

Supplementary Tables

	Study	SampleID	No. of cells	No. of reads	No. of reads per cell	Read length	No. of SNVs in WGS (W)	No. of SNVs in single cell sequencing (N)	No. of SNVs overlapping (TP)	0/1->1/1	1/1->0/1	Recall (TP/W)	Precision (TP/N)	Genotyping accuracy	Overall accuracy
snRNA-seq	Retina tissue	19D013	21016 ^a	722847191	33133	150bp	4043921	830799	823045	2479	15114	0.203	0.991	0.979	0.970
		19D014	20127	717949095	35670	150bp	4069978	827731	820017	2476	15585	0.201	0.991	0.979	0.970
		19D015	26395	619591103	23473	150bp	4147482	885969	878586	2746	13108	0.212	0.992	0.982	0.974
		19D016	25340	594626499	25340	150bp	3925722	905395	892993	3276	12540	0.227	0.986	0.983	0.970
		sciATAC-seq	Transverse colon	ENCDO 845WKR	12122 ^b	67690360	5584	50bp	3900140	1133545	1126660	4068	16289	0.289	0.994
		ENCDO 793IXB	12611	61044400	4840	50bp	3728381	755565	752150	4038	28779	0.202	0.995	0.957	0.952

Table S1. Summary of SNV calling for two benchmarking datasets for Monopogen. ^a: cells with at least 500 genes expressed. ^b: cells with at least 500 peaks detected.

	Platform	Study	SampleID	No. of SNVs in WGS (W)	No. of SNVs in single cells (N)	No. of SNVs overlapping (TP)	0/1->1/1	1/1->0/1	Recall (TP/W)	Precision (TP/N)	Genotyping accuracy	Overall accuracy
Samtools	snRNA-seq	Retina tissue	19D013	4043921	1061214	768328	90076	3027	0.190	0.724	0.879	0.636
			19D014	4069978	1120514	828363	96285	3061	0.204	0.739	0.880	0.651
			19D015	4147482	1055049	840055	83022	2926	0.203	0.796	0.898	0.715
			19D016	3925722	1075721	826081	81474	3666	0.210	0.768	0.897	0.689
	snATAC-seq	Transverse colon	ENCDO 845WKR	3900140	188322	185654	64750	270	0.048	0.986	0.650	0.641
			ENCDO 793IXB	3728381	331891	329371	93192	40	0.088	0.992	0.717	0.711
GATK	snRNA-seq	Retina tissue	19D013	4043921	1068479	423234	3177	2724	0.105	0.396	0.986	0.391
			19D014	4069978	1114374	463466	3888	3016	0.114	0.416	0.985	0.410
			19D015	4147482	891334	455319	2395	2583	0.110	0.511	0.989	0.505
			19D016	3925722	926002	444972	2216	3238	0.113	0.481	0.988	0.475
	snATAC-seq	Transverse colon	ENCDO 845WKR	3900140	507967	464775	95537	627	0.119	0.915	0.793	0.726
			ENCDO 793IXB	3728381	292631	256275	53060	98	0.069	0.876	0.793	0.694

Table S2. Summary of SNV calling for two benchmarking datasets for Samtools and GATK.

Fraction of clusters with SNV	SampleID	No. of SNVs called (N)	No. of SNVs overlapping in WGS (TP)	0/1->0/1	0/1->1/1	1/1->0/1	1/1->1/1	Precision (TP/N)	Genotyping accuracy	Overall accuracy
>0	19D013	129942	37674	37545	45	79	5	0.29	0.997	0.289
>0.1	19D013	124875	37616	37497	36	79	4	0.301	0.997	0.300
>0.2	19D013	106891	37228	37138	15	74	1	0.348	0.998	0.347
>0.3	19D013	83565	36334	36261	4	69	0	0.435	0.998	0.434
>0.4	19D013	64935	34919	34855	3	61	0	0.538	0.998	0.537
>0.5	19D013	51398	32558	32499	2	57	0	0.633	0.998	0.632
>0.6	19D013	41769	29500	29454	1	45	0	0.706	0.998	0.705
>0.7	19D013	33213	25027	24985	1	41	0	0.754	0.998	0.752
>0.8	19D013	24199	19079	19051	0	28	0	0.788	0.999	0.787
>0.9	19D013	12247	10031	10020	0	11	0	0.819	0.999	0.818
>0	19D014	118783	36182	35979	72	126	5	0.305	0.995	0.303
>0.1	19D014	114956	36134	35941	62	126	5	0.314	0.995	0.312
>0.2	19D014	99169	35821	35670	27	123	1	0.361	0.996	0.360
>0.3	19D014	77232	35067	34950	3	114	0	0.454	0.997	0.453
>0.4	19D014	59934	33806	33702	1	103	0	0.564	0.997	0.562
>0.5	19D014	47528	31686	31593	0	93	0	0.667	0.997	0.665
>0.6	19D014	38688	28707	28630	0	77	0	0.742	0.997	0.740
>0.7	19D014	30583	24332	24265	0	67	0	0.796	0.997	0.794
>0.8	19D014	22171	18406	18359	0	47	0	0.83	0.997	0.828
>0.9	19D014	11150	9463	9432	0	31	0	0.849	0.997	0.846
>0	19D015	69548	29467	29370	34	59	4	0.424	0.997	0.423
>0.1	19D015	67710	29441	29351	27	59	4	0.435	0.997	0.434
>0.2	19D015	59270	29201	29136	8	55	2	0.493	0.998	0.492
>0.3	19D015	48496	28717	28663	1	52	1	0.592	0.998	0.591
>0.4	19D015	40188	27902	27851	1	50	0	0.694	0.998	0.693
>0.5	19D015	34524	26581	26537	0	44	0	0.77	0.998	0.768
>0.6	19D015	30417	24877	24836	0	41	0	0.818	0.998	0.816
>0.7	19D015	26685	22655	22622	0	33	0	0.849	0.999	0.848
>0.8	19D015	20575	18207	18181	0	26	0	0.885	0.999	0.884
>0.9	19D015	12066	10952	10939	0	13	0	0.908	0.999	0.907
>0	19D016	79931	30432	30258	47	123	4	0.381	0.994	0.379
>0.1	19D016	77746	30394	30230	37	123	4	0.391	0.995	0.389
>0.2	19D016	67693	30187	30050	13	120	4	0.446	0.996	0.444
>0.3	19D016	54813	29641	29520	3	117	1	0.541	0.996	0.539
>0.4	19D016	44836	28825	28712	0	112	1	0.643	0.996	0.640
>0.5	19D016	38119	27556	27449	0	106	1	0.723	0.996	0.720
>0.6	19D016	33143	25756	25663	0	92	1	0.777	0.996	0.774
>0.7	19D016	28721	23278	23196	0	82	0	0.81	0.996	0.807
>0.8	19D016	22224	18922	18859	0	63	0	0.851	0.997	0.848
>0.9	19D016	12548	10972	10942	0	30	0	0.874	0.997	0.871

Table S3. Summary of novel SNVs detected from Monopogen in 4 retina snRNA-seq samples (related to **Fig. S1b**).

	SampleID	No. of cells	No. of reads	No. of reads per cell	Read length	No. of germline SNVs
Asia Immune Diversity Study	JP_H045	1569	59239054	37755	150bp	121313
	JP_H046	1189	39486450	33209	150bp	99964
	JP_H047	1221	41068349	33635	150bp	110858
	JP_H048	1142	37410391	32758	150bp	93531
	JP_H137	1197	45362685	37896	150bp	124220
	JP_H146	1117	44239330	39605	150bp	112796
	JP_H148	1112	44318390	39854	150bp	120655
	JP_H149	1411	57020159	40411	150bp	132721
	KR_H001	1264	57476150	45471	150bp	163256
	KR_H002	840	35435379	42184	150bp	118850
	KR_H004	821	34368945	41862	150bp	128936
	KR_H005	918	35884600	39089	150bp	114778
	KR_H160	1279	47380301	37044	150bp	120229
	KR_H161	1573	57235627	36386	150bp	131808
	KR_H164	1573	57235627	36386	150bp	120423
	KR_H165	1602	52719939	32908	150bp	103942
	Lonza_3038016	1300	40815193	31396	150bp	102320
	Lonza_3038097	999	44136732	44180	150bp	98936
	Lonza_3038099	1049	48096207	45849	150bp	77076
	Lonza_3038306	761	23257052	30561	150bp	82056
Human Breast Cell Atlas	HBCA02C	1709	324492736	189872	125bp	256088
	HBCA02i	2232	331161319	148369	125bp	369781
	HBCA03C	1865	356381426	191089	125bp	471241
	HBCA03Ccryo	1525	348639606	228616	125bp	310490
	HBCA03i	1470	356132757	242267	125bp	442943
	HBCA04C	1810	357352385	197432	125bp	380657
	HBCA04i	759	349784479	460849	125bp	390222
	HBCA04T	1608	348689072	216846	125bp	352607
	HBCA05C	464	362981567	782287	125bp	441287
	HBCA05Ccryo	1145	349034669	304833	125bp	293419
	HBCA05i	1663	348892182	209796	125bp	430660
	HBCA06C	1045	330866587	316618	125bp	390307
	HBCA07C	1405	320441257	228072	125bp	379910
	HBCA07i	2451	319876418	130508	125bp	429340
	HBCA07T	2226	314283146	141187	125bp	454028
	HBCA09C	1231	319872861	259847	125bp	385241
	HBCA09i	2027	323445690	159568	125bp	314550
	HBCA10C	1466	362133748	247021	125bp	267024
	HBCA10Ccryo	1297	348249946	268504	125bp	300322
	HBCA10i	891	345961110	388284	125bp	237928
GETx	GTEX-13N11	5226	119605363	22887	100bp	300538
	GTEX-144GM	5289	89603310	16941	100bp	181382
	GTEX-15CHR	3508	115170743	32830	100bp	155046
	GTEX-15RIE	5001	114957894	22987	100bp	205432
	GTEX-15SB6	4819	128624204	26691	100bp	304507
	GTEX-16BQI	5269	116701973	22148	100bp	211307
	GTEX-11CG6	4148	109050028	26289	100bp	216682

Table S4. Summary of SNV calling for AIDA, HBCA, and GETx cohorts.

SampleID	No. of SNVs in snRNA-seq	No. of SNVs in snATAC-seq	SampleID	No. of SNVs in snRNA-seq	No. of SNVs in snATAC-seq
ENCDO738SLM	537076	2602120	ENCDO271OUW	N.A	2468503
ENCDO575WHY	788194	2599335	ENCDO793LXB	N.A	2590288
ENCDO377SFB	646028	2595870	ENCDO189VYV	698813	2601870
ENCDO411EVD	790506	2592981	ENCDO123GXG	726431	2594985
ENCDO650FUH	949924	2609254	ENCDO266KDE	1031286	2591638
ENCDO229CTV	998609	2591653	ENCDO182VFD	942648	2601761
ENCDO934DRK	984814	2603980	ENCDO308XYT	704328	2600948
ENCDO269PFV	1176624	2593567	ENCDO239INK	802663	2591464
ENCDO107KXS	954463	2460631	ENCDO971VRE	939773	2587254
ENCDO435KUZ	903239	2595532	ENCDO423HZU	892430	2459095
ENCDO184BIH	760618	2530747	ENCDO593PZY	1061712	2453326
ENCDO602PYC	752144	2594180	ENCDO862XAV	719859	2610909
ENCDO038QFX	676060	2596614	ENCDO212WIV	642434	2579584
ENCDO216BMM	707303	2619222	ENCDO280SCV	671894	2599335
ENCDO528BHB	780800	2596634	ENCDO817MDD	693944	2623213
ENCDO737TEG	881202	2608524	ENCDO607DMC	685762	2587715
ENCDO061UFT	759082	2617048	ENCDO446FXE	690928	2597200
ENCDO751PQQ	1063673	2608314	ENCDO110LFV	710207	2599868
ENCDO874YWU	632607	2587876	ENCDO477WED	N.A	2481147
ENCDO639HZG	706263	2462721	ENCDO768WUT	680723	2599976
ENCDO545EJY	804425	2446069	ENCDO208BPU	649945	2589330
ENCDO739PAW	592706	2602392	ENCDO098ZMW	634326	2589542
ENCDO750LVJ	1038750	2589178	ENCDO695LFW	702332	2618752
ENCDO580GZH	1085464	2466424	ENCDO907YUG	N.A	2964332
ENCDO894OKI	881239	2588923	ENCDO967KID	N.A	2596910
ENCDO187SDN	908590	2603997	ENCDO804CLC	N.A	2585524
ENCDO865TFF	790664	2459535	ENCDO926KEV	N.A	2693594
ENCDO076AMT	418685	2601072	ENCDO808ASZ	N.A	2627648
ENCDO068KYD	886965	2599461	ENCDO439CAZ	N.A	2605541
ENCDO522PCG	706117	2613923	ENCDO039RUH	N.A	2607601
ENCDO529CYH	669832	2615742	ENCDO121UJI	N.A	2633926
ENCDO856ZOJ	888770	2600768	ENCDO240MDH	639683	2597854
			ENCDO166SII	658079	2587348

Table S5. Summary of SNV calling from heart left ventricle samples. N.A: not available.

rsID	CHR	POS	A1	A2	AF1	BETA	SE	P	distancetoFeature	symbol
rs12748496	1	59020879	A	G	0.265	0.168	0.038	8.08E-06	87235	LINC01358
rs12124171	1	80188832	G	A	0.204	-0.206	0.042	8.70E-07	-346924	LINC01781
rs10159130	1	80192436	C	T	0.204	-0.206	0.042	8.70E-07	-343320	LINC01781
rs11162948	1	80192975	C	T	0.204	-0.206	0.042	8.70E-07	-342781	LINC01781
rs17104484	1	80193168	C	A	0.204	-0.206	0.042	8.70E-07	-342588	LINC01781
rs11162949	1	80195006	G	A	0.204	-0.206	0.042	8.70E-07	-340750	LINC01781
rs10782722	1	80197213	G	A	0.204	-0.206	0.042	8.70E-07	-338543	LINC01781
rs10782723	1	80197498	C	G	0.204	-0.206	0.042	8.70E-07	-338258	LINC01781
rs1529999	2	118476740	T	C	0.500	-0.128	0.028	5.87E-06	370939	EN1
rs4849701	2	118478920	C	T	0.510	-0.139	0.028	6.15E-07	368759	EN1
rs6542466	2	118481948	A	G	0.520	-0.133	0.028	1.72E-06	365731	EN1
rs4848510	2	118482581	A	C	0.449	-0.129	0.028	4.12E-06	365098	EN1
rs1344896	2	118492854	T	C	0.449	-0.129	0.028	4.12E-06	354825	EN1
rs6752749	2	118499583	G	C	0.449	-0.129	0.028	4.12E-06	348096	EN1
rs13009652	2	138959515	C	T	0.265	0.179	0.040	7.79E-06	-179166	NXP2
rs1710827	2	235760076	A	G	0.296	0.160	0.030	6.52E-08	254324	AGAP1-IT1
rs2696393	2	235760409	G	A	0.296	0.160	0.030	6.52E-08	254657	AGAP1-IT1
rs2696394	2	235760459	C	G	0.296	0.160	0.030	6.52E-08	254707	AGAP1-IT1
rs2696395	2	235760542	A	G	0.296	0.160	0.030	6.52E-08	254790	AGAP1-IT1
rs2696396	2	235760568	G	A	0.296	0.160	0.030	6.52E-08	254816	AGAP1-IT1
rs2675142	2	235760894	G	A	0.296	0.160	0.030	6.52E-08	255142	AGAP1-IT1
rs2696397	2	235761153	T	C	0.296	0.160	0.030	6.52E-08	255401	AGAP1-IT1
rs72975265	2	235761194	G	A	0.296	0.160	0.030	6.52E-08	255442	AGAP1-IT1
rs12469618	2	235761287	G	A	0.296	0.160	0.030	6.52E-08	255535	AGAP1-IT1
rs12469659	2	235761387	G	A	0.296	0.160	0.030	6.52E-08	255635	AGAP1-IT1
rs6714660	2	235761752	C	T	0.296	0.160	0.030	6.52E-08	256000	AGAP1-IT1
rs6715112	2	235762292	G	A	0.296	0.160	0.030	6.52E-08	256540	AGAP1-IT1
rs6718263	2	235762347	G	T	0.296	0.160	0.030	6.52E-08	256595	AGAP1-IT1
rs2696403	2	235762546	A	G	0.296	0.160	0.030	6.52E-08	256794	AGAP1-IT1
rs2696402	2	235762632	T	C	0.296	0.160	0.030	6.52E-08	256880	AGAP1-IT1
rs2696401	2	235762650	T	C	0.286	0.166	0.031	8.09E-08	256898	AGAP1-IT1
rs2675141	2	235762859	C	T	0.296	0.160	0.030	6.52E-08	257107	AGAP1-IT1
rs3896943	2	235762882	A	G	0.296	0.160	0.030	6.52E-08	257130	AGAP1-IT1
rs938492	2	235762995	C	G	0.306	0.157	0.030	2.33E-07	257243	AGAP1-IT1
rs938491	2	235763052	G	A	0.316	0.153	0.031	7.22E-07	257300	AGAP1-IT1
rs2696405	2	235763462	C	T	0.306	0.157	0.030	2.33E-07	257710	AGAP1-IT1
rs2696406	2	235763593	G	T	0.306	0.157	0.030	2.33E-07	257841	AGAP1-IT1
rs2696407	2	235763618	C	T	0.306	0.157	0.030	2.33E-07	257866	AGAP1-IT1
rs552845949	2	235764030	G	T	0.286	0.157	0.032	8.88E-07	258278	AGAP1-IT1
rs2675139	2	235764071	G	A	0.306	0.157	0.030	2.33E-07	258319	AGAP1-IT1
rs2696409	2	235764087	C	T	0.316	0.156	0.031	3.03E-07	258335	AGAP1-IT1
rs2696410	2	235764169	A	G	0.306	0.157	0.030	2.33E-07	258417	AGAP1-IT1
rs2675138	2	235764317	T	C	0.306	0.157	0.030	2.33E-07	258565	AGAP1-IT1
rs2675136	2	235764447	T	C	0.306	0.157	0.030	2.33E-07	258695	AGAP1-IT1
rs2675135	2	235764536	G	C	0.296	0.161	0.032	3.06E-07	258784	AGAP1-IT1
rs6712556	2	235765406	T	C	0.306	0.157	0.030	2.33E-07	259654	AGAP1-IT1
rs6712558	2	235765411	T	C	0.306	0.157	0.030	2.33E-07	259659	AGAP1-IT1
rs2675134	2	235765760	C	T	0.306	0.157	0.030	2.33E-07	260008	AGAP1-IT1
rs2675133	2	235766294	T	C	0.296	0.161	0.032	3.06E-07	260542	AGAP1-IT1
rs2696386	2	235766387	A	G	0.296	0.161	0.032	3.06E-07	260635	AGAP1-IT1
rs2696387	2	235766438	T	G	0.306	0.157	0.030	2.33E-07	260686	AGAP1-IT1
rs2675132	2	235767018	G	A	0.296	0.161	0.032	3.06E-07	261266	AGAP1-IT1
rs2675131	2	235767377	T	C	0.296	0.161	0.032	3.06E-07	261625	AGAP1-IT1
rs2696388	2	235767450	C	T	0.296	0.161	0.032	3.06E-07	261698	AGAP1-IT1
rs2675130	2	235767464	C	T	0.296	0.161	0.032	3.06E-07	261712	AGAP1-IT1
rs2696389	2	235767675	G	C	0.296	0.161	0.032	3.06E-07	261923	AGAP1-IT1

rs2675129	2	235767934	G	A	0.296	0.161	0.032	3.06E-07	262182	AGAP1-IT1
rs2696391	2	235768052	T	G	0.296	0.161	0.032	3.06E-07	262300	AGAP1-IT1
rs2696392	2	235768704	G	C	0.296	0.161	0.032	3.06E-07	262952	AGAP1-IT1
rs2675128	2	235769187	G	A	0.296	0.161	0.032	3.06E-07	263435	AGAP1-IT1
rs1728290	2	235770056	G	A	0.296	0.161	0.032	3.06E-07	264304	AGAP1-IT1
rs55907328	2	235770216	C	T	0.296	0.161	0.032	3.06E-07	264464	AGAP1-IT1
rs55749012	2	235770415	A	G	0.296	0.161	0.032	3.06E-07	264663	AGAP1-IT1
rs55797253	2	235770425	G	A	0.296	0.161	0.032	3.06E-07	264673	AGAP1-IT1
rs3108498	2	235770557	C	T	0.306	0.157	0.030	2.33E-07	264805	AGAP1-IT1
rs1710823	2	235770800	T	C	0.296	0.161	0.032	3.06E-07	265048	AGAP1-IT1
rs1710822	2	235770942	A	C	0.306	0.157	0.030	2.33E-07	265190	AGAP1-IT1
rs2675127	2	235771440	C	G	0.296	0.161	0.032	3.06E-07	265688	AGAP1-IT1
rs2675126	2	235771482	C	T	0.296	0.161	0.032	3.06E-07	265730	AGAP1-IT1
rs2675125	2	235771605	G	A	0.296	0.161	0.032	3.06E-07	265853	AGAP1-IT1
rs55926594	2	235771838	T	C	0.296	0.161	0.032	3.06E-07	266086	AGAP1-IT1
rs56071605	2	235771872	T	C	0.296	0.161	0.032	3.06E-07	266120	AGAP1-IT1
rs117993231	2	235771999	T	C	0.286	0.162	0.033	1.36E-06	266247	AGAP1-IT1
rs115957313	2	235772047	G	A	0.296	0.161	0.032	3.06E-07	266295	AGAP1-IT1
rs3108499	2	235772298	G	A	0.296	0.161	0.032	3.06E-07	266546	AGAP1-IT1
rs3106791	2	235772312	T	C	0.296	0.161	0.032	3.06E-07	266560	AGAP1-IT1
rs3106792	2	235772645	T	C	0.296	0.161	0.032	3.06E-07	266893	AGAP1-IT1
rs3108501	2	235772820	A	G	0.296	0.161	0.032	3.06E-07	267068	AGAP1-IT1
rs72977127	2	235773027	C	T	0.296	0.161	0.032	3.06E-07	267275	AGAP1-IT1
rs2696413	2	235773216	T	G	0.296	0.161	0.032	3.06E-07	267464	AGAP1-IT1
rs2696412	2	235774212	C	T	0.296	0.161	0.032	3.06E-07	268460	AGAP1-IT1
rs2696411	2	235774270	C	T	0.296	0.161	0.032	3.06E-07	268518	AGAP1-IT1
rs2249999	2	235774743	A	C	0.296	0.161	0.032	3.06E-07	268991	AGAP1-IT1
rs1356223	2	235774940	G	A	0.296	0.161	0.032	3.06E-07	269188	AGAP1-IT1
rs1400147	2	235775059	G	A	0.296	0.161	0.032	3.06E-07	269307	AGAP1-IT1
rs2292704	2	235775848	C	T	0.296	0.161	0.032	3.06E-07	270096	AGAP1-IT1
rs2292705	2	235775902	C	T	0.296	0.161	0.032	3.06E-07	270150	AGAP1-IT1
rs12465436	2	235776372	C	T	0.306	0.161	0.032	4.11E-07	270620	AGAP1-IT1
rs12468185	2	235776373	C	G	0.306	0.161	0.032	4.11E-07	270621	AGAP1-IT1
rs12468221	2	235776470	C	G	0.296	0.161	0.032	3.06E-07	270718	AGAP1-IT1
rs72981174	2	235776777	A	C	0.296	0.161	0.032	3.06E-07	271025	AGAP1-IT1
rs72981176	2	235776888	A	G	0.296	0.161	0.032	3.06E-07	271136	AGAP1-IT1
rs113739109	2	235777087	C	G	0.296	0.161	0.032	3.06E-07	271335	AGAP1-IT1
rs138493201	2	235777118	G	A	0.306	0.161	0.032	4.11E-07	271366	AGAP1-IT1
rs12151454	2	235777185	C	T	0.296	0.161	0.032	3.06E-07	271433	AGAP1-IT1
rs72981179	2	235777749	T	C	0.296	0.161	0.032	3.06E-07	271997	AGAP1-IT1
rs55961214	2	235778520	A	G	0.265	0.168	0.033	2.45E-07	272768	AGAP1-IT1
rs61402262	2	235778549	T	C	0.296	0.161	0.032	3.06E-07	272797	AGAP1-IT1
rs12470717	2	235778877	A	G	0.296	0.161	0.032	3.06E-07	273125	AGAP1-IT1
rs12463796	2	235779111	T	C	0.296	0.161	0.032	3.06E-07	273359	AGAP1-IT1
rs13400202	2	235780146	G	A	0.296	0.161	0.032	3.06E-07	274394	AGAP1-IT1
rs12472838	2	235780401	A	G	0.296	0.161	0.032	3.06E-07	274649	AGAP1-IT1
rs12470048	2	235780439	G	T	0.296	0.161	0.032	3.06E-07	274687	AGAP1-IT1
rs60591163	2	235781589	C	T	0.296	0.161	0.032	3.06E-07	275837	AGAP1-IT1
rs72981189	2	235781867	A	G	0.296	0.161	0.032	3.06E-07	276115	AGAP1-IT1
rs963846	2	235783052	G	C	0.684	-0.150	0.031	1.69E-06	277300	AGAP1-IT1
rs373964138	2	235783214	A	T	0.296	0.161	0.032	3.06E-07	277462	AGAP1-IT1
rs1878154	2	235783338	G	A	0.296	0.161	0.032	3.06E-07	277586	AGAP1-IT1
rs12466588	2	235783594	G	A	0.296	0.161	0.032	3.06E-07	277842	AGAP1-IT1
rs72981192	2	235783821	T	C	0.296	0.161	0.032	3.06E-07	278069	AGAP1-IT1
rs59832814	2	235785072	G	A	0.296	0.161	0.032	3.06E-07	279320	AGAP1-IT1
rs56009264	2	235785796	G	T	0.296	0.161	0.032	3.06E-07	280044	AGAP1-IT1
rs12469834	2	235786022	G	A	0.296	0.161	0.032	3.06E-07	280270	AGAP1-IT1

rs57957542	2	235786605	A	G	0.296	0.161	0.032	3.06E-07	280853	AGAP1-IT1
rs61499079	2	235786797	G	C	0.296	0.161	0.032	3.06E-07	281045	AGAP1-IT1
rs1878155	2	235787192	T	G	0.296	0.161	0.032	3.06E-07	281440	AGAP1-IT1
rs12472982	2	235788018	C	T	0.296	0.161	0.032	3.06E-07	282266	AGAP1-IT1
rs12472150	2	235788047	G	A	0.296	0.161	0.032	3.06E-07	282295	AGAP1-IT1
rs56329604	2	235788220	T	C	0.296	0.161	0.032	3.06E-07	282468	AGAP1-IT1
rs72983003	2	235788415	T	G	0.296	0.161	0.032	3.06E-07	282663	AGAP1-IT1
rs72983005	2	235788471	C	T	0.296	0.161	0.032	3.06E-07	282719	AGAP1-IT1
rs72983007	2	235788621	G	T	0.296	0.161	0.032	3.06E-07	282869	AGAP1-IT1
rs72983009	2	235788684	G	A	0.296	0.161	0.032	3.06E-07	282932	AGAP1-IT1
rs72983012	2	235788851	T	C	0.296	0.161	0.032	3.06E-07	283099	AGAP1-IT1
rs12469161	2	235789283	G	C	0.296	0.161	0.032	3.06E-07	283531	AGAP1-IT1
rs12469185	2	235789305	T	C	0.296	0.161	0.032	3.06E-07	283553	AGAP1-IT1
rs12474276	2	235789568	A	T	0.296	0.161	0.032	3.06E-07	283816	AGAP1-IT1
rs56062711	2	235789772	T	G	0.296	0.161	0.032	3.06E-07	284020	AGAP1-IT1
rs55936237	2	235789838	T	C	0.296	0.161	0.032	3.06E-07	284086	AGAP1-IT1
rs72983019	2	235790229	C	T	0.296	0.161	0.032	3.06E-07	284477	AGAP1-IT1
rs12475524	2	235790749	G	T	0.296	0.161	0.032	3.06E-07	284997	AGAP1-IT1
rs12474606	2	235790763	G	A	0.296	0.161	0.032	3.06E-07	285011	AGAP1-IT1
rs12470496	2	235790785	T	C	0.296	0.161	0.032	3.06E-07	285033	AGAP1-IT1
rs12474630	2	235790852	G	A	0.306	0.161	0.032	4.11E-07	285100	AGAP1-IT1
rs55881123	2	235790935	C	T	0.296	0.161	0.032	3.06E-07	285183	AGAP1-IT1
rs72983030	2	235791262	G	A	0.296	0.161	0.032	3.06E-07	285510	AGAP1-IT1
rs72983032	2	235791271	C	T	0.296	0.161	0.032	3.06E-07	285519	AGAP1-IT1
rs6845244	4	14785233	C	A	0.806	-0.177	0.038	2.74E-06	102937	LINC00504
rs4698291	4	14788174	G	C	0.806	-0.177	0.038	2.74E-06	99996	LINC00504
rs13151601	4	27958744	T	A	0.724	0.170	0.038	6.30E-06	741264	LINC02261
rs7665009	4	27960206	T	C	0.724	0.170	0.038	6.30E-06	742726	LINC02261
rs7438137	4	75831883	T	C	0.439	0.145	0.032	5.02E-06	70689	PPEF2
rs62326190	4	155956020	C	T	0.194	0.176	0.038	3.24E-06	197027	GUCY1B1
rs4306914	4	156020957	G	C	0.194	0.176	0.038	3.24E-06	261964	GUCY1B1
rs371103786	4	181401805	T	C	0.286	0.183	0.040	4.71E-06	-242655	LINC00290
rs4113603	4	184286837	C	T	0.347	-0.170	0.037	4.85E-06	-65606	ENPP6
rs1217971	4	184288728	T	C	0.622	0.180	0.038	2.63E-06	65250	LINC02363
rs1217972	4	184288886	G	T	0.622	0.180	0.038	2.63E-06	65092	LINC02363
rs6453850	6	75937483	A	G	0.306	0.170	0.036	1.84E-06	135196	IMPG1
rs9341546	6	75937859	T	C	0.653	-0.157	0.033	2.49E-06	134820	IMPG1
rs9350607	6	75937890	C	T	0.653	-0.157	0.033	2.49E-06	134789	IMPG1
rs9360962	6	75938923	G	T	0.663	-0.165	0.035	1.85E-06	133756	IMPG1
rs9343338	6	75939209	T	A	0.663	-0.165	0.035	1.85E-06	133470	IMPG1
rs13207399	6	75939355	G	C	0.306	0.170	0.036	1.84E-06	133324	IMPG1
rs2313752	6	75940342	C	T	0.663	-0.165	0.035	1.85E-06	132337	IMPG1
rs2313753	6	75942546	G	C	0.663	-0.165	0.035	1.85E-06	130133	IMPG1
rs2313755	6	75943204	T	C	0.673	-0.173	0.033	2.03E-07	129475	IMPG1
rs1610336	6	75943378	A	G	0.306	0.170	0.036	1.84E-06	129301	IMPG1
rs76014128	6	78481469	C	T	0.163	0.209	0.044	2.46E-06	-386004	IRAK1BP1
rs76364903	6	78482432	A	G	0.184	0.199	0.044	5.69E-06	-385041	IRAK1BP1
rs11968517	6	78486543	C	G	0.163	0.209	0.044	2.46E-06	-380930	IRAK1BP1
rs997648	6	78488462	A	G	0.163	0.209	0.044	2.46E-06	-379011	IRAK1BP1
rs78808189	6	78489069	A	T	0.163	0.209	0.044	2.46E-06	-378404	IRAK1BP1
rs77972979	6	78489165	T	C	0.163	0.209	0.044	2.46E-06	-378308	IRAK1BP1
rs79700878	6	78489720	A	G	0.163	0.209	0.044	2.46E-06	-377753	IRAK1BP1
rs1407103	6	78491257	A	C	0.163	0.209	0.044	2.46E-06	-376216	IRAK1BP1
rs7773443	6	78494501	A	G	0.163	0.209	0.044	2.46E-06	-372972	IRAK1BP1
rs76167616	6	78494757	T	C	0.163	0.209	0.044	2.46E-06	-372716	IRAK1BP1
rs76312719	6	78495068	C	T	0.163	0.209	0.044	2.46E-06	-372405	IRAK1BP1
rs77974320	6	78495334	C	T	0.163	0.209	0.044	2.46E-06	-372139	IRAK1BP1

rs148823079	6	78495409	C	T	0.163	0.209	0.044	2.46E-06	-372064	IRAK1BP1
rs114251753	6	78495612	A	G	0.163	0.209	0.044	2.46E-06	-371861	IRAK1BP1
rs80099930	6	78495713	C	T	0.163	0.209	0.044	2.46E-06	-371760	IRAK1BP1
rs115355509	6	78495767	G	A	0.163	0.209	0.044	2.46E-06	-371706	IRAK1BP1
rs200194409	6	78495969	A	C	0.163	0.209	0.044	2.46E-06	-371504	IRAK1BP1
rs11961883	6	78496288	A	G	0.163	0.209	0.044	2.46E-06	-371185	IRAK1BP1
rs7751932	6	78497915	A	C	0.163	0.209	0.044	2.46E-06	-369558	IRAK1BP1
rs79949695	6	78499776	C	G	0.163	0.209	0.044	2.46E-06	-367697	IRAK1BP1
rs7744184	6	78501326	A	G	0.163	0.209	0.044	2.46E-06	-366147	IRAK1BP1
rs79313931	6	78504256	A	G	0.163	0.209	0.044	2.46E-06	-363217	IRAK1BP1
rs6900179	6	78507704	C	G	0.163	0.209	0.044	2.46E-06	-359769	IRAK1BP1
rs6922709	6	78507743	C	T	0.163	0.209	0.044	2.46E-06	-359730	IRAK1BP1
rs1884966	6	78508721	A	G	0.163	0.209	0.044	2.46E-06	-358752	IRAK1BP1
rs60520348	6	78510501	G	T	0.163	0.209	0.044	2.46E-06	-356972	IRAK1BP1
rs11967020	6	78514356	T	C	0.163	0.209	0.044	2.46E-06	-353117	IRAK1BP1
rs1358817	6	78518080	A	C	0.163	0.209	0.044	2.46E-06	-349393	IRAK1BP1
rs723437	6	78521437	G	A	0.163	0.209	0.044	2.46E-06	-346036	IRAK1BP1
rs9359328	6	78524372	A	G	0.163	0.209	0.044	2.46E-06	-343101	IRAK1BP1
rs9343777	6	78525400	G	T	0.163	0.209	0.044	2.46E-06	-342073	IRAK1BP1
rs1321597	6	78527929	T	C	0.163	0.209	0.044	2.46E-06	-339544	IRAK1BP1
rs76641149	6	78541449	A	C	0.143	0.237	0.043	4.60E-08	-326024	IRAK1BP1
rs79747327	6	78556991	G	A	0.133	0.221	0.046	1.88E-06	-310482	IRAK1BP1
rs76889818	6	78566330	A	G	0.133	0.221	0.046	1.88E-06	-301143	IRAK1BP1
rs77413528	6	78581094	G	A	0.133	0.221	0.046	1.88E-06	-286379	IRAK1BP1
rs9359652	6	85344324	A	G	0.418	0.151	0.034	8.55E-06	45863	LINC02535
rs12201128	6	85353689	G	T	0.418	0.151	0.034	8.55E-06	36498	LINC02535
rs11771342	7	46204239	T	G	0.163	0.216	0.044	7.61E-07	-282364	IGFBP3
rs9691259	7	46206982	G	A	0.163	0.216	0.044	7.61E-07	-285107	IGFBP3
rs2633359	7	138122716	C	T	0.888	-0.250	0.055	4.64E-06	-1043	MIR4468
rs2440798	7	138127010	T	C	0.888	-0.250	0.055	4.64E-06	3251	MIR4468
rs4368897	7	146986807	T	C	0.153	0.205	0.046	6.51E-06	110803	CNTNAP2-AS1
rs12682543	8	29222041	A	G	0.643	-0.153	0.034	8.36E-06	41084	KIF13B
rs13263888	8	29223321	C	G	0.643	-0.153	0.034	8.36E-06	39804	KIF13B
rs4585791	9	614530	A	T	0.235	-0.197	0.042	2.68E-06	144238	KANK1
rs11812737	10	62669559	A	G	0.173	0.200	0.040	5.15E-07	-135299	ADO
rs4746518	10	62669835	G	A	0.214	0.171	0.038	6.35E-06	-135023	ADO
rs729738	10	62670505	A	C	0.214	0.171	0.038	6.35E-06	-134353	ADO
rs729739	10	62670542	A	G	0.214	0.171	0.038	6.35E-06	-134316	ADO
rs7394165	10	62677258	T	C	0.173	0.200	0.040	5.15E-07	-127600	ADO
rs7393302	10	62677294	G	T	0.214	0.171	0.038	6.35E-06	-127564	ADO
rs4746524	10	62678037	T	C	0.173	0.200	0.040	5.15E-07	-126821	ADO
rs224121	10	62687592	C	A	0.827	-0.216	0.043	3.96E-07	-117266	ADO
rs2960666	10	115819198	G	A	0.673	-0.156	0.035	8.81E-06	454270	GFRA1
rs372086626	11	39730859	C	T	0.173	0.208	0.044	1.73E-06	1082000	LINC01493
rs11063601	12	562434	G	T	0.112	0.248	0.055	6.25E-06	24053	LOC105369595
rs3217810	12	4279105	T	C	0.153	0.205	0.046	6.45E-06	-2920	CCND2-AS1
rs2075267	12	14962167	G	T	0.612	-0.150	0.032	2.84E-06	-438	ARHGDIB
rs11056258	12	14964465	T	G	0.592	-0.156	0.033	1.70E-06	-2736	ARHGDIB
rs7311989	12	14964603	A	C	0.592	-0.156	0.033	1.70E-06	-2874	ARHGDIB
rs7300467	12	14964663	G	T	0.602	-0.148	0.033	6.58E-06	-2934	ARHGDIB
rs10846097	12	14970137	T	C	0.643	-0.161	0.036	7.28E-06	-2886	PDE6H
rs7978415	12	14970534	A	G	0.592	-0.156	0.033	1.70E-06	-2489	PDE6H
rs3983696	12	14970938	T	C	0.592	-0.156	0.033	1.70E-06	-2085	PDE6H
rs7313555	12	14988129	C	T	0.663	-0.158	0.035	8.00E-06	-13705	LINC01489
rs11058862	12	122592803	T	C	0.398	0.141	0.032	7.77E-06	65556	KNTC1
rs11611668	12	122609181	T	C	0.398	0.143	0.031	4.87E-06	81934	KNTC1
rs61947369	13	25920538	A	G	0.163	0.186	0.042	9.46E-06	130494	SHISA2

rs9548368	13	38482144	T	C	0.367	0.151	0.033	4.62E-06	63156	LINC00437
rs9532237	13	38482716	A	G	0.367	0.151	0.033	4.62E-06	62584	LINC00437
rs6571996	14	40299024	A	C	0.745	-0.184	0.036	3.61E-07	-655875	LINC02315
rs7160617	14	40326534	G	A	0.806	-0.217	0.047	3.19E-06	-628365	LINC02315
rs6494413	15	63564443	A	G	0.755	-0.161	0.036	6.55E-06	-32911	FBXL22
rs72625754	15	63564562	C	T	0.173	0.207	0.039	1.20E-07	-32792	FBXL22
rs6494414	15	63566507	G	A	0.755	-0.161	0.036	6.55E-06	-30847	FBXL22
rs6494415	15	63570130	T	G	0.755	-0.161	0.036	6.55E-06	-27224	FBXL22
rs8028681	15	63572006	T	C	0.755	-0.161	0.036	6.55E-06	-25348	FBXL22
rs8029310	15	63572221	T	G	0.755	-0.161	0.036	6.55E-06	-25133	FBXL22
rs7183892	15	63586733	T	C	0.755	-0.161	0.036	6.55E-06	-10621	FBXL22
rs7168622	15	63668675	A	C	0.122	0.230	0.047	9.81E-07	-67085	USP3-AS1
rs7182375	15	63813431	G	A	0.776	-0.163	0.036	4.85E-06	20512	HERC1
rs7170689	15	63831046	T	C	0.776	-0.159	0.036	9.59E-06	2897	HERC1
rs8042418	15	63832686	A	G	0.776	-0.159	0.036	9.59E-06	1257	HERC1
rs7170433	15	63837452	C	T	0.776	-0.159	0.036	9.59E-06	-3509	HERC1
rs214239	16	303625	A	G	0.214	0.182	0.040	5.50E-06	20472	PDIA2
rs1558346	16	6514333	T	C	0.143	0.208	0.046	7.22E-06	881865	MIR8065
rs72804582	16	86720970	G	A	0.112	0.246	0.055	8.44E-06	985	LINC02189
rs11659939	18	33845019	A	G	0.214	0.179	0.040	9.37E-06	266403	ASXL3
rs1051651	19	7116272	C	G	0.245	0.166	0.035	2.23E-06	46827	ZNF557
rs11670340	19	7436914	A	G	0.408	0.138	0.031	7.47E-06	54079	ARHGEF18
rs6139617	20	5063227	G	A	0.469	-0.143	0.031	2.93E-06	49877	TMEM230

Table S6. Annotation of variants associated with GO_ATP_METABOLIC level with p-val<10⁻⁵.

rsID	CHR	POS	A1	A2	AF1	BETA	SE	P	distancetoFeature	symbol
rs4649064	1	25094616	G	A	0.456	0.232	0.045	2.07E-07	71112	RUNX1
rs6657249	1	25095126	C	A	0.395	0.250	0.044	1.65E-08	71622	RUNX1
rs11588172	1	25095499	C	T	0.395	0.250	0.044	1.65E-08	71995	RUNX1
rs56365408	1	25096844	G	A	0.395	0.250	0.044	1.65E-08	73340	RUNX1
rs56348607	1	25097067	G	A	0.412	0.258	0.045	1.23E-08	73563	RUNX1
rs58693652	1	25097185	A	G	0.395	0.250	0.044	1.65E-08	73681	RUNX1
rs2536363	1	83382963	C	T	0.728	-0.254	0.056	6.46E-06	-396754	LINC01361
rs2536361	1	83383171	T	G	0.728	-0.254	0.056	6.46E-06	-396962	LINC01361
N.A	1	121043250	C	G	0.728	-0.201	0.041	1.25E-06	-44096	FCGR1B
rs12471349	2	231630391	A	C	0.456	-0.203	0.043	2.12E-06	37489	TEX44
rs11686124	2	231631051	A	G	0.447	-0.200	0.042	2.28E-06	38149	TEX44
rs12619551	2	231632587	T	C	0.447	-0.200	0.042	2.28E-06	39685	TEX44
rs12621259	2	231633982	T	C	0.447	-0.200	0.042	2.28E-06	41080	TEX44
rs10204481	2	231635421	T	C	0.456	-0.203	0.043	2.12E-06	42519	TEX44
rs10204963	2	231635773	A	G	0.456	-0.203	0.043	2.12E-06	42871	TEX44
rs11685588	2	231635997	A	C	0.456	-0.203	0.043	2.12E-06	43095	TEX44
rs931390	3	4736178	T	C	0.746	-0.269	0.051	1.26E-07	15413	EGOT
rs4690284	4	73616	C	T	0.105	0.315	0.071	9.38E-06	20330	ZNF595
rs11735004	4	8519493	A	G	0.105	0.359	0.077	3.52E-06	-58833	CPZ
rs28520722	4	168372678	C	G	0.158	0.261	0.055	2.56E-06	-53870	DDX60
rs10474554	5	78503335	T	C	0.816	-0.256	0.054	2.01E-06	142751	SCAMP1
rs10474555	5	78503370	T	C	0.816	-0.256	0.054	2.01E-06	142786	SCAMP1
rs12522528	5	172824478	C	A	0.272	0.247	0.049	5.68E-07	-9798	ERGIC1
rs6891132	5	172824828	G	A	0.711	-0.224	0.049	4.38E-06	-9448	ERGIC1
rs4867689	5	172825091	C	T	0.711	-0.224	0.049	4.38E-06	-9185	ERGIC1
rs4867690	5	172825370	G	A	0.711	-0.224	0.049	4.38E-06	-8906	ERGIC1
rs4868216	5	172825449	A	G	0.711	-0.224	0.049	4.38E-06	-8827	ERGIC1
rs4867691	5	172825540	G	C	0.711	-0.224	0.049	4.38E-06	-8736	ERGIC1
rs7717831	5	172825774	C	T	0.711	-0.224	0.049	4.38E-06	-8502	ERGIC1
rs7717986	5	172825824	A	T	0.711	-0.224	0.049	4.38E-06	-8452	ERGIC1
rs7736149	5	172825871	A	G	0.711	-0.224	0.049	4.38E-06	-8405	ERGIC1
rs7736270	5	172825917	A	G	0.711	-0.224	0.049	4.38E-06	-8359	ERGIC1
rs792994	5	172826179	T	C	0.272	0.247	0.049	5.68E-07	-8097	ERGIC1
rs11748400	5	172826590	G	T	0.263	0.255	0.049	1.53E-07	-7686	ERGIC1
rs4868217	5	172826780	C	T	0.711	-0.224	0.049	4.38E-06	-7496	ERGIC1
rs12519115	5	172827357	T	C	0.254	0.259	0.048	7.76E-08	-6919	ERGIC1
rs7707991	5	172827470	G	A	0.711	-0.224	0.049	4.38E-06	-6806	ERGIC1
rs6556047	5	172828846	A	T	0.702	-0.211	0.047	8.90E-06	-5430	ERGIC1
rs1564259	5	172829021	C	T	0.702	-0.211	0.047	8.90E-06	-5255	ERGIC1
rs1006721	5	172829068	A	G	0.702	-0.211	0.047	8.90E-06	-5208	ERGIC1
rs10057822	5	172829748	G	A	0.702	-0.211	0.047	8.90E-06	-4528	ERGIC1
rs2339652	5	172830696	G	A	0.702	-0.211	0.047	8.90E-06	-3580	ERGIC1
rs4868218	5	172830968	A	C	0.702	-0.211	0.047	8.90E-06	-3308	ERGIC1
rs35566639	5	172834459	A	G	0.254	0.250	0.049	3.70E-07	183	ERGIC1
rs35768025	5	172834486	A	C	0.254	0.250	0.049	3.70E-07	210	ERGIC1
rs78078909	5	172834535	A	C	0.254	0.250	0.049	3.70E-07	259	ERGIC1
rs793010	5	172835670	T	C	0.263	0.241	0.050	1.31E-06	1394	ERGIC1
rs6895746	5	172838337	G	A	0.254	0.263	0.048	3.69E-08	4061	ERGIC1
rs11134762	5	172838397	A	G	0.237	0.267	0.047	1.87E-08	4121	ERGIC1

rs11949146	5	172840207	A	G	0.219	0.282	0.050	1.54E-08	5931	ERGIC1
rs6877332	5	172841627	A	G	0.246	0.267	0.051	1.61E-07	7351	ERGIC1
rs7722970	5	172842868	T	G	0.219	0.258	0.052	8.18E-07	8592	ERGIC1
rs10945708	6	161017963	T	C	0.298	0.227	0.049	3.32E-06	26235	MAP3K4
rs12195182	6	161108526	C	G	0.465	0.195	0.042	4.49E-06	53457	AGPAT4-IT1
rs2314157	6	161190126	C	G	0.439	0.194	0.042	3.99E-06	-28143	AGPAT4-IT1
rs3735487	7	45065547	G	A	0.114	0.274	0.060	4.18E-06	23368	NACAD
rs2140953	7	106848675	C	A	0.105	0.354	0.078	5.32E-06	-16604	PIK3CG
rs7791674	7	106849681	T	C	0.105	0.354	0.078	5.32E-06	-15598	PIK3CG
rs35031873	7	142758607	C	A	0.079	0.385	0.074	2.17E-07	-373471	PIP
rs1567924	8	19201161	G	C	0.237	0.244	0.053	4.21E-06	58309	LOC100128993
rs62524263	8	102126785	G	C	0.649	0.214	0.047	5.51E-06	1352	MIR5680
rs6982041	8	102127205	C	A	0.649	0.214	0.047	5.51E-06	1772	MIR5680
rs7819114	8	102128424	T	C	0.649	0.214	0.047	5.51E-06	2991	MIR5680
rs4734053	8	102129163	A	G	0.649	0.214	0.047	5.51E-06	3730	MIR5680
rs4734616	8	102129293	T	C	0.658	0.215	0.046	3.56E-06	3860	MIR5680
rs7826028	8	102131357	C	T	0.649	0.214	0.047	5.51E-06	5924	MIR5680
rs7000087	8	102131841	G	T	0.640	0.218	0.047	3.59E-06	6408	MIR5680
rs9942801	8	102132950	G	A	0.649	0.214	0.047	5.51E-06	7517	MIR5680
rs4734617	8	102138783	C	A	0.649	0.214	0.047	5.51E-06	13350	MIR5680
rs13248776	8	102145359	T	C	0.649	0.214	0.047	5.51E-06	19926	MIR5680
rs13250882	8	102145366	C	T	0.649	0.214	0.047	5.51E-06	19933	MIR5680
rs6988832	8	102146011	G	A	0.649	0.214	0.047	5.51E-06	20578	MIR5680
rs2105616	8	102146140	C	A	0.649	0.214	0.047	5.51E-06	20707	MIR5680
rs372431986	8	102146141	C	A	0.649	0.214	0.047	5.51E-06	20708	MIR5680
rs1892965	8	102146620	A	C	0.649	0.214	0.047	5.51E-06	21187	MIR5680
rs13268773	8	102147224	A	G	0.649	0.214	0.047	5.51E-06	21791	MIR5680
rs6468817	8	102148609	A	T	0.649	0.214	0.047	5.51E-06	23176	MIR5680
rs12681037	8	102149097	A	T	0.649	0.214	0.047	5.51E-06	23664	MIR5680
rs6468818	8	102149937	G	C	0.649	0.214	0.047	5.51E-06	24504	MIR5680
rs4291239	8	102150410	A	G	0.649	0.214	0.047	5.51E-06	24977	MIR5680
rs10093024	8	102151656	C	T	0.649	0.214	0.047	5.51E-06	26223	MIR5680
rs6992948	8	102152160	A	C	0.596	0.220	0.045	1.27E-06	26727	MIR5680
rs1111911	8	102152888	T	A	0.649	0.214	0.047	5.51E-06	27455	MIR5680
rs6980613	8	102153223	G	T	0.649	0.214	0.047	5.51E-06	27790	MIR5680
rs1573311	8	102154787	T	C	0.649	0.214	0.047	5.51E-06	29354	MIR5680
rs2387095	8	102155415	G	T	0.649	0.214	0.047	5.51E-06	29982	MIR5680
rs1547370	8	102155949	T	C	0.649	0.214	0.047	5.51E-06	30516	MIR5680
rs2186682	8	102157973	G	A	0.649	0.214	0.047	5.51E-06	32540	MIR5680
rs1573309	8	102160658	G	A	0.605	0.234	0.049	1.48E-06	35225	MIR5680
rs1148514	8	102168709	C	G	0.605	0.234	0.049	1.48E-06	43276	MIR5680
rs1148515	8	102168828	G	C	0.605	0.234	0.049	1.48E-06	43395	MIR5680
rs1148516	8	102168999	G	A	0.605	0.234	0.049	1.48E-06	43566	MIR5680
rs78848775	8	133734878	T	A	0.105	0.319	0.071	6.46E-06	42475	LOC101927798
rs77131790	8	133735142	G	A	0.105	0.319	0.071	6.46E-06	42211	LOC101927798
rs75149129	8	133735347	G	T	0.105	0.319	0.071	6.46E-06	42006	LOC101927798
rs76106243	8	133737227	C	T	0.105	0.319	0.071	6.46E-06	40126	LOC101927798
rs17820827	9	13863723	G	C	0.167	0.286	0.062	4.62E-06	-64249	LINC00583
rs7858214	9	13865261	T	C	0.105	0.327	0.070	3.09E-06	-62711	LINC00583
rs11259468	10	15081387	C	G	0.114	0.308	0.069	9.07E-06	7390	ACBD7

rs10901547	10	126174101	T	C	0.281	0.236	0.048	7.53E-07	-200974	FANK1-AS1
rs72826371	10	126177069	T	C	0.237	0.256	0.049	1.45E-07	-203942	FANK1-AS1
rs12356272	10	126177590	G	A	0.272	0.242	0.047	2.49E-07	-204463	FANK1-AS1
rs12357824	10	126180060	C	T	0.272	0.242	0.047	2.49E-07	-206933	FANK1-AS1
rs12766940	10	126180562	C	T	0.272	0.242	0.047	2.49E-07	-207435	FANK1-AS1
rs11244871	10	126183597	A	G	0.263	0.249	0.046	6.57E-08	204859	ADAM12
rs1459709	10	126184259	A	G	0.263	0.249	0.046	6.57E-08	204197	ADAM12
rs17683203	10	126186844	A	G	0.263	0.249	0.046	6.57E-08	201612	ADAM12
rs17745507	10	126187170	T	A	0.228	0.265	0.048	2.93E-08	201286	ADAM12
rs10829685	10	130058387	T	G	0.228	0.259	0.052	6.16E-07	52431	C10orf143
rs7082237	10	130091533	T	C	0.140	0.272	0.061	8.76E-06	19285	C10orf143
rs1945331	11	21242296	T	C	0.123	0.304	0.068	7.66E-06	572744	NELL1
rs4755920	11	44947205	A	G	0.360	-0.214	0.048	6.66E-06	4102	TP53I11
rs141434045	12	115147278	G	A	0.123	0.352	0.072	1.08E-06	-463113	TBX5-TBX3
rs10082870	12	115148523	C	G	0.123	0.352	0.072	1.08E-06	-464358	TBX5-TBX3
rs2270458	12	115151267	T	C	0.114	0.364	0.074	8.36E-07	-467102	TBX5-TBX3
rs12310526	12	115151871	A	G	0.114	0.364	0.074	8.36E-07	-467706	TBX5-TBX3
rs112088312	12	115154065	T	C	0.114	0.364	0.074	8.36E-07	-469900	TBX5-TBX3
rs11067442	12	115154219	T	C	0.114	0.364	0.074	8.36E-07	-470054	TBX5-TBX3
rs74846266	12	115154979	T	C	0.114	0.364	0.074	8.36E-07	-470814	TBX5-TBX3
rs7970502	12	115155723	T	C	0.114	0.364	0.074	8.36E-07	-471558	TBX5-TBX3
rs7145901	14	52220916	T	C	0.228	0.251	0.057	9.57E-06	-46798	PTGDR
rs71474496	15	42625943	G	A	0.123	0.318	0.067	1.90E-06	50283	STARD9
rs11638835	15	42626143	G	A	0.868	-0.301	0.066	5.41E-06	50483	STARD9
rs12911585	15	42642347	C	T	0.132	0.306	0.066	3.31E-06	66687	STARD9
rs61122145	15	42699689	A	G	0.149	0.306	0.063	1.12E-06	37438	CDAN1
rs12902830	15	42705184	T	C	0.140	0.320	0.063	3.93E-07	31943	CDAN1
rs35392023	15	42709462	A	G	0.149	0.311	0.062	6.02E-07	27665	CDAN1
rs1058846	15	42719826	T	C	0.149	0.311	0.062	6.02E-07	17301	CDAN1
rs17774047	15	42721028	T	C	0.149	0.311	0.062	6.02E-07	16099	CDAN1
rs35088691	15	42772565	C	T	0.140	0.328	0.062	1.39E-07	-35438	CDAN1
rs12913618	15	42779131	T	C	0.140	0.328	0.062	1.39E-07	-42004	CDAN1
rs12915116	15	42782482	T	C	0.140	0.328	0.062	1.39E-07	-45355	CDAN1
rs35298309	15	42784803	C	T	0.149	0.337	0.060	1.86E-08	-47676	CDAN1
rs12908349	15	42794029	T	C	0.123	0.315	0.067	2.59E-06	-56902	CDAN1
rs66932813	15	42796424	G	T	0.123	0.315	0.067	2.59E-06	-59297	CDAN1
rs36092914	15	42808425	A	C	0.123	0.315	0.067	2.59E-06	-71298	CDAN1
rs964776412	15	42817281	A	T	0.123	0.315	0.067	2.59E-06	-80154	CDAN1
rs72713784	15	42823738	G	A	0.123	0.315	0.067	2.59E-06	-86611	CDAN1
rs34745458	15	42845003	C	T	0.123	0.315	0.067	2.59E-06	75807	TTBK2
rs72713795	15	42849430	A	T	0.123	0.315	0.067	2.59E-06	71380	TTBK2
rs35202249	15	42855844	T	C	0.123	0.315	0.067	2.59E-06	64966	TTBK2
rs2683240	15	81120333	T	C	0.675	-0.209	0.046	5.84E-06	-62268	IL16
rs2460852	15	81123862	T	G	0.675	-0.209	0.046	5.84E-06	-58739	IL16
rs2683249	15	81129249	G	A	0.675	-0.209	0.046	5.84E-06	-53352	IL16
rs2683255	15	81134198	C	G	0.675	-0.209	0.046	5.84E-06	-48403	IL16
rs2683256	15	81135816	A	G	0.675	-0.209	0.046	5.84E-06	-46785	IL16
rs4404021	15	96060577	T	C	0.228	0.227	0.048	2.70E-06	-265362	NR2F2
rs7166802	15	96062205	T	G	0.237	0.219	0.049	7.62E-06	-263734	NR2F2
rs7166314	15	96062218	G	A	0.237	0.219	0.049	7.62E-06	-263721	NR2F2

rs79651776	16	11650396	G	A	0.140	0.273	0.061	7.50E-06	-14014	LITAF
rs8056041	16	83121479	A	G	0.263	0.240	0.053	6.68E-06	-131180	LOC101928417
rs8082569	17	62828928	G	A	0.491	0.198	0.045	9.81E-06	-20583	MARCHF10
rs12948372	17	62831387	A	G	0.412	0.211	0.047	6.96E-06	-23042	MARCHF10
rs35594211	17	62831620	G	A	0.412	0.211	0.047	6.96E-06	-23275	MARCHF10
rs11868614	17	62831835	A	G	0.412	0.211	0.047	6.96E-06	-23490	MARCHF10
rs35354702	17	62832130	G	A	0.412	0.211	0.047	6.96E-06	-23785	MARCHF10
rs35596881	17	62834618	G	A	0.412	0.211	0.047	6.96E-06	-26273	MARCHF10
rs8182298	17	62837616	C	T	0.439	0.208	0.043	1.08E-06	-29271	MARCHF10
rs8182316	17	62837746	T	C	0.456	0.207	0.042	1.13E-06	-29401	MARCHF10
rs8076190	17	62837908	G	A	0.456	0.207	0.042	1.13E-06	-29563	MARCHF10
rs8077260	17	62838375	C	G	0.456	0.207	0.042	1.13E-06	-30030	MARCHF10
rs8182324	17	62838599	G	A	0.456	0.207	0.042	1.13E-06	-30254	MARCHF10
rs6504130	17	62838901	T	C	0.421	0.215	0.043	4.92E-07	-30556	MARCHF10
rs8064710	17	62839334	C	T	0.439	0.208	0.043	1.08E-06	-30989	MARCHF10
rs8064402	17	62839705	A	G	0.439	0.208	0.043	1.08E-06	-31360	MARCHF10
rs8067960	17	62839798	T	C	0.439	0.208	0.043	1.08E-06	-31453	MARCHF10
rs7226368	17	62840771	C	G	0.421	0.215	0.043	4.92E-07	-32426	MARCHF10
rs12943672	17	62841241	A	T	0.439	0.208	0.043	1.08E-06	-32896	MARCHF10
rs1476811	17	62841947	T	C	0.421	0.215	0.043	4.92E-07	-33602	MARCHF10
rs1476812	17	62842115	T	C	0.421	0.215	0.043	4.92E-07	-33770	MARCHF10
rs1987647	17	62842528	C	T	0.377	0.216	0.046	2.90E-06	-34183	MARCHF10
rs12943559	17	62843136	T	C	0.421	0.215	0.043	4.92E-07	-34791	MARCHF10
rs9903891	17	62843788	A	T	0.447	0.213	0.043	8.16E-07	-35443	MARCHF10
rs12936567	17	62844192	A	G	0.447	0.213	0.043	8.16E-07	-35847	MARCHF10
rs11871628	17	62844788	C	T	0.447	0.213	0.043	8.16E-07	-36443	MARCHF10
rs35395730	17	62845085	C	A	0.447	0.213	0.043	8.16E-07	-36740	MARCHF10
rs55895685	17	62846360	C	G	0.439	0.214	0.044	1.50E-06	-38015	MARCHF10
rs55854611	17	62846443	G	T	0.439	0.214	0.044	1.50E-06	-38098	MARCHF10
rs55909719	17	62846445	A	G	0.404	0.210	0.044	1.85E-06	-38100	MARCHF10
rs8072675	17	62846458	G	A	0.439	0.214	0.044	1.50E-06	-38113	MARCHF10
rs34350332	17	62847043	C	T	0.439	0.214	0.044	1.50E-06	-38698	MARCHF10
rs34826284	17	62847771	T	C	0.404	0.230	0.044	2.15E-07	-39426	MARCHF10
rs35290531	17	62849438	A	C	0.439	0.214	0.044	1.50E-06	-41093	MARCHF10
rs35572014	17	62849602	C	T	0.447	0.213	0.045	2.75E-06	-41257	MARCHF10
rs12051594	17	62850242	A	G	0.456	0.212	0.044	1.49E-06	-41897	MARCHF10
rs9915826	17	62850877	T	C	0.421	0.215	0.045	1.71E-06	-42532	MARCHF10
rs9303464	17	62850993	C	T	0.447	0.213	0.045	2.75E-06	-42648	MARCHF10
rs9890310	17	62851050	G	T	0.447	0.213	0.045	2.75E-06	-42705	MARCHF10
rs9890570	17	62851197	C	T	0.421	0.215	0.045	1.71E-06	-42852	MARCHF10
rs8076646	17	62852550	T	C	0.386	0.209	0.045	3.44E-06	-44205	MARCHF10
rs8081770	17	62852855	C	T	0.465	0.217	0.047	3.98E-06	-44510	MARCHF10
rs61638683	17	82849592	T	G	0.535	-0.210	0.045	3.38E-06	-9013	ZNF750
rs59300995	17	82849594	C	G	0.553	-0.206	0.044	2.47E-06	-9015	ZNF750
rs7216324	17	82851589	C	A	0.535	-0.210	0.045	3.38E-06	-11010	ZNF750
rs4986118	17	82851689	C	G	0.447	0.206	0.044	2.47E-06	-11110	ZNF750
rs7215939	17	82851732	G	C	0.535	-0.210	0.045	3.38E-06	-11153	ZNF750
rs7214952	17	82851853	T	G	0.535	-0.210	0.045	3.38E-06	-11274	ZNF750
rs11077948	17	82852057	T	C	0.553	-0.206	0.044	2.47E-06	-11478	ZNF750
rs9913679	17	82855022	G	A	0.535	-0.210	0.045	3.38E-06	-14443	ZNF750

rs12600507	17	82856293	A	G	0.553	-0.206	0.044	2.47E-06	-15714	ZNF750
rs9303013	17	82857421	C	T	0.544	-0.212	0.046	4.73E-06	-16842	ZNF750
rs7220732	17	82857901	C	A	0.544	-0.212	0.046	4.73E-06	-17322	ZNF750
rs7209378	17	82859192	A	G	0.561	-0.208	0.045	3.36E-06	-18613	ZNF750
rs9890196	17	82860297	C	T	0.553	-0.213	0.045	2.58E-06	-19718	ZNF750
rs6502007	17	82861401	G	A	0.544	-0.196	0.043	6.08E-06	-20822	ZNF750
rs8082007	17	82862130	A	G	0.526	-0.210	0.046	5.71E-06	-21551	ZNF750
rs8065192	17	82862158	G	A	0.553	-0.206	0.044	2.47E-06	-21579	ZNF750
rs9303014	17	82866493	T	G	0.526	-0.210	0.046	5.71E-06	-25914	ZNF750
rs4986120	17	82866778	G	T	0.535	-0.204	0.046	7.70E-06	-26199	ZNF750
rs7224427	17	82867331	A	G	0.526	-0.210	0.046	5.71E-06	-26752	ZNF750
rs56353584	17	82869089	G	T	0.553	-0.207	0.046	6.21E-06	-28510	ZNF750
rs56322462	17	82869216	T	C	0.544	-0.212	0.046	4.73E-06	-28637	ZNF750
rs66893622	17	82869369	T	A	0.535	-0.212	0.047	8.08E-06	-28790	ZNF750
rs9892064	17	82870027	T	C	0.544	-0.212	0.046	4.73E-06	-29448	ZNF750
rs3744161	17	82870181	A	G	0.535	-0.212	0.047	8.08E-06	-29602	ZNF750
rs6502008	17	82872389	A	G	0.544	-0.212	0.046	4.73E-06	-31810	ZNF750
rs6502009	17	82872499	T	C	0.544	-0.212	0.046	4.73E-06	-31920	ZNF750
rs11655504	17	82873448	C	T	0.535	-0.212	0.047	8.08E-06	-32869	ZNF750
rs898093	17	82874591	T	C	0.535	-0.212	0.047	8.08E-06	-34012	ZNF750
rs4986123	17	82876370	T	C	0.544	-0.205	0.045	4.52E-06	-35791	ZNF750
rs8075190	17	82878558	T	C	0.544	-0.201	0.045	8.17E-06	-37979	ZNF750
rs9747095	17	82882712	G	A	0.474	0.204	0.044	4.30E-06	-42133	ZNF750
rs7221830	17	82890938	G	T	0.474	0.204	0.044	4.30E-06	-50359	ZNF750
rs59103510	17	82891072	T	G	0.518	-0.204	0.045	7.08E-06	-50493	ZNF750
rs12948880	17	82893224	C	T	0.474	0.210	0.046	5.71E-06	-52645	ZNF750
rs4986130	17	82895802	C	T	0.482	0.204	0.045	7.08E-06	-55223	ZNF750
rs4986131	17	82895920	G	A	0.482	0.204	0.045	7.08E-06	-55341	ZNF750
rs12951357	17	82896533	A	G	0.474	0.210	0.046	5.71E-06	-55954	ZNF750
rs1809252	17	82897473	A	G	0.518	-0.204	0.045	7.08E-06	-56894	ZNF750
rs939262	17	82897656	G	C	0.518	-0.204	0.045	7.08E-06	-57077	ZNF750
rs9891862	17	82900793	A	G	0.518	-0.204	0.045	7.08E-06	-60214	ZNF750
rs4986134	17	82901278	A	G	0.518	-0.204	0.045	7.08E-06	-60699	ZNF750
rs2292971	17	82905981	C	T	0.482	0.204	0.045	7.08E-06	-65402	ZNF750
rs8074371	17	82908853	C	G	0.482	0.204	0.045	7.08E-06	-68274	ZNF750
rs12947897	17	82913585	G	A	0.474	0.204	0.044	4.16E-06	-73006	ZNF750
rs8064687	17	82915798	C	G	0.482	0.204	0.045	7.08E-06	-75219	ZNF750
rs8069773	17	82916667	T	G	0.474	0.204	0.044	4.16E-06	-76088	ZNF750
rs73007122	19	10004217	T	C	0.105	0.338	0.069	1.08E-06	6255	COL5A3
rs35143140	19	10005321	A	G	0.289	0.218	0.047	2.95E-06	5151	COL5A3
rs11085530	19	10006027	G	A	0.289	0.218	0.047	2.95E-06	4445	COL5A3
rs35678764	19	10006948	A	C	0.289	0.218	0.047	2.95E-06	3524	COL5A3
rs9797822	19	10007058	A	C	0.289	0.218	0.047	2.95E-06	3414	COL5A3
rs9797907	19	10007075	G	T	0.289	0.218	0.047	2.95E-06	3397	COL5A3
rs11672609	19	58495557	T	C	0.140	0.258	0.057	6.77E-06	16509	SLC27A5
rs11672614	19	58495617	T	C	0.140	0.258	0.057	6.77E-06	16449	SLC27A5
rs11672730	19	58495836	A	G	0.140	0.258	0.057	6.77E-06	16230	SLC27A5
rs55652736	19	58496199	T	G	0.140	0.258	0.057	6.77E-06	15867	SLC27A5
rs73066226	19	58496846	C	T	0.149	0.256	0.057	6.21E-06	15220	SLC27A5
rs11671092	19	58497742	C	T	0.149	0.256	0.057	6.21E-06	14324	SLC27A5

rs55928441	19	58498307	C	T	0.140	0.258	0.057	6.77E-06	13759	SLC27A5
rs73066228	19	58501829	G	A	0.140	0.258	0.057	7.22E-06	10237	SLC27A5
rs4810126	20	58244817	T	C	0.167	0.298	0.061	1.23E-06	-16163	ANKRD60
rs76912023	20	58257517	T	C	0.158	0.300	0.062	1.39E-06	-28863	ANKRD60
rs4811976	20	58259149	A	G	0.158	0.300	0.062	1.39E-06	-30495	ANKRD60
rs563489	20	58355773	G	A	0.649	-0.237	0.051	3.08E-06	-33350	VAPB
rs71315381	22	17510895	G	C	0.140	0.274	0.061	6.67E-06	-52545	SLC25A18
rs2142664	22	46559201	G	A	0.237	0.227	0.051	8.47E-06	-16812	GRAMD4

Table S7. Annotation of variants associated with *GATA4* activity level with $p\text{-val} < 10^{-5}$.

