Supplementary Information

Nuclear activation in the dual-durotaxing cells on a matrix with cell-scale stiffness-heterogeneity

Satoru Kidoaki[1*], Hiroyuki Ebata[1], Kosuke Moriyama[1], Thasaneeya Kuboki[1], Yukie Tsuji[1], Rumi Sawada[2], Saori Sasaki[1], Tatsuya Okuda[1], Kosuke Hamano[3], Takahito Kawano[1], Aki Yamamoto[1], Ken Kono[2], Kazusa Tanaka[2]

1: Laboratory of Biomedical and Biophysical Chemistry, Institute for Materials Chemistry and Engineering, Kyushu University, CE41-204, 744 Motooka, Nishi-Ku, Fukuoka 819-0395, Japan.

2: Division of Cell-Based Therapeutic Products, National Institute of Health Sciences, Japan.

3: Graduate School of Engineering, Kyushu University, Japan.

*Correspondence: kidoaki@ms.ifoc.kyushu-u.ac.jp

Supplementary Information

Supplementary Figures

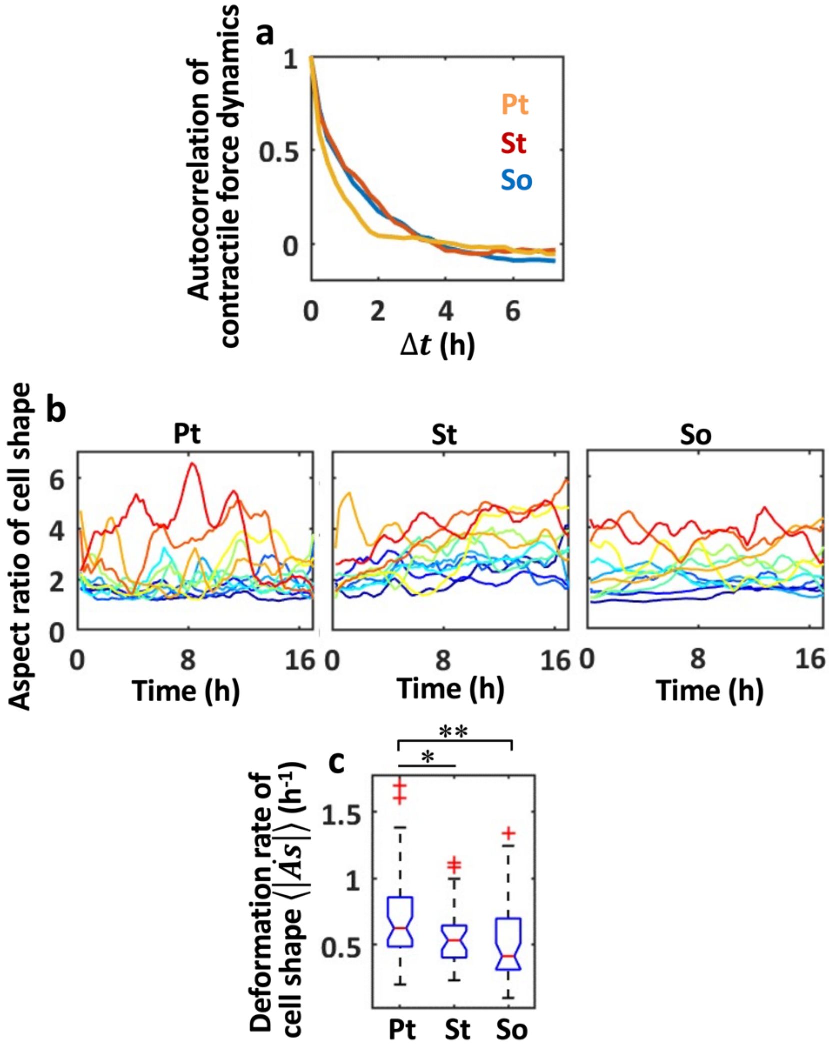


Figure S1. Analysis of dynamics in contractile force and shape of the cells cultured on Pt, St, and So gels. (a) Autocorrelation function of time variation of contractile forces described in Fig. 1i. Correlation time τ_f in Fig. 1j was determined from these data. **(b)** Representative time variation of the aspect ratio of cell shape. n=11 for Pt, St, and So. **(c)** Deformation rate of cell shape calculated from (b). The intensity of fluctuation of cell shape was highest in dual-durotaxing cells on the Pt gels. n= 46 (Pt), 28 (St), 39 (So). **: $P<0.01$. *: $P<0.05$.

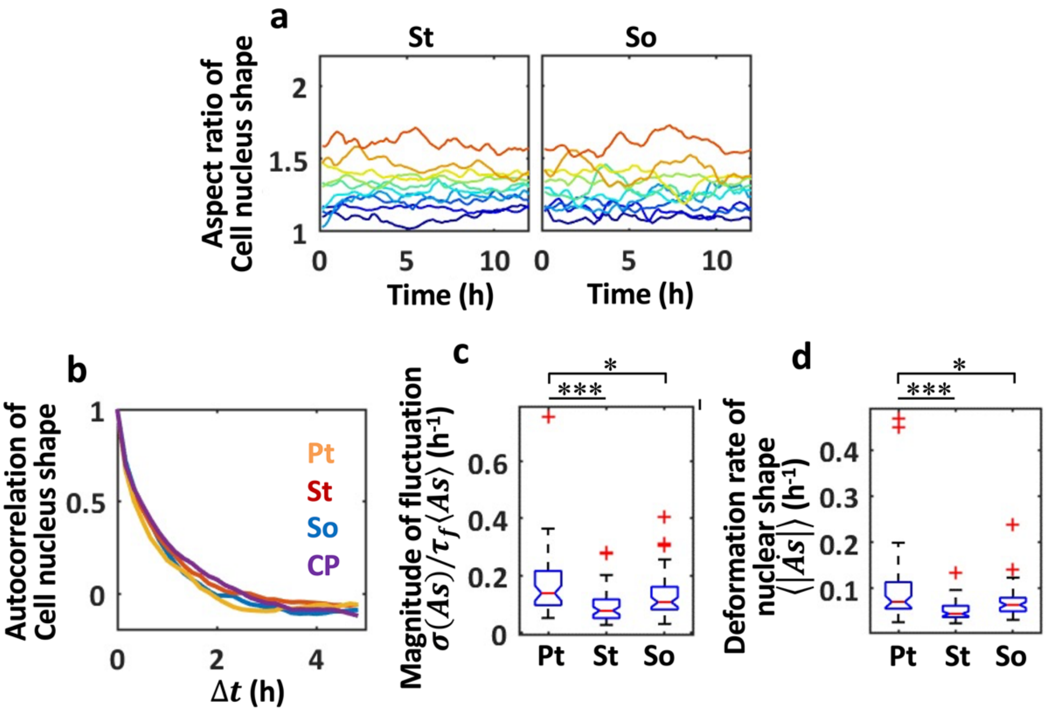


Figure S2. Analysis of dynamics in nuclear shape of cells cultured on Pt, St and So gels, and on CP. **(a)** Representative time variation of the aspect ratio of the cell nucleus on St and So gels. n=10 for St and So. **(b)** Autocorrelation functions of the time variation of nuclear shape described in Fig. 2a and Fig. S2a. **(c, d)** The magnitude of fluctuation (c) and the deformation rate (d) in the nuclear shaping fluctuations. The degree of fluctuation and the deformation rate of nuclear shape were defined as the ratio of normalized standard deviation to correlation time, and the time derivative of fluctuation, respectively. ***: $P<0.001$. *: $P<0.05$. n= 51 (Pt), 59 (St), 56 (So).

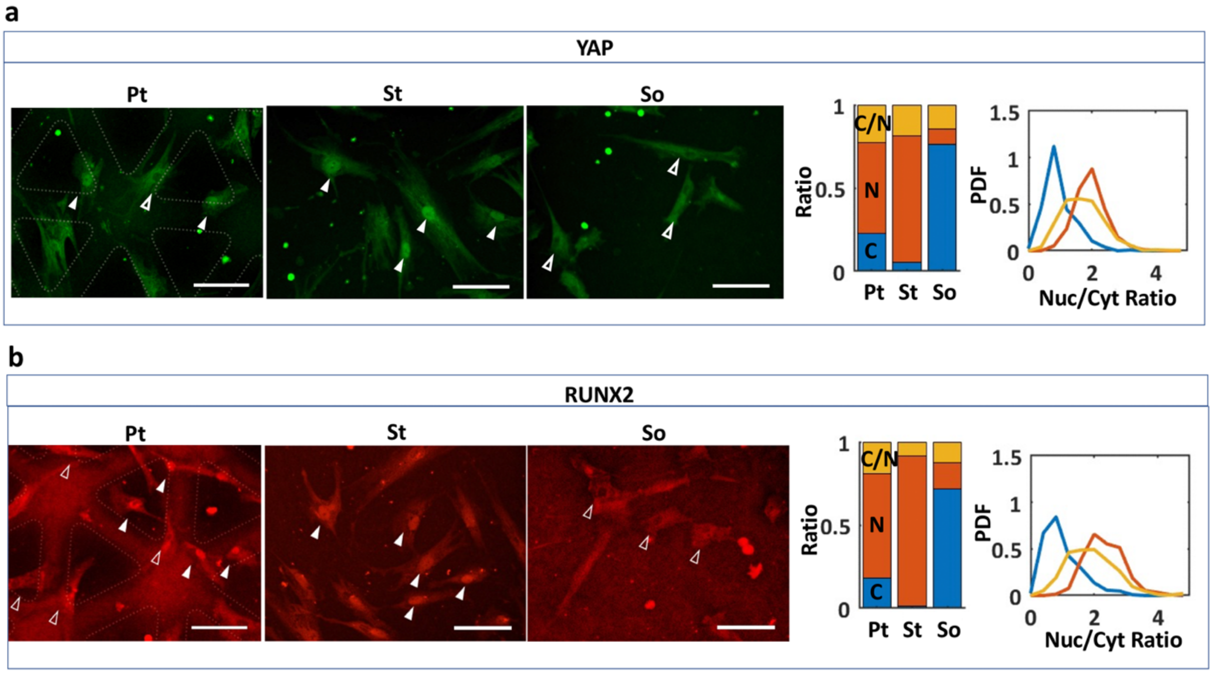


Figure S3. Intracellular localization of YAP (a) and RUNX2 (b) in cells cultured on Pt, St, and So gels. Left: immunofluorescence microscopic images. Solid arrows; nuclear localization. Open arrows; cytoplasmic localization. Scale bars: 100 μm. **Middle:** cellular ratio measured for cytoplasmic localization (C), nuclear localization (N), and cytoplasmic/nuclear co-localization (C/N). n= 497 (Pt), 314 (St), 384 (So). **Right:** probability density functions of the ratio of nuclear to cytoplasmic localization.

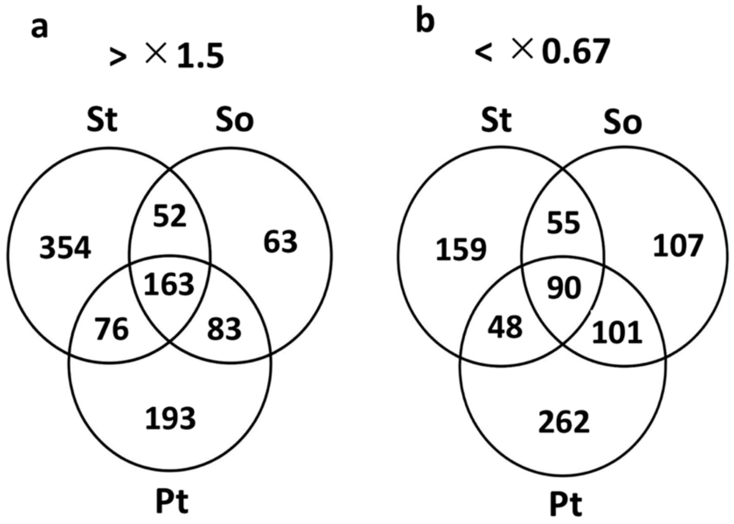


Figure S4. Venn diagrams of up-regulated (a; >1.5-fold relative to CP) and down-regulated (b; <0.67-fold relative to CP) genes analyzed by DNA microarrays with cells cultured on Pt, St, and So gels.

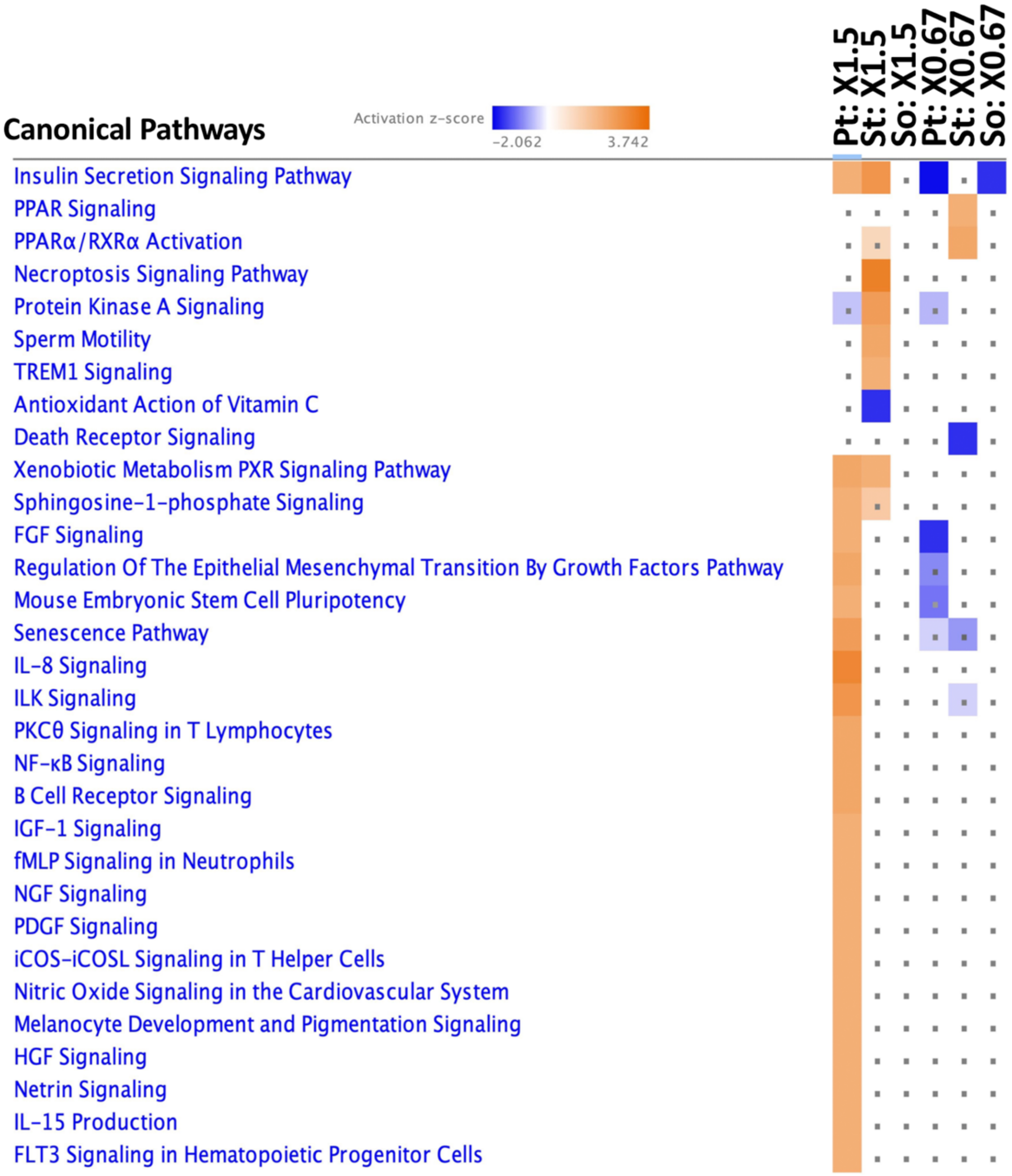


Figure S5. Comparison of the representative canonical pathways predicted to be activated or inactivated based on each expression profile in the DNA microarray data observed in cells cultured on Pt, St, and So gels. Generated by IPA software. Grey dots show insignificant with P > 0.05.

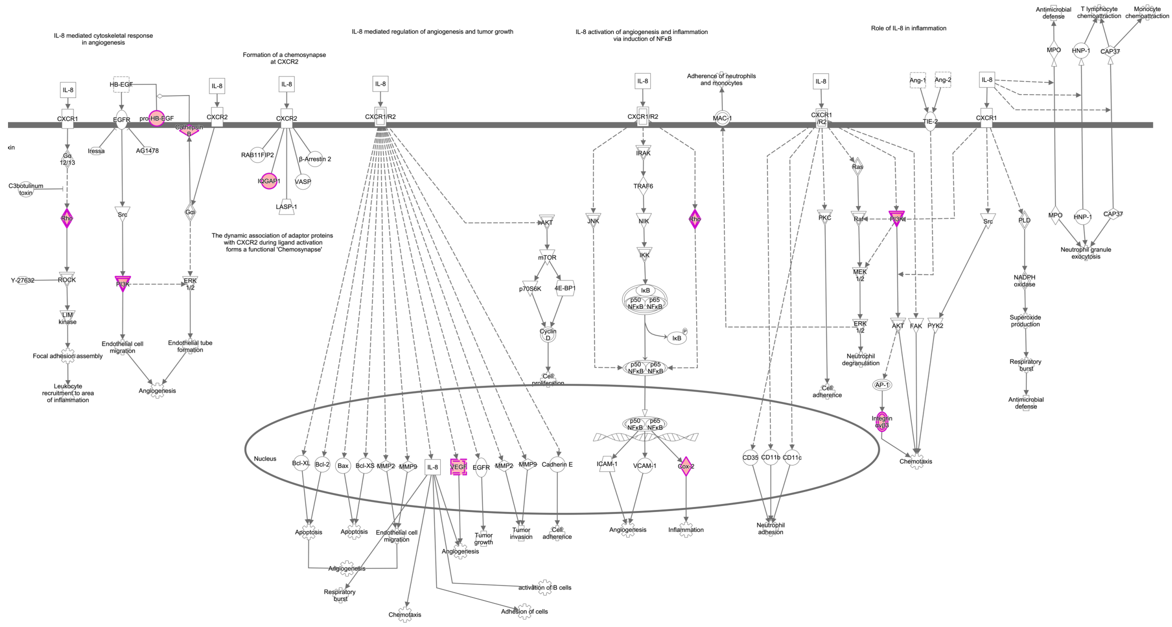


Figure S6a. IL-8 signaling pathway map including the observed up-regulated genes (highlighted in pink).

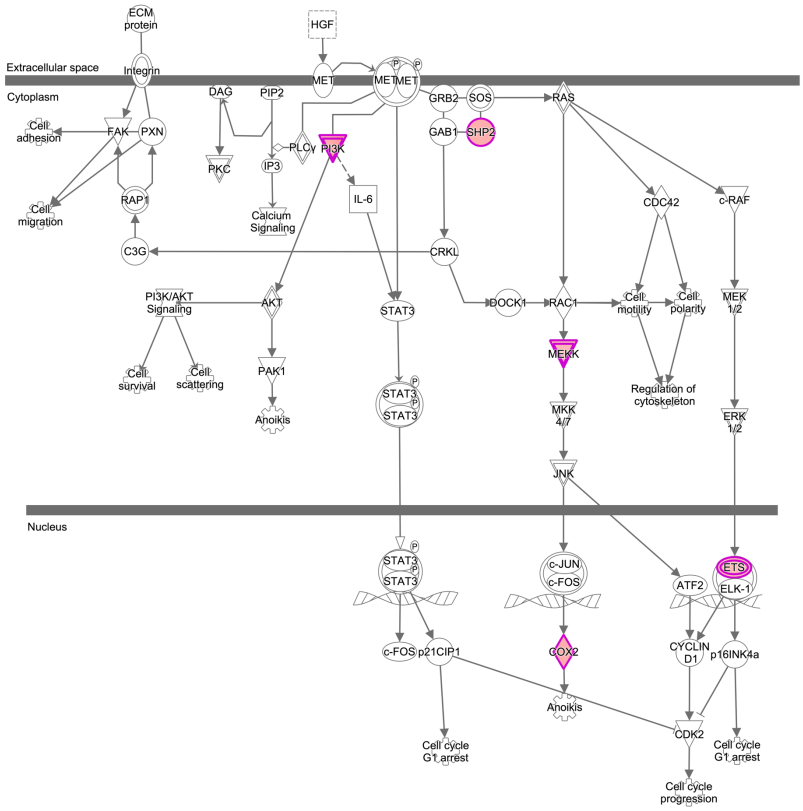


Figure S6b. HGF signaling pathway map including the observed up-regulated genes (highlighted in pink).

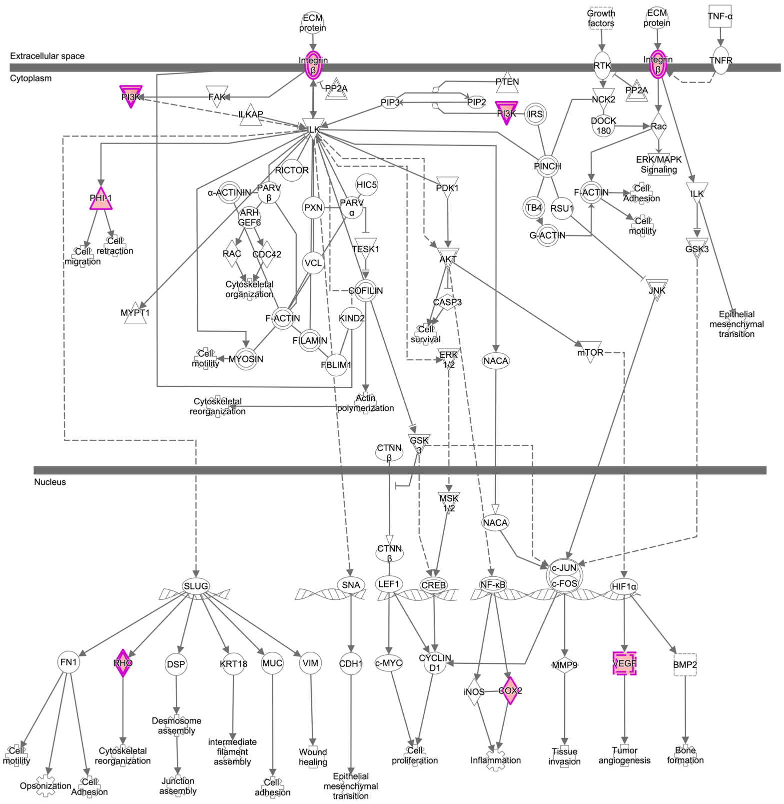


Figure S6c. ILK signaling pathway map including the observed up-regulated genes (highlighted in pink).

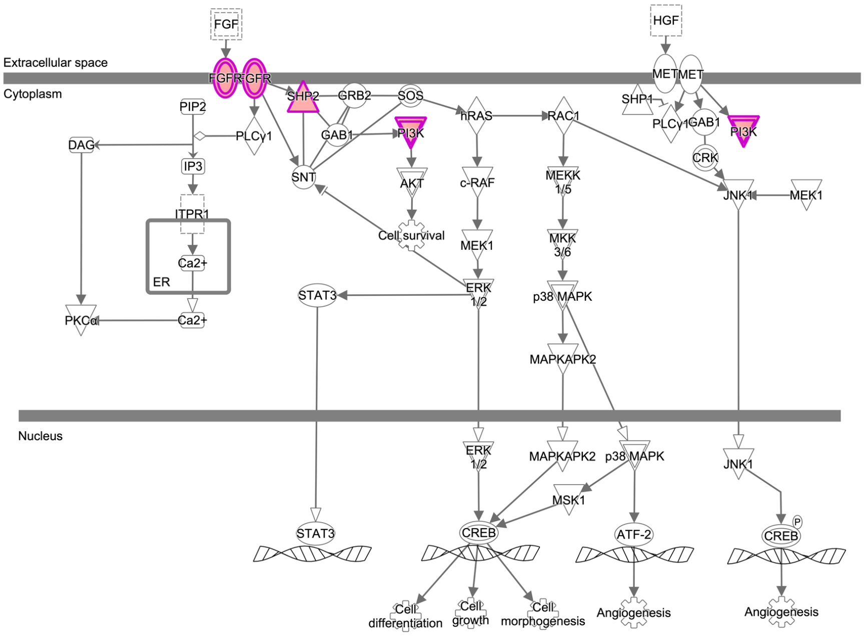


Figure S6d. FGF signaling pathway map including the observed up-regulated genes (highlighted in pink).

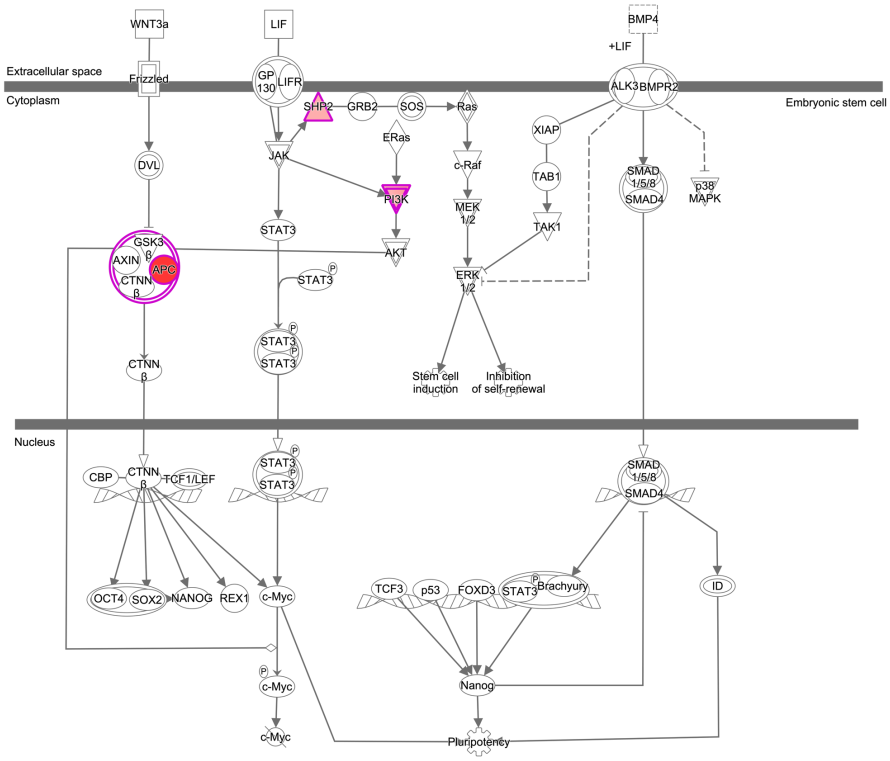


Figure S6e. Mouse embryonic stem cell pluripotency signaling pathway map including the observed up-regulated genes (highlighted in pink).

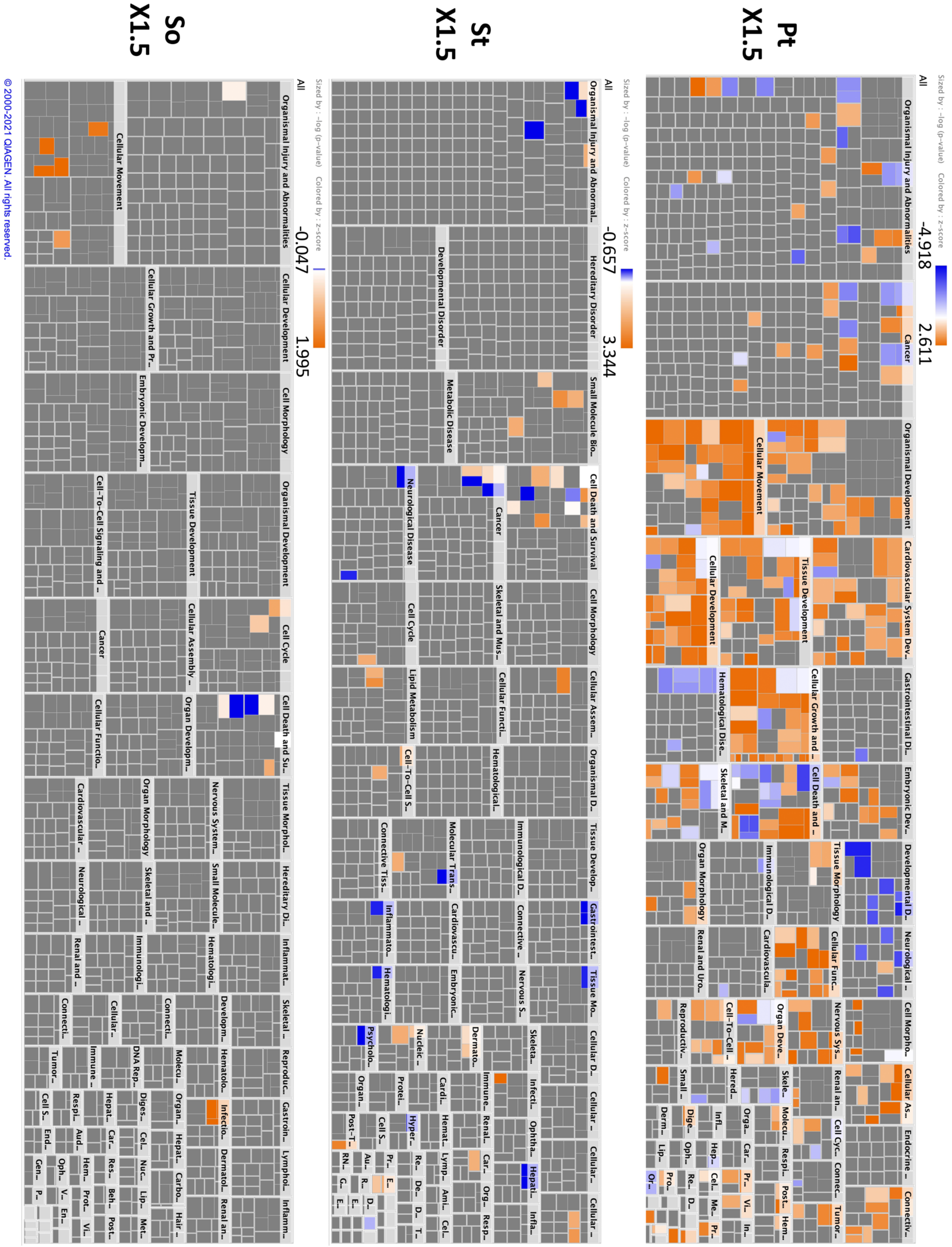


Figure S7a. Diagrams of biofunctions predicted to be activated or inactivated based on each up-regulated expression profile (>1.5-fold) in the DNA microarray data observed in cells cultured on Pt, St, and So gels.

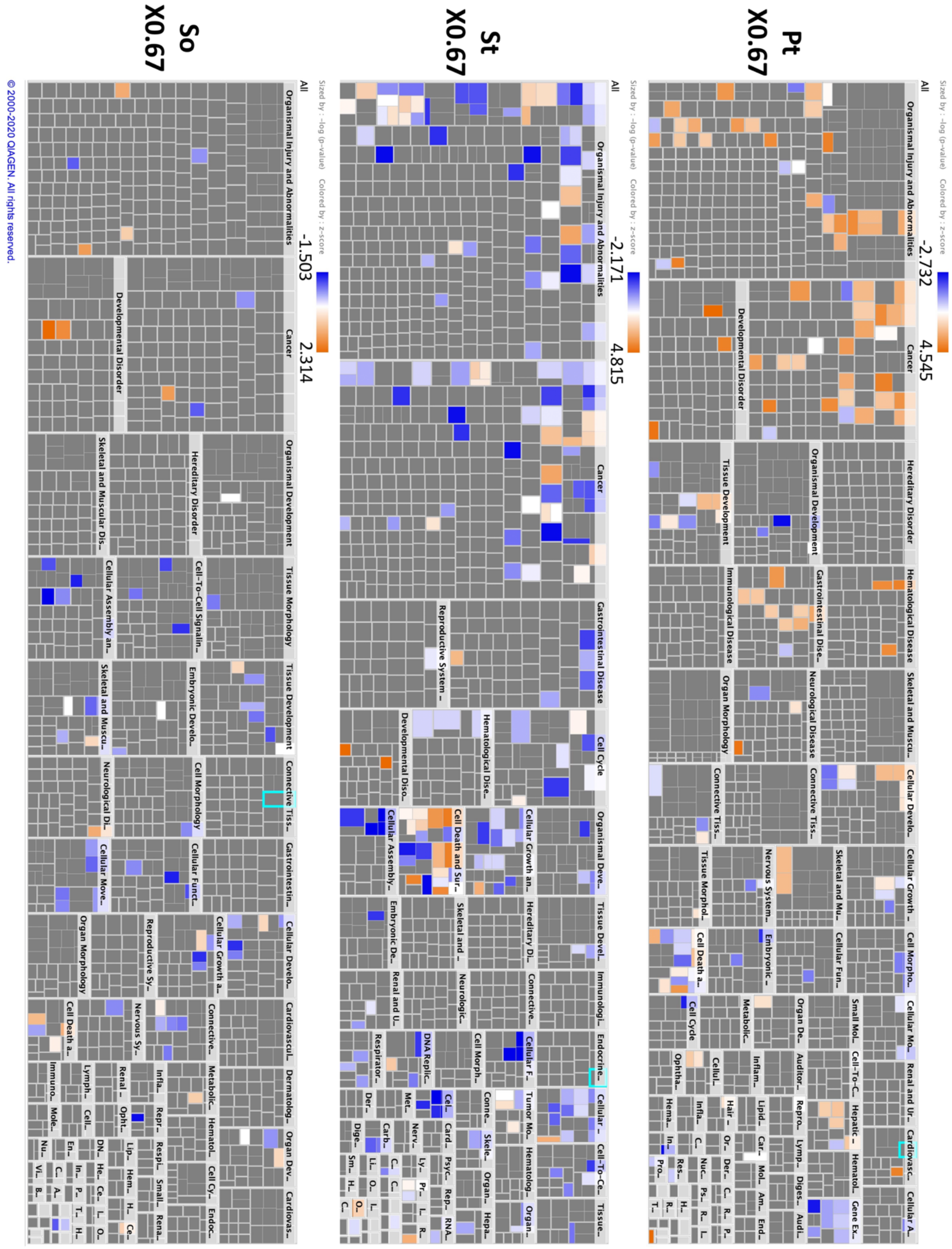


Figure S7b. Diagrams of biofunctions predicted to be activated or inactivated based on each down-regulated expression profile (<0.67-fold) in the DNA microarray data observed in cells cultured on Pt, St, and So gels.

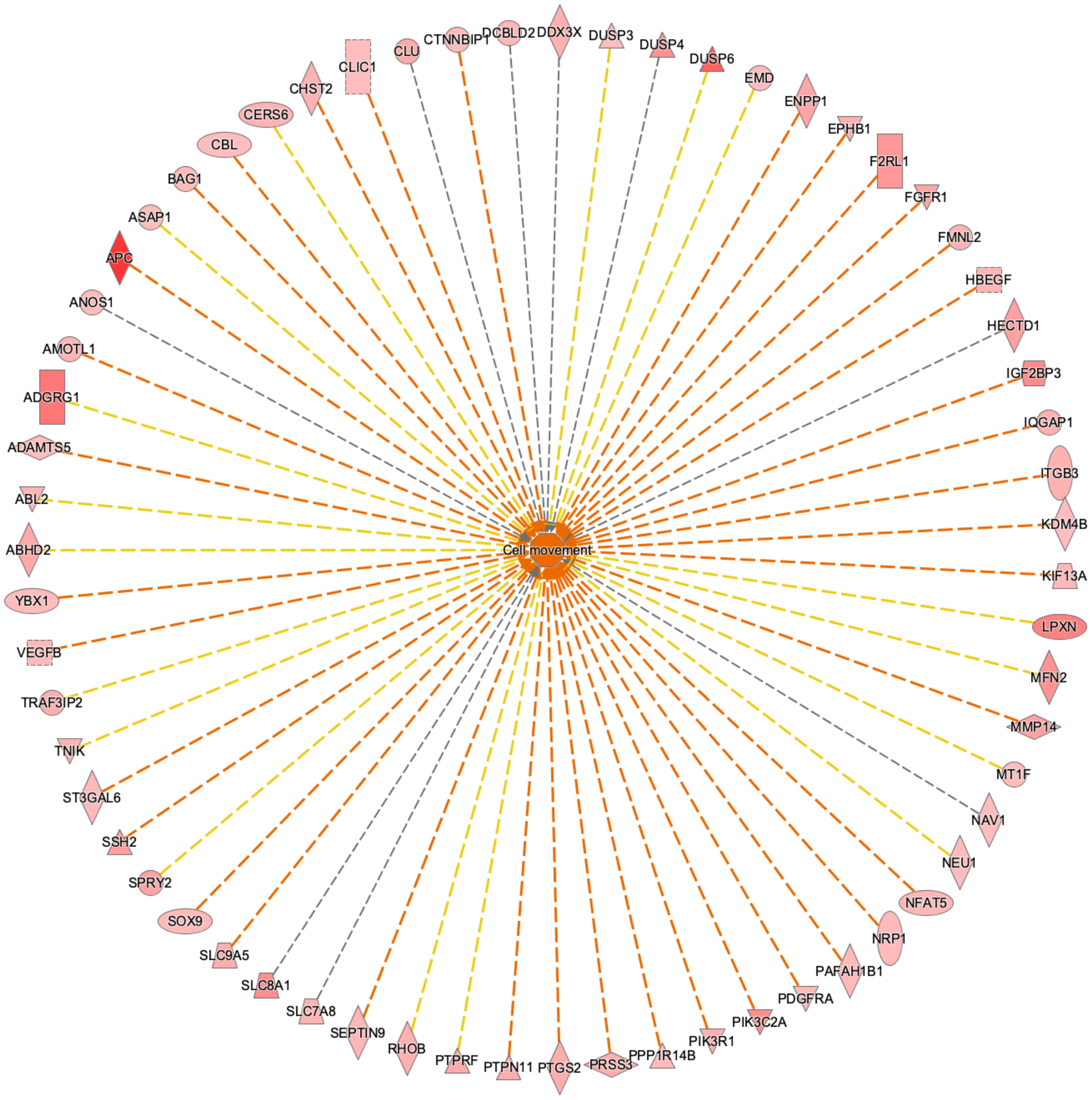
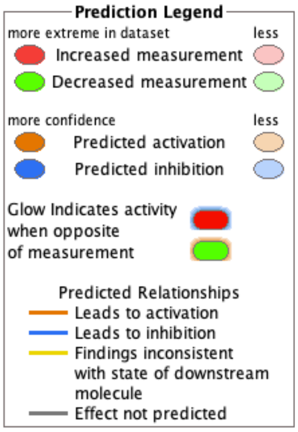


Figure S8a. Network map of the Pt-specifically modulated genes related to the functional category of “Cell movement”.



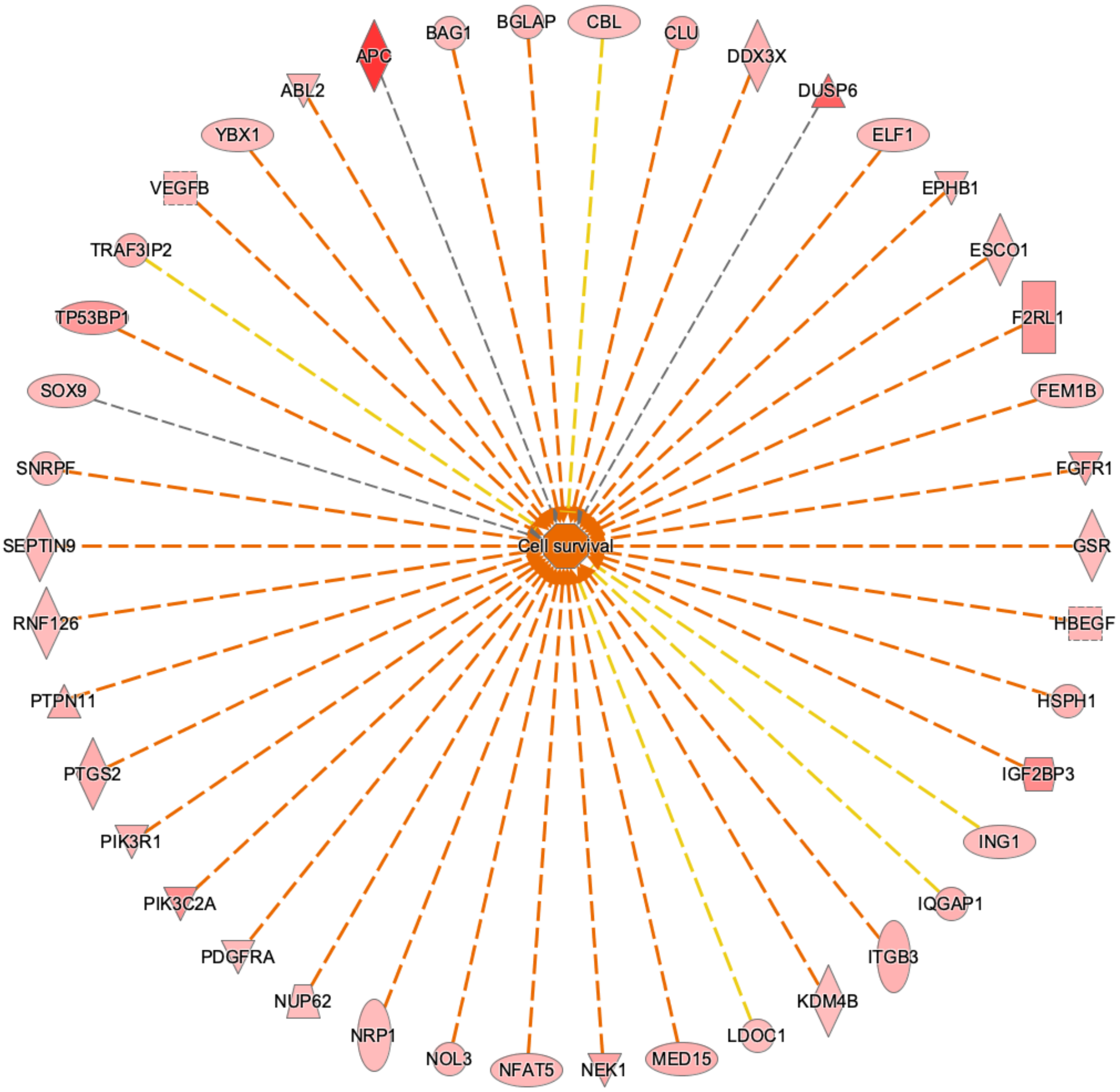


Figure S8b. Network map of the Pt-specifically modulated genes related to the functional category of “Cell survival”.

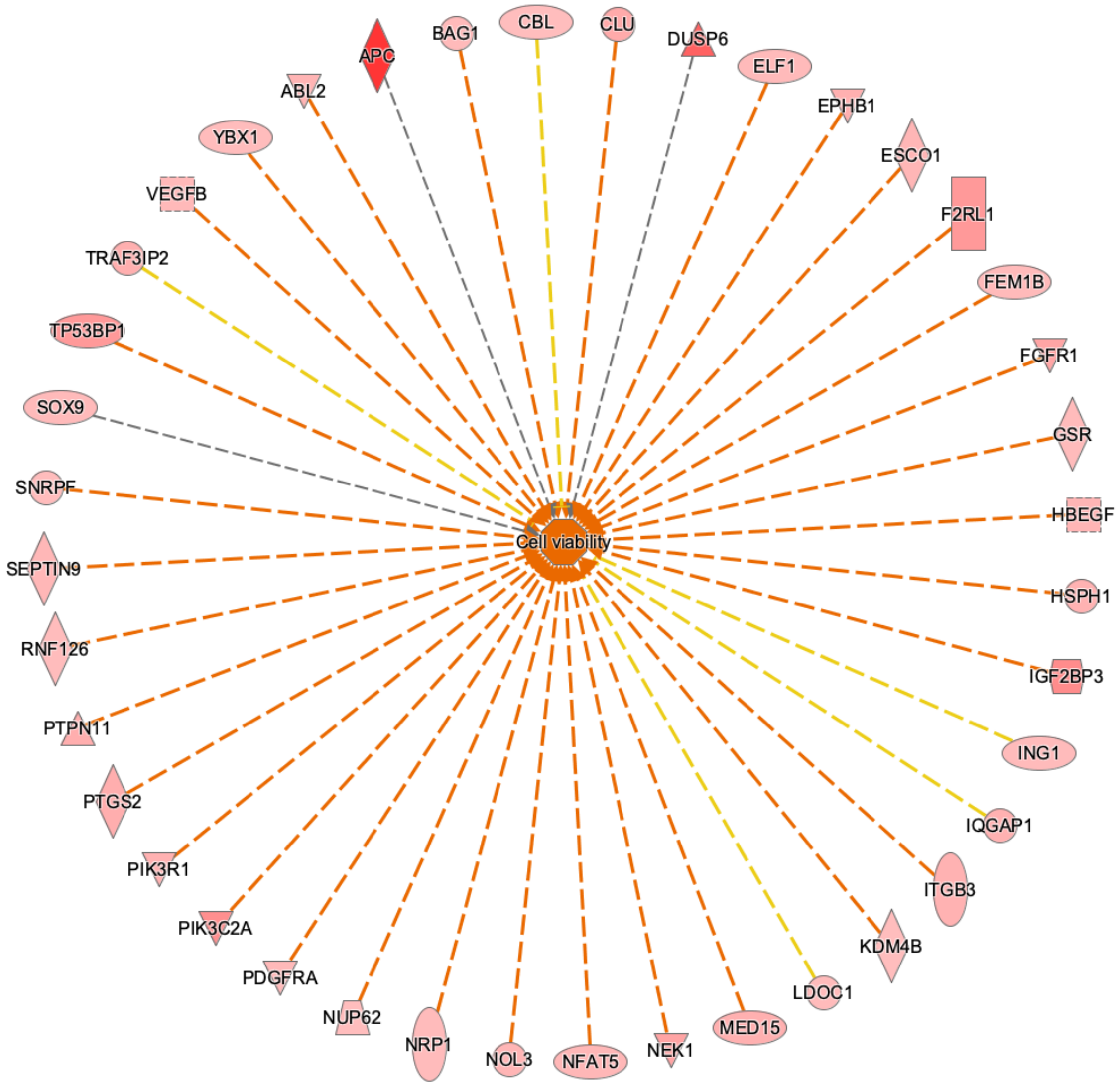


Figure S8c. Network map of the Pt-specifically modulated genes related to the functional category of "Cell viability".

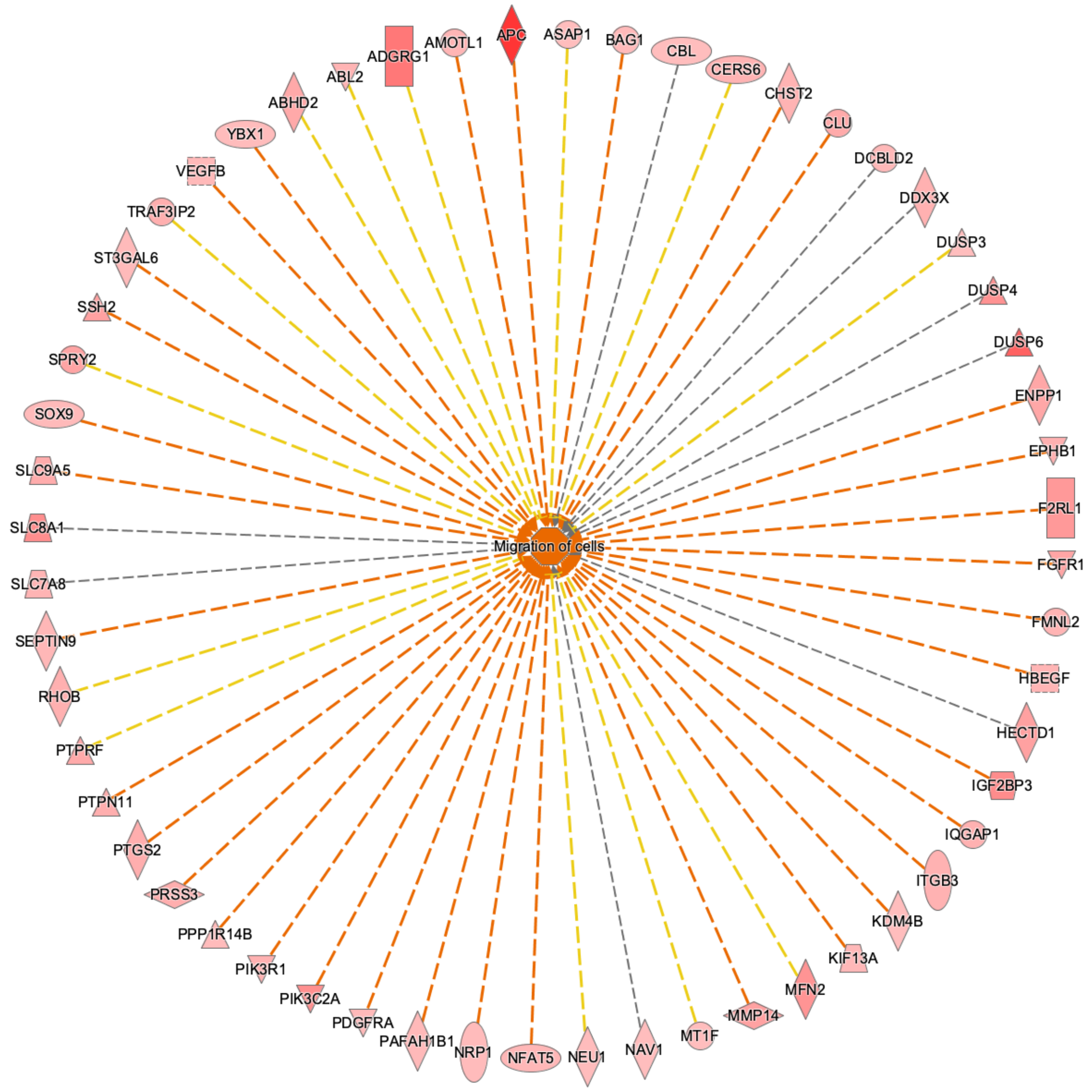


Figure S8d. Network map of the Pt-specifically modulated genes related to the functional category of "Migration of cells".

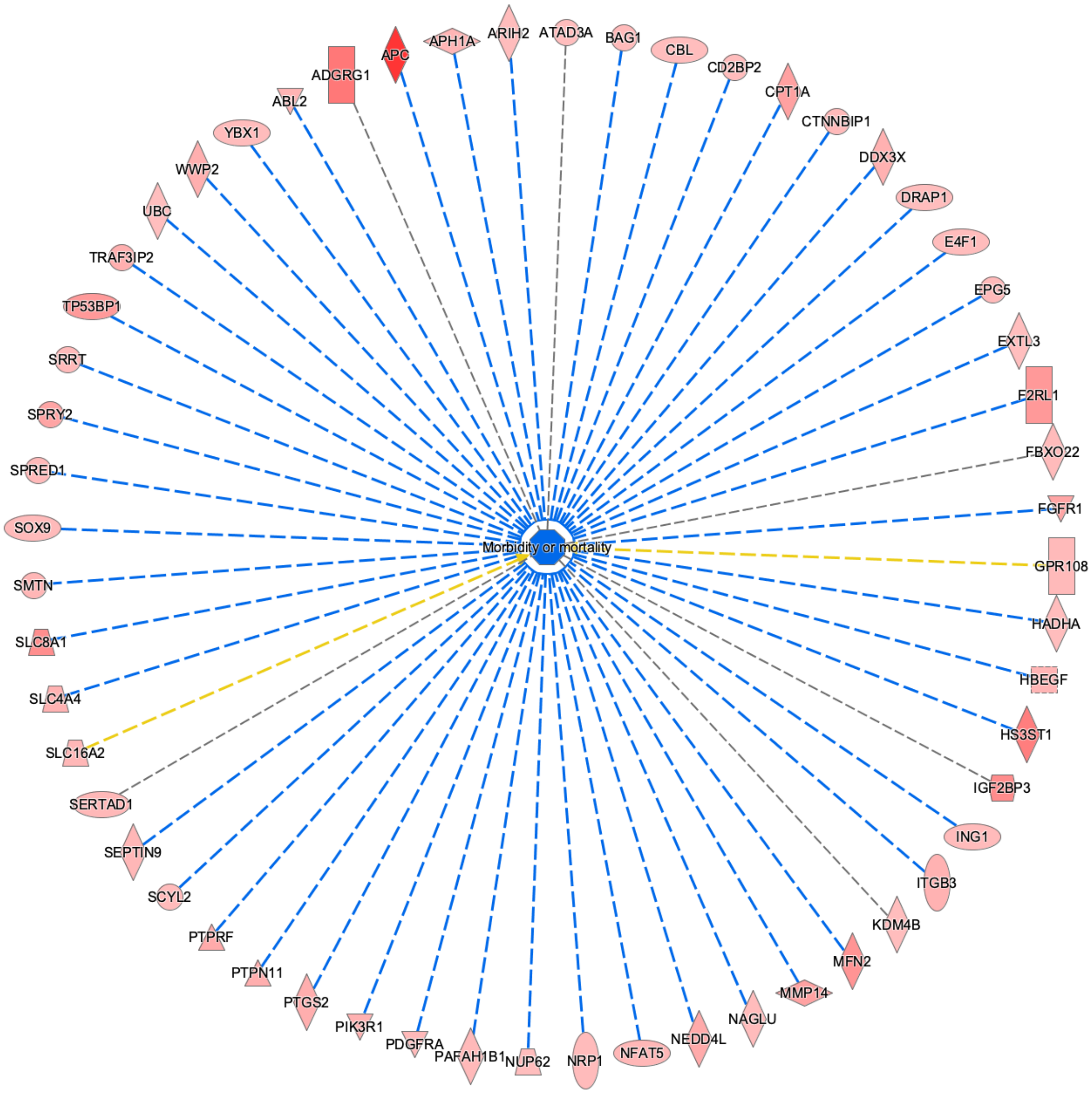


Figure S8e. Network map of the Pt-specifically modulated genes related to the functional category of "Morbidity or Mortality".

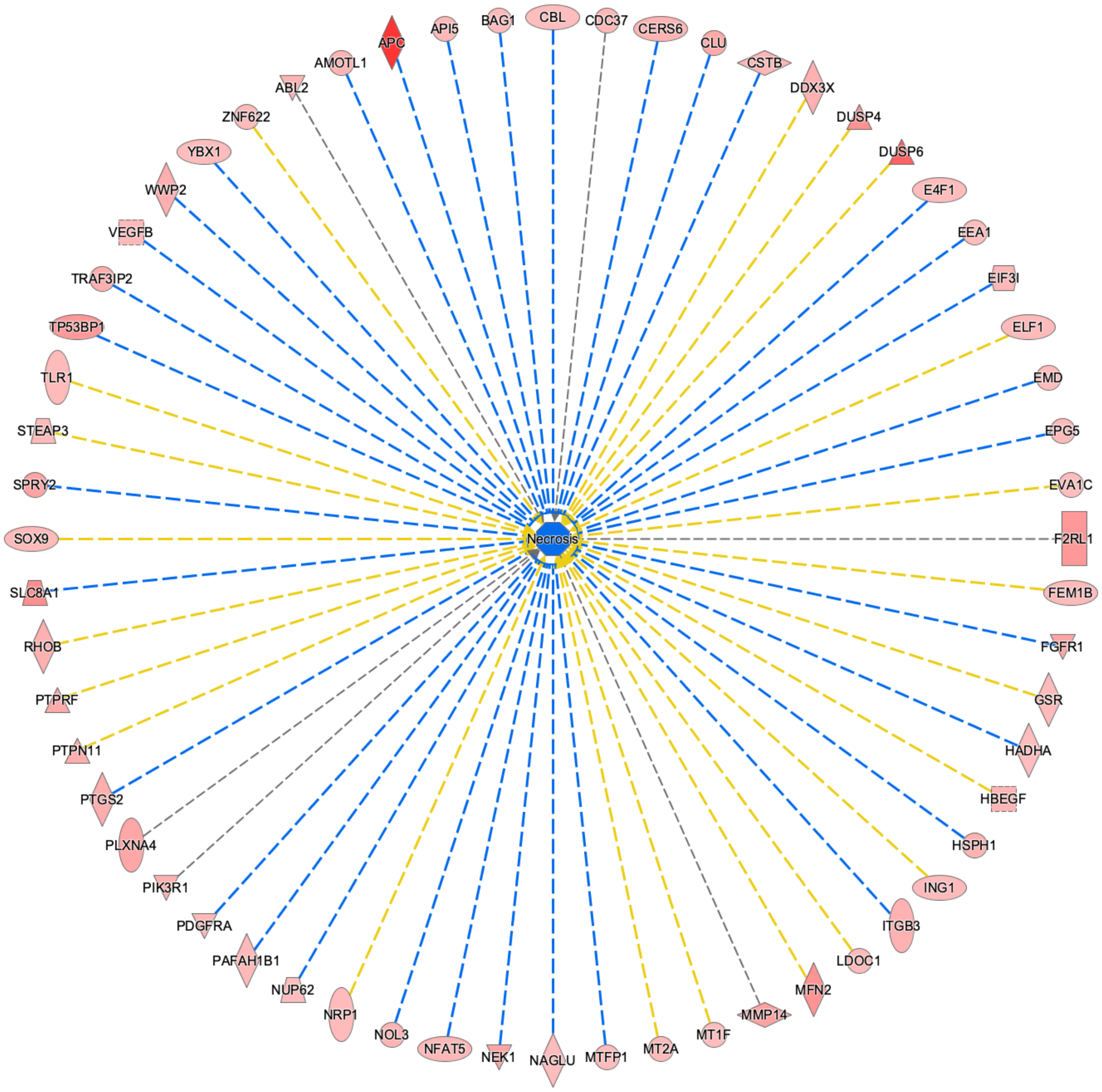


Figure S8f. Network map of the Pt-specifically modulated genes related to the functional category of "Necrosis".

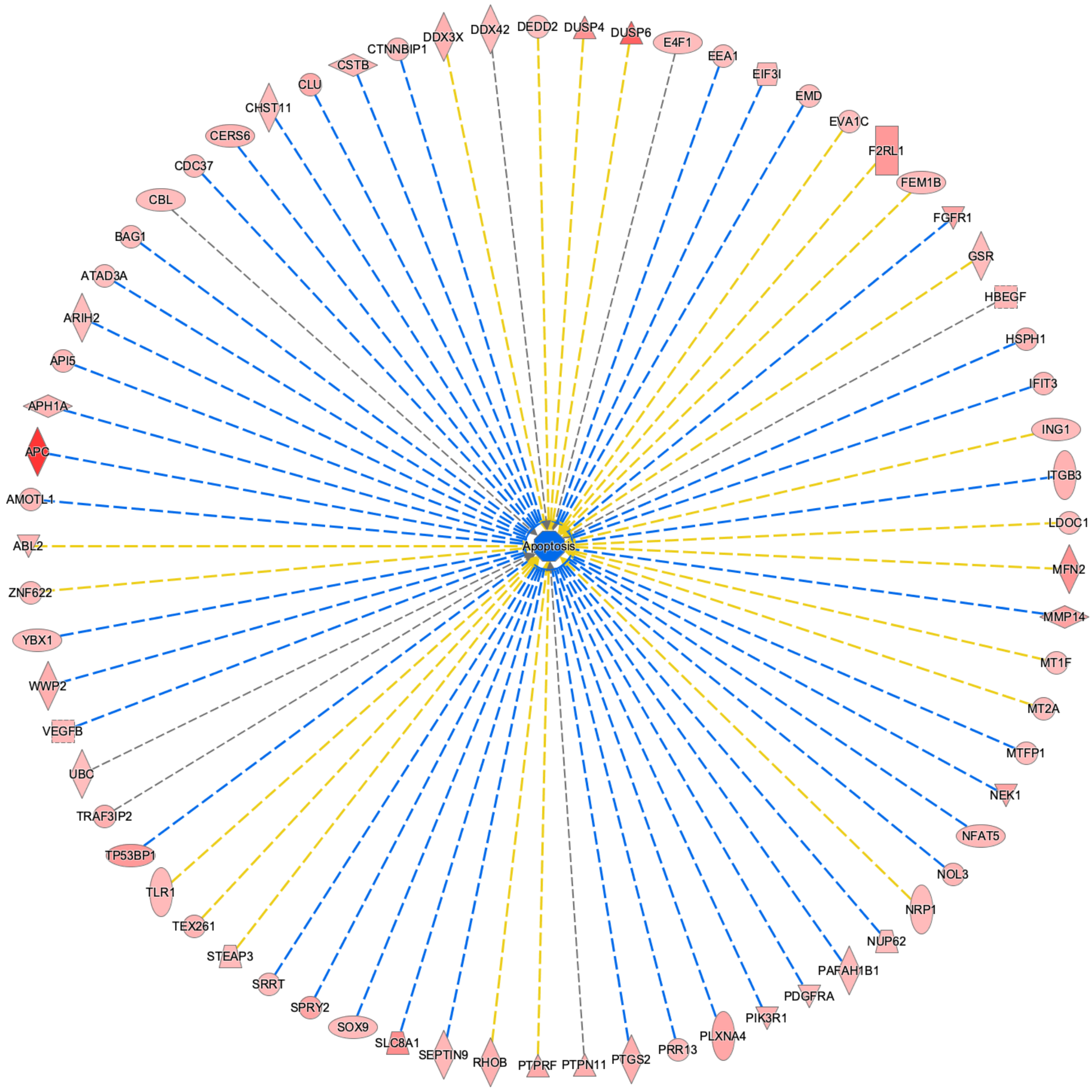


Figure S8g. Network map of the Pt-specifically modulated genes related to the functional category of "Apoptosis".

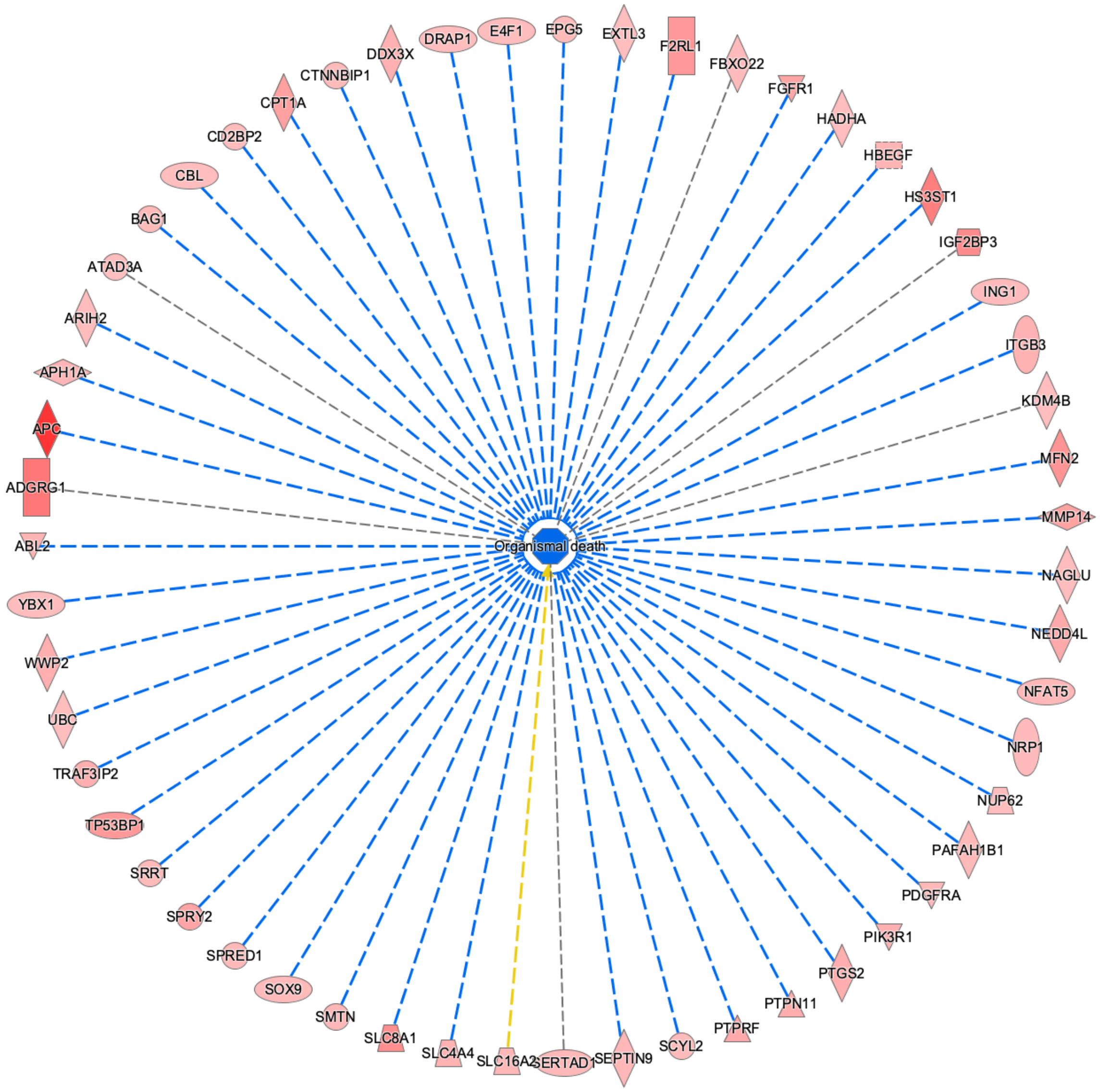


Figure S8h. Network map of the Pt-specifically modulated genes related to the functional category of "Organismal death".

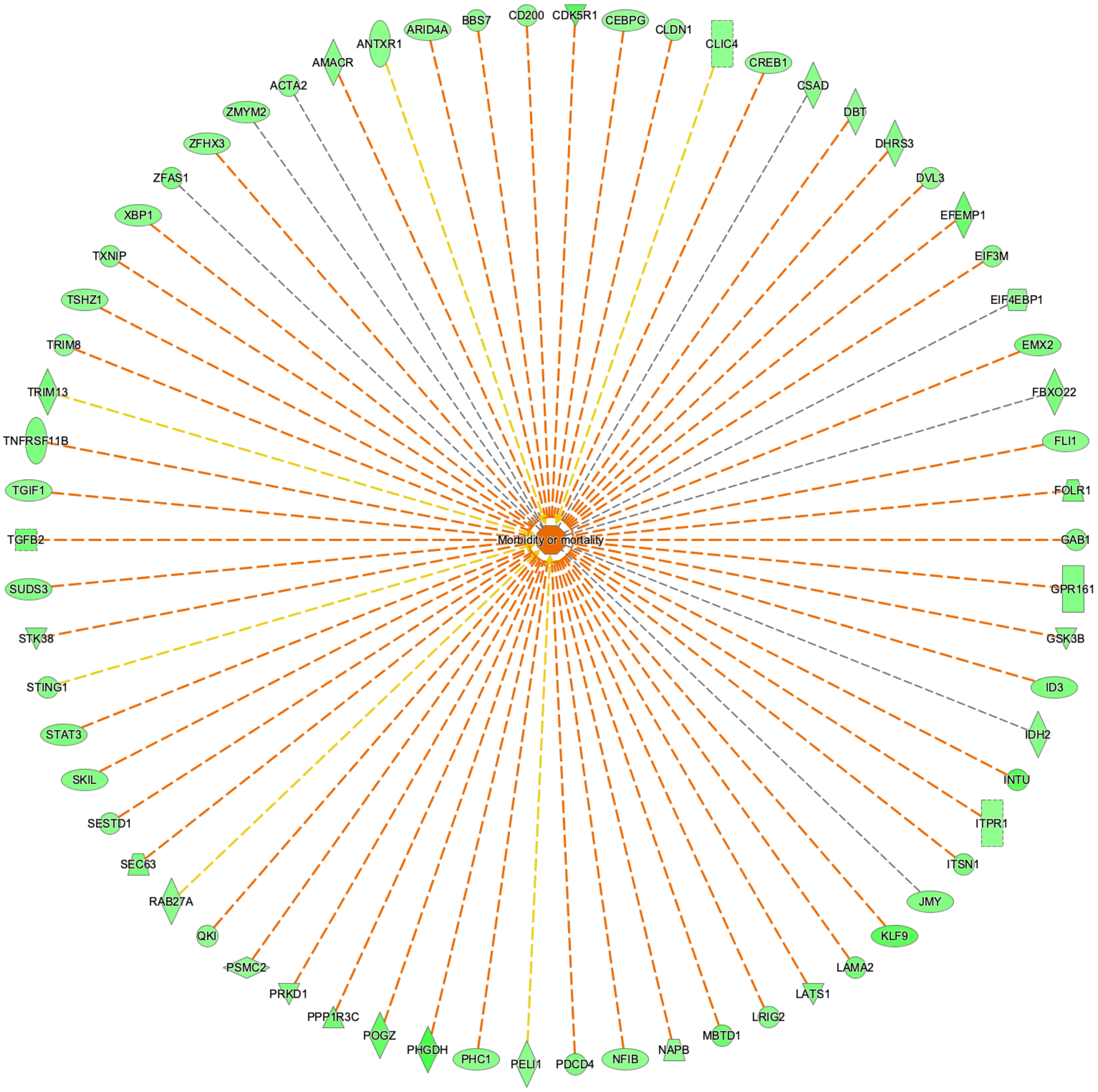


Figure S8i. Network map of the Pt-specifically modulated genes related to the functional category of "Morbidity or Mortality".

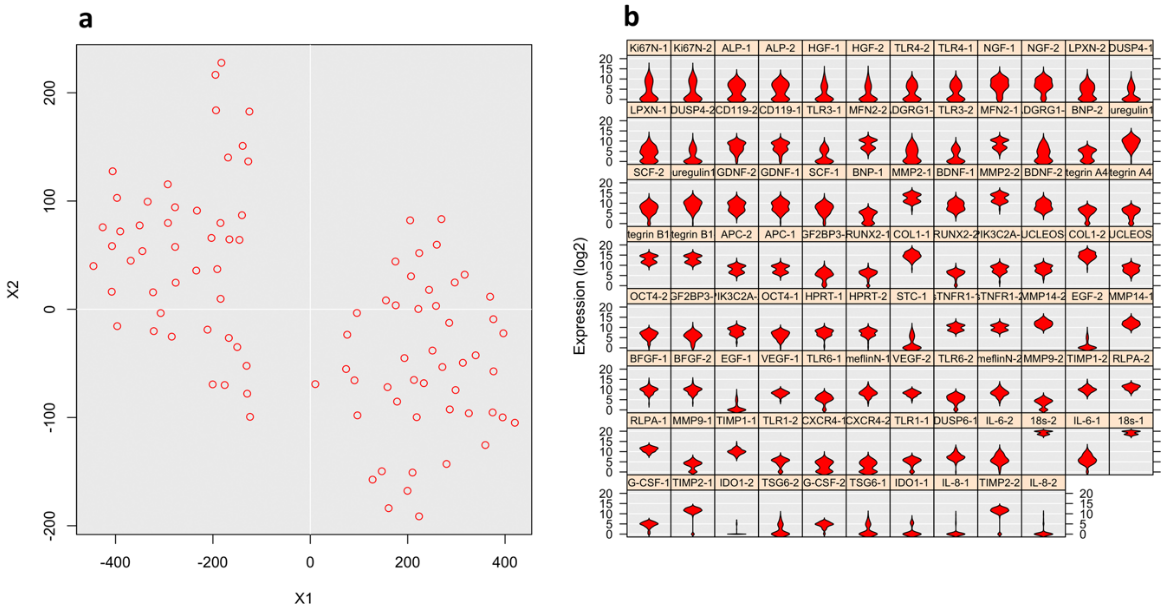


Figure S9. Single-cell population analysis of gene expression in cells cultured on Pt gels. (a) tSNE plot. **(b)** Violin plot.

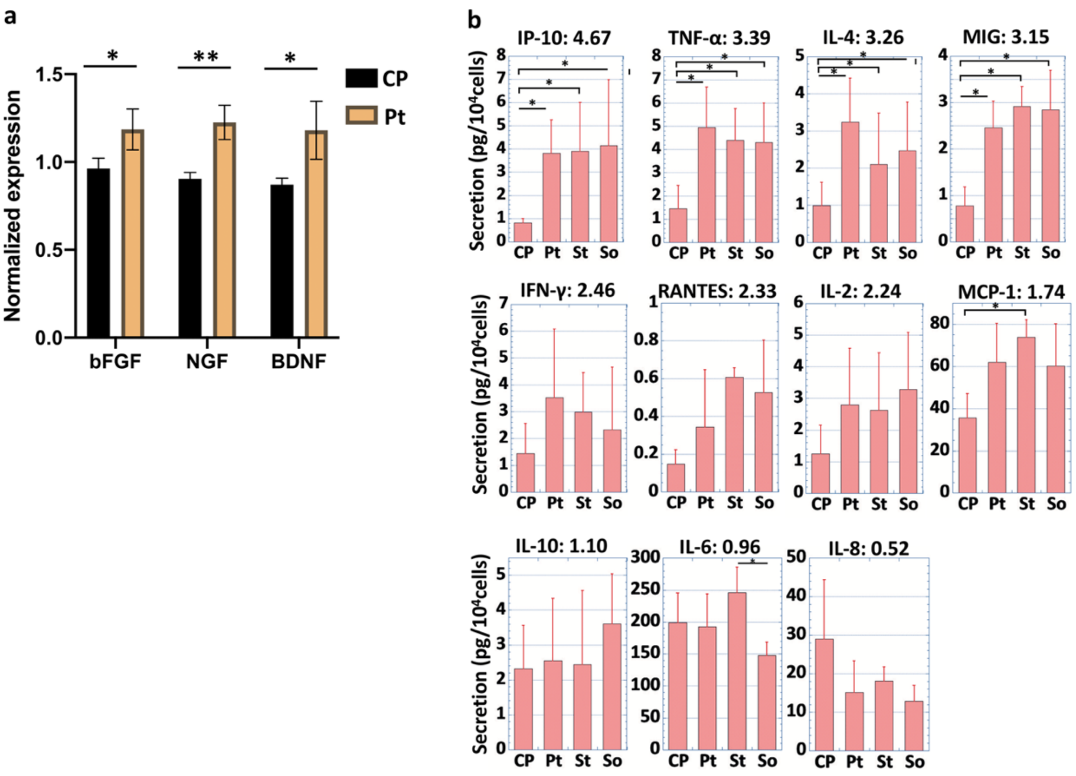


Figure S10. Expression analysis of therapeutic-related molecules in dual-durotactic MSCs cultured on Pt gels. (a) Gene expression of bFGF, NGF, and BDNF measured with q-PCR. **(b)** Secretion of cytokines quantified with a microbead array and flow cytometer. The values on each graph show the ratio of the mean secretion level of Pt to that of control CP. ** $P<0.01$, * $P<0.05$.

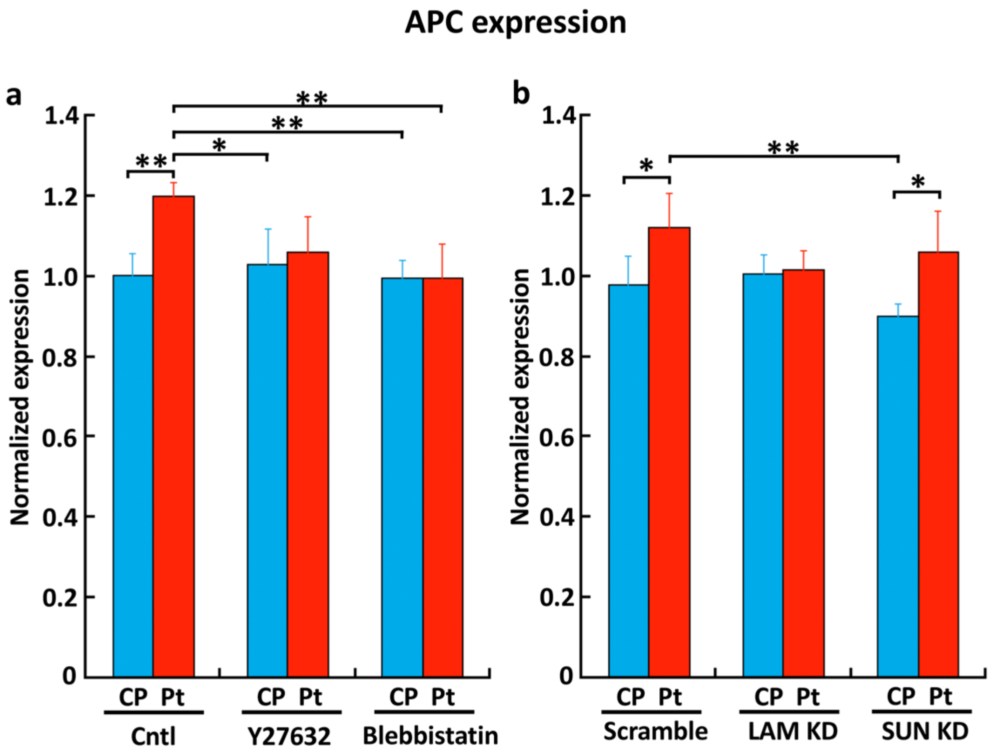


Figure S11. Effects of cytoskeletal tension inhibitors and knockdown of LINC-related molecules on the expression of APC gene. (a) APC expression in cells cultured on CP and Pt gels in the presence of Y27632 and blebbistatin measured with q-PCR. **(b)** APC expression in cells cultured on CP and Pt gels under knockdown with siRNA of LaminA/C and SUN1 measured with q-PCR. ** P<0.01, * P<0.05.

Supplementary Movies

SI Movie 1. Time-lapse observation of nomadic migration of dual-durotaxing MSCs on a microelastically-patterned gel with stiff triangles

SI Movie 2. Representative traction force dynamics in dual-durotaxing MSCs on the Pt gel

SI Movie 3. Representative traction force dynamics in MSCs moving on the St gel

SI Movie 4. Representative traction force dynamics in MSCs moving on the So gel

SI Movie 5. Live imaging of the cell nuclei in dual-durotaxing MSCs on the Pt gel

SI Movie 6. Live imaging of the cell nuclei in MSCs moving on CP

SI Movie 7. Representative live imaging of chromatin dynamics in a single cell nucleus in MSCs moving on the Pt gel. Scale bar: 10 μm

SI Movie 8. Representative live imaging of chromatin dynamics in a single cell nucleus in MSCs moving on CP. Scale bar: 10 μm

SI Movie 9. The most successful live-cell imaging of the moment of nucleocytoplasmic shuttling of YAP in a dual-durotaxing MSC that is crossing the elasticity boundary of a stiff triangle on Pt gel. By 6hr, YAP is mainly localized in cytoplasm inside the stiff triangle pattern though it is usually localized in the nucleus on the plain stiff gel, which is a typical response on Pt gel due to the time-lag effect of YAP translocation when the cell detects the stiff region. YAP translocation into the nucleus requires several hours after the cell enters the stiff region, while translocation into the cytoplasm also needs several hours after the cell feels the soft region. The dual-durotaxing cell moves over the cell-size-scale stiff region about 4hr in the present patterning, therefore the time-lag of YAP translocation emerges. The cytoplasmic localization of YAP in the stiff triangle region is the delayed response of translocation when the cell felt the soft surroundings. Actually, after 6hr, when the cell crosses the elasticity boundary around the corner of the stiff triangle from the stiff to soft region, YAP starts to translocate from the cytoplasm to the nucleus even though the cell starts to feel the soft region. This is because the cell sensed the stiff region.

Supplementary Tables

Table S1. Pt-specifc up-regulated genes (>1.5-fold)

Expr Fold Change	ID	Entrez Gene Name
4.721	APC	APC regulator of WNT signaling pathway
3.614	DUSP6	dual specificity phosphatase 6
3.111	ADGRG1	adhesion G protein-coupled receptor G1
2.967	HS3ST1	heparan sulfate-glucosamine 3-sulfotransferase 1
2.888	LPXN	leupaxin
2.75	RNF128	ring finger protein 128
2.641	IGF2BP3	insulin like growth factor 2 mRNA binding protein 3
2.593	SLC8A1	solute carrier family 8 member A1
2.585	PIK3C2A	phosphatidylinositol-4-phosphate 3-kinase catalytic subunit type 2 alpha
2.511	DUSP4	dual specificity phosphatase 4
2.464	MFN2	mitofusin 2
2.358	F2RL1	F2R like trypsin receptor 1
2.339	TP53BP1	tumor protein p53 binding protein 1
2.174	HECTD1	HECT domain E3 ubiquitin protein ligase 1
2.169	MPP4	membrane palmitoylated protein 4
2.16	CPT1A	carnitine palmitoyltransferase 1A
2.153	SSH2	slingshot protein phosphatase 2
2.143	PKIA	cAMP-dependent protein kinase inhibitor alpha
2.135	MMP14	matrix metallopeptidase 14
2.099	ZFHX4	zinc finger homeobox 4
2.095	NEK1	NIMA related kinase 1
2.087	SPRY2	sprouty RTK signaling antagonist 2
2.08	FGFR1	fibroblast growth factor receptor 1
2.043	CHP1	calcineurin like EF-hand protein 1
2.034	PLXNA4	plexin A4
2.034	RGS2	regulator of G protein signaling 2
2.025	ENPP1	ectonucleotide pyrophosphatase/phosphodiesterase 1
2.016	ABLIM1	actin binding LIM protein 1
2.015	CLTB	clathrin light chain B
1.984	ABHD2	abhydrolase domain containing 2, acylglycerol lipase
1.962	CLU	clusterin
1.957	NEDD4L	NEDD4 like E3 ubiquitin protein ligase
1.945	PTPRF	protein tyrosine phosphatase receptor type F
1.9	SLC9A5	solute carrier family 9 member A5
1.872	PTGS2	prostaglandin-endoperoxide synthase 2
1.867	OTUD4	OTU deubiquitinase 4
1.862	PRSS3	serine protease 3
1.856	PTPN11	protein tyrosine phosphatase non-receptor type 11
1.851	TRAF3IP2	TRAF3 interacting protein 2
1.842	LOXL4	lysyl oxidase like 4
1.839	WWP2	WW domain containing E3 ubiquitin protein ligase 2
1.834	LARS	leucyl-tRNA synthetase 1
1.825	GALNT6	polypeptide N-acetylgalactosaminyltransferase 6
1.817	RHOB	ras homolog family member B
1.814	EPHB1	EPH receptor B1
1.81	KIAA0100	KIAA0100
1.81	PQLC2	solute carrier family 66 member 1
1.809	EGFLAM	EGF like, fibronectin type III and laminin G domains
1.807	MED15	mediator complex subunit 15
1.799	IQGAP1	IQ motif containing GTPase activating protein 1
1.796	PIK3R1	phosphoinositide-3-kinase regulatory subunit 1
1.788	DDX3X	DEAD-box helicase 3 X-linked
1.774	ITGB3	integrin subunit beta 3
1.769	SLC4A4	solute carrier family 4 member 4
1.761	HSPH1	heat shock protein family H (Hsp110) member 1
1.75	CERS6	ceramide synthase 6
1.747	TEX261	testis expressed 261
1.746	CHST2	carbohydrate sulfotransferase 2
1.746	TNIK	TRAF2 and NCK interacting kinase
1.739	BGLAP	bone gamma-carboxyglutamate protein
1.739	PHACTR2	phosphatase and actin regulator 2
1.737	CACTIN	cactin, spliceosome C complex subunit
1.727	ABL2	ABL proto-oncogene 2, non-receptor tyrosine kinase

1.726	NIPAL2	NIPA like domain containing 2
1.725	FMNL2	formin like 2
1.723	SLC16A7	solute carrier family 16 member 7
1.715	LRTOMT	leucine rich transmembrane and O-methyltransferase domain containing
1.715	SLC7A8	solute carrier family 7 member 8
1.713	ANKRD13C	ankyrin repeat domain 13C
1.709	APH1A	aph-1 homolog A, gamma-secretase subunit
1.709	HBEGF	heparin binding EGF like growth factor
1.706	AMOTL1	angiomotin like 1
1.698	C3orf52	chromosome 3 open reading frame 52
1.698	NOL3	nucleolar protein 3
1.695	BLOC1S4	biogenesis of lysosomal organelles complex 1 subunit 4
1.682	CDC27	cell division cycle 27
1.679	CSTB	cystatin B
1.678	IFIT3	interferon induced protein with tetratricopeptide repeats 3
1.674	SMTN	smoothelin
1.672	ESCO1	establishment of sister chromatid cohesion N-acetyltransferase 1
1.665	TOR4A	torsin family 4 member A
1.662	EIF3I	eukaryotic translation initiation factor 3 subunit I
1.662	MAP3K6	mitogen-activated protein kinase kinase kinase 6
1.662	SEPT9	septin 9
1.662	SLC41A2	solute carrier family 41 member 2
1.659	API5	apoptosis inhibitor 5
1.656	NSL1	NSL1 component of MIS12 kinetochore complex
1.654	FRMD4A	FERM domain containing 4A
1.65	NFAT5	nuclear factor of activated T cells 5
1.648	SLC16A2	solute carrier family 16 member 2
1.646	CDC37	cell division cycle 37, HSP90 cochaperone
1.645	FOXN3	forkhead box N3
1.642	KIF13A	kinesin family member 13A
1.634	DCBLD2	discoidin, CUB and LCCL domain containing 2
1.633	AP3D1	adaptor related protein complex 3 subunit delta 1
1.629	SERTAD1	SERTA domain containing 1
1.623	FAM126A	family with sequence similarity 126 member A
1.62	PRKAR2A	protein kinase cAMP-dependent type II regulatory subunit alpha
1.616	FBXL15	F-box and leucine rich repeat protein 15
1.616	PDGFRA	platelet derived growth factor receptor alpha
1.616	RBM14	RNA binding motif protein 14
1.616	VEGFB	vascular endothelial growth factor B
1.615	PAFAH1B1	platelet activating factor acetylhydrolase 1b regulatory subunit 1
1.608	PRR13	proline rich 13
1.608	SCARA3	scavenger receptor class A member 3
1.608	ZNF688	zinc finger protein 688
1.604	C19orf24	family with sequence similarity 174 member C
1.602	MT1E	metallothionein 1E
1.598	SPRED1	sprouty related EVH1 domain containing 1
1.596	GLYR1	glyoxylate reductase 1 homolog
1.596	PURB	purine rich element binding protein B
1.595	CTNNBIP1	catenin beta interacting protein 1
1.595	PITHD1	PITH domain containing 1
1.594	EPG5	ectopic P-granules autophagy protein 5 homolog
1.592	TLR1	toll like receptor 1
1.591	MT2A	metallothionein 2A
1.59	H1FX	H1.10 linker histone
1.587	SOX9	SRY-box transcription factor 9
1.587	SRRT	serrate, RNA effector molecule
1.587	ST3GAL6	ST3 beta-galactoside alpha-2,3-sialyltransferase 6
1.586	ZNF622	zinc finger protein 622
1.584	FEM1B	fem-1 homolog B
1.583	ELF1	E74 like ETS transcription factor 1
1.58	BAG1	BAG cochaperone 1
1.578	DSEL	dermatan sulfate epimerase like
1.577	GPR108	G protein-coupled receptor 108
1.576	CLN6	CLN6 transmembrane ER protein
1.573	LDOC1	LDOC1 regulator of NFKB signaling
1.565	GSR	glutathione-disulfide reductase
1.564	NRP1	neuropilin 1
1.562	MORF4L2-AS1	MORF4L2 antisense RNA 1
1.562	TBC1D20	TBC1 domain family member 20
1.558	DDX42	DEAD-box helicase 42
1.557	EIF2B3	eukaryotic translation initiation factor 2B subunit gamma

1.557	PPP1R14B	protein phosphatase 1 regulatory inhibitor subunit 14B
1.556	CHST11	carbohydrate sulfotransferase 11
1.555	SCYL2	SCY1 like pseudokinase 2
1.554	EMD	emerin
1.554	FBXO22	F-box protein 22
1.554	ZC3H7A	zinc finger CCCH-type containing 7A
1.553	STEAP3	STEAP3 metalloreductase
1.552	ING1	inhibitor of growth family member 1
1.552	SLC35E3	solute carrier family 35 member E3
1.55	EEA1	early endosome antigen 1
1.547	YBX1	Y-box binding protein 1
1.545	ANOS1	anosmin 1
1.545	CD2BP2	CD2 cytoplasmic tail binding protein 2
1.544	MTFP1	mitochondrial fission process 1
1.543	TMED4	transmembrane p24 trafficking protein 4
1.54	EMB	embigin
1.539	GPATCH2	G-patch domain containing 2
1.539	RNF126	ring finger protein 126
1.537	ARIH2	ariadne RBR E3 ubiquitin protein ligase 2
1.537	FBXO33	F-box protein 33
1.536	SNRPF	small nuclear ribonucleoprotein polypeptide F
1.535	CRTAP	cartilage associated protein
1.535	NEU1	neuraminidase 1
1.535	SURF2	surfeit 2
1.532	DIEXF	UTP25 small subunit processor component
1.531	METTL7B	methyltransferase like 7B
1.53	E4F1	E4F transcription factor 1
1.529	NAGLU	N-acetyl-alpha-glucosaminidase
1.528	ZNF480	zinc finger protein 480
1.526	CBL	Cbl proto-oncogene
1.526	MRPL4	mitochondrial ribosomal protein L4
1.524	CDK16	cyclin dependent kinase 16
1.522	FBXW5	F-box and WD repeat domain containing 5
1.521	ASAP1	ArfGAP with SH3 domain, ankyrin repeat and PH domain 1
1.519	CLIC1	chloride intracellular channel 1
1.519	GRHL1	grainyhead like transcription factor 1
1.518	HADHA	hydroxyacyl-CoA dehydrogenase trifunctional multienzyme complex subunit alpha
1.517	ADAMTS5	ADAM metallopeptidase with thrombospondin type 1 motif 5
1.517	COPRS	coordinator of PRMT5 and differentiation stimulator
1.516	NAV1	neuron navigator 1
1.514	EID1	EP300 interacting inhibitor of differentiation 1
1.514	EVA1C	eva-1 homolog C
1.513	KIAA1217	KIAA1217
1.511	MT1F	metallothionein 1F
1.509	DRAP1	DR1 associated protein 1
1.508	ATP11A	ATPase phospholipid transporting 11A
1.508	KDM4B	lysine demethylase 4B
1.508	MUL1	mitochondrial E3 ubiquitin protein ligase 1
1.508	NUP62	nucleoporin 62
1.506	ATAD3A	ATPase family AAA domain containing 3A
1.506	MCAT	malonyl-CoA-acyl carrier protein transacylase
1.505	DUSP3	dual specificity phosphatase 3
1.504	EXTL3	exostosin like glycosyltransferase 3
1.504	TOMM34	translocase of outer mitochondrial membrane 34
1.503	DEDD2	death effector domain containing 2
1.503	HPCAL1	hippocalcin like 1
1.503	UBC	ubiquitin C
1.502	SEC14L1	SEC14 like lipid binding 1

Table S1. contuned. Pt-specifc down-regulated genes (<0.67-fold)

Expr Fold Change	ID	Entrez Gene Name
-3.223	B3GALT2	beta-1,3-galactosyltransferase 2
-3.052	TRIB3	tribbles pseudokinase 3
-2.973	SCAF4	SR-related CTD associated factor 4
-2.925	ITGA1	integrin subunit alpha 1
-2.872	TTC39B	tetratricopeptide repeat domain 39B
-2.608	AIG1	androgen induced 1

-2.525	PHGDH	phosphoglycerate dehydrogenase
-2.516	LCA5	lebercilin LCA5
-2.502	ELL3	elongation factor for RNA polymerase II 3
-2.484	SRGAP2C	SLIT-ROBO Rho GTPase activating protein 2C
-2.401	HOMER2	homer scaffold protein 2
-2.374	SDCBP2-AS1	SDCBP2 antisense RNA 1
-2.353	CDK5R1	cyclin dependent kinase 5 regulatory subunit 1
-2.303	INTU	inturned planar cell polarity protein
-2.287	ZMYM5	zinc finger MYM-type containing 5
-2.243	KLF9	Kruppel like factor 9
-2.234	KCNE4	potassium voltage-gated channel subfamily E regulatory subunit 4
-2.217	RNF180	ring finger protein 180
-2.206	LOC100289230	uncharacterized LOC100289230
-2.193	SESN3	sestrin 3
-2.19	PRR5L	proline rich 5 like
-2.189	XPNPEP3	X-prolyl aminopeptidase 3
-2.173	DLX6	distal-less homeobox 6
-2.17	CEP126	centrosomal protein 126
-2.159	PTPN13	protein tyrosine phosphatase non-receptor type 13
-2.15	CEP152	centrosomal protein 152
-2.14	CPE	carboxypeptidase E
-2.134	POGZ	pogo transposable element derived with ZNF domain
-2.128	GIGYF2	GRB10 interacting GYF protein 2
-2.117	LINC00662	long intergenic non-protein coding RNA 662
-2.084	FAM110B	family with sequence similarity 110 member B
-2.084	RNF150	ring finger protein 150
-2.067	TMEM67	transmembrane protein 67
-2.063	FBXO30	F-box protein 30
-2.055	ZNF462	zinc finger protein 462
-2.028	LGMN	legumain
-2.023	MBTD1	mbt domain containing 1
-2.02	ZNF720	zinc finger protein 720
-2.016	RUSC1-AS1	RUSC1 antisense RNA 1
-2.014	WDR76	WD repeat domain 76
-2.012	BMS1P5	BMS1 pseudogene 1
-2.012	WNK1	WNK lysine deficient protein kinase 1
-2.005	EFEMP1	EGF containing fibulin extracellular matrix protein 1
-1.991	VPS13D	vacuolar protein sorting 13 homolog D
-1.988	CCDC113	coiled-coil domain containing 113
-1.965	MKNK2	MAPK interacting serine/threonine kinase 2
-1.962	PPP1R3C	protein phosphatase 1 regulatory subunit 3C
-1.938	TMEM182	transmembrane protein 182
-1.92	CYB5R2	cytochrome b5 reductase 2
-1.918	TGFB2	transforming growth factor beta 2
-1.904	ZNF623	zinc finger protein 623
-1.903	HAPLN3	hyaluronan and proteoglycan link protein 3
-1.889	LAMA2	laminin subunit alpha 2
-1.883	LOC389906	zinc finger protein 839 pseudogene
-1.861	ITSN1	intersectin 1
-1.86	IPP	intracisternal A particle-promoted polypeptide
-1.858	FOLR1	folate receptor alpha
-1.853	PABPC5	poly(A) binding protein cytoplasmic 5
-1.851	SSPN	sarcospan
-1.851	ZCCHC18	zinc finger CCHC-type containing 18
-1.846	IL20RB	interleukin 20 receptor subunit beta
-1.846	WDR27	WD repeat domain 27
-1.842	SAP30	Sin3A associated protein 30
-1.826	PRMT2	protein arginine methyltransferase 2
-1.821	TRIM13	tripartite motif containing 13
-1.819	RAB30	RAB30, member RAS oncogene family
-1.818	CEP97	centrosomal protein 97
-1.818	SEC63	SEC63 homolog, protein translocation regulator
-1.807	KANSL1L	KAT8 regulatory NSL complex subunit 1 like
-1.807	LATS1	large tumor suppressor kinase 1
-1.803	PDCD4	programmed cell death 4
-1.8	ZNF431	zinc finger protein 431
-1.799	PSPH	phosphoserine phosphatase
-1.795	FBXO22	F-box protein 22
-1.794	ITGBL1	integrin subunit beta like 1
-1.793	EMX2	empty spiracles homeobox 2
-1.793	SLC35A2	solute carrier family 35 member A2

-1.791	STK38	serine/threonine kinase 38
-1.79	GAB1	GRB2 associated binding protein 1
-1.786	STAT3	signal transducer and activator of transcription 3
-1.783	ATP11B	ATPase phospholipid transporting 11B (putative)
-1.771	ERVK13-1	endogenous retrovirus group K13 member 1
-1.768	TPP1	tripeptidyl peptidase 1
-1.764	ZFAS1	ZNFX1 antisense RNA 1
-1.763	NARF	nuclear prelamin A recognition factor
-1.762	FBXL4	F-box and leucine rich repeat protein 4
-1.759	ING3	inhibitor of growth family member 3
-1.752	C6orf89	chromosome 6 open reading frame 89
-1.752	ID3	inhibitor of DNA binding 3, HLH protein
-1.748	SHROOM3	shroom family member 3
-1.744	RNF217	ring finger protein 217
-1.741	DPY19L4	dpy-19 like 4
-1.741	ZC3HAV1L	zinc finger CCCH-type containing, antiviral 1 like
-1.74	TNFRSF11B	TNF receptor superfamily member 11b
-1.739	MSL3	MSL complex subunit 3
-1.737	MDM1	Mdm1 nuclear protein
-1.737	TRIM45	tripartite motif containing 45
-1.736	EPS15	epidermal growth factor receptor pathway substrate 15
-1.735	HNMT	histamine N-methyltransferase
-1.734	ANKRD36B	ankyrin repeat domain 36B
-1.734	CCPG1	cell cycle progression 1
-1.733	MEX3A	mex-3 RNA binding family member A
-1.728	TTC30B	tetratricopeptide repeat domain 30B
-1.726	SULT1A1	sulfotransferase family 1A member 1
-1.722	PRKD1	protein kinase D1
-1.721	SUDS3	SDS3 homolog, SIN3A corepressor complex component
-1.719	GEMIN2	gem nuclear organelle associated protein 2
-1.713	SIKE1	suppressor of IKBKE 1
-1.702	GRB10	growth factor receptor bound protein 10
-1.702	JMY	junction mediating and regulatory protein, p53 cofactor
-1.702	TMEM268	transmembrane protein 268
-1.697	ADCY4	adenylate cyclase 4
-1.691	NUDT17	nudix hydrolase 17
-1.688	EIF3M	eukaryotic translation initiation factor 3 subunit M
-1.686	NAA40	N-alpha-acetyltransferase 40, NatD catalytic subunit
-1.684	CELSR2	cadherin EGF LAG seven-pass G-type receptor 2
-1.684	SKIL	SKI like proto-oncogene
-1.683	CNTRL	centriolin
-1.683	TTF2	transcription termination factor 2
-1.68	ZNF846	zinc finger protein 846
-1.677	TEP1	telomerase associated protein 1
-1.677	USP6	ubiquitin specific peptidase 6
-1.677	WDR59	WD repeat domain 59
-1.676	TFCP2	transcription factor CP2
-1.674	LTV1	LTV1 ribosome biogenesis factor
-1.673	TMEM173	stimulator of interferon response cGAMP interactor 1
-1.672	LOC283788	FSHD region gene 1 pseudogene
-1.67	ZNF814	zinc finger protein 814
-1.669	CCDC82	coiled-coil domain containing 82
-1.669	HOXC6	homeobox C6
-1.669	LRIG2	leucine rich repeats and immunoglobulin like domains 2
-1.668	BTF3L4	basic transcription factor 3 like 4
-1.663	TMEM56	TLC domain containing 4
-1.661	GPR161	G protein-coupled receptor 161
-1.661	ZNF506	zinc finger protein 506
-1.656	TXNIP	thioredoxin interacting protein
-1.655	THAP6	THAP domain containing 6
-1.654	DHRS3	dehydrogenase/reductase 3
-1.654	ZFP90	ZFP90 zinc finger protein
-1.648	RRN3P3	RRN3 pseudogene 3
-1.644	CGNL1	cingulin like 1
-1.642	SPATA7	spermatogenesis associated 7
-1.641	SMAD6	SMAD family member 6
-1.641	TUG1	taurine up-regulated 1
-1.64	SIAE	sialic acid acetylesterase
-1.638	IDH2	isocitrate dehydrogenase (NADP(+)) 2
-1.637	PHC1	polyhomeotic homolog 1
-1.637	RSRP1	arginine and serine rich protein 1

-1.633	IBTK	inhibitor of Bruton tyrosine kinase
-1.633	TMCC1	transmembrane and coiled-coil domain family 1
-1.632	GSK3B	glycogen synthase kinase 3 beta
-1.632	METTL15	methyltransferase like 15
-1.632	ZMYM2	zinc finger MYM-type containing 2
-1.625	CSAD	cysteine sulfinic acid decarboxylase
-1.625	GABRR2	gamma-aminobutyric acid type A receptor subunit rho2
-1.62	ARHGAP26	Rho GTPase activating protein 26
-1.62	FAM76B	family with sequence similarity 76 member B
-1.62	ZNF91	zinc finger protein 91
-1.618	C9orf64	chromosome 9 open reading frame 64
-1.617	CARS	cysteinyl-tRNA synthetase 1
-1.617	NNMT	nicotinamide N-methyltransferase
-1.616	CCDC80	coiled-coil domain containing 80
-1.614	SPARC	secreted protein acidic and cysteine rich
-1.613	RAB27A	RAB27A, member RAS oncogene family
-1.613	SDC2	syndecan 2
-1.608	NFYB	nuclear transcription factor Y subunit beta
-1.607	ZNF805	zinc finger protein 805
-1.604	SESTD1	SEC14 and spectrin domain containing 1
-1.603	LPP	LIM domain containing preferred translocation partner in lipoma
-1.603	ZNF826P	zinc finger protein 826, pseudogene
-1.602	SETD1B	SET domain containing 1B, histone lysine methyltransferase
-1.6	THNSL1	threonine synthase like 1
-1.598	LOC101928230	uncharacterized LOC101928230
-1.597	AMACR	alpha-methylacyl-CoA racemase
-1.595	ERP44	endoplasmic reticulum protein 44
-1.595	LRRFIP1	LRR binding FLII interacting protein 1
-1.593	DAAM1	dishevelled associated activator of morphogenesis 1
-1.593	PELI1	pellino E3 ubiquitin protein ligase 1
-1.593	TSHZ1	teashirt zinc finger homeobox 1
-1.59	RWDD3	RWD domain containing 3
-1.588	ZNF585A	zinc finger protein 585A
-1.585	DPH5	diphthamide biosynthesis 5
-1.585	XBP1	X-box binding protein 1
-1.584	CD200	CD200 molecule
-1.584	STRBP	spermatid perinuclear RNA binding protein
-1.579	RUNX1T1	RUNX1 partner transcriptional co-repressor 1
-1.578	DOCK9	dedicator of cytokinesis 9
-1.578	ZNF701	zinc finger protein 701
-1.576	TRAPPC10	trafficking protein particle complex 10
-1.575	PPP6R2	protein phosphatase 6 regulatory subunit 2
-1.575	ZFHX3	zinc finger homeobox 3
-1.575	ZNF573	zinc finger protein 573
-1.57	ANTXR1	ANTXR cell adhesion molecule 1
-1.57	NFIB	nuclear factor I B
-1.568	C11orf87	chromosome 11 open reading frame 87
-1.568	CC2D2A	coiled-coil and C2 domain containing 2A
-1.566	TBL1X	transducin beta like 1 X-linked
-1.565	FLI1	Fli-1 proto-oncogene, ETS transcription factor
-1.562	ACTA2	actin alpha 2, smooth muscle
-1.562	C11orf80	chromosome 11 open reading frame 80
-1.556	PER3	period circadian regulator 3
-1.553	QKI	QKI, KH domain containing RNA binding
-1.552	GID4	GID complex subunit 4 homolog
-1.551	NCBP3	nuclear cap binding subunit 3
-1.551	NDUFB1	NADH:ubiquinone oxidoreductase subunit B1
-1.551	ZNF260	zinc finger protein 260
-1.548	CLDN1	claudin 1
-1.547	ARID4A	AT-rich interaction domain 4A
-1.547	BBS7	Bardet-Biedl syndrome 7
-1.546	RAB11FIP1	RAB11 family interacting protein 1
-1.546	TEAD3	TEA domain transcription factor 3
-1.545	EIF4EBP1	eukaryotic translation initiation factor 4E binding protein 1
-1.544	CPEB3	cytoplasmic polyadenylation element binding protein 3
-1.542	CEBPG	CCAAT enhancer binding protein gamma
-1.542	MTERF2	mitochondrial transcription termination factor 2
-1.541	LOC101929398	uncharacterized LOC101929398
-1.539	TGIF1	TGFB induced factor homeobox 1
-1.538	CFAP97	cilia and flagella associated protein 97
-1.537	NEU3	neuraminidase 3

-1.534	CMIP	c-Maf inducing protein
-1.533	JAK3	Janus kinase 3
-1.532	DBT	dihydrolipoamide branched chain transacylase E2
-1.532	DDX23	DEAD-box helicase 23
-1.532	TBC1D8B	TBC1 domain family member 8B
-1.531	TRIM8	tripartite motif containing 8
-1.528	CNOT2	CCR4-NOT transcription complex subunit 2
-1.528	ZNF25	zinc finger protein 25
-1.527	TFDP2	transcription factor Dp-2
-1.526	LINC00969	MIR570 host gene
-1.525	NOD1	nucleotide binding oligomerization domain containing 1
-1.524	CLIC4	chloride intracellular channel 4
-1.523	NBPF3	NBPF member 3
-1.521	TCFL5	transcription factor like 5
-1.52	ZNF311	zinc finger protein 311
-1.519	ALKBH8	alkB homolog 8, tRNA methyltransferase
-1.519	COA1	cytochrome c oxidase assembly factor 1 homolog
-1.519	KAZN	kazrin, periplakin interacting protein
-1.518	ZNF416	zinc finger protein 416
-1.517	BRD4	bromodomain containing 4
-1.517	CREB1	cAMP responsive element binding protein 1
-1.517	ITPR1	inositol 1,4,5-trisphosphate receptor type 1
-1.517	PLEKHM3	pleckstrin homology domain containing M3
-1.516	ZNF785	zinc finger protein 785
-1.515	ADAMTS2	ADAM metallopeptidase with thrombospondin type 1 motif 2
-1.515	SARS	seryl-tRNA synthetase 1
-1.514	PSMC2	proteasome 26S subunit, ATPase 2
-1.511	DVL3	dishevelled segment polarity protein 3
-1.51	CNNM3	cyclin and CBS domain divalent metal cation transport mediator 3
-1.509	MBOAT2	membrane bound O-acyltransferase domain containing 2
-1.509	NAPB	NSF attachment protein beta
-1.509	USP28	ubiquitin specific peptidase 28
-1.509	USP53	ubiquitin specific peptidase 53
-1.508	ZNF284	zinc finger protein 284
-1.507	ASXL2	ASXL transcriptional regulator 2
-1.507	IMPACT	impact RWD domain protein
-1.507	KBTBD7	kelch repeat and BTB domain containing 7
-1.506	TNRC6B	trinucleotide repeat containing adaptor 6B
-1.505	EFCAB2	EF-hand calcium binding domain 2
-1.504	EFS	embryonal Fyn-associated substrate
-1.502	CENPP	centromere protein P
-1.502	SLC10A7	solute carrier family 10 member 7
-1.501	FCF1	FCF1 rRNA-processing protein
-1.501	OIP5-AS1	OIP5 antisense RNA 1

Table S3. So-specifc up-regulated genes (>1.5-fold)

Expr Fold Change	ID	Entrez Gene Name
2.356	LSS	lanosterol synthase
2.122	EGR3	early growth response 3
2.107	CD74	CD74 molecule
2.038	COLEC12	collectin subfamily member 12
1.967	SMIM10	small integral membrane protein 10
1.919	HOMER3	homer scaffold protein 3
1.886	LINC00342	long intergenic non-protein coding RNA 342
1.878	SORL1	sortilin related receptor 1
1.867	BCAS4	breast carcinoma amplified sequence 4
1.848	GEM	GTP binding protein overexpressed in skeletal muscle
1.792	ZAR1	zygote arrest 1
1.79	UEVLD	UEV and lactate/malate dehyrogenase domains
1.757	RASSF3	Ras association domain family member 3
1.754	MOB3C	MOB kinase activator 3C
1.722	KLHL36	kelch like family member 36
1.698	PCOTH	Pro-X-Gly collagen triple helix like repeat containing
1.696	FAM129B	niban apoptosis regulator 2
1.687	PLEKHG5	pleckstrin homology and RhoGEF domain containing G5
1.683	COPS6	COP9 signalosome subunit 6
1.673	DYNC1LI2	dynein cytoplasmic 1 light intermediate chain 2
1.654	PLK3	polo like kinase 3
1.649	METTL7A	methyltransferase like 7A
1.642	HLA-DMB	major histocompatibility complex, class II, DM beta
1.641	FAM225B	family with sequence similarity 225 member B
1.637	KCNMA1	potassium calcium-activated channel subfamily M alpha 1
1.621	DPP9	dipeptidyl peptidase 9
1.621	SIKE1	suppressor of IKBKE 1
1.616	GGCX	gamma-glutamyl carboxylase
1.61	USP12	ubiquitin specific peptidase 12
1.603	MED27	mediator complex subunit 27
1.602	ANAPC2	anaphase promoting complex subunit 2
1.596	DNALI1	dynein axonemal light intermediate chain 1
1.595	MOCS2	molybdenum cofactor synthesis 2
1.59	IDH3B	isocitrate dehydrogenase (NAD(+)) 3 non-catalytic subunit beta
1.585	RIOK2	RIO kinase 2
1.577	HGF	hepatocyte growth factor
1.577	TMEM63B	transmembrane protein 63B
1.576	SOCS5	suppressor of cytokine signaling 5
1.574	ERAP2	endoplasmic reticulum aminopeptidase 2
1.57	AGPAT3	1-acylglycerol-3-phosphate O-acyltransferase 3
1.555	CCBE1	collagen and calcium binding EGF domains 1
1.546	CUL7	cullin 7
1.546	SMIM3	small integral membrane protein 3
1.545	MRPS18B	mitochondrial ribosomal protein S18B
1.545	MT1HL1	metallothionein 1H like 1
1.54	IRAK2	interleukin 1 receptor associated kinase 2
1.539	NIPAL3	NIPA like domain containing 3
1.538	CARHSP1	calcium regulated heat stable protein 1
1.535	SIVA1	SIVA1 apoptosis inducing factor
1.529	PRMT1	protein arginine methyltransferase 1
1.527	IRF2	interferon regulatory factor 2
1.524	AKT1S1	AKT1 substrate 1
1.523	ZNF252P	zinc finger protein 252, pseudogene
1.522	EEF1E1	eukaryotic translation elongation factor 1 epsilon 1
1.52	GAR1	GAR1 ribonucleoprotein
1.52	SAMHD1	SAM and HD domain containing deoxynucleoside triphosphate triphosphohydrolase 1
1.517	NAGK	N-acetylglucosamine kinase
1.516	TNPO3	transportin 3
1.511	MAP4K4	mitogen-activated protein kinase kinase kinase kinase 4
1.51	SLC14A1	solute carrier family 14 member 1 (Kidd blood group)
1.509	COX16	cytochrome c oxidase assembly factor COX16
1.504	NET1	neuroepithelial cell transforming 1
1.501	TRAPPC2L	trafficking protein particle complex 2 like

Table S3. continued. So-specifc down-regulated genes (<0.67-fold)

Expr Fold Change	ID	Entrez Gene Name
-3.331	MKX	mohawk homeobox
-2.802	EIF3CL	eukaryotic translation initiation factor 3 subunit C like
-2.774	WAC	WW domain containing adaptor with coiled-coil
-2.667	DLEU2	deleted in lymphocytic leukemia 2
-2.653	CRIPT	CXXC repeat containing interactor of PDZ3 domain
-2.535	MYOCD	myocardin
-2.475	LINC00597	long intergenic non-protein coding RNA 597
-2.413	RAB3GAP2	RAB3 GTPase activating non-catalytic protein subunit 2
-2.322	SBF2	SET binding factor 2
-2.296	RUFY2	RUN and FYVE domain containing 2
-2.291	TMEM43	transmembrane protein 43
-2.24	SEC61B	SEC61 translocon subunit beta
-2.173	CBX3	chromobox 3
-2.139	PRKAA1	protein kinase AMP-activated catalytic subunit alpha 1
-2.068	AKAP9	A-kinase anchoring protein 9
-2.056	OSBP	oxysterol binding protein
-2.047	BGN	biglycan
-2.045	EEF1A1	eukaryotic translation elongation factor 1 alpha 1
-2.028	LOC145474	uncharacterized LOC145474
-2.027	EPG5	ectopic P-granules autophagy protein 5 homolog
-2.025	FLRT2	fibronectin leucine rich transmembrane protein 2
-2.017	VPS8	VPS8 subunit of CORVET complex
-2.009	N4BP2L2	NEDD4 binding protein 2 like 2
-2.008	MDC1	mediator of DNA damage checkpoint 1
-1.978	EMC3	ER membrane protein complex subunit 3
-1.977	MALSU1	mitochondrial assembly of ribosomal large subunit 1
-1.947	ZNF654	zinc finger protein 654
-1.94	LINC00342	long intergenic non-protein coding RNA 342
-1.931	KATNBL1	katanin regulatory subunit B1 like 1
-1.922	UBE2D3	ubiquitin conjugating enzyme E2 D3
-1.921	CTTN	cortactin
-1.91	PHC3	polyhomeotic homolog 3
-1.897	SENP7	SUMO specific peptidase 7
-1.858	FN1	fibronectin 1
-1.843	EWSR1	EWS RNA binding protein 1
-1.843	MTHFSD	methenyltetrahydrofolate synthetase domain containing
-1.838	DDX11	DEAD/H-box helicase 11
-1.838	WDR33	WD repeat domain 33
-1.829	ITPR2	inositol 1,4,5-trisphosphate receptor type 2
-1.817	FGF14	fibroblast growth factor 14
-1.804	IGDCC4	immunoglobulin superfamily DCC subclass member 4
-1.79	SPATS2L	spermatogenesis associated serine rich 2 like
-1.77	FRMD6-AS1	FRMD6 antisense RNA 1
-1.769	SEC14L1P1	SEC14 like 1 pseudogene 1
-1.762	COL7A1	collagen type VII alpha 1 chain
-1.755	TMEM154	transmembrane protein 154
-1.744	ZNF117	zinc finger protein 117
-1.729	PRPF38B	pre-mRNA processing factor 38B
-1.722	CCDC18-AS1	CCDC18 antisense RNA 1
-1.712	RNF34	ring finger protein 34
-1.71	FAM84A	LRAT domain containing 1
-1.708	TXLNGY	taxilin gamma pseudogene, Y-linked
-1.706	CLHC1	clathrin heavy chain linker domain containing 1
-1.703	PHF11	PHD finger protein 11
-1.699	RPS10P2	ribosomal protein S10 pseudogene 2
-1.69	RUFY3	RUN and FYVE domain containing 3
-1.69	SSH3	slingshot protein phosphatase 3
-1.689	LRP1	LDL receptor related protein 1
-1.675	KMT2D	lysine methyltransferase 2D
-1.675	LOC114224	uncharacterized LOC114224
-1.674	KLF2	Kruppel like factor 2
-1.672	KCTD16	potassium channel tetramerization domain containing 16
-1.671	FNBP4	formin binding protein 4
-1.663	ITPK1-AS1	ITPK1 antisense RNA 1
-1.66	AFG3L1P	AFG3 like matrix AAA peptidase subunit 1, pseudogene
-1.659	SNX25	sorting nexin 25
-1.643	WDR1	WD repeat domain 1
-1.639	FZD1	frizzled class receptor 1

-1.639	TEAD2	TEA domain transcription factor 2
-1.636	STK35	serine/threonine kinase 35
-1.635	AGO3	argonaute RISC catalytic component 3
-1.632	TRIM4	tripartite motif containing 4
-1.63	MRPS25	mitochondrial ribosomal protein S25
-1.625	SMC6	structural maintenance of chromosomes 6
-1.614	TRA2A	transformer 2 alpha homolog
-1.61	SESN2	sestrin 2
-1.61	ZBTB7A	zinc finger and BTB domain containing 7A
-1.609	RTN4	reticulon 4
-1.606	PRPF4B	pre-mRNA processing factor 4B
-1.601	IGF1R	insulin like growth factor 1 receptor
-1.596	ATP9B	ATPase phospholipid transporting 9B (putative)
-1.584	TMED5	transmembrane p24 trafficking protein 5
-1.584	TPM4	tropomyosin 4
-1.581	C6orf62	chromosome 6 open reading frame 62
-1.581	RAVER2	ribonucleoprotein, PTB binding 2
-1.577	C8orf59	ribosomal biogenesis factor
-1.576	RNF216	ring finger protein 216
-1.572	BAG2	BAG cochaperone 2
-1.571	PPP1R9B	protein phosphatase 1 regulatory subunit 9B
-1.569	SFRP4	secreted frizzled related protein 4
-1.567	PRKAR1A	protein kinase cAMP-dependent type I regulatory subunit alpha
-1.563	FRY	FRY microtubule binding protein
-1.561	ZBTB1	zinc finger and BTB domain containing 1
-1.555	HDAC4	histone deacetylase 4
-1.549	TTBK2	tau tubulin kinase 2
-1.545	ZNF37BP	zinc finger protein 37B, pseudogene
-1.543	GOPC	golgi associated PDZ and coiled-coil motif containing
-1.539	ANKRD13D	ankyrin repeat domain 13D
-1.539	BANK1	B cell scaffold protein with ankyrin repeats 1
-1.533	SLC7A6	solute carrier family 7 member 6
-1.532	TFG	trafficking from ER to golgi regulator
-1.531	ACVR2A	activin A receptor type 2A
-1.531	TRAPPC2	trafficking protein particle complex 2
-1.529	ANKRD44	ankyrin repeat domain 44
-1.529	FBLN5	fibulin 5
-1.527	MAGI1	membrane associated guanylate kinase, WW and PDZ domain containing 1
-1.525	MICAL3	microtubule associated monooxygenase, calponin and LIM domain containing 3
-1.525	SAMD4B	sterile alpha motif domain containing 4B
-1.516	LRPPRC	leucine rich pentatricopeptide repeat containing
-1.502	ZNF570	zinc finger protein 570

Table S4. Selected genes for single cellular q-PCR analysis

	Symbol	description	Focused functions for the selection in single cellular qPCR
1	APC	APC Regulator Of WNT Signaling Pathway	Pt-specific upregulated
2	DUSP6	dual specificity phosphatase 6	Pt-specific upregulated
3	ADGRG1	Adhesion G Protein-Coupled Receptor G1	Pt-specific upregulated
4	IFNGR1	Interferon Gamma Receptor 1 (CD119)	Pt-specific upregulated
5	LPXN	Leupaxin	Pt-specific upregulated
6	IGF2BP3	Insulin Like Growth Factor 2 MRNA Binding Protein 3	Pt-specific upregulated
7	PIK3C2A	Phosphatidylinositol-4-Phosphate 3-Kinase Catalytic Subunit Type 2	Pt-specific upregulated
8	DUSP4	dual specificity phosphatase 4	Pt-specific upregulated
9	MFN2	Mitofusin 2	Pt-specific upregulated
10	POU5F1	POU Class 5 Homeobox 1 (Oct4)	Pluripotency
11	ISLR	Immunoglobulin Superfamily Containing Leucine Rich Repeat (meflin)	Stemness marker of MSCs
12	KITLG	KIT ligand (SCF)	Hematopoiesis
13	EGF	Epidermal Growth Factor	Cell growth & differentiation
14	GNL3	G Protein Nucleolar 3 (nucleostemin)	Cell-cycle progression
15	MKI67	marker of Ki67	Cell-cycle progression
16	COL1A1	Collagen Type I Alpha 1 Chain	Cell adhesion
17	RUNX2	RUNX Family Transcription Factor 2	Osteogenic differentiation related
18	ALP	alkaline phosphatase	Osteogenic differentiation related/Stemness of MSC
19	TLR1	Toll Like Receptor 1	Immunomodulator
20	TLR3	Toll Like Receptor 3	Immunomodulator
21	TLR4	Toll Like Receptor 4	Immunomodulator
22	TLR6	Toll Like Receptor 6	Immunomodulator
23	IL-6	Interleukin 6	Immunomodulator
24	IL-8	Interleukin8	Immunomodulator
25	HGF	Hepatocyte Growth Factor	Tissue protection
26	BDNF	Brain Derived Neurotrophic Factor	Tissue protection
27	NGF	Nerve GrowthFactor	Tissue protection
28	NRG1	neuregulin1	Tissue protection
29	NPPB	natriuretic peptide B (BNP)	Tissue protection
30	GDNF	Glial Cell Derived Neurotrophic Factor	Tissue protection
31	CSF3	Colony Stimulating Factor 3 (G-CSF)	Tissue protection
32	FGF2	Fibroblast GrowthFactor 2	Tissue protection/Angiogenesis
33	VEGFA	Vascular Endothelial Growth Factor A	Tissue protection/Angiogenesis
34	IDO1	Indoleamine 2,3-Dioxygenase 1	Anti-inflammatory
35	TNFRSF1A	TNF Receptor Superfamily Member 1A	Anti-inflammatory
36	TNFAIP6	TNF Alpha Induced Protein 6 (TSG6)	Anti-inflammatory
37	ITGA4	Integrin Subunit Alpha 4	Migration to inflammatory site
38	ITGB1	Integrin Subunit Beta 1	Migration to inflammatory site
39	CXCR4	C-X-C Motif Chemokine Receptor 4	Migration to inflammatory site
40	MMP2	Matrix Metallopeptidase 2	Migration to inflammatory site
41	MMP9	Matrix Metallopeptidase 9	Migration to inflammatory site
42	MMP14	Matrix Metallopeptidase 14	Migration to inflammatory site
43	TMP1	TIMP Metallopeptidase Inhibitor 1	Migration to inflammatory site
44	TMP2	TIMP Metallopeptidase Inhibitor 2	Migration to inflammatory site
45	STC1	Stanniocalcin 1	Anti-apoptosis
46	HPRT1	Hypoxanthine Phosphoribosyltransferase 1	House keeping
47	RNA18S1	18S ribosomal 1	House keeping
48	RPL13A	Ribosomal Protein L13A	House keeping