MIF-ACKR3 (T cell → Capillary)                                                           | MIF      | ACKR3    | T cell    | Capillary | Angiogenesis         | PTC     | Young     | 0        | 1               |
| SELE-CD44 (Capillary → T cell)                                                           | SELE     | CD44     | Capillary | T cell    | Retention            | Old     | PTC       | 1.22222  | 0               |
| SELE-CD44 (Capillary → T cell)                                                           | SELE     | CD44     | Capillary | T cell    | Retention            | Old     | Old       | 1.36632  | 0               |
| SELE-CD44 (Capillary → T cell)                                                           | SELE     | CD44     | Capillary | T cell    | Retention            | Old     | Young     | 1.00107  | 0               |
| TGFB1-ENG (T cell → Capillary)                                                           | TGFB1    | ENG      | T cell    | Capillary | Angiogenesis         | PTC     | PTC       | 1.90068  | 0               |
| TGFB1-ENG (T cell → Capillary)                                                           | TGFB1    | ENG      | T cell    | Capillary | Angiogenesis         | PTC     | Old       | 1.30225  | 0               |
| TGFB1-ENG (T cell → Capillary)                                                           | TGFB1    | ENG      | T cell    | Capillary | Angiogenesis         | PTC     | Young     | 1.24839  | 0               |
| TGFB1-ITGB1 (T cell → Capillary)                                                         | TGFB1    | ITGB1    | T cell    | Capillary | Angiogenesis         | PTC     | PTC       | 1.55533  | 0               |
| TGFB1-ITGB1 (T cell → Capillary)                                                         | TGFB1    | ITGB1    | T cell    | Capillary | Angiogenesis         | PTC     | Old       | 1.29455  | 0               |
| TGFB1-ITGB1 (T cell → Capillary)                                                         | TGFB1    | ITGB1    | T cell    | Capillary | Angiogenesis         | PTC     | Young     | 1.0883   | 0               |
| TNF-TNFRSF1A (T cell → Capillary)                                                        | TNF      | TNFRSF1A | T cell    | Capillary | Pro-inflammatory     | Common  | PTC       | 0.392264 | 0               |
| TNF-TNFRSF1A (T cell → Capillary)                                                        | TNF      | TNFRSF1A | T cell    | Capillary | Pro-inflammatory     | Common  | Old       | 0.294138 | 0               |
| TNF-TNFRSF1A (T cell → Capillary)                                                        | TNF      | TNFRSF1A | T cell    | Capillary | Pro-inflammatory     | Common  | Young     | 0.255061 | 0               |
| TNF-TNFRSF1B (T cell → Capillary)                                                        | TNF      | TNFRSF1B | T cell    | Capillary | Pro-inflammatory     | Common  | PTC       | 0.295157 | 1               |
| TNF-TNFRSF1B (T cell → Capillary)                                                        | TNF      | TNFRSF1B | T cell    | Capillary | Pro-inflammatory     | Common  | Old       | 0.21518  | 1               |
| TNF-TNFRSF1B (T cell → Capillary)                                                        | TNF      | TNFRSF1B | T cell    | Capillary | Pro-inflammatory     | Common  | Young     | 0.17059  | 1               |