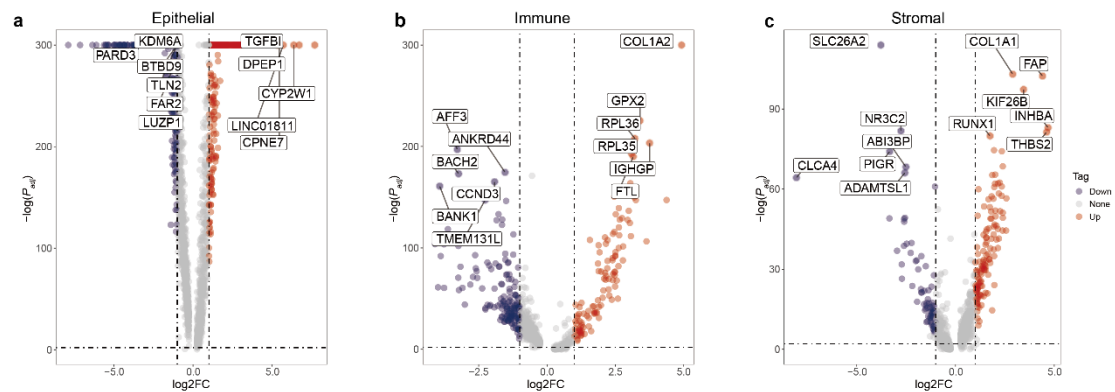
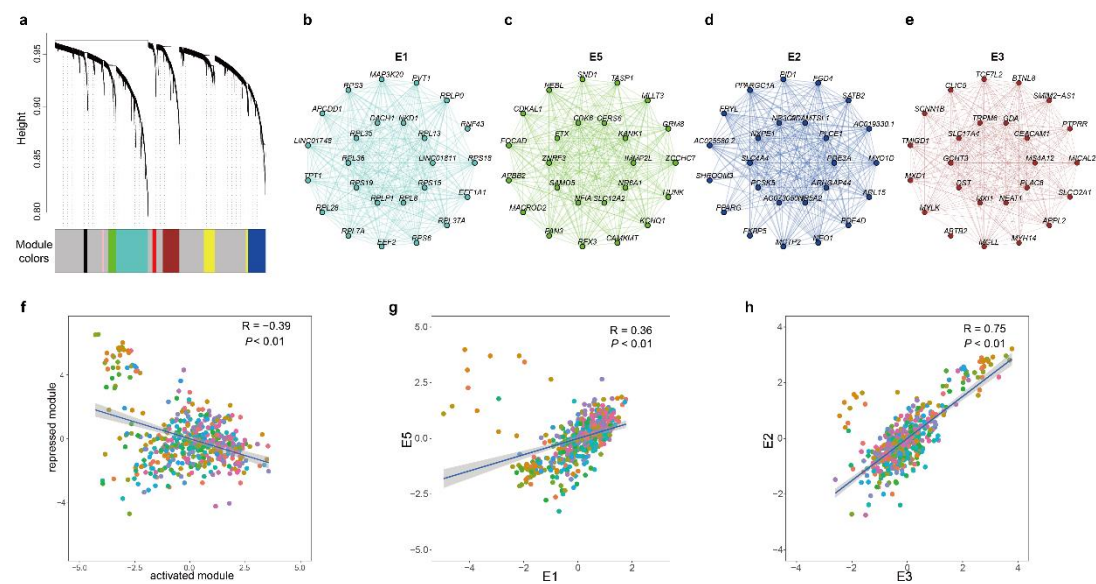


Supplementary Information

Supplementary Figures

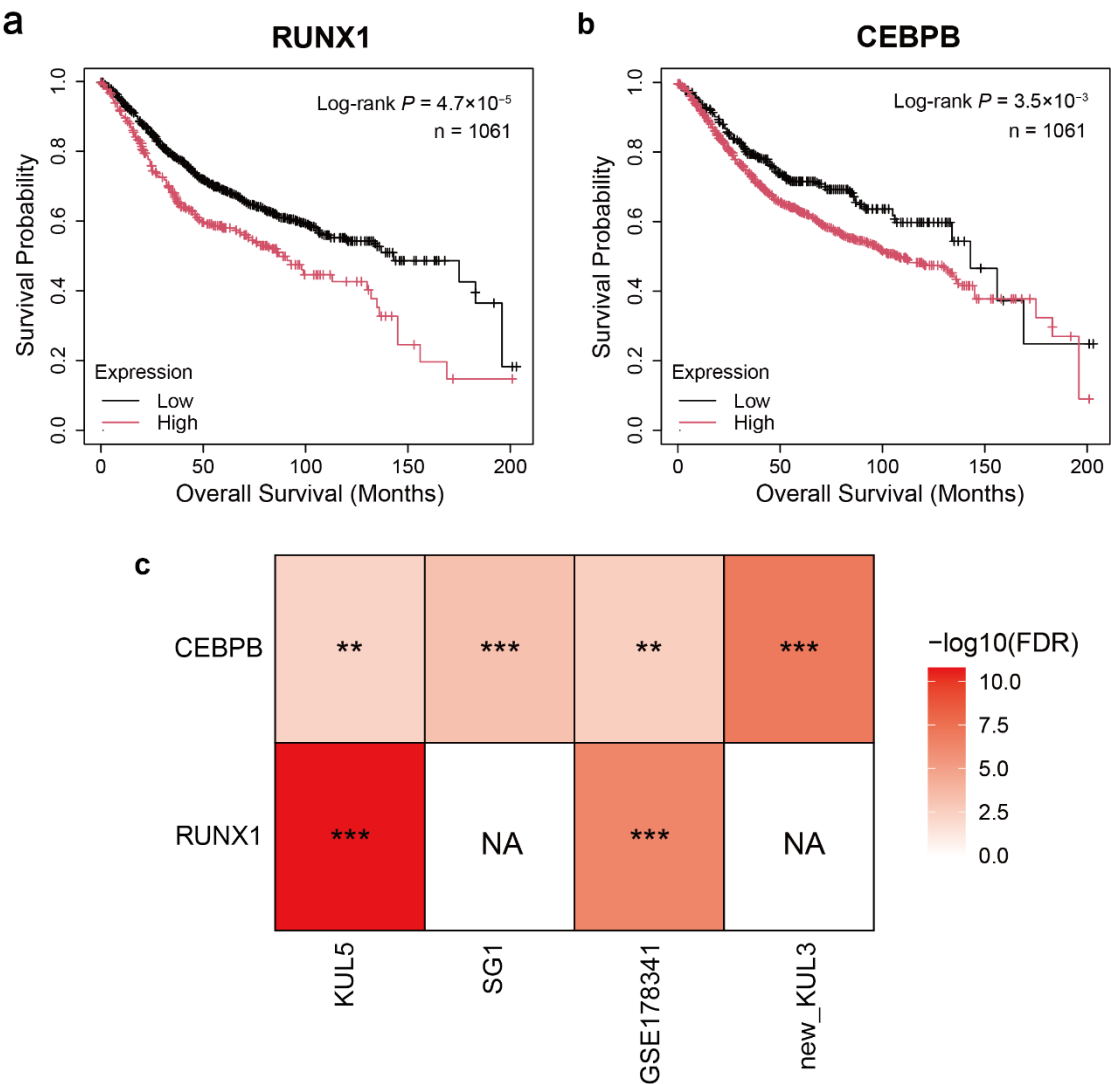


Supplementary Figure 1 | DEGs identified in different cell types. a-c, Volcano plots of DEGs identified in epithelial (a), immune (b), and stromal (c) cells comparing cancerous samples to adjacent unaffected samples.



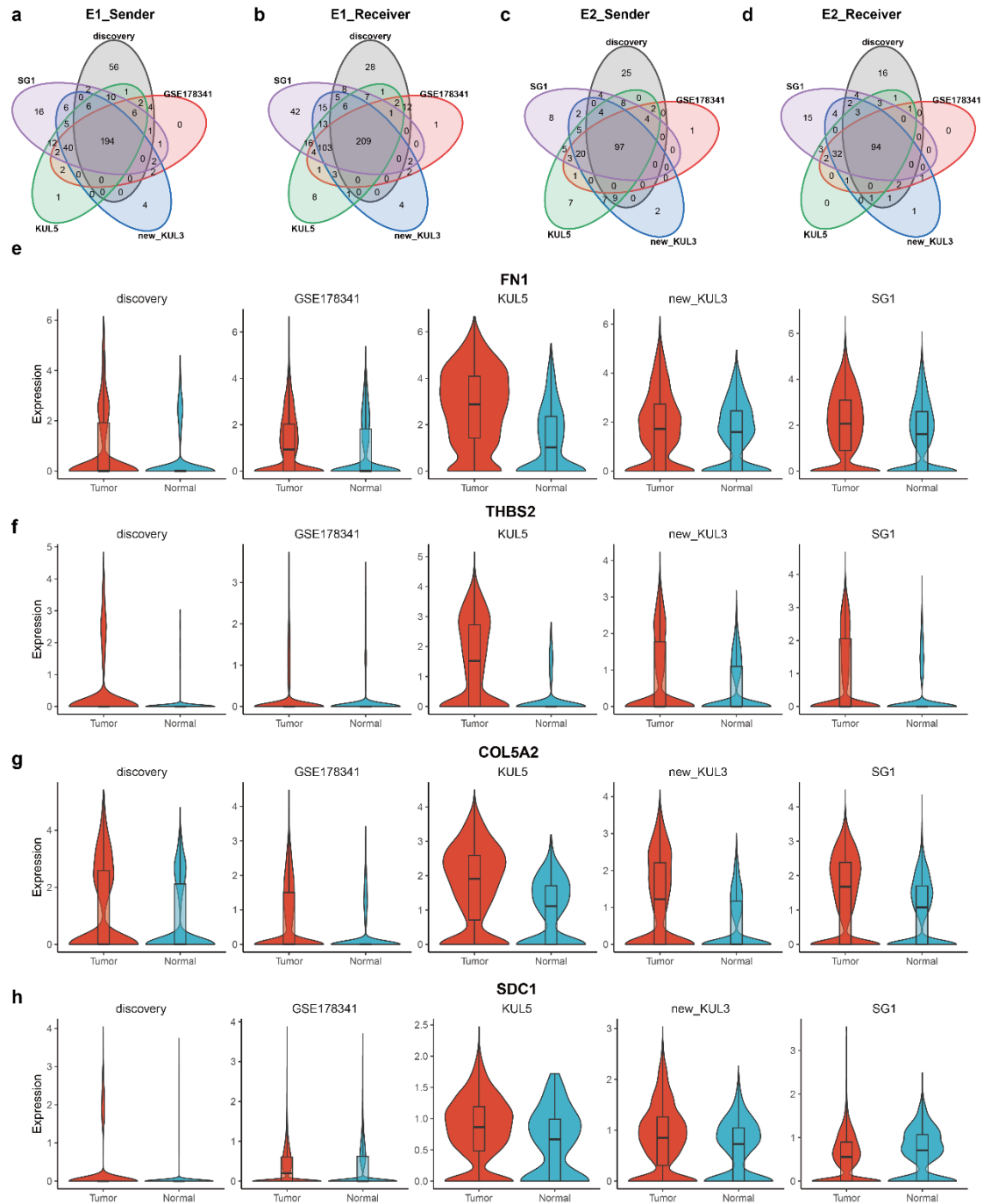
Supplementary Figure 2 | Identification and validation of epithelial modules. a, Genes were classified into 8 modules by hdWGCNA. **b-e,** Co-expression plots for modules E1 (b), E5 (c), E2(d), and E3 (e). The top 10 genes within each network are identified as hub genes, and the network color corresponds to the module color shown in a. **f-h,** Scatter plots showing the correlations between activated and repressed modules (f), between modules E1 and E5 (g), and between modules E2 and E3 (h). Each dot represents a sample from the TCGA COAD cohort.

The x- and y-axis values correspond to ssGSEA scores (z-normalized) for the respective modules.



Supplementary Figure 3 | Survival analysis and validation of RUNX1 and CEBPB

regulons. a-b, Kaplan-Meier survival curves of RUNX1 (**a**) and CEBPB (**b**) generated using the Kaplan-Meier Plotter database. **c**, The overlap between the validation regulons and the corresponding discovery regulons. The enrichment of RUNX1 and CEBPB regulons across the counterparts identified in the four validation datasets.



Supplementary Figure 4 | Validation of LR pairs and expression of representative ligands

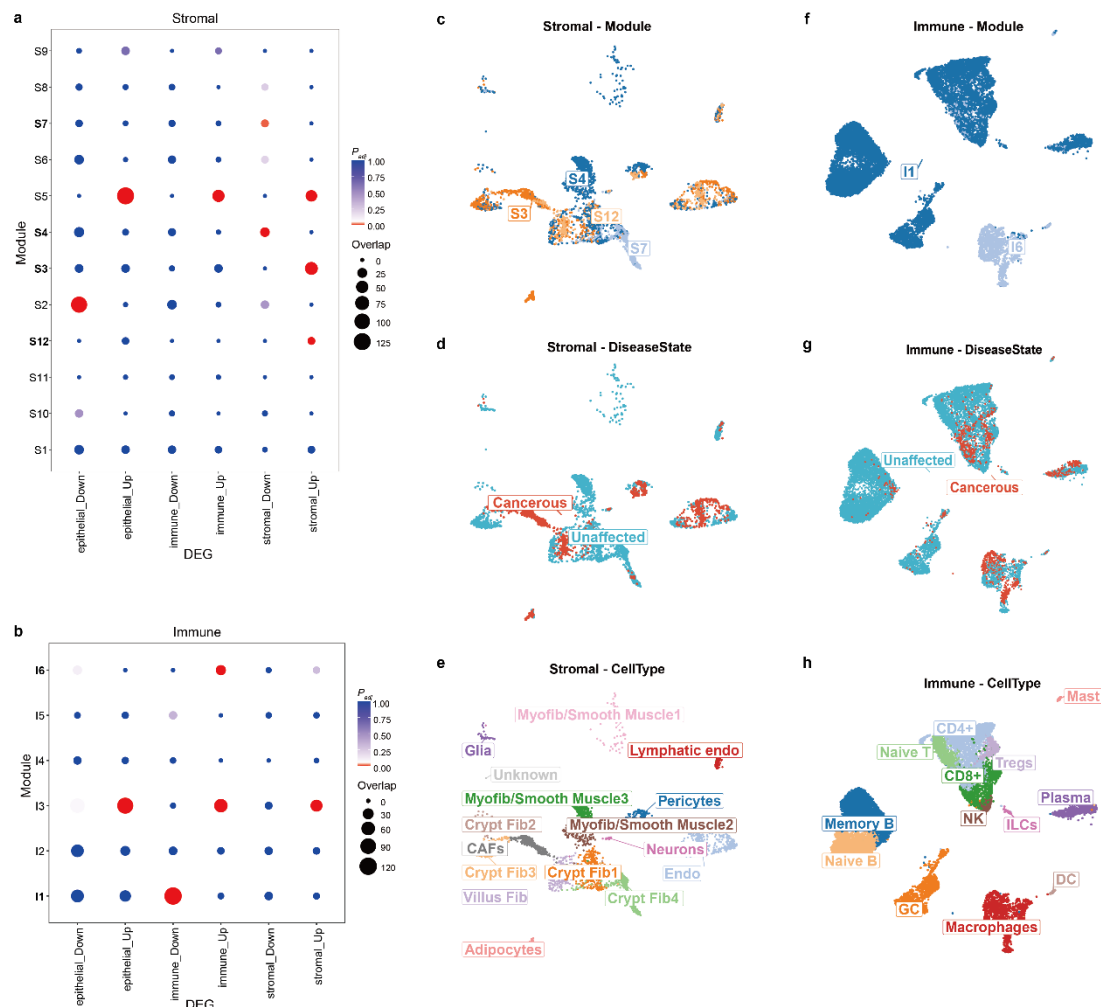
and receptors. a-d, Overlap of LRPs between discovery and validation datasets for E1 ligands

with epithelial sending cells (a), for E1 receptors with epithelial receiving cells (b), for E2

ligands with epithelial sending cells (c), and for E2 receptors with epithelial receiving cells (d).

Overlap indicates identical sending cell type, ligand, receiving cell type, and receptor across

datasets. e-h, Expression patterns of representative stromal ligands FN1, THBS2, and COL5A2, and the epithelial receptor SDC1 across different datasets.



Supplementary Figure 5 | Activated and repressed modules and their cell identity in the stromal and immune cells. a-b, Dot plots depicting the enrichment of stromal modules (**a**) and immune modules (**b**) in DEGs. **c-e,** UMAP of the stromal cells colored by activated and repressed modules (**c**), disease states (**d**) and cell types (**e**). **f-h,** UMAP of the immune cells colored by activated and repressed modules (**f**), disease states (**g**) and cell types (**h**).

SupplementaryTable 1-1 DEGs in epithelial cells

p_val	log2FC	p_val_adj	Tag	Gene
0	7.68498822	0	Up	CYP2W1
0	6.70280303	0	Up	AC007277.1
0	6.36142791	0	Up	LINC01811
0	5.69721722	0	Up	CPNE7
0	5.44726892	0	Up	DPEP1
0	5.32123777	0	Up	TGFBI
0	5.23583788	0	Up	TMEM178B
0	4.83244323	0	Up	AC009975.1
0	4.80829414	0	Up	SLC38A11
0	4.61704432	0	Up	KCNJ3
0	4.60569693	0	Up	RPS21
0	4.47894837	0	Up	PGGHG
0	4.22803221	0	Up	MIR4435-2HG
0	4.19215021	0	Up	DNAJB1
0	4.18896052	0	Up	RPS15
0	4.13768093	0	Up	RPL7A
0	4.01763006	0	Up	RPS18
0	4.0156208	0	Up	CCND1
0	3.92998851	0	Up	APCDD1
0	3.91184061	0	Up	AC011287.1
0	3.88540479	0	Up	MAP3K20
0	3.81100508	0	Up	DPP7
0	3.79604482	0	Up	RPS19
0	3.7656679	0	Up	HSPH1
0	3.73508219	0	Up	HSPB1
0	3.701217	0	Up	RPLP1
0	3.68594702	0	Up	PTK7
0	3.67359605	0	Up	NORAD
0	3.60599606	0	Up	NKAIN2
0	3.5883218	0	Up	RPL35
0	3.52369164	0	Up	RPL36
0	3.51774187	0	Up	NKD1
0	3.4786022	0	Up	HSPA1B
0	3.42685648	0	Up	KIZ
0	3.42067243	0	Up	RPL12
0	3.4027049	0	Up	LINC01748
0	3.39654262	0	Up	RPLP0
0	3.38186349	0	Up	RPL37A
0	3.36145032	0	Up	ASPSCR1
0	3.33982172	0	Up	PMEPA1
0	3.33078111	0	Up	PERP
0	3.26567835	0	Up	SOX9
0	3.26307468	0	Up	RPS11
0	3.25922855	0	Up	FTL
0	3.22476023	0	Up	RPS2
0	3.2151753	0	Up	CAB39L
0	3.20989283	0	Up	RBPMS
0	3.20376358	0	Up	TRPM3

0	3.1885831	0	Up	RPS3
0	3.17815781	0	Up	RPL18
0	3.17297812	0	Up	RPL8
0	3.15979496	0	Up	RPL37
0	3.14524824	0	Up	PVT1
0	3.10040887	0	Up	RPL13
0	3.10028567	0	Up	DACH1
0	3.09774767	0	Up	PCBP1
0	3.09107194	0	Up	MLXIPL
0	3.07933812	0	Up	RPS28
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0	3.03233132	0	Up	RPL14
0	3.02314751	0	Up	RPL7
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0	2.93886778	0	Up	TMSB10
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0	2.88260926	0	Up	NRXN3
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0	2.8725328	0	Up	RPL19
0	2.86194899	0	Up	TPT1
0	2.83744604	0	Up	RPL28
0	2.81131956	0	Up	RPL3
0	2.80135836	0	Up	ZFAS1
0	2.80071647	0	Up	CST3
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0	2.63294951	0	Up	RPS27A
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0	2.57551482	0	Up	HSPD1
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0	2.52685025	0	Up	H2AFJ
0	2.50857133	0	Up	SKAP1
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5.9268E-291	1.55857885	1.5882E-286	Up	AC106869.1
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3.3591E-281	1.0384566	9.0015E-277	Up	ZC3H13
7.0712E-273	1.12260558	1.8949E-268	Up	PFN1
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1.4945E-270	1.26654756	4.0048E-266	Up	TRIM24
1.0644E-267	1.1589759	2.8523E-263	Up	NUDCD3
1.6633E-266	1.38303741	4.4572E-262	Up	VAV2
1.9598E-265	1.70985905	5.2518E-261	Up	CD55
4.1151E-263	1.15024335	1.1027E-258	Up	SUPT3H
1.0817E-261	1.3909413	2.8986E-257	Up	CASC9
2.4705E-261	1.34053671	6.6201E-257	Up	SESTD1
4.2252E-260	1.32467738	1.1322E-255	Up	IARS
7.6221E-260	1.49022013	2.0425E-255	Up	FP700111.1
2.0985E-258	1.05041735	5.6233E-254	Up	PCBP2
3.3009E-253	1.39085871	8.8453E-249	Up	SULF2
8.4562E-250	1.29694765	2.266E-245	Up	BMS1P14
2.7319E-249	1.25824906	7.3208E-245	Up	CCND2
2.7338E-249	1.03019629	7.3257E-245	Up	MT-CYB
1.2951E-247	1.2819701	3.4704E-243	Up	CDC14B
4.9148E-247	1.12861066	1.317E-242	Up	PSPC1
3.1149E-246	1.32114175	8.3469E-242	Up	ZNF217
1.9141E-244	1.19070373	5.1292E-240	Up	PLXNB1
2.1003E-243	1.49021461	5.6282E-239	Up	BCL2L1
2.1595E-243	1.31186057	5.7867E-239	Up	CRLS1
9.4652E-242	1.23562649	2.5364E-237	Up	P4HB
5.2098E-240	1.39004422	1.3961E-235	Up	MLLT6
3.6658E-235	1.34029346	9.8232E-231	Up	NMT1
1.178E-234	1.30468221	3.1566E-230	Up	HUNK
2.3804E-232	1.1788839	6.3787E-228	Up	BRD9
3.6834E-232	1.00918745	9.8704E-228	Up	PCAT1
3.464E-231	1.57384798	9.2825E-227	Up	AL117382.1
9.2288E-231	1.17697195	2.473E-226	Up	COBLL1
3.2309E-228	1.36446628	8.6579E-224	Up	AC245060.5
1.4043E-227	1.31694026	3.7632E-223	Up	NAA16
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1.7953E-220	1.08255926	4.8109E-216	Up	CMSS1

1.141E-216	1.30533403	3.0576E-212	Up	PIGU
2.3879E-213	1.46646606	6.399E-209	Up	PSMD14
3.7439E-213	1.32545903	1.0033E-208	Up	SUCO
8.2904E-212	1.05113334	2.2216E-207	Up	STAU1
8.4405E-207	1.33936051	2.2618E-202	Up	NFIX
2.8103E-206	1.03375999	7.5308E-202	Up	HNRNPA3
3.8038E-201	1.10682178	1.0193E-196	Up	TARBP1
2.7325E-200	1.13179404	7.3222E-196	Up	C1GALT1
1.7144E-199	1.57349361	4.5939E-195	Up	ARMC9
7.3933E-198	1.16328232	1.9812E-193	Up	DNAJC3
6.8245E-196	1.16828058	1.8287E-191	Up	GPR35
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5.7715E-191	1.44383556	1.5466E-186	Up	NHLRC3
1.0329E-190	1.17606768	2.7679E-186	Up	POM121C
2.9687E-189	1.42834393	7.9552E-185	Up	RHEB
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2.1578E-187	1.02750562	5.7822E-183	Up	TMEM63A
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7.2177E-166	1.17784333	1.9341E-161	Up	TTN-AS1
3.4794E-164	1.19215672	9.3237E-160	Up	TM9SF2
8.2973E-164	1.15239848	2.2234E-159	Up	ST7
2.7986E-162	1.0058173	7.4993E-158	Up	GTF2F2
2.0099E-161	1.12380388	5.386E-157	Up	FO XK1
1.2648E-158	1.17847572	3.3892E-154	Up	TAF4
2.3542E-158	1.16798843	6.3086E-154	Up	ANP32B
6.5018E-156	1.09457452	1.7423E-151	Up	CLDN3
5.2912E-154	1.24739915	1.4179E-149	Up	ABHD2
3.4584E-153	1.27775688	9.2675E-149	Up	KIF3B
8.7852E-153	1.03503623	2.3542E-148	Up	DEK
8.7862E-144	1.01397546	2.3544E-139	Up	GALK2
1.4003E-143	1.12853865	3.7523E-139	Up	AGO2
4.2483E-143	1.00366012	1.1384E-138	Up	UQCC1
5.2912E-143	1.12241825	1.4179E-138	Up	UGGT1
2.3952E-136	1.12835222	6.4183E-132	Up	GABPB1-AS1
1.0959E-126	1.07570725	2.9366E-122	Up	RAD23B
4.8599E-126	1.01509174	1.3023E-121	Up	HES1
1.0467E-125	1.02758538	2.8047E-121	Up	SHLD1
1.9914E-121	1.0551684	5.3363E-117	Up	FUBP3

1.962E-120	1.0298256	5.2577E-116	Up	TM9SF4
6.7462E-117	1.11438356	1.8078E-112	Up	S100A10
4.9945E-115	1.00039959	1.3384E-110	Up	YWHAB
1.6572E-114	1.10524799	4.4408E-110	Up	UBQLN1
5.3683E-101	1.00746678	1.43853E-96	Up	EIF3H
5.10437E-93	1.00867809	1.36782E-88	Up	VAPB
1.73236E-87	1.02800298	4.64219E-83	Up	NUDT4
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0	-4.86650711	0	Down	SLC4A4
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0	-4.51606112	0	Down	ADAMTSL1
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0	-4.35341062	0	Down	ADTRP
0	-4.33630036	0	Down	HMGCS2
0	-4.32938508	0	Down	NXPE1
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0	-4.15721007	0	Down	CPNE8
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0	-4.13321314	0	Down	HHLA2
0	-3.88736253	0	Down	CEACAM7
0	-3.84808615	0	Down	AC019330.1
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1.1E-306	-1.23030663	2.9477E-302	Down	KAT6B
2.566E-303	-1.75867918	6.8761E-299	Down	FAM83E
3.0832E-302	-1.0053365	8.262E-298	Down	TLN2
1.527E-301	-1.03937208	4.092E-297	Down	KIAA1671
1.2474E-299	-1.62757389	3.3427E-295	Down	RIOK3
5.737E-299	-1.01633394	1.5373E-294	Down	ARHGEF10L
7.3575E-299	-1.25223219	1.9716E-294	Down	FEZ2
5.8382E-297	-1.56505484	1.5645E-292	Down	SRI
1.7546E-296	-1.05507252	4.7017E-292	Down	CCDC14
1.1294E-292	-1.77767765	3.0265E-288	Down	FAM114A1
1.9157E-291	-1.10427518	5.1335E-287	Down	WSB1
5.7874E-291	-1.12466205	1.5508E-286	Down	PTPRF
7.851E-291	-1.18885015	2.1038E-286	Down	MIA2
1.4129E-290	-1.0685059	3.786E-286	Down	PHACTR4
1.1294E-288	-1.21801866	3.0265E-284	Down	CYTH1
1.6072E-288	-1.00049823	4.3069E-284	Down	FAR2
1.0347E-285	-1.21624393	2.7727E-281	Down	MIER1
4.64E-283	-1.27166018	1.2434E-278	Down	VDR
8.6924E-282	-1.32809791	2.3293E-277	Down	SEPT11
1.5546E-281	-1.13931514	4.166E-277	Down	WASF2
3.9029E-281	-1.59292873	1.0459E-276	Down	CHP1
1.4341E-280	-1.16778333	3.843E-276	Down	ABCD3

3.512E-280	-1.01748415	9.4112E-276	Down	SOS2
5.3913E-279	-1.10067761	1.4447E-274	Down	SH3PXD2A
3.4866E-278	-1.04587289	9.343E-274	Down	CBLB
8.0142E-277	-1.58970089	2.1476E-272	Down	MARCH8
3.371E-276	-1.63223457	9.0334E-272	Down	PDE5A
6.5717E-275	-1.55771029	1.761E-270	Down	PTPN21
1.4067E-274	-1.41493231	3.7696E-270	Down	WDR7
4.0239E-274	-1.76138171	1.0783E-269	Down	CDC14A
7.3968E-270	-1.68856612	1.9821E-265	Down	KCNK1
9.9009E-269	-1.69137474	2.6532E-264	Down	MCOLN2
1.6317E-268	-1.34266312	4.3726E-264	Down	ACO2
3.6472E-268	-1.02613719	9.7734E-264	Down	ABCA5
9.5974E-268	-1.27374065	2.5718E-263	Down	LRIG3
1.4371E-267	-1.19048215	3.851E-263	Down	SPPL2A
1.6836E-267	-1.44726019	4.5115E-263	Down	SMC5-AS1
4.843E-265	-1.13997551	1.2978E-260	Down	PCSK7
2.2752E-263	-1.54660493	6.0969E-259	Down	OTUD7A
6.0346E-263	-1.06103084	1.6171E-258	Down	TFCP2L1
1.5821E-261	-1.55728604	4.2396E-257	Down	FAM160A2
2.7477E-261	-1.31988275	7.363E-257	Down	KIAA1522
1.21E-260	-1.43730895	3.2425E-256	Down	PIAS2
2.4989E-260	-1.39843305	6.6964E-256	Down	SEMA4B
7.2861E-259	-1.4342663	1.9525E-254	Down	ACER3
2.7432E-257	-1.18954124	7.3511E-253	Down	NDRG1
5.2752E-257	-1.03214301	1.4136E-252	Down	CLINT1
3.6E-256	-1.05604985	9.647E-252	Down	FNIP2
2.33E-254	-1.16436412	6.2436E-250	Down	PRKN
3.1038E-254	-1.30870015	8.3173E-250	Down	SLC44A4
1.1691E-253	-1.33256144	3.1328E-249	Down	ZMIZ1
1.6184E-251	-1.2123642	4.3367E-247	Down	BICDL2
2.831E-251	-1.1349919	7.5862E-247	Down	SLC35D1
3.4368E-247	-1.15355505	9.2095E-243	Down	CDCP1
1.6117E-246	-1.38780148	4.3189E-242	Down	ETHE1
8.6764E-246	-1.81011584	2.325E-241	Down	TRPM6
1.9599E-243	-1.4028157	5.252E-239	Down	NOSTRIN
7.5315E-243	-1.12415087	2.0182E-238	Down	NRIP1
1.6579E-242	-1.13747991	4.4427E-238	Down	R3HCC1L
4.7155E-241	-1.29754174	1.2636E-236	Down	AAK1
1.8495E-240	-1.17846771	4.956E-236	Down	PHYKPL
6.1942E-239	-1.517923	1.6599E-234	Down	FOS
2.7994E-238	-1.08819257	7.5017E-234	Down	TMOD3
4.3327E-238	-1.34304773	1.161E-233	Down	AFG3L2
3.0057E-237	-1.35734207	8.0543E-233	Down	PARVA
9.3033E-236	-1.19993644	2.493E-231	Down	NFATC2IP
2.3642E-235	-1.37713084	6.3352E-231	Down	ADCY9
1.8688E-234	-1.31934275	5.0078E-230	Down	NFYC
1.0987E-233	-1.17661378	2.9443E-229	Down	TMTC2
8.8151E-233	-1.28245943	2.3622E-228	Down	CNNM4
2.5733E-231	-1.09144273	6.8957E-227	Down	ENOSF1
1.2549E-229	-1.08302823	3.3627E-225	Down	EFNB2

3.148E-229	-1.28258178	8.4357E-225	Down	DSC2
1.11E-226	-1.05610166	2.9745E-222	Down	DOPEY2
2.2184E-226	-1.12519941	5.9447E-222	Down	ZNF827
7.7836E-226	-1.33868803	2.0858E-221	Down	RMDN2
1.3675E-223	-1.36482413	3.6646E-219	Down	CDHR5
1.8659E-223	-1.04617492	5.0002E-219	Down	ALPK1
8.1081E-221	-1.33304478	2.1727E-216	Down	ARHGEF2
1.702E-220	-1.21240312	4.5608E-216	Down	MTMR8
1.6732E-218	-1.1213866	4.4836E-214	Down	HIF1A
7.3096E-218	-1.06560448	1.9588E-213	Down	TRAPPC8
5.918E-217	-1.0035586	1.5858E-212	Down	LUZP1
3.7081E-216	-1.13020073	9.9367E-212	Down	NFKB1
5.4449E-215	-1.04268539	1.4591E-210	Down	ACOT11
1.6653E-214	-1.05157365	4.4625E-210	Down	PLSCR1
8.1688E-212	-1.11186151	2.189E-207	Down	APPL2
1.2569E-209	-1.08705172	3.3681E-205	Down	DERA
2.109E-206	-1.324167	5.6515E-202	Down	PLEKHH1
1.5731E-204	-1.0191004	4.2153E-200	Down	SLC44A3
1.8525E-204	-1.11800555	4.9641E-200	Down	CASD1
7.1264E-203	-1.06049105	1.9097E-198	Down	BDH1
2.8484E-202	-1.20130082	7.6329E-198	Down	PCSK6
1.5488E-199	-1.04025218	4.1504E-195	Down	NIPAL2
2.1903E-198	-1.21292003	5.8692E-194	Down	RAPGEFL1
2.3072E-198	-1.14603788	6.1827E-194	Down	ST5
9.8742E-197	-1.02475868	2.646E-192	Down	MYOF
2.5946E-194	-1.0898435	6.9527E-190	Down	CALCOCO2
5.5528E-194	-1.09119246	1.488E-189	Down	CAMK2G
3.079E-190	-1.3201413	8.2508E-186	Down	PHLPP2
6.57E-190	-1.19419052	1.7606E-185	Down	MAST4
1.5629E-189	-1.1597673	4.188E-185	Down	LYST
1.2319E-185	-1.14403912	3.3011E-181	Down	SLC25A37
1.8171E-183	-1.05852047	4.8694E-179	Down	TMEM164
5.74E-183	-1.27801398	1.5381E-178	Down	AMN
3.6992E-182	-1.1889494	9.9127E-178	Down	CCDC125
1.5294E-179	-1.12082089	4.0984E-175	Down	LRRC1
2.6799E-176	-1.02244713	7.1814E-172	Down	DNAJC1
4.4938E-176	-1.11301049	1.2042E-171	Down	ACSF2
6.2779E-175	-1.10605746	1.6823E-170	Down	NIPAL1
1.8095E-173	-1.19817297	4.8489E-169	Down	AP002495.2
8.6847E-167	-1.09138573	2.3272E-162	Down	GPRIN3
1.6124E-165	-1.05168922	4.3209E-161	Down	TPK1
2.6364E-160	-1.09672886	7.0647E-156	Down	ATP2A3
9.4907E-156	-1.16608574	2.5432E-151	Down	PELI2
1.3157E-143	-1.03464619	3.5257E-139	Down	LITAF
2.3578E-138	-1.09814318	6.3182E-134	Down	LPIN2
2.7777E-138	-1.02027855	7.4434E-134	Down	ANKRD26
6.0496E-124	-1.02552679	1.6211E-119	Down	ODF2L
1.0375E-123	-1.4025113	2.7803E-119	Down	CPA6
5.1134E-117	-1.07505718	1.3702E-112	Down	MXD1

SupplementaryTable 1-2 DEGs in immune cells

p_val	log2FC	p_val_adj	Tag	Gene
0	4.92022157	0	Up	COL1A2
3.6868E-226	3.40173094	9.8796E-222	Up	GPX2
1.3614E-208	3.2116557	3.6481E-204	Up	RPL36
3.9629E-204	3.75304024	1.0619E-199	Up	IGHGP
9.0152E-194	3.08818181	2.4158E-189	Up	RPL35
9.6022E-191	3.15442897	2.5731E-186	Up	FTL
2.2284E-176	3.2255081	5.9716E-172	Up	DACH1
1.6373E-164	3.04868681	4.3874E-160	Up	DOCK4
4.5835E-153	3.20068723	1.2282E-148	Up	RPS15
3.0145E-151	2.45834038	8.0779E-147	Up	LRMDA
1.0874E-150	3.19013457	2.914E-146	Up	RPLP0
6.1362E-148	4.37210057	1.6443E-143	Up	SLC16A10
7.3433E-148	3.24758343	1.9678E-143	Up	RPS18
6.0539E-140	2.62550348	1.6223E-135	Up	PLXDC2
2.8437E-137	2.9887522	7.6201E-133	Up	RPLP1
6.5645E-134	2.51226865	1.7591E-129	Up	RPL8
4.4374E-130	2.74131875	1.1891E-125	Up	FMNL2
1.0739E-128	2.65778761	2.8779E-124	Up	TPT1
2.62E-128	2.95074717	7.0209E-124	Up	IGHG3
2.7395E-125	3.02924038	7.3409E-121	Up	RPL37A
5.4676E-121	2.62769587	1.4651E-116	Up	MERTK
1.7853E-116	2.46109511	4.7841E-112	Up	RPL13
1.3386E-114	2.41302771	3.5872E-110	Up	UBA52
2.9504E-113	2.63996208	7.9062E-109	Up	RPS3
2.5286E-112	3.06716445	6.776E-108	Up	RPL7A
4.6153E-111	2.12044026	1.2368E-106	Up	SLC8A1
1.5541E-108	1.56641018	4.1646E-104	Up	NEAT1
2.1313E-108	2.21706006	5.7113E-104	Up	RRBP1
3.4349E-107	3.63705408	9.2044E-103	Up	NAMPT
7.5746E-105	2.15481682	2.0298E-100	Up	SAT1
2.3568E-103	1.88404457	6.3156E-99	Up	FNDC3B
3.3235E-102	2.7836487	8.906E-98	Up	ATP5F1E
1.1657E-100	2.62088642	3.12367E-96	Up	ANXA2
1.53344E-96	2.50198884	4.10915E-92	Up	TMSB10
2.3063E-96	1.92223499	6.1802E-92	Up	ATP8B4
8.04728E-93	2.49711423	2.15643E-88	Up	RPS11
9.32358E-93	2.4926425	2.49844E-88	Up	EEF2
1.00562E-90	2.39925609	2.69475E-86	Up	RPS6
1.28254E-88	2.39403892	3.43682E-84	Up	CTSB
1.93527E-88	2.7744104	5.18595E-84	Up	PPDPF
6.06848E-88	2.21337557	1.62617E-83	Up	RPL29
2.47733E-85	1.86313518	6.63849E-81	Up	DAPK1
1.04822E-82	2.61214481	2.80891E-78	Up	RPL37
1.1726E-80	2.20172744	3.14221E-76	Up	RPS9
7.3854E-78	1.88784299	1.97907E-73	Up	PTMA
2.5162E-77	1.98205022	6.74267E-73	Up	HSP90AA1
2.52288E-77	2.48121561	6.76057E-73	Up	RPL4
1.21036E-76	2.4769382	3.24341E-72	Up	RPS19

3.43631E-76	2.12195448	9.20828E-72	Up	RPL28
6.05679E-75	2.41397041	1.62304E-70	Up	FMN1
9.34699E-74	2.47654635	2.50471E-69	Up	RAB31
4.28713E-73	2.16165169	1.14882E-68	Up	EEF1A1
2.11067E-70	2.08961078	5.65596E-66	Up	FRMD4B
4.13646E-70	2.25887164	1.10845E-65	Up	RPL3
1.81981E-69	2.14159513	4.87654E-65	Up	STARD13
5.49428E-69	2.40960851	1.4723E-64	Up	RPL18
1.39514E-68	2.54897949	3.73855E-64	Up	ELL2
1.11589E-62	2.48760469	2.99024E-58	Up	RPL11
7.55433E-60	2.25250147	2.02433E-55	Up	RPL27A
9.80722E-59	2.06224512	2.62804E-54	Up	DMXL2
1.02184E-53	2.27928926	2.73822E-49	Up	RPS2
1.54398E-51	2.03362454	4.13739E-47	Up	RPLP2
1.12652E-50	2.59177248	3.01874E-46	Up	RBPJ
1.15476E-49	2.36876288	3.0944E-45	Up	CPEB4
4.92438E-49	1.86287515	1.31959E-44	Up	RPL13A
1.50509E-46	1.26094576	4.03318E-42	Up	SFMBT2
1.27475E-44	1.04709769	3.41594E-40	Up	MT-CO2
3.73523E-44	1.97056595	1.00093E-39	Up	RPS8
2.95404E-43	1.71098295	7.91595E-39	Up	RBM47
6.22199E-43	1.66402577	1.66731E-38	Up	ARHGAP18
1.51472E-42	1.8935932	4.05899E-38	Up	RPL10
1.83199E-42	1.19093523	4.90917E-38	Up	MT-CO3
1.91876E-38	1.51320444	5.14171E-34	Up	QKI
1.05041E-37	1.73523258	2.81477E-33	Up	ABCA1
5.4973E-37	1.78569151	1.47311E-32	Up	EPCAM
7.76928E-37	1.82658405	2.08193E-32	Up	APOO
1.50119E-36	1.73450546	4.02273E-32	Up	NCL
6.9736E-36	1.3391265	1.86872E-31	Up	FTH1
7.07912E-36	1.72817326	1.89699E-31	Up	CD46
1.16831E-35	1.16896519	3.13072E-31	Up	MT-ND3
4.13258E-34	1.11337553	1.10741E-29	Up	ACTB
8.9562E-34	1.46181123	2.39999E-29	Up	FRMD4A
4.44353E-32	1.10731401	1.19073E-27	Up	TBXAS1
8.42665E-32	1.52597999	2.25809E-27	Up	RNF130
1.02728E-31	1.89843131	2.75279E-27	Up	SRGN
1.88802E-28	1.03992693	5.05932E-24	Up	PABPC1
2.16587E-28	1.19161455	5.80388E-24	Up	TNS3
3.99314E-27	1.26290828	1.07004E-22	Up	MYO1F
2.60075E-26	1.07083007	6.96924E-22	Up	MT-ND4
7.99751E-25	1.27424122	2.14309E-20	Up	ACTN4
2.85892E-23	1.52863934	7.66104E-19	Up	S100A6
5.9583E-23	1.23551233	1.59665E-18	Up	RNF149
2.16554E-22	1.32593317	5.803E-18	Up	NBEAL1
2.51184E-21	1.02976407	6.73096E-17	Up	VMP1
4.32999E-21	1.17155569	1.16031E-16	Up	ARHGAP26
8.42268E-20	1.20143597	2.25703E-15	Up	IGF2R
4.15936E-19	1.16055479	1.11458E-14	Up	AP2A2
5.93738E-19	1.27298819	1.59104E-14	Up	H2AFY

1.15908E-18	1.61573777	3.10599E-14	Up	TPM4
1.48014E-18	1.03732578	3.96633E-14	Up	CTNNB1
2.25577E-18	1.20310189	6.0448E-14	Up	ZEB2
1.70678E-17	1.22091212	4.57367E-13	Up	ACTG1
1.51716E-16	1.25626342	4.06553E-12	Up	HSP90B1
8.21079E-16	1.37379312	2.20024E-11	Up	IGKC
5.6194E-15	1.26029178	1.50583E-10	Up	SLC12A2
1.44958E-14	1.08022759	3.88443E-10	Up	MT-ND4L
1.60957E-14	1.13499721	4.31315E-10	Up	MAN1A1
6.47139E-14	1.23081836	1.73414E-09	Up	SAMSN1
1.66318E-13	1.00073288	4.45681E-09	Up	TMSB4X
1.9137E-10	1.10867688	5.12815E-06	Up	PDE4B
3.09318E-09	1.11172595	8.28879E-05	Up	ANKS1A
8.952E-198	-3.28056536	2.3989E-193	Down	AFF3
3.2908E-175	-1.53637267	8.8182E-171	Down	ANKRD44
7.7661E-174	-3.23413768	2.0811E-169	Down	BACH2
5.973E-166	-1.91846195	1.6006E-161	Down	CCND3
1.161E-161	-3.92556814	3.1111E-157	Down	BANK1
4.7772E-148	-2.26106407	1.2802E-143	Down	TMEM131L
5.0671E-147	-1.49631021	1.3578E-142	Down	SSH2
5.7458E-134	-1.77362904	1.5397E-129	Down	RIPOR2
1.0513E-128	-1.63643223	2.817E-124	Down	PRKCB
5.4409E-128	-1.84468617	1.458E-123	Down	PDE7A
1.7645E-123	-1.64631228	4.7283E-119	Down	MGAT5
3.0636E-119	-3.62549166	8.2095E-115	Down	EBF1
4.6361E-114	-1.23002746	1.2423E-109	Down	ARHGAP15
4.0754E-113	-3.22302758	1.0921E-108	Down	BLK
1.9795E-104	-4.09565455	5.3044E-100	Down	FCRL1
2.8461E-104	-3.77149748	7.6267E-100	Down	MS4A1
1.2084E-102	-3.23986789	3.23827E-98	Down	SLC26A2
5.49997E-95	-1.52786066	1.47383E-90	Down	PACS1
4.52683E-94	-1.2356135	1.21306E-89	Down	FOXP1
1.45354E-93	-2.62773447	3.89505E-89	Down	ARHGAP24
1.08021E-92	-3.88774592	2.89464E-88	Down	PAX5
4.07465E-89	-1.52381128	1.09188E-84	Down	KLF12
1.67815E-86	-1.41004226	4.49694E-82	Down	TNFAIP8
2.40932E-86	-2.18045866	6.45625E-82	Down	KCNQ5
5.76241E-86	-1.43319249	1.54415E-81	Down	TXNIP
2.36612E-85	-1.88130124	6.34049E-81	Down	IKZF3
2.62969E-83	-2.11313443	7.04679E-79	Down	STK17A
1.68583E-82	-1.74347071	4.51751E-78	Down	RALGPS2
3.39984E-82	-3.16568514	9.11054E-78	Down	AC119396.1
3.47263E-82	-1.75474699	9.30562E-78	Down	RCSD1
1.90541E-81	-1.05689679	5.10592E-77	Down	TNRC6B
1.26061E-80	-2.60509422	3.37806E-76	Down	NR3C2
7.09648E-80	-2.04032935	1.90164E-75	Down	STRBP
8.89727E-78	-2.57534216	2.3842E-73	Down	MICAL3
1.35436E-74	-1.46407265	3.62928E-70	Down	RHOH
1.35458E-74	-1.37966131	3.62986E-70	Down	SP100
4.46308E-74	-1.49838769	1.19597E-69	Down	CAMK2D

3.72082E-72	-2.7093472	9.97067E-68	Down	BCL11A
2.23901E-71	-3.244892	5.99988E-67	Down	KHDRBS2
3.99352E-71	-2.55139367	1.07014E-66	Down	PLEKHG1
6.25487E-70	-1.40235721	1.67612E-65	Down	ZHX2
1.05121E-69	-1.30050689	2.81692E-65	Down	SLC38A1
3.36011E-67	-1.15755432	9.00408E-63	Down	IKZF1
3.8011E-65	-1.67074592	1.01858E-60	Down	CD53
7.16902E-65	-1.64599199	1.92108E-60	Down	ITPR1
1.35264E-64	-2.80472765	3.62467E-60	Down	PIGR
2.88623E-62	-1.19563729	7.73422E-58	Down	ZCCHC7
6.86325E-62	-3.98633815	1.83915E-57	Down	CD22
2.4824E-61	-3.76439559	6.6521E-57	Down	PDE3A
2.62655E-61	-3.09283079	7.03836E-57	Down	GRAPL
8.22556E-61	-2.37152886	2.2042E-56	Down	OSBPL10
1.26193E-60	-1.91953606	3.3816E-56	Down	MARCH1
2.8016E-60	-1.37533217	7.50744E-56	Down	CARD11
3.78374E-59	-3.22280543	1.01393E-54	Down	AC008878.3
1.47336E-57	-1.37232075	3.94816E-53	Down	MAP4K4
1.03276E-54	-1.1712838	2.76749E-50	Down	BCL2
2.76445E-54	-1.14300558	7.40788E-50	Down	XYLT1
6.62817E-54	-1.15365956	1.77615E-49	Down	KIAA1551
7.0571E-53	-1.57459422	1.89109E-48	Down	SP140
8.65012E-52	-1.3570473	2.31797E-47	Down	TPD52
3.30435E-51	-1.0439722	8.85467E-47	Down	MAML2
3.9693E-51	-1.07842215	1.06365E-46	Down	INPP5D
1.29026E-50	-1.68056924	3.45751E-46	Down	SETBP1
7.48968E-49	-1.35810128	2.00701E-44	Down	C22orf34
2.52972E-48	-1.58656191	6.7789E-44	Down	CYFIP2
1.48291E-47	-1.60127843	3.97376E-43	Down	SP110
2.87329E-47	-1.41082355	7.69956E-43	Down	GNG7
3.37757E-47	-1.27720986	9.05089E-43	Down	ADK
4.42035E-46	-1.54069639	1.18452E-41	Down	USP6NL
1.08408E-45	-1.7089383	2.905E-41	Down	WDFY4
1.34479E-45	-1.11790636	3.60364E-41	Down	SIPA1L3
2.02971E-45	-1.09438153	5.43901E-41	Down	CLEC2D
7.91628E-45	-3.00704452	2.12133E-40	Down	RHEX
1.42114E-44	-2.17748065	3.80823E-40	Down	SLC44A2
2.22386E-44	-2.06766901	5.95928E-40	Down	UST
3.31031E-44	-1.17544976	8.87064E-40	Down	MEF2C
5.20899E-44	-1.09717195	1.39585E-39	Down	NCK2
5.80656E-44	-1.61958531	1.55598E-39	Down	SIDT1
1.2663E-43	-1.80393348	3.3933E-39	Down	IGHM
1.3771E-43	-1.33472307	3.69022E-39	Down	ANK3
1.88481E-43	-2.09260968	5.05072E-39	Down	LARGE1
3.98413E-43	-1.00144667	1.06763E-38	Down	CAMK1D
6.02248E-43	-1.50923935	1.61385E-38	Down	TMEM156
7.11969E-43	-1.46097125	1.90786E-38	Down	TRAF5
1.5033E-42	-1.03340571	4.0284E-38	Down	PPP1R16B
3.95301E-42	-1.92850899	1.05929E-37	Down	SMIM14
4.70294E-42	-1.05815802	1.26025E-37	Down	SEL1L3

2.38289E-41	-1.27612386	6.38543E-37	Down	POU2F2
2.43505E-41	-2.25426331	6.5252E-37	Down	CR1
2.49704E-41	-1.03366691	6.69133E-37	Down	UVRAG
2.66786E-41	-1.20915937	7.14906E-37	Down	XKR6
2.96707E-41	-1.16188761	7.95087E-37	Down	PRKCE
4.61319E-41	-1.65068867	1.2362E-36	Down	SMAD3
5.9402E-41	-1.45360517	1.5918E-36	Down	PTK2
6.80012E-41	-1.47113863	1.82223E-36	Down	COL19A1
8.40657E-41	-1.31271551	2.25271E-36	Down	CD74
1.21358E-40	-1.12853461	3.25204E-36	Down	ADAM19
4.7441E-40	-2.25332632	1.27128E-35	Down	CERS4
6.49648E-40	-1.0190943	1.74086E-35	Down	EPB41
4.46235E-39	-1.02922117	1.19578E-34	Down	STIM1
1.50163E-38	-1.19227289	4.02391E-34	Down	TMC8
1.84656E-38	-1.36518793	4.94822E-34	Down	STX7
6.2114E-38	-1.45112151	1.66447E-33	Down	CCDC6
8.7796E-37	-1.31306635	2.35267E-32	Down	FAM69A
1.9967E-36	-1.31008115	5.35057E-32	Down	SAMD12
2.5515E-36	-1.39218081	6.83725E-32	Down	ADAM28
5.63786E-36	-1.21056353	1.51078E-31	Down	AUTS2
7.83353E-36	-1.5521632	2.09915E-31	Down	SCML4
8.12256E-36	-1.15789042	2.1766E-31	Down	ELOVL5
5.07371E-35	-1.26238603	1.3596E-30	Down	GGNBP2
2.1132E-34	-1.44924801	5.66275E-30	Down	ERAP2
3.15213E-34	-1.02712687	8.44675E-30	Down	HDAC9
4.70409E-34	-1.17314491	1.26055E-29	Down	P2RY8
1.35243E-33	-1.19593539	3.62412E-29	Down	JAZF1
1.62987E-33	-1.32653852	4.36757E-29	Down	SORL1
2.69844E-33	-1.46936305	7.23101E-29	Down	AC027097.2
4.28648E-33	-1.64747317	1.14865E-28	Down	SESN3
7.59848E-33	-1.35099829	2.03616E-28	Down	CAMK4
1.91978E-32	-1.66148936	5.14442E-28	Down	ZNF827
2.455E-32	-1.29480044	6.57866E-28	Down	ZNF721
2.63623E-32	-1.00244345	7.0643E-28	Down	AKT3
4.40648E-32	-1.17945123	1.1808E-27	Down	ITPKB
7.1847E-32	-1.10175264	1.92528E-27	Down	MAP3K1
7.9784E-32	-1.37101918	2.13797E-27	Down	TRIM22
1.28841E-31	-1.33217827	3.45256E-27	Down	SLAMF6
3.16904E-31	-1.53750619	8.49206E-27	Down	LRMP
7.1476E-31	-1.05420212	1.91534E-26	Down	ZNF831
1.02656E-30	-1.30440442	2.75088E-26	Down	SLC16A7
2.06314E-30	-1.01673017	5.5286E-26	Down	BICD1
4.1909E-30	-1.04820568	1.12304E-25	Down	TBC1D1
6.7857E-30	-1.49294529	1.81836E-25	Down	TNRC6C
7.40271E-30	-1.33889174	1.9837E-25	Down	SWAP70
1.19947E-29	-1.70680458	3.21421E-25	Down	TXK
2.8593E-29	-1.41785226	7.66207E-25	Down	MCUB
5.8668E-29	-1.43330534	1.57213E-24	Down	TRAF3IP3
1.00145E-28	-1.40510953	2.68358E-24	Down	FAM117B
1.14168E-28	-1.02286454	3.05937E-24	Down	ATF7IP2

3.62144E-28	-1.55472937	9.70437E-24	Down	PXK
5.63113E-28	-1.02925692	1.50897E-23	Down	DGKD
9.0048E-28	-1.55816188	2.41302E-23	Down	PARP15
3.60759E-27	-1.16962388	9.66727E-23	Down	OFD1
2.89365E-26	-1.29515411	7.75413E-22	Down	USP12
2.96992E-26	-1.03115779	7.9585E-22	Down	BIRC3
3.82081E-26	-1.27155801	1.02386E-21	Down	PRAG1
1.39375E-24	-1.17233472	3.73483E-20	Down	IQSEC1
5.05804E-22	-1.22527972	1.3554E-17	Down	SP140L
1.2085E-21	-1.03607605	3.23841E-17	Down	RFTN1
3.30545E-21	-1.14161498	8.85761E-17	Down	NEDD4L
1.70737E-20	-1.06529511	4.57525E-16	Down	PIK3AP1
2.46387E-20	-1.02325367	6.60243E-16	Down	GGA2
3.01019E-20	-1.00589761	8.0664E-16	Down	ELP4
3.3408E-20	-1.04333128	8.95234E-16	Down	ANAPC16
1.29368E-19	-1.00696855	3.46668E-15	Down	NUTM2B-AS1
3.23985E-17	-1.08257314	8.68183E-13	Down	IL4R
6.42587E-14	-1.00318671	1.72194E-09	Down	ZDHHHC14
2.38886E-11	-1.02007046	6.40142E-07	Down	IL6ST

SupplementaryTable 1-3 DEGs in stromal cells

p_val	log2FC	p_val_adj	Tag	Gene
9.4167E-104	2.89333288	2.523E-99	Up	COL1A1
4.6861E-103	4.40317808	1.2557E-98	Up	FAP
5.0029E-98	3.44518275	1.3406E-93	Up	KIF26B
1.01844E-83	4.68741413	2.7291E-79	Up	INHBA
4.63245E-82	4.60867109	1.2414E-77	Up	THBS2
1.25307E-80	1.74541138	3.3578E-76	Up	RUNX1
2.78925E-75	1.94667542	7.4743E-71	Up	COL1A2
7.02803E-75	2.34243798	1.8833E-70	Up	GPX2
3.13322E-69	2.39009944	8.3961E-65	Up	IGHG3
3.96459E-66	2.00747413	1.0624E-61	Up	FTL
5.65342E-66	1.85742339	1.5149E-61	Up	MIR4435-2HG
3.89036E-63	2.23441122	1.0425E-58	Up	SERPINE1
8.02264E-63	2.14528423	2.1498E-58	Up	RPL36
9.27028E-63	1.996587	2.4842E-58	Up	RPL35
1.04801E-61	2.33764468	2.8083E-57	Up	RPLP0
1.69831E-61	1.96136992	4.551E-57	Up	SGIP1
1.14108E-60	1.1595576	3.0578E-56	Up	NEAT1
4.46889E-59	2.18804045	1.1975E-54	Up	RPS3
3.24403E-58	2.33334299	8.693E-54	Up	RPS15
5.30412E-58	1.8234601	1.4213E-53	Up	HIF1A
2.8805E-57	2.57404582	7.7189E-53	Up	LMCD1
3.90005E-57	1.91540812	1.0451E-52	Up	EEF2
6.51091E-57	1.66833511	1.7447E-52	Up	NR4A1
3.20766E-54	1.44120111	8.5956E-50	Up	VCAN
5.63366E-54	1.73280081	1.5097E-49	Up	RPL13
1.10215E-52	2.01409803	2.9534E-48	Up	ARMC9
1.91654E-52	2.25520375	5.1357E-48	Up	RPL37
2.7061E-52	1.80309598	7.2515E-48	Up	RPL8
7.28286E-52	2.39139799	1.9516E-47	Up	RHOQ
9.20704E-51	1.11588371	2.4672E-46	Up	RASAL2
1.65736E-50	2.02841329	4.4412E-46	Up	RASGRF2
5.42883E-50	2.39330601	1.4548E-45	Up	RPS19
1.07631E-49	1.81664027	2.8842E-45	Up	COL4A1
1.12575E-49	1.76765794	3.0167E-45	Up	ANKRD28
1.89093E-47	1.9776011	5.0671E-43	Up	SOX4
5.20688E-47	2.06894241	1.3953E-42	Up	RPLP1
1.08756E-46	1.9471617	2.9143E-42	Up	SLC2A3
4.78992E-46	1.68432411	1.2836E-41	Up	RPL13A
8.18952E-46	2.13958147	2.1945E-41	Up	RPL37A
1.16954E-45	1.58380665	3.134E-41	Up	TANC2
3.36505E-45	2.55913827	9.0173E-41	Up	TIMP1
3.37916E-45	2.3817164	9.0551E-41	Up	RPS18
8.67124E-45	1.54785007	2.3236E-40	Up	SAT1
9.57219E-44	1.92677265	2.5651E-39	Up	HSPB1
1.34975E-43	1.41850564	3.6169E-39	Up	SKIL
1.45305E-42	1.55648774	3.8937E-38	Up	TMSB10
1.7068E-42	1.55625018	4.5737E-38	Up	TPT1
3.18793E-42	2.19819812	8.5427E-38	Up	RNF24

3.90373E-42	1.80849062	1.0461E-37	Up	COL18A1
7.66397E-42	2.06774533	2.0537E-37	Up	ELL2
1.11675E-40	1.56085016	2.9925E-36	Up	EEF1A1
6.39584E-40	1.51518033	1.7139E-35	Up	COL3A1
5.93337E-39	1.09021245	1.59E-34	Up	PTMA
1.17481E-38	2.14870109	3.1481E-34	Up	RPL18
1.34279E-38	1.75773859	3.5983E-34	Up	RPL4
4.70605E-38	1.93279698	1.2611E-33	Up	NAMPT
1.69144E-37	1.41007465	4.5325E-33	Up	HSP90AA1
1.85261E-36	1.6533483	4.9644E-32	Up	RPS11
1.97074E-36	1.12549264	5.281E-32	Up	PVT1
5.64927E-36	1.55541699	1.5138E-31	Up	CHSY1
1.16432E-35	1.95364212	3.12E-31	Up	COL12A1
1.8799E-34	1.71564521	5.0376E-30	Up	SULF1
1.92968E-34	1.69735506	5.171E-30	Up	EEF1D
3.00536E-34	1.42820572	8.0535E-30	Up	RPL28
6.41721E-34	1.54125053	1.7196E-29	Up	NCL
1.41544E-33	1.39115615	3.793E-29	Up	RPS8
1.60645E-33	1.20411668	4.3048E-29	Up	MYO10
2.59763E-33	1.00972327	6.9609E-29	Up	IGFBP7
4.20269E-33	1.75928429	1.1262E-28	Up	RPS2
1.28489E-32	1.45617161	3.4431E-28	Up	RNF144A
3.64648E-32	1.48249137	9.7715E-28	Up	RPS6
6.3861E-32	1.33024931	1.7113E-27	Up	COL6A3
9.47831E-32	1.53542235	2.5399E-27	Up	ADAMTS12
9.59332E-32	1.38597493	2.5707E-27	Up	RPL29
3.68156E-31	1.34057312	9.8655E-27	Up	DNAH14
6.7535E-31	1.44509504	1.8097E-26	Up	RPL10
8.32829E-31	1.34482388	2.2317E-26	Up	RPLP2
1.42941E-30	1.47353721	3.8304E-26	Up	RPL3
2.1639E-30	1.52191651	5.7986E-26	Up	SLC7A6
2.21952E-30	1.44027726	5.9476E-26	Up	RPS9
3.30633E-30	1.04850233	8.86E-26	Up	DDAH1
4.01326E-30	1.11422045	1.0754E-25	Up	CHSY3
9.87432E-30	1.0742404	2.646E-25	Up	SH3RF3
1.77443E-29	1.24502509	4.7549E-25	Up	IGFBP4
7.74077E-29	1.31132355	2.0743E-24	Up	UBA52
1.15568E-28	1.65155589	3.0969E-24	Up	ACSL4
1.37745E-28	1.07546144	3.6911E-24	Up	MTHFD1L
1.04895E-27	1.11217522	2.8109E-23	Up	PTPRE
4.9153E-27	1.18535226	1.3172E-22	Up	HSPG2
2.79892E-26	1.28878256	7.5003E-22	Up	RAB31
6.78673E-26	1.27264677	1.8186E-21	Up	AEBP1
8.91816E-26	1.21242977	2.3898E-21	Up	COL5A1
3.05982E-25	1.17200344	8.1994E-21	Up	PDE10A
8.63539E-25	1.96386852	2.314E-20	Up	ANXA1
1.13186E-24	1.01924936	3.033E-20	Up	UACA
1.25041E-24	1.12239674	3.3507E-20	Up	FRY
1.65111E-24	1.26766755	4.4245E-20	Up	RBMS3-AS3
1.99541E-24	1.34335514	5.3471E-20	Up	TENM3

3.16613E-24	1.07032545	8.4843E-20	Up	ABL2
5.01418E-24	1.06895753	1.3436E-19	Up	CTIF
1.6997E-23	1.11579242	4.5547E-19	Up	ATP9A
2.12312E-23	1.08435443	5.6893E-19	Up	CD46
2.22095E-23	1.11445744	5.9515E-19	Up	CDH11
3.54425E-23	1.04977432	9.4975E-19	Up	ATP2A2
4.86233E-23	1.10125558	1.303E-18	Up	LMNA
1.35241E-22	1.00115895	3.6241E-18	Up	PRKD1
2.8671E-22	1.04677216	7.683E-18	Up	STK38L
4.18524E-22	1.05525846	1.1215E-17	Up	SSH1
6.14999E-22	1.08366504	1.648E-17	Up	RAI14
7.00182E-22	1.51144436	1.8763E-17	Up	MDM2
1.19936E-21	1.61941145	3.2139E-17	Up	PLOD2
3.13924E-21	1.23214106	8.4122E-17	Up	B4GALT1
4.83396E-21	1.25184935	1.2954E-16	Up	HSPD1
9.88344E-21	1.30177447	2.6485E-16	Up	FOXO1
1.26193E-20	1.42365228	3.3816E-16	Up	SUGCT
1.63728E-20	1.14851477	4.3874E-16	Up	NRP1
7.25974E-20	1.09517916	1.9454E-15	Up	SFMBT2
1.65425E-19	1.11377448	4.4329E-15	Up	HSP90AB1
2.39145E-19	1.02702815	6.4084E-15	Up	SH3PXD2B
6.90884E-19	1.08217149	1.8514E-14	Up	COL4A2
5.03612E-18	1.07947954	1.3495E-13	Up	AFAP1
8.25958E-18	1.11795581	2.2133E-13	Up	NPAS2
2.16713E-17	1.07680703	5.8072E-13	Up	PLXDC2
3.07608E-17	1.31058044	8.243E-13	Up	EMP1
1.09559E-16	1.11196036	2.9359E-12	Up	COL5A2
2.31367E-16	1.1941009	6.1999E-12	Up	SPON1
2.50709E-15	1.85511427	6.7182E-11	Up	FN1
7.1215E-15	1.10117959	1.9083E-10	Up	ATP1B3
2.54746E-12	1.11013214	6.8264E-08	Up	LINC00578
3.28406E-11	1.20688256	8.8003E-07	Up	INSR
1.16826E-09	1.15576634	3.1306E-05	Up	ADAMTS9
1.1671E-114	-3.78300257	3.128E-110	Down	SLC26A2
1.66163E-82	-2.76669443	4.4527E-78	Down	NR3C2
8.7498E-75	-3.33381628	2.3447E-70	Down	PIGR
5.20657E-69	-2.51465091	1.3952E-64	Down	ABI3BP
8.0135E-67	-2.56622872	2.1474E-62	Down	ADAMTSL1
5.3055E-65	-8.05641238	1.4217E-60	Down	CLCA4
1.13097E-61	-1.04346741	3.0307E-57	Down	ZBTB16
5.29967E-50	-2.56447681	1.4202E-45	Down	SYNPO2
9.34533E-50	-3.34978352	2.5043E-45	Down	GRIP1
1.61584E-49	-2.60398777	4.33E-45	Down	AFF3
1.60311E-48	-2.60179756	4.2958E-44	Down	LIFR
1.43958E-40	-2.2266509	3.8576E-36	Down	RCAN2
2.84577E-40	-2.47412641	7.6258E-36	Down	IGHA1
1.87386E-39	-2.61174529	5.0214E-35	Down	TOX
1.23471E-37	-2.96176254	3.3086E-33	Down	KCNMA1
8.0935E-37	-2.2725176	2.1688E-32	Down	SLC4A4
1.20446E-35	-1.72860047	3.2276E-31	Down	SLC9A9

4.89452E-34	-1.96469831	1.3116E-29	Down	PCDH7
8.84062E-34	-2.01783635	2.369E-29	Down	TMTC2
1.62147E-32	-2.72720836	4.345E-28	Down	MYH11
7.7157E-32	-1.50713328	2.0676E-27	Down	NBEA
1.154E-30	-1.88928269	3.0924E-26	Down	ITIH5
1.84968E-28	-1.09812648	4.9566E-24	Down	FRYL
3.64268E-27	-2.71617912	9.7613E-23	Down	HPSE2
1.88414E-24	-2.19300123	5.0489E-20	Down	FGF13
3.53252E-24	-1.21859049	9.4661E-20	Down	BCL2
2.9809E-23	-1.75594847	7.9879E-19	Down	NOVA1
7.50246E-23	-1.37364458	2.0104E-18	Down	TXNIP
1.33672E-22	-1.58578087	3.582E-18	Down	CRYBG3
4.34323E-22	-1.71411765	1.1639E-17	Down	ANKS1B
6.03266E-22	-1.72762834	1.6166E-17	Down	NEDD4L
1.72861E-19	-1.40221731	4.6321E-15	Down	DANT2
1.50173E-18	-1.94629777	4.0242E-14	Down	PRUNE2
3.44656E-18	-1.18906153	9.2357E-14	Down	TGFR3
4.67004E-18	-1.46126357	1.2514E-13	Down	ARHGAP6
5.75543E-18	-1.34652044	1.5423E-13	Down	FOXP2
1.17635E-17	-1.59293082	3.1523E-13	Down	SAMD12
3.95303E-17	-1.48516314	1.0593E-12	Down	ROBO1
4.55265E-17	-1.15644512	1.22E-12	Down	FHL1
7.09889E-17	-1.09250092	1.9023E-12	Down	CNTN4
2.10081E-16	-1.28460933	5.6295E-12	Down	PDE7B
2.752E-16	-1.42217085	7.3745E-12	Down	PDE5A
6.23576E-16	-1.51333018	1.671E-11	Down	PDCD4
6.7426E-16	-1.18858597	1.8068E-11	Down	DOCK10
2.36486E-15	-1.54519827	6.3371E-11	Down	PID1
2.71511E-15	-1.12855127	7.2757E-11	Down	DLG2
7.51906E-15	-1.24436809	2.0149E-10	Down	THSD4
9.64941E-15	-1.09557271	2.5858E-10	Down	PELI2
1.55547E-14	-1.15437996	4.1682E-10	Down	NPAS3
1.79193E-14	-1.14525429	4.8018E-10	Down	ADD3
1.85363E-14	-1.20382915	4.9672E-10	Down	SDK1
2.8199E-13	-1.24866101	7.5565E-09	Down	ZDHHC14
3.45705E-13	-1.38995598	9.2638E-09	Down	BMP2K
3.86037E-13	-1.17126463	1.0345E-08	Down	NRXN3
6.92447E-13	-1.1295474	1.8556E-08	Down	ANK3
1.0987E-12	-1.28834128	2.9442E-08	Down	TMEM131L
1.33868E-12	-1.17074176	3.5873E-08	Down	TRERF1
2.85358E-12	-1.24915153	7.6467E-08	Down	RAB8B
3.15615E-11	-1.42206754	8.4575E-07	Down	MACROD2
4.5259E-11	-1.27266259	1.2128E-06	Down	GLCCI1
6.00318E-11	-1.47277008	1.6087E-06	Down	UST
9.16031E-11	-1.00988276	2.4547E-06	Down	COL19A1
1.83012E-10	-1.20128495	4.9042E-06	Down	TLE4
1.03803E-09	-1.20108787	2.7816E-05	Down	EFNA5
2.16196E-09	-1.10257413	5.7934E-05	Down	PDK4
3.61521E-09	-1.116735	9.6877E-05	Down	CEP85L
2.08739E-08	-1.13211016	0.00055936	Down	CARMN

5.29381E-08	-1.1000727	0.00141858	Down	RALGPS2
1.60269E-07	-1.05787518	0.00429474	Down	PRELID2
3.47876E-07	-1.09055548	0.00932203	Down	PLCB4

Supplementary Table 2-1 KEGG pathway enrichment analysis of epithelial DEGs

ID	Description	LogP	Log(q-value)	Enrichment
hsa03010	Ribosome	-37.79400842	-35.23650122	11.86715076
hsa05171	Coronavirus disease - COVID-19	-35.94938222	-33.69290502	9.451388809
hsa05200	Pathways in cancer	-10.53697387	-8.456587921	2.838118094
hsa04510	Focal adhesion	-9.544827699	-7.700843261	4.09118849
hsa05205	Proteoglycans in cancer	-9.49465541	-7.700843261	4.071133644
hsa04151	PI3K-Akt signaling pathway	-8.588478891	-6.876069729	3.031661084
hsa05165	Human papillomavirus infection	-8.475637052	-6.821219837	3.117534773
hsa04919	Thyroid hormone signaling pathway	-8.311089903	-6.707825211	4.862478123
hsa05131	Shigellosis	-8.089425596	-6.531918394	3.44068952
hsa04921	Oxytocin signaling pathway	-7.875228708	-6.359114191	4.20996493
hsa05231	Choline metabolism in cancer	-7.471372814	-5.993046858	5.093323044
hsa04141	Protein processing in endoplasmic reticulum	-6.784482391	-5.306156435	4.410648111
hsa04015	Rap1 signaling pathway	-6.611757327	-5.200378161	3.357862251
hsa05032	Morphine addiction	-6.427654289	-5.074267069	4.889195036
hsa05415	Diabetic cardiomyopathy	-6.294238865	-4.967180585	3.327832589
hsa04931	Insulin resistance	-6.105647472	-4.803412776	4.353925365
hsa05215	Prostate cancer	-6.000288235	-4.743811028	4.539966819
hsa04961	Endocrine and other factor-regulated calcium reabsorption	-5.898810024	-4.683725503	6.156080794
hsa04714	Thermogenesis	-5.925746102	-4.569370328	3.545201791
hsa04725	Cholinergic synapse	-5.73689519	-4.541115824	4.09118849
hsa05132	Salmonella infection	-5.623570904	-4.393472201	5.484244839
hsa04024	cAMP signaling pathway	-5.556973037	-4.379677076	3.018609207
hsa05418	Fluid shear stress and atherosclerosis	-5.360549885	-4.218016031	7.32205029
hsa04915	Estrogen signaling pathway	-5.323840376	-4.197696939	3.627618571
hsa04713	Circadian entrainment	-5.332489253	-4.197696939	4.280985894
hsa04140	Autophagy - animal	-5.325735317	-4.197696939	3.334681743
hsa04530	Tight junction	-5.287990069	-4.177640899	3.315065968
hsa04666	Fc gamma R-mediated phagocytosis	-5.226405232	-4.15512695	4.194501331
hsa05412	Arrhythmogenic right ventricular cardiomyopathy	-5.221272458	-4.15512695	4.483657153
hsa00230	Purine metabolism	-5.170408805	-4.118051581	3.707639569
hsa04310	Wnt signaling pathway	-5.140150449	-4.101157187	3.238857555
hsa04928	Parathyroid hormone synthesis, secretion and action	-5.113568934	-4.087540649	3.868841289
hsa04211	Longevity regulating pathway	-4.999142078	-4.0098366	4.284383502
hsa05012	Parkinson disease	-4.98736294	-3.961334655	3.074252476
hsa04072	Phospholipase D signaling pathway	-4.916601561	-3.96115435	3.384154238
hsa04912	GnRH signaling pathway	-4.841044024	-3.906786112	4.146177583
hsa04152	AMPK signaling pathway	-4.798848188	-3.874809441	3.646858593
hsa04910	Insulin signaling pathway	-4.751826787	-3.837772262	3.438970035
hsa04261	Adrenergic signaling in cardiomyocytes	-4.727253035	-3.822958347	3.2742791
hsa04218	Cellular senescence	-4.617832991	-3.732423647	3.211713257
hsa01522	Endocrine resistance	-4.54459428	-3.668328316	3.894894093
hsa04960	Aldosterone-regulated sodium reabsorption	-4.490915256	-3.623604134	6.24444559
hsa04724	Glutamatergic synapse	-4.428723898	-3.5701867	3.579789929
hsa04728	Dopaminergic synapse	-4.390498151	-3.540561125	3.370581426
hsa05207	Chemical carcinogenesis - receptor	-4.350571556	-3.518224889	2.759173633
hsa04971	Gastric acid secretion	-4.329585158	-3.518224889	4.293056343
hsa05214	Glioma	-4.329585158	-3.518224889	4.293056343
hsa05014	Amyotrophic lateral sclerosis	-4.41756939	-3.483783313	2.582454944
hsa05414	Dilated cardiomyopathy	-4.271709816	-3.47007747	3.672328716
hsa04020	Calcium signaling pathway	-4.250280618	-3.456201409	2.569073087
hsa05100	Bacterial invasion of epithelial cells	-4.223195204	-3.436540013	4.182977975
hsa05130	Pathogenic Escherichia coli infection	-4.200118611	-3.420762659	2.776163618
hsa04922	Glucagon signaling pathway	-4.185486236	-3.413308869	3.603687058

hsa04216	Ferroptosis	-4.160066794	-3.401900141	5.649736486
hsa04934	Cushing syndrome	-4.130968716	-3.379641488	3.061792676
hsa04390	Hippo signaling pathway	-4.064427416	-3.327430941	3.022788948
hsa04066	HIF-1 signaling pathway	-4.060271297	-3.327430941	3.505404683
hsa05163	Human cytomegalovirus infection	-4.048046329	-3.32304804	2.624877571
hsa04010	MAPK signaling pathway	-4.032364602	-3.313706491	2.372889324
hsa04924	Renin secretion	-3.992940488	-3.280531326	4.298712544
hsa04217	Necroptosis	-4.087114368	-3.219803246	5.771679055
hsa04911	Insulin secretion	-3.831727955	-3.149282016	3.793863745
hsa05202	Transcriptional misregulation in cancer	-3.850744152	-3.149282016	2.696465141
hsa05417	Lipid and atherosclerosis	-3.899094941	-3.097462595	4.779671717
hsa04360	Axon guidance	-3.754614285	-3.083597808	2.740429247
hsa05225	Hepatocellular carcinoma	-3.66069474	-3.006277525	2.791634499
hsa05208	Chemical carcinogenesis - reactive oxygen species	-3.737244177	-2.957888225	4.548057669
hsa05220	Chronic myeloid leukemia	-3.589528091	-2.951098981	3.852093059
hsa04148	Efferocytosis	-3.53942577	-2.911337494	2.833864639
hsa04520	Adherens junction	-3.527890006	-2.904881255	3.508304108
hsa05022	Pathways of neurodegeneration - multiple diseases	-3.508390845	-2.802141992	2.156113926
hsa05031	Amphetamine addiction	-3.29962104	-2.681633091	3.868841289
hsa05162	Measles	-3.260018227	-2.631929951	3.296527565
hsa05166	Human T-cell leukemia virus 1 infection	-3.19857554	-2.585551011	2.38348258
hsa05210	Colorectal cancer	-3.158783594	-2.550666399	3.409323742
hsa04923	Regulation of lipolysis in adipocytes	-3.105343713	-2.502079021	4.021846312
hsa04144	Endocytosis	-3.008688778	-2.419664525	2.236354026
hsa05167	Kaposi sarcoma-associated herpesvirus infection	-2.979812797	-2.4000292	2.421315637
hsa04213	Longevity regulating pathway - multiple species	-2.960635562	-2.389900094	3.827240845
hsa00920	Sulfur metabolism	-2.836415863	-2.312332416	12.49683631
hsa04936	Alcoholic liver disease	-2.589220092	-2.135516611	2.892786184
hsa05213	Endometrial cancer	-2.542306236	-2.118337943	4.2362157
hsa05224	Breast cancer	-2.503167752	-2.085539636	2.814602773
hsa04920	Adipocytokine signaling pathway	-2.617071449	-2.063885621	3.389841892
hsa05416	Viral myocarditis	-2.617071449	-2.063885621	3.389841892
hsa04722	Neurotrophin signaling pathway	-2.60393019	-2.05502316	2.718935684
hsa04932	Non-alcoholic fatty liver disease	-2.580186898	-2.03551692	2.45601602
hsa05206	MicroRNAs in cancer	-2.412969146	-2.027584227	2.136211336
hsa05160	Hepatitis C	-2.283209556	-1.943186298	2.619881827
hsa05010	Alzheimer disease	-2.422122099	-1.898038652	1.820631195
hsa04917	Prolactin signaling pathway	-2.144630042	-1.842395345	3.520235581

Supplementary Table 2-2 KEGG pathway enrichment analysis of immune DEGs

ID	Description	LogP	Log(q-value)	Enrichment
hsa03010	Ribosome	-37.79400842	-35.23650122	11.86715076
hsa05171	Coronavirus disease - COVID-	-35.94938222	-33.69290502	9.451388809
hsa05200	Pathways in cancer	-10.53697387	-8.456587921	2.838118094
hsa04510	Focal adhesion	-9.544827699	-7.700843261	4.09118849
hsa05205	Proteoglycans in cancer	-9.49465541	-7.700843261	4.071133644
hsa04933	AGE-RAGE signaling pathway in diabetic complications	-8.821867898	-7.218603206	14.91749175
hsa04151	PI3K-Akt signaling pathway	-8.588478891	-6.876069729	3.031661084
hsa04919	Thyroid hormone signaling pathway	-8.311089903	-6.707825211	4.862478123
hsa05131	Shigellosis	-8.089425596	-6.531918394	3.44068952
hsa04921	Oxytocin signaling pathway	-7.875228708	-6.359114191	4.20996493
hsa04015	Rap1 signaling pathway	-6.611757327	-5.200378161	3.357862251
hsa05032	Morphine addiction	-6.427654289	-5.074267069	4.889195036
hsa05415	Diabetic cardiomyopathy	-6.294238865	-4.967180585	3.327832589
hsa05215	Prostate cancer	-6.000288235	-4.743811028	4.539966819
hsa04925	Aldosterone synthesis and secretion	-6.000288235	-4.743811028	4.539966819
hsa04371	Apelin signaling pathway	-5.91712309	-4.683725503	3.813572128
hsa04714	Thermogenesis	-5.925746102	-4.569370328	3.545201791
hsa04725	Cholinergic synapse	-5.73689519	-4.541115824	4.09118849
hsa04662	B cell receptor signaling	-5.864807857	-4.537749577	10.08458208
hsa05132	Salmonella infection	-5.623570904	-4.393472201	5.484244839
hsa05418	Fluid shear stress and atherosclerosis	-5.360549885	-4.218016031	7.32205029
hsa04915	Estrogen signaling pathway	-5.323840376	-4.197696939	3.627618571
hsa04140	Autophagy - animal	-5.325735317	-4.197696939	3.334681743
hsa04530	Tight junction	-5.287990069	-4.177640899	3.315065968
hsa05412	Arrhythmogenic right ventricular cardiomyopathy	-5.221272458	-4.15512695	4.483657153
hsa04928	Parathyroid hormone synthesis, secretion and action	-5.113568934	-4.087540649	3.868841289
hsa04670	Leukocyte transendothelial migration	-5.07253682	-3.992150873	7.911180773
hsa05012	Parkinson disease	-4.98736294	-3.961334655	3.074252476
hsa04022	cGMP-PKG signaling pathway	-4.861086765	-3.91636342	3.21626565
hsa04912	GnRH signaling pathway	-4.841044024	-3.906786112	4.146177583
hsa04611	Platelet activation	-4.630049397	-3.735300027	3.531085304
hsa04960	Aldosterone-regulated sodium reabsorption	-4.490915256	-3.623604134	6.24444559
hsa04728	Dopaminergic synapse	-4.390498151	-3.540561125	3.370581426
hsa04810	Regulation of actin cytoskeleton	-4.361909188	-3.520405329	2.684842447
hsa04971	Gastric acid secretion	-4.329585158	-3.518224889	4.293056343
hsa05214	Glioma	-4.329585158	-3.518224889	4.293056343
hsa05014	Amyotrophic lateral sclerosis	-4.41756939	-3.483783313	2.582454944
hsa04020	Calcium signaling pathway	-4.250280618	-3.456201409	2.569073087
hsa05100	Bacterial invasion of epithelial cells	-4.223195204	-3.436540013	4.182977975
hsa05130	Pathogenic Escherichia coli infection	-4.200118611	-3.420762659	2.776163618
hsa05222	Small cell lung cancer	-4.165046186	-3.401900141	3.827240845
hsa04216	Ferroptosis	-4.160066794	-3.401900141	5.649736486
hsa04390	Hippo signaling pathway	-4.064427416	-3.327430941	3.022788948
hsa04066	HIF-1 signaling pathway	-4.060271297	-3.327430941	3.505404683
hsa05163	Human cytomegalovirus	-4.048046329	-3.32304804	2.624877571
hsa04217	Necroptosis	-4.087114368	-3.219803246	5.771679055

hsa04012	ErbB signaling pathway	-3.831727955	-3.149282016	3.793863745
hsa04260	Cardiac muscle contraction	-3.78627568	-3.10958207	3.750256116
hsa05417	Lipid and atherosclerosis	-3.899094941	-3.097462595	4.779671717
hsa04918	Thyroid hormone synthesis	-3.684921725	-3.019509126	3.95481554
hsa05203	Viral carcinogenesis	-3.662303382	-3.006277525	2.604390722
hsa05225	Hepatocellular carcinoma	-3.66069474	-3.006277525	2.791634499
hsa04935	Growth hormone synthesis, secretion and action	-3.603813573	-2.960120223	3.16061078
hsa05208	Chemical carcinogenesis - reactive oxygen species	-3.737244177	-2.957888225	4.548057669
hsa04210	Apoptosis	-3.722419542	-2.950242175	5.948035915
hsa04520	Adherens junction	-3.527890006	-2.904881255	3.508304108
hsa04621	NOD-like receptor signaling pathway	-3.571141844	-2.854377784	4.855539522
hsa05022	Pathways of neurodegeneration - multiple diseases	-3.508390845	-2.802141992	2.156113926
hsa05210	Colorectal cancer	-3.158783594	-2.550666399	3.409323742
hsa05167	Kaposi sarcoma-associated herpesvirus infection	-2.979812797	-2.4000292	2.421315637
hsa05168	Herpes simplex virus 1 infection	-2.946095104	-2.370859135	4.412004662
hsa00190	Oxidative phosphorylation	-2.864704667	-2.336581243	4.987483531
hsa04613	Neutrophil extracellular trap formation	-2.799701883	-2.283587366	4.160543256
hsa04070	Phosphatidylinositol signaling system	-2.768947917	-2.272138555	5.852659246
hsa05016	Huntington disease	-2.760750719	-2.267701506	3.319643379
hsa04723	Retrograde endocannabinoid signaling	-2.78149531	-2.215214183	2.587882652
hsa04064	NF-kappa B signaling pathway	-2.637430598	-2.176833409	5.462481962
hsa05170	Human immunodeficiency virus 1 infection	-2.558797478	-2.121864207	3.769881918
hsa04720	Long-term potentiation	-2.550772887	-2.119302739	6.848484848
hsa04722	Neurotrophin signaling pathway	-2.60393019	-2.05502316	2.718935684
hsa04071	Sphingolipid signaling pathway	-2.357356107	-1.991099571	4.701316443
hsa04120	Ubiquitin mediated proteolysis	-2.495510104	-1.959192201	2.50657323
hsa01521	EGFR tyrosine kinase inhibitor resistance	-2.274352595	-1.936953481	5.735606061
hsa05010	Alzheimer disease	-2.422122099	-1.898038652	1.820631195

Supplementary Table 2-3 KEGG pathway enrichment analysis of stromal DEGs

ID	Description	LogP	Log(q-value)	Enrichment
hsa03010	Ribosome	-37.79400842	-35.23650122	11.86715076
hsa05171	Coronavirus disease - COVID-19	-35.94938222	-33.69290502	9.451388809
hsa04820	Cytoskeleton in muscle cells	-13.59892194	-11.88651278	11.68965517
hsa04974	Protein digestion and absorption	-11.22365542	-9.569238208	17.21904762
hsa05200	Pathways in cancer	-10.53697387	-8.456587921	2.838118094
hsa04510	Focal adhesion	-9.544827699	-7.700843261	4.09118849
hsa05205	Proteoglycans in cancer	-9.49465541	-7.700843261	4.071133644
hsa04933	AGE-RAGE signaling pathway in diabetic complications	-8.821867898	-7.218603206	14.91749175
hsa04151	PI3K-Akt signaling pathway	-8.588478891	-6.876069729	3.031661084
hsa05165	Human papillomavirus infection	-8.475637052	-6.821219837	3.117534773
hsa04919	Thyroid hormone signaling pathway	-8.311089903	-6.707825211	4.862478123
hsa04512	ECM-receptor interaction	-6.835590546	-5.319476029	13.54307116
hsa05415	Diabetic cardiomyopathy	-6.294238865	-4.967180585	3.327832589
hsa05146	Amoebiasis	-6.342822392	-4.899258543	11.70226537
hsa05215	Prostate cancer	-6.000288235	-4.743811028	4.539966819
hsa04925	Aldosterone synthesis and secretion	-6.000288235	-4.743811028	4.539966819
hsa04530	Tight junction	-5.287990069	-4.177640899	3.315065968
hsa04926	Relaxin signaling pathway	-5.083103275	-4.069664118	3.65059896
hsa04022	cGMP-PKG signaling pathway	-4.861086765	-3.91636342	3.21626565
hsa04960	Aldosterone-regulated sodium reabsorption	-4.490915256	-3.623604134	6.24444559
hsa05222	Small cell lung cancer	-4.165046186	-3.401900141	3.827240845
hsa04216	Ferroptosis	-4.160066794	-3.401900141	5.649736486
hsa04066	HIF-1 signaling pathway	-4.060271297	-3.327430941	3.505404683
hsa04972	Pancreatic secretion	-4.10796003	-3.231694065	8.528301887
hsa04621	NOD-like receptor signaling pathway	-3.571141844	-2.854377784	4.855539522
hsa00532	Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	-3.454997131	-2.767051772	21.52380952
hsa04659	Th17 cell differentiation	-2.215173062	-1.886785427	5.529051988

Supplementary Table 3-1 hdWGCNA-identified
modules in epithelial cells

Gene	Module	Tag
SSU72	E1	activated
SKI	E1	activated
RPL22	E1	activated
NBL1	E1	activated
RPL11	E1	activated
SH3BGRL3	E1	activated
SFN	E1	activated
NUDC	E1	activated
RCC1	E1	activated
ATP6V0B	E1	activated
RPS8	E1	activated
PRDX1	E1	activated
LINC01748	E1	activated
AC099792.1	E1	activated
SERBP1	E1	activated
TGFBR3	E1	activated
RPL5	E1	activated
GPSM2	E1	activated
SLC16A1-AS1	E1	activated
FP700111.1	E1	activated
AC245297.3	E1	activated
MRPS21	E1	activated
MCL1	E1	activated
PSMD4	E1	activated
S100A10	E1	activated
S100A6	E1	activated
DENND4B	E1	activated
JTB	E1	activated
ADAM15	E1	activated
EFNA1	E1	activated
CCT3	E1	activated
HDGF	E1	activated
TAGLN2	E1	activated
F11R	E1	activated
HSD17B7	E1	activated
ARPC5	E1	activated
LAD1	E1	activated
ELK4	E1	activated
NUCKS1	E1	activated
MAPKAPK2	E1	activated
CD55	E1	activated
CD46	E1	activated
LAMB3	E1	activated
TRAF5	E1	activated
PROX1	E1	activated
SLC30A10	E1	activated
DNAH14	E1	activated

LBR	E1	activated
SRP9	E1	activated
TMEM63A	E1	activated
GUK1	E1	activated
PCNX2	E1	activated
IRF2BP2	E1	activated
TOMM20	E1	activated
HEATR1	E1	activated
ZBTB18	E1	activated
HNRNPU	E1	activated
AHCTF1	E1	activated
RPS7	E1	activated
PDIA6	E1	activated
ROCK2	E1	activated
LAPTM4A	E1	activated
SDC1	E1	activated
KLHL29	E1	activated
ADCY3	E1	activated
DTNB	E1	activated
CAD	E1	activated
WDR43	E1	activated
YIPF4	E1	activated
CEBPZ	E1	activated
PKDCC	E1	activated
EPCAM	E1	activated
AC009975.1	E1	activated
RPS27A	E1	activated
XPO1	E1	activated
CCT4	E1	activated
PCBP1	E1	activated
AUP1	E1	activated
TMSB10	E1	activated
TGOLN2	E1	activated
MAT2A	E1	activated
USP39	E1	activated
SNRNP200	E1	activated
RPL31	E1	activated
C2orf49	E1	activated
LINC01594	E1	activated
EDAR	E1	activated
MIR4435-2HG	E1	activated
DDX18	E1	activated
NIFK	E1	activated
UGGT1	E1	activated
SMPD4	E1	activated
PLEKHB2	E1	activated
MGAT5	E1	activated
AC105402.3	E1	activated
FMNL2	E1	activated
KCNJ3	E1	activated

SLC38A11	E1	activated
AC007277.1	E1	activated
DYNC1I2	E1	activated
MAP3K20	E1	activated
CDCA7	E1	activated
HNRNPA3	E1	activated
SESTD1	E1	activated
FSIP2-AS1	E1	activated
SLC40A1	E1	activated
GLS	E1	activated
SLC39A10	E1	activated
HSPD1	E1	activated
CLK1	E1	activated
CASP8	E1	activated
SUMO1	E1	activated
NOP58	E1	activated
INO80D	E1	activated
EEF1B2	E1	activated
KLF7	E1	activated
ATIC	E1	activated
RPL37A	E1	activated
VIL1	E1	activated
IHH	E1	activated
ANKZF1	E1	activated
NCL	E1	activated
PTMA	E1	activated
SNORC	E1	activated
SH3BP4	E1	activated
RNPEPL1	E1	activated
GPR35	E1	activated
STK25	E1	activated
ING5	E1	activated
AC069277.1	E1	activated
RPL32	E1	activated
KCNH8	E1	activated
RPL15	E1	activated
SLC4A7	E1	activated
CMTM6	E1	activated
LINC01811	E1	activated
RPSA	E1	activated
MYRIP	E1	activated
RPL14	E1	activated
CTNNB1	E1	activated
NBEAL2	E1	activated
SMARCC1	E1	activated
PLXNB1	E1	activated
TMA7	E1	activated
UQCRC1	E1	activated
WDR6	E1	activated
RPL29	E1	activated

WDR82	E1	activated
GNL3	E1	activated
TKT	E1	activated
CACNA1D	E1	activated
IL17RB	E1	activated
CACNA2D3	E1	activated
CADPS	E1	activated
ROBO1	E1	activated
MTRNR2L12	E1	activated
CMSS1	E1	activated
SEC61A1	E1	activated
RPN1	E1	activated
SERP1	E1	activated
SKIL	E1	activated
ECT2	E1	activated
FXR1	E1	activated
EPHB3	E1	activated
EIF4A2	E1	activated
RPL35A	E1	activated
ATP5ME	E1	activated
CTBP1	E1	activated
TMEM33	E1	activated
AREG	E1	activated
ANXA3	E1	activated
RASGEF1B	E1	activated
TSPAN5	E1	activated
LEF1	E1	activated
RPL34	E1	activated
LINC01091	E1	activated
ABCE1	E1	activated
RAPGEF2	E1	activated
HMGB2	E1	activated
SPCS3	E1	activated
CFAP97	E1	activated
FAT1	E1	activated
BRD9	E1	activated
SLC12A7	E1	activated
CLPTM1L	E1	activated
NDUFS6	E1	activated
CCT5	E1	activated
NUP155	E1	activated
RPL37	E1	activated
NSA2	E1	activated
DHFR	E1	activated
RPS23	E1	activated
PAM	E1	activated
SLC27A6	E1	activated
HSPA4	E1	activated
VDAC1	E1	activated
H2AFY	E1	activated

TGFB1	E1	activated
TAF7	E1	activated
TCOF1	E1	activated
RPS14	E1	activated
G3BP1	E1	activated
NPM1	E1	activated
SH3PXD2B	E1	activated
RNF44	E1	activated
FGFR4	E1	activated
LMAN2	E1	activated
HNRNPAB	E1	activated
CANX	E1	activated
SQSTM1	E1	activated
RACK1	E1	activated
SSR1	E1	activated
DEK	E1	activated
SOX4	E1	activated
HLA-A	E1	activated
HLA-E	E1	activated
TUBB	E1	activated
IER3	E1	activated
CCHCR1	E1	activated
HLA-B	E1	activated
PRRC2A	E1	activated
CLIC1	E1	activated
HSPA1B	E1	activated
EHMT2	E1	activated
RPS18	E1	activated
TAPBP	E1	activated
RPL10A	E1	activated
SRSF3	E1	activated
PTK7	E1	activated
XPO5	E1	activated
HSP90AB1	E1	activated
OOEP	E1	activated
EEF1A1	E1	activated
ME1	E1	activated
AKIRIN2	E1	activated
CD24	E1	activated
NKAIN2	E1	activated
NCOA7	E1	activated
LAMA2	E1	activated
SAMD3	E1	activated
EPB41L2	E1	activated
RPS12	E1	activated
PERP	E1	activated
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SLC22A3	E1	activated
PSMB1	E1	activated
PRKAR1B	E1	activated

ADAP1	E1	activated
C7orf50	E1	activated
INTS1	E1	activated
SNX8	E1	activated
EIF3B	E1	activated
LFNG	E1	activated
BRAT1	E1	activated
TTYH3	E1	activated
FOXK1	E1	activated
AP5Z1	E1	activated
WIP1	E1	activated
TNRC18	E1	activated
FBXL18	E1	activated
ACTB	E1	activated
RNF216	E1	activated
USP42	E1	activated
RAC1	E1	activated
DAGLB	E1	activated
ZNF316	E1	activated
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ARL4A	E1	activated
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MACC1	E1	activated
ITGB8	E1	activated
STEAP1B	E1	activated
TRA2A	E1	activated
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NUDCD3	E1	activated
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SUMF2	E1	activated
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BUD23	E1	activated
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TRIB1	E1	activated
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CHORDC1	E1	activated
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DDX21	E1	activated
HKDC1	E1	activated
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STRAP	E1	activated
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GALNT6	E1	activated
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PPM1H	E1	activated
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LGR5	E1	activated
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HSP90B1	E1	activated
TXNRD1	E1	activated
ANAPC7	E1	activated
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TMED2	E1	activated
SCARB1	E1	activated
UBC	E1	activated
MPHOSPH8	E1	activated
ZDHHC20	E1	activated
GTF3A	E1	activated
SLC7A1	E1	activated
HMGB1	E1	activated
USPL1	E1	activated
HSPH1	E1	activated
NAA16	E1	activated
EPSTI1	E1	activated
DNAJC15	E1	activated
TPT1	E1	activated
ZC3H13	E1	activated
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RB1	E1	activated
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SUGT1	E1	activated
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IRS2	E1	activated
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TFDP1	E1	activated
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GPX2	E1	activated
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INF2	E1	activated
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ANXA2	E1	activated
VPS13C	E1	activated
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RHOT2	E1	activated
CLCN7	E1	activated
MAPK8IP3	E1	activated
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ABCC1	E1	activated
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FUK	E1	activated
SF3B3	E1	activated
DHX38	E1	activated
PMFBP1	E1	activated
LINC01572	E1	activated
PSMD7	E1	activated
PLCG2	E1	activated
TAF1C	E1	activated
COX4I1	E1	activated
CYBA	E1	activated
PIEZO1	E1	activated
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SPIRE2	E1	activated
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SOX9	E1	activated
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SRSF2	E1	activated
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TMC6	E1	activated
SYNGR2	E1	activated
USP36	E1	activated
LGALS3BP	E1	activated
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HM13	E1	activated
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CAPNS1	E1	activated
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ZNF146	E1	activated
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PPP2R1A	E1	activated
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LENG8	E1	activated
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FP236383.1	E1	activated
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MT-CO1	E1	activated
MT-CO2	E1	activated
MT-ATP6	E1	activated
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EREG	E1	activated
BBOX1-AS1	E1	activated
CYP2W1	E1	activated
RERE	E2	repressed
KIF1B	E2	repressed
VPS13D	E2	repressed
KAZN	E2	repressed
NBPF1	E2	repressed
PADI2	E2	repressed
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TCEA3	E2	repressed
RSRP1	E2	repressed
WASF2	E2	repressed
PHACTR4	E2	repressed
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RHBDL2	E2	repressed
NFYC	E2	repressed
GPBP1L1	E2	repressed
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OSBPL9	E2	repressed
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PGM1	E2	repressed
RAVER2	E2	repressed
WDR78	E2	repressed
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SAMD13	E2	repressed
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EVI5	E2	repressed
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ABCD3	E2	repressed
SLC44A3	E2	repressed
DPYD	E2	repressed
RAP1A	E2	repressed
CTTNBP2NL	E2	repressed
WNT2B	E2	repressed
MAGI3	E2	repressed
PTPN22	E2	repressed
ATP1A1	E2	repressed
HMGCS2	E2	repressed
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GSAP	E5	activated
GTPBP10	E5	activated
CDK6	E5	activated
IMMP2L	E5	activated
ST7	E5	activated
TSPAN12	E5	activated
FAM3C	E5	activated
CADPS2	E5	activated
POT1	E5	activated
GRM8	E5	activated
SND1	E5	activated
UBE2H	E5	activated
LINC00513	E5	activated
MKLN1	E5	activated
TRIM24	E5	activated
GALNT11	E5	activated
DPP6	E5	activated
LMBR1	E5	activated
NHS	E5	activated
SHROOM4	E5	activated
FTX	E5	activated
WRN	E5	activated
PLEKHA2	E5	activated
PCMTD1	E5	activated
WWP1	E5	activated
KANK1	E5	activated
RFX3	E5	activated
AK3	E5	activated

RCL1	E5	activated
DENND4C	E5	activated
MLLT3	E5	activated
FOCAD	E5	activated
UBAP2	E5	activated
ZCCHC7	E5	activated
CEMP2	E5	activated
CARNMT1	E5	activated
UBQLN1	E5	activated
SYK	E5	activated
FANCC	E5	activated
PTCH1	E5	activated
CDC14B	E5	activated
ZNF782	E5	activated
MFSD14C	E5	activated
FKTN	E5	activated
TMEM245	E5	activated
TXN	E5	activated
SUSD1	E5	activated
PTBP3	E5	activated
HSDL2	E5	activated
KIAA1958	E5	activated
PSMD5	E5	activated
PSMB7	E5	activated
NR6A1	E5	activated
MIR181A2HG	E5	activated
SCAI	E5	activated
KCNQ1	E5	activated
CD44	E5	activated
USP6NL	E5	activated
NEBL	E5	activated
RHOBTB1	E5	activated
SHTN1	E5	activated
RAB11FIP2	E5	activated
CACNA1C	E5	activated
CCND2	E5	activated
GRIN2B	E5	activated
PTPRO	E5	activated
STK38L	E5	activated
CPSF6	E5	activated
CAPS2	E5	activated
WASHC3	E5	activated
PSPC1	E5	activated
ZMYM2	E5	activated
XPO4	E5	activated
POLR1D	E5	activated
PAN3	E5	activated
N4BP2L2	E5	activated
PDS5B	E5	activated
NBEA	E5	activated

ALG5	E5	activated
UFM1	E5	activated
PROSER1	E5	activated
NHLRC3	E5	activated
DGKH	E5	activated
TSC22D1	E5	activated
GPALPP1	E5	activated
GTF2F2	E5	activated
LRCH1	E5	activated
ITM2B	E5	activated
FNDC3A	E5	activated
RNASEH2B	E5	activated
PIBF1	E5	activated
MYCBP2	E5	activated
RBM26	E5	activated
DNAJC3	E5	activated
UGGT2	E5	activated
FARP1	E5	activated
TM9SF2	E5	activated
TMTC4	E5	activated
TPP2	E5	activated
CARS2	E5	activated
ANKRD10	E5	activated
CDC16	E5	activated
STXBP6	E5	activated
NUBPL	E5	activated
CCDC175	E5	activated
MNAT1	E5	activated
AL359232.1	E5	activated
RAD51B	E5	activated
PAPOLA	E5	activated
AC124312.1	E5	activated
AC013652.1	E5	activated
MYEF2	E5	activated
GALK2	E5	activated
GABPB1-AS1	E5	activated
MIR4713HG	E5	activated
GLCE	E5	activated
WVOX	E5	activated
TAF15	E5	activated
TSPOAP1-AS1	E5	activated
CEP112	E5	activated
L3MBTL4	E5	activated
FHOD3	E5	activated
ITPA	E5	activated
SLC23A2	E5	activated
TMEM230	E5	activated
SHLD1	E5	activated
CRLS1	E5	activated
PLCB4	E5	activated

TASP1	E5	activated
MACROD2	E5	activated
DSTN	E5	activated
XRN2	E5	activated
NAPB	E5	activated
UQCC1	E5	activated
AL354993.2	E5	activated
ZNRF3	E5	activated
HUNK	E5	activated
RUNX1	E5	activated
ETS2	E5	activated
BACE2	E5	activated
CASC9	E5	activated
ACAP3	E6	None
CCNL2	E6	None
ATAD3B	E6	None
MIB2	E6	None
SPEN	E6	None
SRRM1	E6	None
PABPC4	E6	None
SRSF11	E6	None
PRPF38B	E6	None
RBM15	E6	None
PRRC2C	E6	None
TPR	E6	None
MDM4	E6	None
ZC3H11B	E6	None
LINC00486	E6	None
ZFP36L2	E6	None
MPHOSPH10	E6	None
AC092683.1	E6	None
EIF5B	E6	None
RANBP2	E6	None
RIF1	E6	None
PPIG	E6	None
SF3B1	E6	None
GOLGA4	E6	None
NKTR	E6	None
TOPBP1	E6	None
ATR	E6	None
EIF4G1	E6	None
TRA2B	E6	None
LSG1	E6	None
BOD1L1	E6	None
HNRNPDL	E6	None
SREK1	E6	None
BDP1	E6	None
ENC1	E6	None
DDX46	E6	None
LARP1	E6	None

NSD1	E6	None
HNRNPH1	E6	None
PRPF4B	E6	None
ABCF1	E6	None
BRD2	E6	None
ZNF318	E6	None
COL19A1	E6	None
SYNCRIP	E6	None
MDN1	E6	None
CASP8AP2	E6	None
BAZ1B	E6	None
SRRT	E6	None
NOM1	E6	None
KANTR	E6	None
ATRX	E6	None
UPF3B	E6	None
THOC2	E6	None
AP2A2	E6	None
CALCB	E6	None
NCR3LG1	E6	None
FNBP4	E6	None
NDUFV1	E6	None
CEP295	E6	None
TAF1D	E6	None
CWF19L2	E6	None
CEP164	E6	None
KMT2A	E6	None
UPF2	E6	None
TIMM23B	E6	None
CDHR1	E6	None
PDCD11	E6	None
EIF3A	E6	None
PTPN6	E6	None
KIAA1551	E6	None
ZFC3H1	E6	None
METAP2	E6	None
RSRC2	E6	None
DDX55	E6	None
POLE	E6	None
ARGLU1	E6	None
ACIN1	E6	None
PNN	E6	None
RBM25	E6	None
DDX24	E6	None
DYNC1H1	E6	None
HERC2	E6	None
RTF1	E6	None
PDCD7	E6	None
MAN2C1	E6	None
LUC7L	E6	None

KNOP1	E6	None
RBBP6	E6	None
GSE1	E6	None
ZC3H18	E6	None
ANKRD11	E6	None
SPG7	E6	None
TCF25	E6	None
CLUH	E6	None
PELP1	E6	None
CHD3	E6	None
CDK5RAP3	E6	None
SPATA20	E6	None
LUC7L3	E6	None
DDX42	E6	None
DDX5	E6	None
HEXDC	E6	None
RNMT	E6	None
NOP56	E6	None
AP3D1	E6	None
SAFB2	E6	None
ILF3	E6	None
KMT2B	E6	None
HNRNPL	E6	None
IRF3	E6	None
PPP1R12C	E6	None
HMGXB4	E6	None
SELENOO	E6	None
PCNT	E6	None
CDK11B	E7	None
CDK11A	E7	None
TNFRSF14	E7	None
EXOSC10	E7	None
MFN2	E7	None
HP1BP3	E7	None
AGBL4	E7	None
L1TD1	E7	None
ZRANB2	E7	None
LMO4	E7	None
RNPC3	E7	None
NBPF14	E7	None
GON4L	E7	None
CEP350	E7	None
ELF3	E7	None
ID2	E7	None
MTIF2	E7	None
MRPS5	E7	None
ANKRD36C	E7	None
REV1	E7	None
PTPN18	E7	None
ANKRD44	E7	None

BHLHE40-AS1	E7	None
XPC	E7	None
RBM6	E7	None
RBM5	E7	None
GOLGB1	E7	None
MBD4	E7	None
CCNL1	E7	None
SEC62	E7	None
PCGF3	E7	None
GAK	E7	None
MAEA	E7	None
FGFR3	E7	None
NSD2	E7	None
YTHDC1	E7	None
LARP7	E7	None
LARP1B	E7	None
SCLT1	E7	None
DHX29	E7	None
CETN3	E7	None
AC137770.1	E7	None
TCERG1	E7	None
TRIM52	E7	None
DSP	E7	None
SNRNP48	E7	None
PNISR	E7	None
CRYBG1	E7	None
AKAP9	E7	None
TECPR1	E7	None
AGFG2	E7	None
WDR60	E7	None
AKAP17A	E7	None
OFD1	E7	None
ZC4H2	E7	None
SLC25A37	E7	None
IL7	E7	None
GOLGA2	E7	None
SETX	E7	None
RABL6	E7	None
PHPT1	E7	None
MUC5B	E7	None
TNKS1BP1	E7	None
FAM111A	E7	None
AP002495.2	E7	None
NUMA1	E7	None
POLD3	E7	None
PCF11	E7	None
RBM17	E7	None
BMS1	E7	None
CCAR1	E7	None
TUBGCP2	E7	None

KDM5A	E7	None
CHD4	E7	None
SCAF11	E7	None
CCNT1	E7	None
CSAD	E7	None
CEP290	E7	None
ACADS	E7	None
TMEM132D	E7	None
NEMF	E7	None
ARID4A	E7	None
SYNE2	E7	None
CALM1	E7	None
TRIP11	E7	None
CDC42BPB	E7	None
GOLGA8A	E7	None
CEP152	E7	None
USP8	E7	None
SLTM	E7	None
CLK3	E7	None
SRRM2	E7	None
UBN1	E7	None
NP1PB6	E7	None
NFATC2IP	E7	None
NCBP3	E7	None
ATP2A3	E7	None
KIAA0753	E7	None
ACADVL	E7	None
GGNBP2	E7	None
CWC25	E7	None
AC103702.2	E7	None
AKAP1	E7	None
BPTF	E7	None
NARS	E7	None
ZBTB7A	E7	None
LTBP4	E7	None
SNRNP70	E7	None
DGCR8	E7	None
PRR14L	E7	None
GGA1	E7	None
NUP50	E7	None
TIAM1	E7	None
SON	E7	None
TTC3	E7	None
NASP	E8	None
STIL	E8	None
CCDC18	E8	None
TTF2	E8	None
ASPM	E8	None
CENPF	E8	None
BARD1	E8	None

POLQ	E8	None
SMC4	E8	None
CENPE	E8	None
ZGRF1	E8	None
CENPK	E8	None
LMNB1	E8	None
MMS22L	E8	None
EZH2	E8	None
NCAPG2	E8	None
POLA1	E8	None
SMC1A	E8	None
ATAD2	E8	None
MELK	E8	None
CENPP	E8	None
SMC2	E8	None
NCAPD3	E8	None
DNA2	E8	None
KIF20B	E8	None
HELLS	E8	None
MKI67	E8	None
DDX11	E8	None
PARPBP	E8	None
CIT	E8	None
KNTC1	E8	None
CENPJ	E8	None
BRCA2	E8	None
RFC3	E8	None
DIAPH3	E8	None
WDHD1	E8	None
CEP128	E8	None
AC091057.6	E8	None
KNL1	E8	None
FANCI	E8	None
FANCA	E8	None
ATAD5	E8	None
TOP2A	E8	None
BRCA1	E8	None
BRIP1	E8	None
AC016205.1	E8	None
TPX2	E8	None
RBL1	E8	None
CHAF1A	E8	None
DNMT1	E8	None
AP001347.1	E8	None

Supplementary Table 3-2 hdWGCNA-identified
modules in immune cells

Gene	Module	Tag
GNB1	I1	repressed
RERE	I1	repressed
PRDM2	I1	repressed
RCC2	I1	repressed
EIF4G3	I1	repressed
IFNLR1	I1	repressed
CLIC4	I1	repressed
RSRP1	I1	repressed
WASF2	I1	repressed
STX12	I1	repressed
KPNA6	I1	repressed
HDAC1	I1	repressed
S100PBP	I1	repressed
STK40	I1	repressed
INPP5B	I1	repressed
RLF	I1	repressed
SMAP2	I1	repressed
NFYC	I1	repressed
ERI3	I1	repressed
EPS15	I1	repressed
OSBPL9	I1	repressed
TUT4	I1	repressed
USP24	I1	repressed
ATG4C	I1	repressed
PDE4B	I1	repressed
ACADM	I1	repressed
ST6GALNAC3	I1	repressed
AL078459.1	I1	repressed
SELENOF	I1	repressed
HS2ST1	I1	repressed
ZNF644	I1	repressed
EVI5	I1	repressed
FAM69A	I1	repressed
MTF2	I1	repressed
CCDC18	I1	repressed
PTBP2	I1	repressed
AC093157.1	I1	repressed
VAV3	I1	repressed
CD53	I1	repressed
DRAM2	I1	repressed
CEPT1	I1	repressed
CAPZA1	I1	repressed
SLC16A1-AS1	I1	repressed
MAN1A2	I1	repressed
AL359915.2	I1	repressed
NOTCH2	I1	repressed

NBPF15	I1	repressed
AC242426.2	I1	repressed
CHD1L	I1	repressed
NBPF11	I1	repressed
NBPF14	I1	repressed
AC245297.3	I1	repressed
PLEKHO1	I1	repressed
CTSS	I1	repressed
IFI16	I1	repressed
POU2F1	I1	repressed
MPZL1	I1	repressed
RC3H1	I1	repressed
RABGAP1L	I1	repressed
KIAA0040	I1	repressed
COP1	I1	repressed
RALGPS2	I1	repressed
ACBD6	I1	repressed
LAMC1	I1	repressed
TRMT1L	I1	repressed
PIK3C2B	I1	repressed
RHEX	I1	repressed
SRGAP2	I1	repressed
CD55	I1	repressed
HHAT	I1	repressed
TRAF5	I1	repressed
LPGAT1	I1	repressed
NSL1	I1	repressed
LYPLAL1	I1	repressed
AIDA	I1	repressed
FAM177B	I1	repressed
AC093152.1	I1	repressed
ACBD3	I1	repressed
ZNF678	I1	repressed
LYST	I1	repressed
ERO1B	I1	repressed
CEP170	I1	repressed
SDCCAG8	I1	repressed
CNST	I1	repressed
ADAM17	I1	repressed
HPCAL1	I1	repressed
SMC6	I1	repressed
ITSN2	I1	repressed
LCLAT1	I1	repressed
RASGRP3	I1	repressed
HEATR5B	I1	repressed
PRKD3	I1	repressed
RMDN2	I1	repressed
PRKCE	I1	repressed
RHOQ	I1	repressed
PIGF	I1	repressed

SOCS5	I1	repressed
TTC7A	I1	repressed
FBXO11	I1	repressed
ACYP2	I1	repressed
VRK2	I1	repressed
BCL11A	I1	repressed
REL	I1	repressed
XPO1	I1	repressed
WDPCP	I1	repressed
SERTAD2	I1	repressed
LINC02576	I1	repressed
APLF	I1	repressed
MOB1A	I1	repressed
EIF2AK3	I1	repressed
TMEM131	I1	repressed
AFF3	I1	repressed
MAP4K4	I1	repressed
MAP3K2	I1	repressed
MGAT5	I1	repressed
TMEM163	I1	repressed
RAB3GAP1	I1	repressed
SPOPL	I1	repressed
KYNU	I1	repressed
ARHGAP15	I1	repressed
ZEB2	I1	repressed
MBD5	I1	repressed
TANK	I1	repressed
COBLL1	I1	repressed
AC078883.1	I1	repressed
CIR1	I1	repressed
SESTD1	I1	repressed
DNAJC10	I1	repressed
ANKAR	I1	repressed
SLC39A10	I1	repressed
STK17B	I1	repressed
ANKRD44	I1	repressed
BMPR2	I1	repressed
FAM117B	I1	repressed
KLF7	I1	repressed
CREB1	I1	repressed
PIKFYVE	I1	repressed
KANSL1L	I1	repressed
AP1S3	I1	repressed
CUL3	I1	repressed
RHBDD1	I1	repressed
COL4A4	I1	repressed
COL4A3	I1	repressed
SP110	I1	repressed
SP140	I1	repressed
SP140L	I1	repressed

SP100	I1	repressed
PDE6D	I1	repressed
INPP5D	I1	repressed
DGKD	I1	repressed
SNED1	I1	repressed
FARP2	I1	repressed
ITPR1	I1	repressed
THUMPD3-AS1	I1	repressed
SETD5	I1	repressed
MTMR14	I1	repressed
IRAK2	I1	repressed
IQSEC1	I1	repressed
CAPN7	I1	repressed
SH3BP5	I1	repressed
RFTN1	I1	repressed
PLCL2	I1	repressed
TBC1D5	I1	repressed
KCNH8	I1	repressed
UBE2E2	I1	repressed
UBE2E1	I1	repressed
THRB	I1	repressed
TOP2B	I1	repressed
NGLY1	I1	repressed
OSBPL10	I1	repressed
GLB1	I1	repressed
CLASP2	I1	repressed
TRAK1	I1	repressed
LIMD1	I1	repressed
CCDC12	I1	repressed
SETD2	I1	repressed
APPL1	I1	repressed
PXK	I1	repressed
SUCLG2	I1	repressed
UBA3	I1	repressed
FOXP1	I1	repressed
GBE1	I1	repressed
CMSS1	I1	repressed
PCNP	I1	repressed
ALCAM	I1	repressed
BBX	I1	repressed
CD47	I1	repressed
IFT57	I1	repressed
SIDT1	I1	repressed
USF3	I1	repressed
ATP6V1A	I1	repressed
CCDC191	I1	repressed
ZBTB20	I1	repressed
IQCB1	I1	repressed
EAF2	I1	repressed
SLC15A2	I1	repressed

PARP15	I1	repressed
PARP14	I1	repressed
HACD2	I1	repressed
ZNF148	I1	repressed
OSBPL11	I1	repressed
EEFSEC	I1	repressed
MBD4	I1	repressed
STAG1	I1	repressed
AC097103.2	I1	repressed
HPS3	I1	repressed
RNF13	I1	repressed
TSC22D2	I1	repressed
RSRC1	I1	repressed
SEC62	I1	repressed
GPR160	I1	repressed
PHC3	I1	repressed
SKIL	I1	repressed
PIK3CA	I1	repressed
MFN1	I1	repressed
ST6GAL1	I1	repressed
CCDC50	I1	repressed
ACAP2	I1	repressed
RUBCN	I1	repressed
LRCH3	I1	repressed
ZNF595	I1	repressed
ZNF718	I1	repressed
ZNF141	I1	repressed
ZNF721	I1	repressed
ADD1	I1	repressed
HTT	I1	repressed
BOD1L1	I1	repressed
CD38	I1	repressed
TAPT1	I1	repressed
TAPT1-AS1	I1	repressed
LCORL	I1	repressed
SEL1L3	I1	repressed
STIM2	I1	repressed
TBC1D1	I1	repressed
TLR1	I1	repressed
KLHL5	I1	repressed
SMIM14	I1	repressed
RHOH	I1	repressed
ATP10D	I1	repressed
SCFD2	I1	repressed
RUFY3	I1	repressed
CCNG2	I1	repressed
BMP2K	I1	repressed
PLAC8	I1	repressed
ARHGAP24	I1	repressed
KLHL8	I1	repressed

PPM1K	I1	repressed
CCSER1	I1	repressed
DAPP1	I1	repressed
PPP3CA	I1	repressed
BANK1	I1	repressed
NFKB1	I1	repressed
MANBA	I1	repressed
GSTCD	I1	repressed
CAMK2D	I1	repressed
UGT8	I1	repressed
AC096711.2	I1	repressed
SETD7	I1	repressed
TBC1D9	I1	repressed
AC104596.1	I1	repressed
GAB1	I1	repressed
ABCE1	I1	repressed
TMEM154	I1	repressed
TMEM131L	I1	repressed
MARCH1	I1	repressed
CBR4	I1	repressed
IRF2	I1	repressed
SNX25	I1	repressed
TRIO	I1	repressed
BASP1	I1	repressed
LINC02100	I1	repressed
LINC02241	I1	repressed
C1QTNF3-AMACR	I1	repressed
NIPBL	I1	repressed
TMEM267	I1	repressed
ARL15	I1	repressed
MAP3K1	I1	repressed
GPBP1	I1	repressed
PDE4D	I1	repressed
CWC27	I1	repressed
ADAMTS6	I1	repressed
ERBIN	I1	repressed
MRPS27	I1	repressed
TBCA	I1	repressed
AP3B1	I1	repressed
TENT2	I1	repressed
SSBP2	I1	repressed
MEF2C	I1	repressed
MEF2C-AS1	I1	repressed
FAM172A	I1	repressed
LIX1-AS1	I1	repressed
FBXL17	I1	repressed
FER	I1	repressed
PJA2	I1	repressed
REEP5	I1	repressed
PGGT1B	I1	repressed

AP3S1	I1	repressed
COMMD10	I1	repressed
SEMA6A-AS1	I1	repressed
DTWD2	I1	repressed
DMXL1	I1	repressed
TNFAIP8	I1	repressed
HSD17B4	I1	repressed
SNX2	I1	repressed
CEP120	I1	repressed
CSNK1G3	I1	repressed
ZNF608	I1	repressed
MARCH3	I1	repressed
LINC01184	I1	repressed
CDC42SE2	I1	repressed
AFF4	I1	repressed
ZCCHC10	I1	repressed
HSPA4	I1	repressed
FAM13B	I1	repressed
UBE2D2	I1	repressed
CD74	I1	repressed
ANXA6	I1	repressed
CCDC69	I1	repressed
GALNT10	I1	repressed
CYFIP2	I1	repressed
ADAM19	I1	repressed
RNF145	I1	repressed
DOCK2	I1	repressed
FBXW11	I1	repressed
ERGIC1	I1	repressed
SIMC1	I1	repressed
UIMC1	I1	repressed
DOK3	I1	repressed
RUFY1	I1	repressed
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AC119396.1	I1	repressed
AC008878.3	I1	repressed
FCER2	I1	repressed
CLEC17A	I1	repressed
FAM129C	I1	repressed
MAP4K1	I1	repressed
CEACAM21	I1	repressed
CD79A	I1	repressed
CD37	I1	repressed
LILRB1	I1	repressed
TNFRSF13C	I1	repressed

PARVB	I1	repressed
PARVG	I1	repressed
PRKCZ	I2	None
TNFRSF1B	I2	None
VPS13D	I2	None
CROCC	I2	None
CAPZB	I2	None
LUZP1	I2	None
RCAN3	I2	None
RUNX3	I2	None
MAN1C1	I2	None
PTP4A2	I2	None
LCK	I2	None
KIAA0319L	I2	None
MACF1	I2	None
HIVEP3	I2	None
ZSWIM5	I2	None
ECHDC2	I2	None
SSBP3	I2	None
NFIA	I2	None
PATJ	I2	None
MIER1	I2	None
SRSF11	I2	None
PIGK	I2	None
ODF2L	I2	None
GBP2	I2	None
GLMN	I2	None
RPAP2	I2	None
ABCD3	I2	None
DPYD	I2	None
CDC14A	I2	None
RNPC3	I2	None
DENND2D	I2	None
RAP1A	I2	None
RSBN1	I2	None
PTPN22	I2	None
HIPK1	I2	None
CD2	I2	None
RNF115	I2	None
PDE4DIP	I2	None
NBPF19	I2	None
GABPB2	I2	None
ATP8B2	I2	None
IL6R	I2	None
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CD247	I2	None
NME7	I2	None
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FAM129A	I2	None
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DENND1B	I2	None
NEK7	I2	None
ATP2B4	I2	None
RASSF5	I2	None
GPATCH2	I2	None
TMEM63A	I2	None
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PCNX2	I2	None
MTR	I2	None
RNF144A	I2	None
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NCOA1	I2	None
DNMT3A	I2	None
DTNB	I2	None
PPP1CB	I2	None
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GALM	I2	None
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AAK1	I2	None
EXOC6B	I2	None
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TGOLN2	I2	None
KDM3A	I2	None
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RNF149	I2	None
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GCC2	I2	None
LIMS1	I2	None
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PTPN4	I2	None
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ACVR1	I2	None
PKP4	I2	None
RBMS1	I2	None
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ITGA6	I2	None
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MFSD6	I2	None
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STAT1	I2	None
STAT4	I2	None
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FYCO1	I2	None
WDR82	I2	None
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SMC4	I2	None
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TTC14	I2	None
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PPP1R2	I2	None

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ZFYVE28	I2	None
KIAA0232	I2	None
TBC1D14	I2	None
RAB28	I2	None
PACRGL	I2	None
KLF3	I2	None
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TXK	I2	None
FRYL	I2	None
REST	I2	None
SEPT11	I2	None
CNOT6L	I2	None
GPRIN3	I2	None
TSPAN5	I2	None
LEF1	I2	None
MCUB	I2	None
KIAA1109	I2	None
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ARHGAP10	I2	None
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DDX60L	I2	None
BRD9	I2	None
ANKH	I2	None
RETREG1	I2	None
DROSHA	I2	None
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JMY	I2	None
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MAN2A1	I2	None
CAMK4	I2	None
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DIAPH1	I2	None
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GMDS	I2	None
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BTN3A1	I2	None
HLA-F	I2	None
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STK38	I2	None
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CLIC5	I2	None
SMAP1	I2	None
PREP	I2	None
PRDM1	I2	None
CRYBG1	I2	None
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FYN	I2	None
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THEMIS	I2	None
SAMD3	I2	None
HBS1L	I2	None
MAP7	I2	None
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TNFAIP3	I2	None
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HECA	I2	None
HIVEP2	I2	None
PHACTR2	I2	None
STXBP5	I2	None
SYNE1	I2	None
IPCEF1	I2	None
TMEM181	I2	None
SYTL3	I2	None
IGF2R	I2	None
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SDK1	I2	None
RNF216	I2	None
GLCCI1	I2	None
ICA1	I2	None
TAX1BP1	I2	None
HERPUD2	I2	None
AOAH	I2	None
OGDH	I2	None
IKZF1	I2	None
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MDFIC	I2	None
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GALNT11	I2	None
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SH3KBP1	I2	None
RPS6KA3	I2	None
CASK	I2	None
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PGK1	I2	None
ARHGEF6	I2	None
FAM85B	I2	None
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MTUS1	I2	None
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GSR	I2	None
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SGK3	I2	None
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PAG1	I2	None
WWP1	I2	None
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TRPS1	I2	None
EXT1	I2	None
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FBXO32	I2	None
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PVT1	I2	None
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SLA	I2	None
ST3GAL1	I2	None
TTC39B	I2	None
HAUS6	I2	None
DENND4C	I2	None
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KLF9	I2	None

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SEMA4D	I2	None
FGD3	I2	None
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TGFBR1	I2	None
TMEM245	I2	None
AKNA	I2	None
TRAF1	I2	None
MVB12B	I2	None
FAM102A	I2	None
SLC25A25	I2	None
SPTAN1	I2	None
USP20	I2	None
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MED27	I2	None
CAMSAP1	I2	None
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NAP1L4	I2	None
ARNTL	I2	None
PSMA1	I2	None
PDE3B	I2	None
NUCB2	I2	None
DGKZ	I2	None
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TMEM135	I2	None
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ATM	I2	None
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JAML	I2	None
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UBASH3B	I2	None
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CELF2	I2	None
FRMD4A	I2	None
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CUBN	I2	None
STAM	I2	None
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SVIL	I2	None
CCDC7	I2	None
ANK3	I2	None
VSIR	I2	None
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KAT6B	I2	None
TSPAN14	I2	None
CCSER2	I2	None
STAMBPL1	I2	None
TM9SF3	I2	None
SUFU	I2	None
SLK	I2	None
MXI1	I2	None
PDCD4	I2	None
CCDC186	I2	None
ABLIM1	I2	None
FAM160B1	I2	None
PDZD8	I2	None
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WNK1	I2	None
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BORCS5	I2	None
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CREBL2	I2	None
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FAR2	I2	None
KIAA1551	I2	None
NELL2	I2	None
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DGKA	I2	None
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HELB	I2	None
GRIP1	I2	None
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SCYL2	I2	None
RIC8B	I2	None
BTBD11	I2	None
ACACB	I2	None
ATP2A2	I2	None
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PXN	I2	None
P2RX4	I2	None

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EP400	I2	None
MPHOSPH8	I2	None
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ZMYM2	I2	None
ZDHHC20	I2	None
MTMR6	I2	None
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NAA16	I2	None
VWA8	I2	None
DGKH	I2	None
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ZC3H13	I2	None
ITM2B	I2	None
LPAR6	I2	None
TBC1D4	I2	None
LMO7	I2	None
ABCC4	I2	None
DOCK9	I2	None
TNFSF13B	I2	None
ATP11A	I2	None
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SNX6	I2	None
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RALGAPA1	I2	None
FBXO34	I2	None
PSMA3	I2	None
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SYNE2	I2	None
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GPHN	I2	None
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CEP128	I2	None
LINC02328	I2	None
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TC2N	I2	None
RIN3	I2	None
DDX24	I2	None
LINC01550	I2	None
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SETD3	I2	None
EVL	I2	None
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APBA2	I2	None
KLF13	I2	None
GOLGA8B	I2	None
RASGRP1	I2	None
C15orf53	I2	None

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ADAM10	I2	None
MINDY2	I2	None
RORA	I2	None
HERC1	I2	None
ZNF609	I2	None
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SEC11A	I2	None
SLCO3A1	I2	None
IGF1R	I2	None
ADAMTS17	I2	None
TARSL2	I2	None
MKL2	I2	None
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METTL9	I2	None
CDR2	I2	None
XPO6	I2	None
SEPT1	I2	None
ITGAL	I2	None
FUS	I2	None
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CYLD	I2	None
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SLC7A6	I2	None
SNTB2	I2	None
GLG1	I2	None
ZNRF1	I2	None
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KIAA0513	I2	None
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PIEZO1	I2	None
ANKRD11	I2	None
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ALOX12-AS1	I2	None
CHD3	I2	None
PIK3R5	I2	None
COX10	I2	None
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CPD	I2	None
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SLFN12L	I2	None
MLLT6	I2	None
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STAT3	I2	None
NBR1	I2	None

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DDX5	I2	None
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PITPNC1	I2	None
ARSG	I2	None
MAP2K6	I2	None
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TMC8	I2	None
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USP36	I2	None
RNF213	I2	None
CCDC57	I2	None
TBCD	I2	None
ENOSF1	I2	None
LPIN2	I2	None
PTPRM	I2	None
ANKRD12	I2	None
LDLRAD4	I2	None
NPC1	I2	None
TTC39C	I2	None
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WDR7	I2	None
CD226	I2	None
ATP9B	I2	None
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BCL2L1	I2	None
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CDK5RAP1	I2	None
SAMHD1	I2	None
PLCG1	I2	None
TOX2	I2	None
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NFATC2	I2	None
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ADGRE5	I2	None
TECR	I2	None
GATAD2A	I2	None
PBX4	I2	None
URI1	I2	None
GPI	I2	None
GRAMD1A	I2	None

KMT2B	I2	None
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SAE1	I2	None
IL17RA	I2	None
DGCR2	I2	None
MED15	I2	None
CABIN1	I2	None
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LIMK2	I2	None
PIK3IP1	I2	None
PIK3IP1-AS1	I2	None
SFI1	I2	None
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GRAP2	I2	None
NUP50	I2	None
FAM118A	I2	None
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EVA1C	I2	None
SYNJ1	I2	None
PAXBP1	I2	None
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RRP1B	I2	None
AGPAT3	I2	None
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SLAMF1	I2	None
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CLIP4	I2	None
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GPR174	I2	None
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LINC00861	I2	None
TNFSF8	I2	None
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CD3G	I2	None
SRGN	I2	None
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MAF	I2	None
CCR7	I2	None
AC008105.3	I2	None
SIRPG	I2	None
RASAL3	I2	None
ADA2	I2	None
ITGB2	I2	None
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TNFRSF14	I3	None
KAZN	I3	None
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HMGN2	I3	None
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RPS8	I3	None
CMPK1	I3	None
SCP2	I3	None
JUN	I3	None
CLCA4	I3	None
RPL5	I3	None
SLC25A24	I3	None
PRPF38B	I3	None
MAGI3	I3	None
ATP1A1	I3	None
SELENBP1	I3	None
S100A10	I3	None
S100A6	I3	None
PBX1	I3	None
ATP1B1	I3	None
PRRC2C	I3	None
RASAL2	I3	None
ARPC5	I3	None
C1orf21	I3	None
IVNS1ABP	I3	None
NR5A2	I3	None
ELF3	I3	None
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CD46	I3	None
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CAPN2	I3	None
CDC42BPA	I3	None
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CRIM1	I3	None
EPCAM	I3	None
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FABP1	I3	None
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SLC20A1	I3	None

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NCKAP5	I3	None
AC105402.3	I3	None
PPIG	I3	None
SSFA2	I3	None
SF3B1	I3	None
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PAR3B	I3	None
INO80D	I3	None
EEF1B2	I3	None
RPL37A	I3	None
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AGAP1	I3	None
NDUFA10	I3	None
CNTN4	I3	None
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GOLGA4	I3	None
WDR6	I3	None
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FLNB	I3	None
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MAGI1	I3	None
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HHLA2	I3	None
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MGLL	I3	None
SEC61A1	I3	None
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NAALADL2	I3	None
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MAP3K13	I3	None
IGF2BP2	I3	None
EIF4A2	I3	None
MUC20-OT1	I3	None
GAK	I3	None
ADGRA3	I3	None
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SHROOM3	I3	None
RASGEF1B	I3	None
SH3D19	I3	None
FAM160A1	I3	None

FNIP2	I3	None
SH3RF1	I3	None
SEMA5A	I3	None
MYO10	I3	None
RPL37	I3	None
SELENOP	I3	None
PLPP1	I3	None
SREK1	I3	None
BDP1	I3	None
DHFR	I3	None
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PRELID2	I3	None
SLC26A2	I3	None
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LARP1	I3	None
ATP10B	I3	None
NPM1	I3	None
HNRNPH1	I3	None
CANX	I3	None
SQSTM1	I3	None
MGAT1	I3	None
RACK1	I3	None
C6orf62	I3	None
HLA-A	I3	None
HLA-E	I3	None
PPP1R10	I3	None
HLA-B	I3	None
BRD2	I3	None
RPS18	I3	None
SRSF3	I3	None
HSP90AB1	I3	None
LRRC1	I3	None
DST	I3	None
EEF1A1	I3	None
MYO6	I3	None
CD24	I3	None
MARCKS	I3	None
SGK1	I3	None
AFDN	I3	None
INTS1	I3	None
TNRC18	I3	None
ACTB	I3	None
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ZMIZ2	I3	None
PPIA	I3	None
SEMA3C	I3	None
AKAP9	I3	None
BAIAP2L1	I3	None
ZKSCAN1	I3	None

SLC26A3	I3	None
CFTR	I3	None
CHRM2	I3	None
AKAP17A	I3	None
MID1	I3	None
TMSB4X	I3	None
RBM10	I3	None
HEPH	I3	None
RPS4X	I3	None
POF1B	I3	None
BCAP31	I3	None
CSMD1	I3	None
DOCK5	I3	None
RPS20	I3	None
RPL7	I3	None
HNF4G	I3	None
CDH17	I3	None
PABPC1	I3	None
NDRG1	I3	None
PLEC	I3	None
PARP10	I3	None
RPL8	I3	None
AK3	I3	None
PTPRD	I3	None
NFIB	I3	None
RPS6	I3	None
UNC13B	I3	None
PCSK5	I3	None
VPS13A	I3	None
HNRNPK	I3	None
SLC44A1	I3	None
ECPAS	I3	None
RPL35	I3	None
RPL7A	I3	None
RABL6	I3	None
DPP7	I3	None
RPLP2	I3	None
RPL27A	I3	None
MTRNR2L8	I3	None
EIF4G2	I3	None
MICAL2	I3	None
CALCB	I3	None
PLEKHA7	I3	None
LGR4	I3	None
PRR5L	I3	None
CTNND1	I3	None
FTH1	I3	None
AHNAK	I3	None
CCDC88B	I3	None
NEAT1	I3	None

EHBP1L1	I3	None
CFL1	I3	None
GRK2	I3	None
CPT1A	I3	None
RPS3	I3	None
NXPE1	I3	None
ARHGEF12	I3	None
TMEM45B	I3	None
ST14	I3	None
KLF6	I3	None
RBM17	I3	None
KIAA1217	I3	None
ARHGAP21	I3	None
KIF5B	I3	None
PARD3	I3	None
TIMM23B	I3	None
PRKG1	I3	None
PSAP	I3	None
USP54	I3	None
PAPSS2	I3	None
PLCE1	I3	None
SH3PXD2A	I3	None
TCF7L2	I3	None
EIF3A	I3	None
CTBP2	I3	None
DOCK1	I3	None
CCND2	I3	None
GAPDH	I3	None
PTPN6	I3	None
EPS8	I3	None
FGD4	I3	None
PKP2	I3	None
TMBIM6	I3	None
LIMA1	I3	None
DAZAP2	I3	None
KRT8	I3	None
PRR13	I3	None
HNRNPA1	I3	None
MYL6	I3	None
NACA	I3	None
TSPAN8	I3	None
SLC25A3	I3	None
HSP90B1	I3	None
RPL6	I3	None
RPLP0	I3	None
MLEC	I3	None
UBC	I3	None
TPT1	I3	None
DACH1	I3	None
KLF5	I3	None

NDFIP2	I3	None
UGGT2	I3	None
PCCA	I3	None
ARGLU1	I3	None
LAMP1	I3	None
ACIN1	I3	None
NFKBIA	I3	None
PNN	I3	None
RPS29	I3	None
LGALS3	I3	None
GPX2	I3	None
SRSF5	I3	None
RBM25	I3	None
FOS	I3	None
CALM1	I3	None
DYNC1H1	I3	None
HSP90AA1	I3	None
CKB	I3	None
IGHA1	I3	None
HERC2	I3	None
GOLGA8A	I3	None
PHGR1	I3	None
SERF2	I3	None
B2M	I3	None
ANXA2	I3	None
TLN2	I3	None
TPM1	I3	None
RPL4	I3	None
RPLP1	I3	None
UACA	I3	None
THSD4-AS1	I3	None
NEO1	I3	None
LINGO1	I3	None
RHOT2	I3	None
RPS2	I3	None
SRRM2	I3	None
RBFOX1	I3	None
LITAF	I3	None
NFATC2IP	I3	None
DYNC1LI2	I3	None
CES2	I3	None
CDH1	I3	None
COX4I1	I3	None
KLHDC4	I3	None
RPL13	I3	None
TCF25	I3	None
PFN1	I3	None
ACADVL	I3	None
CWC25	I3	None
RPL23	I3	None

KRT19	I3	None
UBTF	I3	None
LUC7L3	I3	None
SPAG9	I3	None
RNF43	I3	None
LINC00511	I3	None
LLGL2	I3	None
ACOX1	I3	None
ACTG1	I3	None
P4HB	I3	None
ARHGDIA	I3	None
MIB1	I3	None
RIOK3	I3	None
MAVS	I3	None
PLCB4	I3	None
KIF16B	I3	None
RRBP1	I3	None
PYGB	I3	None
ACSS2	I3	None
SRSF6	I3	None
HNF4A	I3	None
YWHAB	I3	None
ZNF217	I3	None
BCAS1	I3	None
CTSZ	I3	None
ATP5F1E	I3	None
PPDPF	I3	None
PCMTD2	I3	None
BSG	I3	None
PTBP1	I3	None
TMEM259	I3	None
ABCA7	I3	None
ARHGAP45	I3	None
STK11	I3	None
CIRBP	I3	None
RPS15	I3	None
ABHD17A	I3	None
AP3D1	I3	None
AES	I3	None
EEF2	I3	None
ZBTB7A	I3	None
RPL36	I3	None
INSR	I3	None
ILF3	I3	None
TRIR	I3	None
JAK3	I3	None
JUND	I3	None
UBA52	I3	None
FXVD3	I3	None
ACTN4	I3	None

LGALS4	I3	None
SUPT5H	I3	None
FCGBP	I3	None
AC243967.1	I3	None
CEACAM1	I3	None
RPL18	I3	None
FTL	I3	None
RPL13A	I3	None
RPS11	I3	None
MYH14	I3	None
RPS9	I3	None
LENG8	I3	None
RPL28	I3	None
EPN1	I3	None
KIAA1671	I3	None
RPL3	I3	None
TRABD	I3	None
FP671120.1	I3	None
FP236383.1	I3	None
SON	I3	None
ETS2	I3	None
TMPRSS2	I3	None
PDE9A	I3	None
PDXK	I3	None
PFKL	I3	None
UBE2G2	I3	None
PTTG1IP	I3	None
PCNT	I3	None
MT-ND1	I3	None
MT-ND2	I3	None
MT-CO1	I3	None
MT-CO2	I3	None
MT-ATP6	I3	None
MT-CO3	I3	None
MT-ND3	I3	None
MT-ND4L	I3	None
MT-ND4	I3	None
MT-ND5	I3	None
MT-ND6	I3	None
MT-CYB	I3	None
GUCA2A	I3	None
UGT2B17	I3	None
TBC1D10C	I3	None
VIM	I3	None
SPEN	I4	None
SRSF10	I4	None
NASP	I4	None
MAST2	I4	None
AC104170.1	I4	None
NDC1	I4	None

LMO4	I4	None
BCAR3	I4	None
RBM15	I4	None
TTF2	I4	None
RGS13	I4	None
LBR	I4	None
TAF1B	I4	None
LPIN1	I4	None
GEN1	I4	None
MTA3	I4	None
MSH6	I4	None
EML6	I4	None
CCDC88A	I4	None
USP34	I4	None
SPRED2	I4	None
CCDC138	I4	None
BCL2L1	I4	None
PRPF40A	I4	None
TTN	I4	None
SPAG16	I4	None
FANCD2	I4	None
RBM6	I4	None
ZBTB20-AS5	I4	None
HMCES	I4	None
TOPBP1	I4	None
TRA2B	I4	None
BCL6	I4	None
LPP	I4	None
NSD2	I4	None
RFC1	I4	None
APBB2	I4	None
KIAA1211	I4	None
MOB1B	I4	None
RASSF6	I4	None
MAML3	I4	None
ZNF827	I4	None
OTULIN	I4	None
RAD17	I4	None
LHFPL2	I4	None
NSD1	I4	None
HIVEP1	I4	None
UBE2J1	I4	None
RAPGEF5	I4	None
EEPD1	I4	None
SUGCT	I4	None
CUX1	I4	None
EZH2	I4	None
CTPS2	I4	None
RBBP7	I4	None
POLA1	I4	None

DMD	I4	None
LOXL2	I4	None
ENTPD4	I4	None
TCEA1	I4	None
MYBL1	I4	None
CPNE3	I4	None
UBR5	I4	None
AC023590.1	I4	None
ZFAT	I4	None
KANK1	I4	None
CCDC171	I4	None
UBAP2	I4	None
ANP32B	I4	None
SNX30	I4	None
RALGPS1	I4	None
TSC1	I4	None
PDGFD	I4	None
ZFAND4	I4	None
BTAF1	I4	None
IDE	I4	None
HELLS	I4	None
DNMBP	I4	None
SOX5	I4	None
LRMP	I4	None
DDX11	I4	None
HDAC7	I4	None
SPATS2	I4	None
FGD6	I4	None
VEZT	I4	None
METAP2	I4	None
SLC41A2	I4	None
KNTC1	I4	None
BRI3BP	I4	None
HMGB1	I4	None
BRCA2	I4	None
RFC3	I4	None
ARHGEF7	I4	None
UPF3A	I4	None
TXNDC16	I4	None
SGPP1	I4	None
RCOR1	I4	None
CEP152	I4	None
MYO1E	I4	None
MYO9A	I4	None
DNASE1	I4	None
USP7	I4	None
SMG1	I4	None
ST3GAL2	I4	None
CDYL2	I4	None
ACSF3	I4	None

FANCA	I4	None
ARHGAP44	I4	None
AC098850.3	I4	None
PRPSAP2	I4	None
ATAD5	I4	None
GGNBP2	I4	None
BRCA1	I4	None
BRIP1	I4	None
SLC39A11	I4	None
SEC14L1	I4	None
DSTN	I4	None
KIF3B	I4	None
DNMT1	I4	None
SUGP2	I4	None
AC011447.3	I4	None
PPP6R1	I4	None
TTC28	I4	None
BRWD1	I4	None
AC012368.1	I4	None
ZNF804A	I4	None
MME	I4	None
KLHL6	I4	None
S100Z	I4	None
AFF2	I4	None
NUGGC	I4	None
AC025569.1	I4	None
EPB41	I5	None
FAF1	I5	None
JAK1	I5	None
PRKACB	I5	None
SLC30A7	I5	None
LINC00623	I5	None
RPRD2	I5	None
CDC42SE1	I5	None
SLAMF6	I5	None
PTPRC	I5	None
DSTYK	I5	None
TRAF3IP3	I5	None
ITPKB	I5	None
ARID4B	I5	None
AKT3	I5	None
SMYD3	I5	None
BABAM2	I5	None
EML4	I5	None
THADA	I5	None
CAMKMT	I5	None
FOXN2	I5	None
NCK2	I5	None
SH3RF3	I5	None
R3HDM1	I5	None

CYTIP	I5	None
TLK1	I5	None
WIPF1	I5	None
SLC4A7	I5	None
TGFBR2	I5	None
IP6K1	I5	None
DENND6A	I5	None
ZNF654	I5	None
RYK	I5	None
RASA2	I5	None
MBNL1	I5	None
ATP11B	I5	None
ARAP2	I5	None
SLAIN2	I5	None
CHIC2	I5	None
AC053527.1	I5	None
RAP1GDS1	I5	None
SPATA5	I5	None
LRBA	I5	None
RICTOR	I5	None
OXCT1	I5	None
EMB	I5	None
KIF2A	I5	None
RASA1	I5	None
CCNH	I5	None
AC116366.3	I5	None
THOC3	I5	None
EXOC2	I5	None
CDKAL1	I5	None
SUPT3H	I5	None
SESN1	I5	None
CEP85L	I5	None
AKAP7	I5	None
MAP3K5	I5	None
TAB2	I5	None
SP4	I5	None
BBS9	I5	None
TYW1	I5	None
PHTF2	I5	None
TRIM56	I5	None
COG5	I5	None
MAGED1	I5	None
FTX	I5	None
AMMECR1	I5	None
SEPT6	I5	None
STAG2	I5	None
MECP2	I5	None
KAT6A	I5	None
DECR1	I5	None
SMARCA2	I5	None

CEMIP2	I5	None
USP47	I5	None
CD44	I5	None
TTC12	I5	None
CBL	I5	None
TAF3	I5	None
ZEB1	I5	None
EPC1	I5	None
NUTM2B-AS1	I5	None
ADD3	I5	None
CLEC2D	I5	None
CCDC91	I5	None
PCED1B	I5	None
SLC16A7	I5	None
USP15	I5	None
OSBPL8	I5	None
CRADD	I5	None
PSPC1	I5	None
FOXO1	I5	None
PIBF1	I5	None
KLF12	I5	None
UBAC2	I5	None
CLYBL	I5	None
GNG2	I5	None
ARMH4	I5	None
DCAF5	I5	None
CCDC88C	I5	None
WDR20	I5	None
MARK3	I5	None
GABPB1	I5	None
USP3	I5	None
MAP2K5	I5	None
ARIH1	I5	None
CRTC3	I5	None
FTO	I5	None
TANGO6	I5	None
CRLF3	I5	None
ZNF207	I5	None
TAF15	I5	None
TSPOAP1-AS1	I5	None
MALT1	I5	None
BCL2	I5	None
MBP	I5	None
MMP24OS	I5	None
STK4	I5	None
ZNF708	I5	None
RUNX1	I5	None
ADARB1	I5	None
ITGA4	I5	None
AC093010.2	I5	None

APBB1IP	I5	None
CD69	I5	None
ACAP1	I5	None
KIF1B	I6	activated
CTTNBP2NL	I6	activated
MCL1	I6	activated
RGL1	I6	activated
SLC8A1	I6	activated
MERTK	I6	activated
FMNL2	I6	activated
BAZ2B	I6	activated
SPATS2L	I6	activated
PID1	I6	activated
FRMD4B	I6	activated
ATP1B3	I6	activated
PLSCR1	I6	activated
ABCC5	I6	activated
TFRC	I6	activated
RBPJ	I6	activated
RBM47	I6	activated
WDFY3	I6	activated
FAM13A	I6	activated
ACSL1	I6	activated
ZSWIM6	I6	activated
FCHO2	I6	activated
MCTP1	I6	activated
H2AFY	I6	activated
RNF130	I6	activated
SLC22A23	I6	activated
ANKS1A	I6	activated
ARHGAP18	I6	activated
NHSL1	I6	activated
NAMPT	I6	activated
DOCK4	I6	activated
SAT1	I6	activated
CTSB	I6	activated
STK3	I6	activated
ZFAND5	I6	activated
DAPK1	I6	activated
AP2A2	I6	activated
CHKA	I6	activated
SLCO2B1	I6	activated
MRC1	I6	activated
PLXDC2	I6	activated
CREM	I6	activated
LRMDA	I6	activated
KCNMA1	I6	activated
ZMIZ1	I6	activated
PTPRE	I6	activated
CD163L1	I6	activated

SRGAP1	I6	activated
CPM	I6	activated
STARD13	I6	activated
FMN1	I6	activated
SPRED1	I6	activated
ATP8B4	I6	activated
DMXL2	I6	activated
ZFHX3	I6	activated
GAS7	I6	activated
EPB41L3	I6	activated
RAB31	I6	activated
C20orf194	I6	activated
NFIC	I6	activated
MYO1F	I6	activated
ITSN1	I6	activated
MS4A6A	I6	activated

Supplementary Table 3-3 hdWGCNA-identified modules
in stromal cells

Gene	Module	Tag
GNB1	S1	None
TNFRSF1B	S1	None
HSPG2	S1	None
LUZP1	S1	None
GPBP1L1	S1	None
LEPR	S1	None
ST6GALNAC3	S1	None
ARHGAP29	S1	None
VAV3	S1	None
CEPT1	S1	None
WNT2B	S1	None
RNF115	S1	None
TPM3	S1	None
IFI16	S1	None
DNM3	S1	None
XPR1	S1	None
NR5A2	S1	None
PLXNA2	S1	None
PPP2R5A	S1	None
PTPN14	S1	None
ITPKB	S1	None
CDC42BPA	S1	None
DISC1	S1	None
AKT3	S1	None
SNTG2	S1	None
PXDN	S1	None
ITSN2	S1	None
FOSL2	S1	None
RASGRP3	S1	None
CRIM1	S1	None
EPAS1	S1	None
FBXO11	S1	None
FOXM2	S1	None
PELI1	S1	None
ARID5A	S1	None
MGAT4A	S1	None
TBC1D8	S1	None
BCL2L11	S1	None
PKP4	S1	None
NOSTRIN	S1	None
ITGA6	S1	None
RAPGEF4	S1	None
CHN1	S1	None
TTN	S1	None
HECW2	S1	None
BMPR2	S1	None

NRP2	S1	None
KLF7	S1	None
EPHA4	S1	None
WDFY1	S1	None
INPP5D	S1	None
VGLL4	S1	None
IQSEC1	S1	None
GALNT15	S1	None
ZNF385D	S1	None
TGFBR2	S1	None
CMTM8	S1	None
MYRIP	S1	None
CTNNB1	S1	None
NKTR	S1	None
SNRK	S1	None
GNAI2	S1	None
ARHGEF3	S1	None
ADAMTS9	S1	None
MAGI1	S1	None
FRMD4B	S1	None
ARHGAP31	S1	None
KALRN	S1	None
PLXND1	S1	None
SLCO2A1	S1	None
NCK1	S1	None
PIK3CB	S1	None
ATP1B3	S1	None
WWTR1	S1	None
IQCJ-SCHIP1	S1	None
MECOM	S1	None
GNB4	S1	None
USP13	S1	None
ST6GAL1	S1	None
CCDC50	S1	None
ZFYVE28	S1	None
RNF4	S1	None
LDB2	S1	None
CCDC149	S1	None
KLHL5	S1	None
LIMCH1	S1	None
UBA6	S1	None
CNOT6L	S1	None
TSPAN5	S1	None
EMCN	S1	None
SEC24B	S1	None
SPRY1	S1	None
TBC1D9	S1	None
SMAD1	S1	None
RAPGEF2	S1	None
DDX60L	S1	None

GPM6A	S1	None
STOX2	S1	None
SNX25	S1	None
SORBS2	S1	None
MTMR12	S1	None
RAI14	S1	None
ARL15	S1	None
PLPP1	S1	None
IPO11	S1	None
ADAMTS6	S1	None
MAST4	S1	None
FCHO2	S1	None
ARHGEF28	S1	None
COL4A3BP	S1	None
RASGRF2	S1	None
MEF2C	S1	None
MCTP1	S1	None
EPB41L4A	S1	None
SEMA6A	S1	None
LINC02147	S1	None
MARCH3	S1	None
KLHL3	S1	None
CTNNA1	S1	None
DIAPH1	S1	None
ARHGAP26	S1	None
NDST1	S1	None
STK10	S1	None
DUSP22	S1	None
SLC22A23	S1	None
NEDD9	S1	None
PHACTR1	S1	None
DTNBP1	S1	None
ANKS1A	S1	None
LRRC1	S1	None
AL357507.1	S1	None
NKAIN2	S1	None
NCOA7	S1	None
NHSL1	S1	None
UTRN	S1	None
SASH1	S1	None
PLEKHG1	S1	None
CNKSR3	S1	None
ZDHHC14	S1	None
AGPAT4	S1	None
AFDN	S1	None
ICA1	S1	None
THSD7A	S1	None
RAPGEF5	S1	None
OSBPL3	S1	None
NOD1	S1	None

ELMO1	S1	None
GRB10	S1	None
HIP1	S1	None
PTPN12	S1	None
ABCB1	S1	None
TECPR1	S1	None
TRIM56	S1	None
KMT2E	S1	None
DOCK4	S1	None
ZNF277	S1	None
MET	S1	None
CTTNBP2	S1	None
METTL2B	S1	None
PRKX	S1	None
RPGR	S1	None
SHROOM4	S1	None
NBDY	S1	None
MSN	S1	None
CLIC2	S1	None
MSRA	S1	None
MTUS1	S1	None
CSGALNACT1	S1	None
TNFRSF10B	S1	None
HMBOX1	S1	None
KAT6A	S1	None
LYN	S1	None
FZD6	S1	None
FAM91A1	S1	None
PCAT1	S1	None
ASAP1	S1	None
NDRG1	S1	None
PTK2	S1	None
DENND3	S1	None
HSF1	S1	None
ZNF251	S1	None
RFX3	S1	None
NFIB	S1	None
DENND4C	S1	None
BMS1P14	S1	None
CNTNAP3B	S1	None
CEMIP2	S1	None
ABHD17B	S1	None
ZNF462	S1	None
CTNNAL1	S1	None
ENG	S1	None
RAPGEF1	S1	None
SWAP70	S1	None
GALNT18	S1	None
PIK3C2A	S1	None
HSD17B12	S1	None

FCHSD2	S1	None
RAB6A	S1	None
PICALM	S1	None
PRSS23	S1	None
FZD4	S1	None
SESN3	S1	None
RDX	S1	None
ARHGEF12	S1	None
ETS1	S1	None
FLI1	S1	None
LARP4B	S1	None
SFMBT2	S1	None
PIP4K2A	S1	None
CREM	S1	None
CCNY	S1	None
JMJD1C	S1	None
DDX21	S1	None
LRMDA	S1	None
FAM213A	S1	None
TSPAN14	S1	None
NRG3	S1	None
EXOC6	S1	None
PDLIM1	S1	None
ENTPD1	S1	None
AL365273.2	S1	None
ABLIM1	S1	None
CHST15	S1	None
PTPRE	S1	None
WNK1	S1	None
RIMKLB	S1	None
APOLD1	S1	None
TMTC1	S1	None
BICD1	S1	None
HDAC7	S1	None
AC074032.1	S1	None
TFCP2	S1	None
RBMS2	S1	None
PTPRB	S1	None
TBC1D15	S1	None
DUSP6	S1	None
ATP2B1	S1	None
NR2C1	S1	None
VEZT	S1	None
ELK3	S1	None
CDK17	S1	None
PXN	S1	None
FLT1	S1	None
STARD13	S1	None
RFC3	S1	None
LRCH1	S1	None

RB1	S1	None
KPNA3	S1	None
DOCK9	S1	None
EFNB2	S1	None
FAM155A	S1	None
ARHGEF7	S1	None
ATP11A	S1	None
MCF2L	S1	None
GAS6	S1	None
PRKCH	S1	None
SYNE2	S1	None
SPTLC2	S1	None
ATXN3	S1	None
BTBD7	S1	None
WARS	S1	None
CDC42BPB	S1	None
KLC1	S1	None
PPP1R13B	S1	None
CYFIP1	S1	None
TJP1	S1	None
SLC12A6	S1	None
MAPKBP1	S1	None
MYO5C	S1	None
MYO5A	S1	None
NEDD4	S1	None
MYO1E	S1	None
UACA	S1	None
SIN3A	S1	None
NR2F2	S1	None
MEF2A	S1	None
EMP2	S1	None
MKL2	S1	None
IQCK	S1	None
NLRC5	S1	None
SNTB2	S1	None
ZNRF1	S1	None
CDH13	S1	None
TAF1C	S1	None
FBXO31	S1	None
CRK	S1	None
NLRP1	S1	None
TTC19	S1	None
PLEKHM1	S1	None
CDC27	S1	None
PPM1D	S1	None
MAP3K3	S1	None
PECAM1	S1	None
PITPNC1	S1	None
MYO15B	S1	None
SEC14L1	S1	None

CYTH1	S1	None
TBCD	S1	None
YES1	S1	None
PTPRM	S1	None
GALNT1	S1	None
TCF4	S1	None
ATP8B1	S1	None
ZCCHC2	S1	None
AL136531.2	S1	None
PLCB1	S1	None
PLCB4	S1	None
BTBD3	S1	None
RALGAPA2	S1	None
ASXL1	S1	None
PPP1R16B	S1	None
PKIG	S1	None
NCOA3	S1	None
PIP5K1C	S1	None
INSR	S1	None
CDC37	S1	None
SLC44A2	S1	None
DOCK6	S1	None
AKAP8	S1	None
SIN3B	S1	None
KIAA0355	S1	None
GRAMD1A	S1	None
ZNF235	S1	None
PRKD2	S1	None
SELENOW	S1	None
CARD8	S1	None
BCR	S1	None
KIAA1671	S1	None
LIMK2	S1	None
MYH9	S1	None
TPTEP2-CSNK1E	S1	None
TBC1D22A	S1	None
C22orf34	S1	None
SHANK3	S1	None
USP25	S1	None
APP	S1	None
EVA1C	S1	None
ERG	S1	None
BACE2	S1	None
ABCG1	S1	None
ADGRL4	S1	None
PALMD	S1	None
CALCRL	S1	None
FGD5	S1	None
STK32B	S1	None
TLL1	S1	None

VEGFC	S1	None
ABLIM3	S1	None
ADGRF5	S1	None
FILIP1	S1	None
CD36	S1	None
CAV1	S1	None
CXorf36	S1	None
PREX2	S1	None
PKHD1L1	S1	None
ENPP2	S1	None
TEK	S1	None
EGFL7	S1	None
MCAM	S1	None
NRP1	S1	None
SRGN	S1	None
CPXM2	S1	None
ANO2	S1	None
VWF	S1	None
GRASP	S1	None
RHOJ	S1	None
HDGFL3	S1	None
ZNF521	S1	None
KLF2	S1	None
PARVB	S1	None
TMCO4	S10	None
SPATA6	S10	None
AGL	S10	None
ASH1L	S10	None
KCTD3	S10	None
NUP133	S10	None
ANKRD36C	S10	None
ARHGAP15	S10	None
UBR3	S10	None
LRRFIP2	S10	None
DZIP3	S10	None
AC092691.1	S10	None
PPM1L	S10	None
MAP3K13	S10	None
BANK1	S10	None
PRDM5	S10	None
GAB1	S10	None
PHYKPL	S10	None
TNXB	S10	None
BICRAL	S10	None
ADGRB3	S10	None
UFL1	S10	None
RNF146	S10	None
BMPER	S10	None
ELN	S10	None
PDK4	S10	None

PRKAR2B	S10	None
ZFX	S10	None
KDM6A	S10	None
OPHN1	S10	None
SYTL4	S10	None
RAP2C-AS1	S10	None
FGF13	S10	None
CDC37L1	S10	None
FKBP15	S10	None
GSN	S10	None
PSMA1	S10	None
PDE3B	S10	None
TTC17	S10	None
EPC1	S10	None
PPP3CB	S10	None
KAT6B	S10	None
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SOS2	S10	None
FAM214A	S10	None
SLTM	S10	None
TLN2	S10	None
ADAMTSL3	S10	None
LMF1	S10	None
ASPA	S10	None
ULK2	S10	None
CALCOCO2	S10	None
KIAA1328	S10	None
SPTLC3	S10	None
SAMHD1	S10	None
TNRC6B	S10	None
CP	S10	None
ADH1B	S10	None
ANKRD33B	S10	None
SEMA3E	S10	None
SCARA5	S10	None
ABCA8	S10	None
ADAMTS1	S10	None
SCMH1	S11	None
LTBP1	S11	None
GTDC1	S11	None
FMNL2	S11	None
ITGAV	S11	None
RBMS3	S11	None
GXYLT2	S11	None
ROBO2	S11	None
EPHA3	S11	None
TMEM150C	S11	None
PARP8	S11	None

ANKRD6	S11	None
MOXD1	S11	None
ARID1B	S11	None
SLC22A3	S11	None
CACNA2D1	S11	None
HIPK2	S11	None
MSC-AS1	S11	None
ZC2HC1A	S11	None
AF117829.1	S11	None
ZHX2	S11	None
PAPPA	S11	None
PHF21A	S11	None
FAM208B	S11	None
IL15RA	S11	None
ZEB1-AS1	S11	None
ARHGAP22	S11	None
SGPL1	S11	None
FAS	S11	None
CLEC2D	S11	None
OSBPL8	S11	None
WASHC4	S11	None
ENOX1	S11	None
CCDC122	S11	None
MFGE8	S11	None
SLCO3A1	S11	None
CLEC16A	S11	None
STXBP4	S11	None
FHOD3	S11	None
MIR646HG	S11	None
C3	S11	None
TYMP	S11	None
PCBP3	S11	None
RFTN2	S11	None
OSMR-AS1	S11	None
GRID1	S11	None
DZIP1	S11	None
LTBP2	S11	None
FAM20A	S11	None
LINC01482	S11	None
ALPK2	S11	None
SGIP1	S12	activated
MAPKAPK2	S12	activated
DNAH14	S12	activated
YWHAQ	S12	activated
GMCL1	S12	activated
MAT2A	S12	activated
CYTOR	S12	activated
MIR4435-2HG	S12	activated
AC007319.1	S12	activated
SLC39A10	S12	activated

BHLHE40	S12	activated
SMARCC1	S12	activated
ZMAT3	S12	activated
ANKH	S12	activated
SUB1	S12	activated
ENC1	S12	activated
MCC	S12	activated
SQSTM1	S12	activated
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HACE1	S12	activated
PDE10A	S12	activated
MTPN	S12	activated
CDKL5	S12	activated
TIMP1	S12	activated
PVT1	S12	activated
MFSD14B	S12	activated
XRRA1	S12	activated
RHOBTB1	S12	activated
FMNL3	S12	activated
POLR1D	S12	activated
FRY	S12	activated
TSC22D1	S12	activated
IPO5	S12	activated
MMP14	S12	activated
TMED10	S12	activated
TBC1D2B	S12	activated
KIFC3	S12	activated
BCAR1	S12	activated
IGFBP4	S12	activated
RNF24	S12	activated
BCL2L1	S12	activated
SULF2	S12	activated
GNAS	S12	activated
SH3GL1	S12	activated
JUNB	S12	activated
KIAA0930	S12	activated
COL18A1	S12	activated
RBMS3-AS3	S12	activated
PLAT	S12	activated
PER3	S2	None
FBLIM1	S2	None
SPEN	S2	None
ARHGEF10L	S2	None
HP1BP3	S2	None
EIF4G3	S2	None
HMG2	S2	None
PHACTR4	S2	None
EPB41	S2	None
RBBP4	S2	None

PTPRF	S2	None
ZSWIM5	S2	None
TESK2	S2	None
ZYG11B	S2	None
RAVER2	S2	None
GIPC2	S2	None
ADGRL2	S2	None
CLCA4	S2	None
CTTNBP2NL	S2	None
MAGI3	S2	None
RSBN1	S2	None
TXNIP	S2	None
CTSS	S2	None
SELENBP1	S2	None
GATAD2B	S2	None
PRDX6	S2	None
KLHL20	S2	None
RALGPS2	S2	None
TOR1AIP1	S2	None
DENND1B	S2	None
PTPRC	S2	None
PIGR	S2	None
NSL1	S2	None
IARS2	S2	None
TTC13	S2	None
SIPA1L2	S2	None
LYST	S2	None
CHRM3	S2	None
CNST	S2	None
KIDINS220	S2	None
MBOAT2	S2	None
SMC6	S2	None
SLC30A6	S2	None
MXD1	S2	None
ALMS1	S2	None
TET3	S2	None
FABP1	S2	None
MRPS5	S2	None
TMEM131	S2	None
REV1	S2	None
PTPN18	S2	None
BAZ2B	S2	None
AC073050.1	S2	None
STK39	S2	None
AC019330.1	S2	None
SATB2	S2	None
SP110	S2	None
FARP2	S2	None
TAMM41	S2	None
PPARG	S2	None

TSEN2	S2	None
RAF1	S2	None
OXNAD1	S2	None
NR1D2	S2	None
LIMD1	S2	None
SCAP	S2	None
RBM6	S2	None
FAM3D	S2	None
PPP4R2	S2	None
CGGBP1	S2	None
MTRNR2L12	S2	None
ZNF148	S2	None
MGLL	S2	None
STAG1	S2	None
PLS1	S2	None
PLCH1	S2	None
TNFSF10	S2	None
LSG1	S2	None
ACAP2	S2	None
MUC20-OT1	S2	None
TFRC	S2	None
ZNF718	S2	None
ZNF721	S2	None
GAK	S2	None
MAEA	S2	None
NSD2	S2	None
ANAPC4	S2	None
STIM2	S2	None
KLF3	S2	None
SMIM14	S2	None
RBM47	S2	None
ATP8A1	S2	None
SLAIN2	S2	None
FRYL	S2	None
SLC4A4	S2	None
SHROOM3	S2	None
PLAC8	S2	None
HSD17B11	S2	None
TET2	S2	None
INPP4B	S2	None
NR3C2	S2	None
FAM160A1	S2	None
DDX60	S2	None
GALNT7	S2	None
HPGD	S2	None
RETREG1	S2	None
SELENOP	S2	None
MIER3	S2	None
IQGAP2	S2	None
TMEM161B	S2	None

GRAMD2B	S2	None
CDC42SE2	S2	None
PCBD2	S2	None
PRELID2	S2	None
SH3RF2	S2	None
SLC26A2	S2	None
PANK3	S2	None
HNRNPH1	S2	None
TBC1D9B	S2	None
GMDS	S2	None
GCNT2	S2	None
MBOAT1	S2	None
TDP2	S2	None
RIPOR2	S2	None
BTN3A1	S2	None
UBR2	S2	None
CLIC5	S2	None
CD2AP	S2	None
PHF3	S2	None
COL19A1	S2	None
FAM135A	S2	None
SH3BGRL2	S2	None
CYB5R4	S2	None
PKIB	S2	None
MAP7	S2	None
EZR	S2	None
FGFR1OP	S2	None
AOAH	S2	None
OGDH	S2	None
COBL	S2	None
SRI	S2	None
AKAP9	S2	None
SAMD9L	S2	None
PPP1R9A	S2	None
LMTK2	S2	None
CYP3A5	S2	None
LINC01004	S2	None
AHCYL2	S2	None
CHRM2	S2	None
PARP12	S2	None
MKRN1	S2	None
KMT2C	S2	None
RBBP7	S2	None
PHKA2	S2	None
MAGED1	S2	None
FAAH2	S2	None
HEPH	S2	None
TMEM164	S2	None
XACT	S2	None
LINC00894	S2	None

MTM1	S2	None
DOCK5	S2	None
PTK2B	S2	None
RAB11FIP1	S2	None
SLC20A2	S2	None
CPA6	S2	None
TPD52	S2	None
INTS8	S2	None
SAMD12	S2	None
PSIP1	S2	None
UNC13B	S2	None
GNE	S2	None
PIP5K1B	S2	None
TRPM6	S2	None
RASEF	S2	None
GOLM1	S2	None
MFSD14C	S2	None
ERP44	S2	None
STRBP	S2	None
DENND1A	S2	None
PPP6C	S2	None
ABO	S2	None
CDHR5	S2	None
LGR4	S2	None
PRR5L	S2	None
PTPRJ	S2	None
CTNND1	S2	None
FAM111A	S2	None
AHNAK	S2	None
CHKA	S2	None
CPT1A	S2	None
SHANK2	S2	None
NUMA1	S2	None
POLD3	S2	None
ARRB1	S2	None
PAK1	S2	None
PCF11	S2	None
SYTL2	S2	None
BIRC3	S2	None
NXPE1	S2	None
KMT2A	S2	None
SORL1	S2	None
TBRG1	S2	None
TMEM45B	S2	None
APLP2	S2	None
USP6NL	S2	None
FAM171A1	S2	None
ANKRD26	S2	None
MPP7	S2	None
SIRT1	S2	None

SLC25A16	S2	None
ANAPC16	S2	None
PLCE1	S2	None
ZNF518A	S2	None
DNMBP	S2	None
NT5C2	S2	None
MXI1	S2	None
PDCD4	S2	None
TCF7L2	S2	None
CCDC186	S2	None
ATE1	S2	None
B4GALNT3	S2	None
FAR2	S2	None
FGD4	S2	None
PKP2	S2	None
SLC2A13	S2	None
SLC38A1	S2	None
METTL7A	S2	None
MYL6	S2	None
RASSF3	S2	None
PAWR	S2	None
TMCC3	S2	None
APAF1	S2	None
TDG	S2	None
SLC41A2	S2	None
UBE3B	S2	None
ANKRD13A	S2	None
PPP1CC	S2	None
ALDH2	S2	None
MAPKAPK5	S2	None
RNF34	S2	None
MLXIP	S2	None
PITPNM2	S2	None
SBNO1	S2	None
STK24	S2	None
CHD8	S2	None
FBXO34	S2	None
PPM1A	S2	None
SGPP1	S2	None
FUT8	S2	None
PTPN21	S2	None
CALM1	S2	None
RPS6KA5	S2	None
DGLUCY	S2	None
CCDC88C	S2	None
PPP4R3A	S2	None
CLMN	S2	None
CCNK	S2	None
WDR20	S2	None
RCOR1	S2	None

CKB	S2	None
IGHA1	S2	None
RTF1	S2	None
TMEM87A	S2	None
STARD9	S2	None
CASC4	S2	None
C15orf48	S2	None
AC025580.2	S2	None
DMXL2	S2	None
HERC1	S2	None
DAPK2	S2	None
SCAPER	S2	None
ZNF710	S2	None
SEMA4B	S2	None
LUC7L	S2	None
ADCY9	S2	None
RBFOX1	S2	None
LITAF	S2	None
TMC5	S2	None
CDR2	S2	None
PRKCB	S2	None
ARHGAP17	S2	None
AQP8	S2	None
N4BP1	S2	None
CNOT1	S2	None
CES2	S2	None
PDPR	S2	None
PSMD7	S2	None
PLCG2	S2	None
KLHDC4	S2	None
SPG7	S2	None
MYO1C	S2	None
ZZEF1	S2	None
ARHGAP44	S2	None
PRPSAP2	S2	None
SUZ12	S2	None
CWC25	S2	None
SKAP1	S2	None
AKAP1	S2	None
CLTC	S2	None
DCAF7	S2	None
PRKCA	S2	None
BPTF	S2	None
MAP2K6	S2	None
LINC00511	S2	None
GRB2	S2	None
LLGL2	S2	None
ACOX1	S2	None
SMCHD1	S2	None
MYL12B	S2	None

ABHD3	S2	None
RIOK3	S2	None
MYO5B	S2	None
CCDC68	S2	None
NEDD4L	S2	None
KIAA1468	S2	None
VPS4B	S2	None
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ACSS2	S2	None
ZMYND8	S2	None
BCAS1	S2	None
PCK1	S2	None
GNA11	S2	None
DPP9	S2	None
TRIP10	S2	None
ZNF846	S2	None
DNM2	S2	None
MAU2	S2	None
RHPN2	S2	None
FXYD3	S2	None
SIPA1L3	S2	None
LGALS4	S2	None
FCGBP	S2	None
AKT2	S2	None
LTBP4	S2	None
CEACAM7	S2	None
CEACAM1	S2	None
ARHGAP35	S2	None
FCGRT	S2	None
IRF3	S2	None
ZSCAN5A	S2	None
MICAL3	S2	None
EWSR1	S2	None
PRR14L	S2	None
TST	S2	None
ACO2	S2	None
TCF20	S2	None
DOPEY2	S2	None
TMPRSS2	S2	None
SLC37A1	S2	None
PDE9A	S2	None
GUCA2A	S2	None
LIMS2	S2	None
UGT2B17	S2	None
HLA-DRA	S2	None
A2M	S2	None
ERRFI1	S3	activated
MIR34AHG	S3	activated
SPSB1	S3	activated
PLEKHM2	S3	activated

FBXO42	S3	activated
COL16A1	S3	activated
CSMD2	S3	activated
DDAH1	S3	activated
HS2ST1	S3	activated
COL11A1	S3	activated
SLC16A1-AS1	S3	activated
SLC22A15	S3	activated
NBPF15	S3	activated
PDE4DIP	S3	activated
AC245297.3	S3	activated
FLG-AS1	S3	activated
ATP8B2	S3	activated
LMNA	S3	activated
COPA	S3	activated
DCAF6	S3	activated
SLC19A2	S3	activated
RASAL2	S3	activated
ABL2	S3	activated
SOAT1	S3	activated
ATF3	S3	activated
ENAH	S3	activated
ACBD3	S3	activated
GALNT2	S3	activated
KIF26B	S3	activated
SMYD3	S3	activated
RNF144A	S3	activated
ADAM17	S3	activated
NBAS	S3	activated
RHOQ	S3	activated
TTC7A	S3	activated
RTN4	S3	activated
UGP2	S3	activated
RAB1A	S3	activated
ANTXR1	S3	activated
SFXN5	S3	activated
EIF2AK3	S3	activated
NPAS2	S3	activated
MAP4K4	S3	activated
IL1R1	S3	activated
LIMS1	S3	activated
RND3	S3	activated
NR4A2	S3	activated
RBMS1	S3	activated
COBLL1	S3	activated
MAP3K20	S3	activated
COL3A1	S3	activated
COL5A2	S3	activated
GLS	S3	activated
SPATS2L	S3	activated

ZDBF2	S3	activated
SPAG16	S3	activated
FN1	S3	activated
ARMC9	S3	activated
COL6A3	S3	activated
LRRFIP1	S3	activated
LINC01266	S3	activated
LMCD1-AS1	S3	activated
LMCD1	S3	activated
ANKRD28	S3	activated
UBE2E2	S3	activated
UBE2E1	S3	activated
FBXL2	S3	activated
PTPRG	S3	activated
PRICKLE2	S3	activated
GBE1	S3	activated
COL8A1	S3	activated
NFKBIZ	S3	activated
ALCAM	S3	activated
CBLB	S3	activated
ATP6V1A	S3	activated
ITGB5	S3	activated
HEG1	S3	activated
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TMCC1	S3	activated
PLOD2	S3	activated
PLSCR4	S3	activated
TSC22D2	S3	activated
TIPARP	S3	activated
MLF1	S3	activated
SKIL	S3	activated
FNDC3B	S3	activated
LINC00578	S3	activated
TPRG1	S3	activated
MB21D2	S3	activated
ATP13A3	S3	activated
APBB2	S3	activated
TMEM165	S3	activated
RUFY3	S3	activated
SEPT11	S3	activated
SCD5	S3	activated
SEC31A	S3	activated
PDLIM5	S3	activated
PPP3CA	S3	activated
SEC24D	S3	activated
ANXA5	S3	activated
FNIP2	S3	activated
TENM3	S3	activated
ACSL1	S3	activated
TRIO	S3	activated

BASP1	S3	activated
OXCT1	S3	activated
LHFPL2	S3	activated
HOMER1	S3	activated
VCAN	S3	activated
NR2F1-AS1	S3	activated
ELL2	S3	activated
SNCAIP	S3	activated
SPOCK1	S3	activated
HSPA9	S3	activated
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SH3PXD2B	S3	activated
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RUNX2	S3	activated
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MAGI2	S3	activated
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PID1	S6	None
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BCL6	S6	None
SORCS2	S6	None
SLIT2	S6	None
FAM114A1	S6	None
ATP10D	S6	None
ANTXR2	S6	None
WDFY3	S6	None
ARHGAP24	S6	None
MAPK10	S6	None
PTPN13	S6	None
PKD2	S6	None
FAM13A	S6	None
ANK2	S6	None
CAMK2D	S6	None
USP53	S6	None
ARHGAP10	S6	None
SH3D19	S6	None
FBXL7	S6	None
GHR	S6	None
PIK3R1	S6	None
CMYA5	S6	None
SSBP2	S6	None
RHOBTB3	S6	None
PAM	S6	None
EFNA5	S6	None
FER	S6	None
SLIT3	S6	None
CARMIL1	S6	None

FKBP5	S6	None
TENT5A	S6	None
BACH2	S6	None
FOXO3	S6	None
REV3L	S6	None
TRAF3IP2-AS1	S6	None
MAN1A1	S6	None
LAMA2	S6	None
PLAGL1	S6	None
UST	S6	None
ESR1	S6	None
SYNE1	S6	None
PRKN	S6	None
SDK1	S6	None
JAZF1	S6	None
CREB5	S6	None
EGFR	S6	None
TPST1	S6	None
AUTS2	S6	None
GALNT17	S6	None
AASS	S6	None
XIST	S6	None
MORC4	S6	None
DOCK11	S6	None
LONRF1	S6	None
DLC1	S6	None
TACC1	S6	None
FAM110B	S6	None
CYP7B1	S6	None
SDC2	S6	None
CPQ	S6	None
STK3	S6	None
VPS13B	S6	None
ZFPM2	S6	None
COL14A1	S6	None
PTPRD	S6	None
BNC2	S6	None
KLF9	S6	None
SVEP1	S6	None
LPAR1	S6	None
PBX3	S6	None
STIM1	S6	None
DLG2	S6	None
MAML2	S6	None
CEP126	S6	None
DYNC2H1	S6	None
CELF2	S6	None
PARD3	S6	None
ADK	S6	None
PTEN	S6	None

RNLS	S6	None
CUTC	S6	None
GBF1	S6	None
C1S	S6	None
MGST1	S6	None
SOX5	S6	None
SLC16A7	S6	None
FAM19A2	S6	None
MON2	S6	None
SRGAP1	S6	None
FRS2	S6	None
ACSS3	S6	None
MED13L	S6	None
LHFPL6	S6	None
ELF1	S6	None
PCDH9	S6	None
KLF12	S6	None
MYCBP2	S6	None
GPC6	S6	None
MBNL2	S6	None
FGF14	S6	None
ZFP36L1	S6	None
LINC02256	S6	None
FBN1	S6	None
RORA	S6	None
RAB8B	S6	None
IL16	S6	None
ZFHX3	S6	None
CRISPLD2	S6	None
WSB1	S6	None
ABCA9	S6	None
ABCA6	S6	None
ABCA10	S6	None
EPB41L3	S6	None
SETBP1	S6	None
ZBTB7C	S6	None
PTPRS	S6	None
HIF3A	S6	None
GRK3	S6	None
TTC28	S6	None
MKL1	S6	None
ROR1	S6	None
NID1	S6	None
MEIS1	S6	None
FIGN	S6	None
SCN7A	S6	None
ZNF385B	S6	None
AOX1	S6	None
C7	S6	None
EBF1	S6	None

RSPO3	S6	None
GLI3	S6	None
SRPX	S6	None
FGFR1	S6	None
LINC01239	S6	None
ZBTB16	S6	None
NNMT	S6	None
CLMP	S6	None
APBB1IP	S6	None
MFAP5	S6	None
RERG	S6	None
PDZRN4	S6	None
DCN	S6	None
IGF1	S6	None
ADGRD1	S6	None
WASF3	S6	None
DCLK1	S6	None
FLRT2	S6	None
FBLN5	S6	None
MEG3	S6	None
FBLN1	S6	None
RSRP1	S7	repressed
SMAP2	S7	repressed
HIVEP3	S7	repressed
EPS15	S7	repressed
FAM78B	S7	repressed
RABGAP1L	S7	repressed
LAMC2	S7	repressed
NFASC	S7	repressed
ESRRG	S7	repressed
SOS1	S7	repressed
TCF7L1	S7	repressed
INPP4A	S7	repressed
ZC3H6	S7	repressed
PLA2R1	S7	repressed
CSRNP3	S7	repressed
DNAH7	S7	repressed
ANKRD44	S7	repressed
COL4A4	S7	repressed
RFTN1	S7	repressed
CACNA2D3	S7	repressed
LRIG1	S7	repressed
ROBO1	S7	repressed
CFAP44	S7	repressed
USF3	S7	repressed
POGLUT1	S7	repressed
TMEM108	S7	repressed
SLC9A9	S7	repressed
PLD1	S7	repressed
NCEH1	S7	repressed

TAPT1-AS1	S7	repressed
KCNIP4	S7	repressed
RBPJ	S7	repressed
BMP2K	S7	repressed
STPG2	S7	repressed
PPA2	S7	repressed
ALPK1	S7	repressed
IL15	S7	repressed
LRBA	S7	repressed
TMEM131L	S7	repressed
SEMA5A	S7	repressed
OTULIN	S7	repressed
FYB1	S7	repressed
IL6ST	S7	repressed
TENT2	S7	repressed
FBN2	S7	repressed
SIL1	S7	repressed
NRG2	S7	repressed
RNF145	S7	repressed
TENM2	S7	repressed
HIVEP1	S7	repressed
PPARD	S7	repressed
HMG3	S7	repressed
PTPRK	S7	repressed
IFNGR1	S7	repressed
TNFAIP3	S7	repressed
ITGB8	S7	repressed
GSAP	S7	repressed
ADAM22	S7	repressed
DLD	S7	repressed
TMEM178B	S7	repressed
RAI2	S7	repressed
PCDH11X	S7	repressed
ERICH1	S7	repressed
AC120193.1	S7	repressed
CLU	S7	repressed
XKR4	S7	repressed
MATN2	S7	repressed
RNF19A	S7	repressed
RCL1	S7	repressed
JAK2	S7	repressed
KDM4C	S7	repressed
ADAMTSL1	S7	repressed
MOB3B	S7	repressed
GNA14	S7	repressed
DAPK1	S7	repressed
MUSK	S7	repressed
GARNL3	S7	repressed
PPFIBP2	S7	repressed
ABTB2	S7	repressed

SLCO2B1	S7	repressed
ACER3	S7	repressed
PIWIL4	S7	repressed
ARHGAP42	S7	repressed
ITIH5	S7	repressed
RASSF4	S7	repressed
SORCS1	S7	repressed
PARP11	S7	repressed
C1RL-AS1	S7	repressed
ST8SIA1	S7	repressed
TM7SF3	S7	repressed
ARNTL2	S7	repressed
CNTN1	S7	repressed
AC025159.1	S7	repressed
TRHDE	S7	repressed
SYT1	S7	repressed
LIN7A	S7	repressed
NEDD1	S7	repressed
CHPT1	S7	repressed
TMEM132C	S7	repressed
SMAD9	S7	repressed
NPAS3	S7	repressed
GNG2	S7	repressed
DAAM1	S7	repressed
TTLL5	S7	repressed
NRXN3	S7	repressed
TRAF3	S7	repressed
EXOC3L4	S7	repressed
TNFAIP2	S7	repressed
DPH6-DT	S7	repressed
PIAS1	S7	repressed
CTSH	S7	repressed
AC110023.1	S7	repressed
NR2F2-AS1	S7	repressed
AC138150.1	S7	repressed
TOM1L1	S7	repressed
CDC42EP4	S7	repressed
GNAL	S7	repressed
ANKRD29	S7	repressed
LAMA3	S7	repressed
MALT1	S7	repressed
BCL2	S7	repressed
PTPRT	S7	repressed
PLA2G4C	S7	repressed
LARGE1	S7	repressed
SREBF2	S7	repressed
CELSR1	S7	repressed
NRIP1	S7	repressed
PAXBP1	S7	repressed
C2CD2	S7	repressed

VCAM1	S7	repressed
CR2	S7	repressed
CR1	S7	repressed
DIRC3	S7	repressed
RARB	S7	repressed
FDCSP	S7	repressed
LIFR	S7	repressed
SNAP91	S7	repressed
SEMA3D	S7	repressed
GRIA4	S7	repressed
PKNOX2	S7	repressed
GFRA1	S7	repressed
MYO16	S7	repressed
NOVA1	S7	repressed
PAPLN	S7	repressed
AC091078.1	S7	repressed
LINC01197	S7	repressed
HS3ST3A1	S7	repressed
COLEC12	S7	repressed
CCNL2	S8	None
TNFRSF14	S8	None
NBPF3	S8	None
SRRM1	S8	None
NASP	S8	None
SSBP3	S8	None
JUN	S8	None
SRSF11	S8	None
GBP1	S8	None
PRPF38B	S8	None
SOX13	S8	None
MDM4	S8	None
PLEKHH2	S8	None
ZNF638	S8	None
NCKAP5	S8	None
HNMT	S8	None
PIIG	S8	None
SF3B1	S8	None
CHL1	S8	None
TRANK1	S8	None
GOLGA4	S8	None
PXK	S8	None
SUCLG2	S8	None
CRYBG3	S8	None
PARP14	S8	None
ADGRL3	S8	None
UNC5C	S8	None
KIAA1109	S8	None
OTULINL	S8	None
SREK1	S8	None
BDP1	S8	None

DDX46	S8	None
NSD1	S8	None
EXOC2	S8	None
TRERF1	S8	None
CUL9	S8	None
DST	S8	None
CASP8AP2	S8	None
PNISR	S8	None
LAMA4	S8	None
CEP85L	S8	None
TARID	S8	None
PDE7B	S8	None
DLL1	S8	None
GLCCI1	S8	None
PDE1C	S8	None
NT5C3A	S8	None
HERPUD2	S8	None
ZKSCAN1	S8	None
DENND2A	S8	None
TMEM176B	S8	None
AKAP17A	S8	None
ZC3H12B	S8	None
ATRX	S8	None
ARHGEF6	S8	None
PCM1	S8	None
PSD3	S8	None
ADAM28	S8	None
NKAIN3	S8	None
IL7	S8	None
TRAPPC9	S8	None
PTCH1	S8	None
LINC00476	S8	None
ERCC6L2	S8	None
SETX	S8	None
ST5	S8	None
SBF2	S8	None
ATM	S8	None
WAC-AS1	S8	None
TIMM23B	S8	None
ANK3	S8	None
CCAR1	S8	None
GRK5	S8	None
FGFR2	S8	None
C1RL	S8	None
BAZ2A	S8	None
R3HDM2	S8	None
ARGLU1	S8	None
HECTD1	S8	None
RBM25	S8	None
FOS	S8	None

SNW1	S8	None
GOLGA8A	S8	None
THSD4	S8	None
NEO1	S8	None
SMG1	S8	None
IL34	S8	None
FENDRR	S8	None
NCBP3	S8	None
XAF1	S8	None
MYO18A	S8	None
GGNBP2	S8	None
LUC7L3	S8	None
RNF213	S8	None
ANKRD12	S8	None
RALBP1	S8	None
CCDC102B	S8	None
PROCR	S8	None
SAFB	S8	None
ZNF43	S8	None
SNRNP70	S8	None
AC245060.5	S8	None
KREMEN1	S8	None
FP236383.1	S8	None
LTN1	S8	None
SON	S8	None
RCSD1	S8	None
EDIL3	S8	None
AC113383.1	S8	None
BMP5	S8	None
EPHA7	S8	None
GRIA3	S8	None
ADAMDEC1	S8	None
HAS2	S8	None
GPSM1	S8	None
ITGA8	S8	None
C1R	S8	None
RIPOR3	S8	None
GGT5	S8	None
CAMK2N1	S9	None
SH3BGRL3	S9	None
SFN	S9	None
PATJ	S9	None
ATP1B1	S9	None
ELF3	S9	None
PLEKHA6	S9	None
SLC30A10	S9	None
LBR	S9	None
AC105402.3	S9	None
SSFA2	S9	None
INO80D	S9	None

NDUFA10	S9	None
UQCRC1	S9	None
MUC13	S9	None
RASGEF1B	S9	None
CLCN3	S9	None
DHFR	S9	None
SLC27A6	S9	None
ATP10B	S9	None
HNRNPAB	S9	None
HLA-A	S9	None
TAPBP	S9	None
CD24	S9	None
MARCKS	S9	None
ACTB	S9	None
RAC1	S9	None
MUC12	S9	None
SLC26A3	S9	None
CFTR	S9	None
TMSB4X	S9	None
POF1B	S9	None
CSMD1	S9	None
HNF4G	S9	None
CDH17	S9	None
WNK2	S9	None
MTRNR2L8	S9	None
CFL1	S9	None
ST14	S9	None
GAPDH	S9	None
TMBIM6	S9	None
PRR13	S9	None
TSPAN8	S9	None
OLFM4	S9	None
KLF5	S9	None
LGALS3	S9	None
PHGR1	S9	None
B2M	S9	None
TSPAN3	S9	None
LINGO1	S9	None
ABHD17C	S9	None
CDH1	S9	None
CYB5B	S9	None
ATP2A3	S9	None
PFN1	S9	None
KRT19	S9	None
LINC02086	S9	None
ACTG1	S9	None
ARHGDIA	S9	None
DSG2	S9	None
HNF4A	S9	None
CTSZ	S9	None

BSG	S9	None
MISP	S9	None
ATP5F1D	S9	None
TRIR	S9	None
ZNF91	S9	None
C19orf33	S9	None
AC243967.1	S9	None
MYH14	S9	None
EPN1	S9	None
TTTY14	S9	None
FP671120.1	S9	None
TFF3	S9	None
MT-ND1	S9	None
MT-ND2	S9	None
MT-CO1	S9	None
MT-CO2	S9	None
MT-ATP6	S9	None
MT-CO3	S9	None
MT-ND4	S9	None
MT-ND5	S9	None
MT-ND6	S9	None

Supplementary Table 4-1 The enrichment analysis
of E1 and E5 for CMS classification

Module	CMS markers	FDR
E1	CMS1	1
E1	CMS2	1.75E-10
E1	CMS3	0.947124813
E1	CMS4	1
E5	CMS1	1
E5	CMS2	1.92E-06
E5	CMS3	1
E5	CMS4	0.839459845

Supplementary Table 4-2 The enrichment analysis of
E1 and E5 for iCMS classification

Module	iCMS markers	FDR
E1	iCMS2_Down	1
E1	iCMS2_Up	3.46E-64
E1	iCMS3_Down	1
E1	iCMS3_Up	0.410913112
E2	iCMS2_Down	4.34E-44
E5	iCMS2_Down	1
E5	iCMS2_Up	5.02E-08
E5	iCMS3_Down	1
E5	iCMS3_Up	1

Supplementary Table 5 The regulatory direction of the validation regulons

Regulons	Datasets	Regulon direction*	FDR
CEBPB	GSE178341	Up	1.99E-26
CEBPB	KUL5	Up	7.07E-07
CEBPB	SG1	Can't determine	NA
CEBPB	new_KUL3	Up	4.08E-20
RUNX1	GSE178341	Up	0.002627104
RUNX1	KUL5	Up	1.39E-13

*The direction of up- or downregulation in cancer cell was determined by the enrichment of regulons in DEGs (hypergeometric test).

Supplementary Table 6-1 Ligand–receptor interactions with E1 module genes as ligands

top_group	sender	receiver	ligand	receptor	id
Cancerous	epithelial	immune	ZP3	MERTK	ZP3_MERTK_epithelial_immune
Cancerous	epithelial	stromal	ANXA2	PLAT	ANXA2_PLAT_epithelial_stromal
Cancerous	epithelial	immune	CD55	ADGRE2	CD55_ADGRE2_epithelial_immune
Cancerous	epithelial	epithelial	F11R	F11R	F11R_F11R_epithelial_epithelial
Cancerous	epithelial	immune	ANXA2	TLR2	ANXA2_TLR2_epithelial_immune
Cancerous	epithelial	stromal	LFNG	NOTCH1	LFNG_NOTCH1_epithelial_stromal
Cancerous	epithelial	epithelial	LAMB3	ITGB4	LAMB3_ITGB4_epithelial_epithelial
Cancerous	epithelial	stromal	TGFBI	ITGB5	TGFBI_ITGB5_epithelial_stromal
Cancerous	epithelial	stromal	LAMB3	ITGA2	LAMB3_ITGA2_epithelial_stromal
Cancerous	epithelial	immune	LAMB3	ITGB1	LAMB3_ITGB1_epithelial_immune
Cancerous	epithelial	epithelial	LAMB3	ITGA2	LAMB3_ITGA2_epithelial_epithelial
Cancerous	epithelial	epithelial	SEMA4D	MET	SEMA4D_MET_epithelial_epithelial
Cancerous	epithelial	stromal	F11R	JAM3	F11R_JAM3_epithelial_stromal
Cancerous	epithelial	immune	CD55	ADGRE5	CD55_ADGRE5_epithelial_immune
Cancerous	epithelial	stromal	LAMB3	ITGB1	LAMB3_ITGB1_epithelial_stromal
Cancerous	epithelial	epithelial	SEMA4D	PLXNB1	SEMA4D_PLXNB1_epithelial_epithelial
Cancerous	epithelial	epithelial	TGFBI	ITGB4	TGFBI_ITGB4_epithelial_epithelial
Cancerous	epithelial	stromal	ANXA2	DYSF	ANXA2_DYSF_epithelial_stromal
Cancerous	epithelial	epithelial	LFNG	NOTCH1	LFNG_NOTCH1_epithelial_epithelial
Cancerous	epithelial	epithelial	EPCAM	CLDN1	EPCAM_CLDN1_epithelial_epithelial
Cancerous	epithelial	immune	TGFBI	ITGB1	TGFBI_ITGB1_epithelial_immune
Cancerous	epithelial	immune	CEACAM6	STAB1	CEACAM6_STAB1_epithelial_immune
Cancerous	epithelial	stromal	COL27A1	ITGA2	COL27A1_ITGA2_epithelial_stromal
Cancerous	epithelial	stromal	COL27A1	ITGA11	COL27A1_ITGA11_epithelial_stromal
Cancerous	epithelial	immune	CALR	LRP1	CALR_LRP1_epithelial_immune
Cancerous	epithelial	stromal	CD55	ADGRE2	CD55_ADGRE2_epithelial_stromal
Cancerous	epithelial	stromal	TGFBI	ITGB1	TGFBI_ITGB1_epithelial_stromal
Cancerous	epithelial	epithelial	LAMB3	CD151	LAMB3_CD151_epithelial_epithelial
Cancerous	epithelial	stromal	PAM	FAP	PAM_FAP_epithelial_stromal
Cancerous	epithelial	stromal	TGFBI	ITGA1	TGFBI_ITGA1_epithelial_stromal
Cancerous	epithelial	epithelial	ZP3	CHRNA7	ZP3_CHRNA7_epithelial_epithelial
Cancerous	epithelial	immune	HSP90B1	LRP1	HSP90B1_LRP1_epithelial_immune
Unaffected	epithelial	epithelial	EPCAM	CLDN7	EPCAM_CLDN7_epithelial_epithelial
Cancerous	epithelial	epithelial	HMGB1	SDC1	HMGB1_SDC1_epithelial_epithelial
Unaffected	epithelial	epithelial	EFNA1	EPHA4	EFNA1_EPHA4_epithelial_epithelial
Cancerous	epithelial	stromal	LAMB3	CD151	LAMB3_CD151_epithelial_stromal
Unaffected	epithelial	stromal	EFNA1	EPHA3	EFNA1_EPHA3_epithelial_stromal
Cancerous	epithelial	epithelial	NRXN3	FGFR4	NRXN3_FGFR4_epithelial_epithelial
Cancerous	epithelial	stromal	SEMA4D	PLXNB2	SEMA4D_PLXNB2_epithelial_stromal
Cancerous	epithelial	epithelial	CALR	LRP1	CALR_LRP1_epithelial_epithelial
Cancerous	epithelial	immune	COL27A1	ITGB1	COL27A1_ITGB1_epithelial_immune
Cancerous	epithelial	immune	LAMB3	ITGA2	LAMB3_ITGA2_epithelial_immune
Cancerous	epithelial	stromal	CALR	LRP1	CALR_LRP1_epithelial_stromal
Cancerous	epithelial	epithelial	COL27A1	ITGA2	COL27A1_ITGA2_epithelial_epithelial
Cancerous	epithelial	stromal	ADAM15	ITGB1	ADAM15_ITGB1_epithelial_stromal
Cancerous	epithelial	epithelial	LAMB3	ITGA6	LAMB3_ITGA6_epithelial_epithelial

Cancerous	epithelial	stromal	BMP7	ENG	BMP7_ENG_epithelial_stromal
Cancerous	epithelial	immune	TRAF2	TNFRSF1B	TRAF2_TNFRSF1B_epithelial_immune
Cancerous	epithelial	stromal	COL27A1	ITGB1	COL27A1_ITGB1_epithelial_stromal
Cancerous	epithelial	stromal	TGFBI	ITGA5	TGFBI_ITGA5_epithelial_stromal
Cancerous	epithelial	immune	LAMB3	ITGA6	LAMB3_ITGA6_epithelial_immune
Cancerous	epithelial	stromal	COL27A1	ITGA1	COL27A1_ITGA1_epithelial_stromal
Cancerous	epithelial	stromal	GNAS	ADCY9	GNAS_ADCY9_epithelial_stromal
Cancerous	epithelial	epithelial	AREG	ERBB2	AREG_ERBB2_epithelial_epithelial
Cancerous	epithelial	stromal	CEACAM6	ITGA1	CEACAM6_ITGA1_epithelial_stromal
Unaffected	epithelial	stromal	EFNA1	EPHA6	EFNA1_EPHA6_epithelial_stromal
Cancerous	epithelial	epithelial	CD55	ADGRE5	CD55_ADGRE5_epithelial_epithelial
Cancerous	epithelial	stromal	ANXA2	ROBO4	ANXA2_ROBO4_epithelial_stromal
Cancerous	epithelial	epithelial	AREG	ERBB3	AREG_ERBB3_epithelial_epithelial
Cancerous	epithelial	epithelial	LAMA2	ITGB4	LAMA2_ITGB4_epithelial_epithelial
Cancerous	epithelial	immune	ADAM15	ITGB1	ADAM15_ITGB1_epithelial_immune
Cancerous	epithelial	stromal	ZP3	EGFR	ZP3_EGFR_epithelial_stromal
Cancerous	epithelial	immune	RPS19	C5AR1	RPS19_C5AR1_epithelial_immune
Cancerous	epithelial	immune	TGOLN2	BTN3A1	TGOLN2_BTN3A1_epithelial_immune
Cancerous	epithelial	epithelial	LAMA2	ITGA2	LAMA2_ITGA2_epithelial_epithelial
Unaffected	epithelial	stromal	ANXA2	EGFR	ANXA2_EGFR_epithelial_stromal
Cancerous	epithelial	immune	BMP7	ENG	BMP7_ENG_epithelial_immune
Cancerous	epithelial	stromal	LAMB3	ITGA6	LAMB3_ITGA6_epithelial_stromal
Cancerous	epithelial	immune	TGFBI	ITGAV	TGFBI_ITGAV_epithelial_immune
Cancerous	epithelial	epithelial	TGFBI	ITGA6	TGFBI_ITGA6_epithelial_epithelial
Cancerous	epithelial	stromal	BMP7	BMPR2	BMP7_BMPR2_epithelial_stromal
Cancerous	epithelial	stromal	NRXN3	NLGN4Y	NRXN3_NLGN4Y_epithelial_stromal
Cancerous	epithelial	immune	COL27A1	ITGA2	COL27A1_ITGA2_epithelial_immune
Cancerous	epithelial	immune	TGFBI	ITGA6	TGFBI_ITGA6_epithelial_immune
Cancerous	epithelial	epithelial	LAMA2	RPSA	LAMA2_RPSA_epithelial_epithelial
Cancerous	epithelial	immune	LGALS3BP	ITGB1	LGALS3BP_ITGB1_epithelial_immune
Cancerous	epithelial	immune	TGFBI	ITGB5	TGFBI_ITGB5_epithelial_immune
Cancerous	epithelial	stromal	LAMA2	RPSA	LAMA2_RPSA_epithelial_stromal
Cancerous	epithelial	stromal	BMP7	ACVR1	BMP7_ACVR1_epithelial_stromal
Cancerous	epithelial	epithelial	SEMA4D	ERBB2	SEMA4D_ERBB2_epithelial_epithelial
Unaffected	epithelial	epithelial	ANXA2	EGFR	ANXA2_EGFR_epithelial_epithelial
Cancerous	epithelial	stromal	HSP90B1	LRP1	HSP90B1_LRP1_epithelial_stromal
Cancerous	epithelial	stromal	ADAM15	ITGA5	ADAM15_ITGA5_epithelial_stromal
Unaffected	epithelial	stromal	IHH	CDON	IHH_CDON_epithelial_stromal
Cancerous	epithelial	epithelial	ZP3	EGFR	ZP3_EGFR_epithelial_epithelial
Unaffected	epithelial	stromal	IHH	PTCH1	IHH_PTCH1_epithelial_stromal
Cancerous	epithelial	stromal	F11R	ROBO3	F11R_ROBO3_epithelial_stromal
Cancerous	epithelial	immune	LFNG	NOTCH2	LFNG_NOTCH2_epithelial_immune
Cancerous	epithelial	stromal	TGFBI	ITGA6	TGFBI_ITGA6_epithelial_stromal
Cancerous	epithelial	epithelial	EFNA1	EPHA2	EFNA1_EPHA2_epithelial_epithelial
Cancerous	epithelial	stromal	ADAM15	ITGA9	ADAM15_ITGA9_epithelial_stromal
Cancerous	epithelial	stromal	LGALS3BP	ITGB1	LGALS3BP_ITGB1_epithelial_stromal
Cancerous	epithelial	epithelial	CLDN3	CLDN1	CLDN3_CLDN1_epithelial_epithelial
Cancerous	epithelial	stromal	TGFBI	ITGAV	TGFBI_ITGAV_epithelial_stromal
Unaffected	epithelial	stromal	EFNA1	EPHA7	EFNA1_EPHA7_epithelial_stromal
Unaffected	epithelial	stromal	IHH	HHIP	IHH_HHIP_epithelial_stromal

Cancerous	epithelial	stromal	LAMA2	ITGA2	LAMA2_ITGA2_epithelial_stromal
Cancerous	epithelial	stromal	CALR	TAP1	CALR_TAP1_epithelial_stromal
Cancerous	epithelial	stromal	CD55	ADGRE5	CD55_ADGRE5_epithelial_stromal
Unaffected	epithelial	stromal	EFNA1	EPHA4	EFNA1_EPHA4_epithelial_stromal
Cancerous	epithelial	epithelial	ZP3	MERTK	ZP3_MERTK_epithelial_epithelial
Cancerous	epithelial	immune	F11R	ITGB2	F11R_ITGB2_epithelial_immune
Cancerous	epithelial	immune	BMP7	ACVR1	BMP7_ACVR1_epithelial_immune
Cancerous	epithelial	epithelial	HSP90B1	LRP1	HSP90B1_LRP1_epithelial_epithelial
Cancerous	epithelial	immune	HMGB1	TLR2	HMGB1_TLR2_epithelial_immune
Cancerous	epithelial	immune	ADAM15	ITGA9	ADAM15_ITGA9_epithelial_immune
Cancerous	epithelial	immune	TGFBI	ITGA4	TGFBI_ITGA4_epithelial_immune
Cancerous	epithelial	epithelial	NRXN3	DAG1	NRXN3_DAG1_epithelial_epithelial
Cancerous	epithelial	stromal	LAMA2	ITGB1	LAMA2_ITGB1_epithelial_stromal
Cancerous	epithelial	immune	GRN	TNFRSF1B	GRN_TNFRSF1B_epithelial_immune
Cancerous	epithelial	immune	HMGB1	HAVCR2	HMGB1_HAVCR2_epithelial_immune
Cancerous	epithelial	stromal	LAMA2	ITGA1	LAMA2_ITGA1_epithelial_stromal
Cancerous	epithelial	stromal	SDC4	ADAM12	SDC4_ADAM12_epithelial_stromal
Cancerous	epithelial	immune	LAMA2	RPSA	LAMA2_RPSA_epithelial_immune
Cancerous	epithelial	immune	CALR	TAP1	CALR_TAP1_epithelial_immune
Cancerous	epithelial	immune	LAMA2	ITGB1	LAMA2_ITGB1_epithelial_immune
Cancerous	epithelial	immune	F11R	ITGAL	F11R_ITGAL_epithelial_immune
Cancerous	epithelial	immune	CD55	CR1	CD55_CR1_epithelial_immune
Cancerous	epithelial	stromal	GRN	TNFRSF1A	GRN_TNFRSF1A_epithelial_stromal
Cancerous	epithelial	stromal	TGFBI	ITGA7	TGFBI_ITGA7_epithelial_stromal
Cancerous	epithelial	epithelial	LAMA2	DAG1	LAMA2_DAG1_epithelial_epithelial
Cancerous	epithelial	stromal	EREG	ERBB2	EREG_ERBB2_epithelial_stromal
Cancerous	epithelial	immune	GRN	SORT1	GRN_SORT1_epithelial_immune
Cancerous	epithelial	epithelial	EREG	ERBB2	EREG_ERBB2_epithelial_epithelial
Cancerous	epithelial	epithelial	EREG	ERBB3	EREG_ERBB3_epithelial_epithelial
Cancerous	epithelial	stromal	SEMA4D	PLXNB1	SEMA4D_PLXNB1_epithelial_stromal
Cancerous	epithelial	immune	LFNG	NOTCH1	LFNG_NOTCH1_epithelial_immune
Cancerous	epithelial	epithelial	TGOLN2	BTN3A1	TGOLN2_BTN3A1_epithelial_epithelial
Cancerous	epithelial	epithelial	LAMB3	ITGA3	LAMB3_ITGA3_epithelial_epithelial
Cancerous	epithelial	epithelial	LAMA2	ITGA6	LAMA2_ITGA6_epithelial_epithelial
Cancerous	epithelial	immune	CALR	ITGAV	CALR_ITGAV_epithelial_immune
Cancerous	epithelial	immune	SDC4	ADAM12	SDC4_ADAM12_epithelial_immune
Cancerous	epithelial	immune	SEMA4D	PLXNB2	SEMA4D_PLXNB2_epithelial_immune
Cancerous	epithelial	epithelial	CALR	ITGA3	CALR_ITGA3_epithelial_epithelial
Unaffected	epithelial	epithelial	CEACAM6	CEACAM7	CEACAM6_CEACAM7_epithelial_epithelial
Cancerous	epithelial	stromal	CALR	ITGAV	CALR_ITGAV_epithelial_stromal
Cancerous	epithelial	immune	LAMA2	ITGA9	LAMA2_ITGA9_epithelial_immune
Cancerous	epithelial	stromal	GRN	SORT1	GRN_SORT1_epithelial_stromal
Cancerous	epithelial	stromal	IGFBP4	LRP6	IGFBP4_LRP6_epithelial_stromal
Cancerous	epithelial	stromal	SEMA4D	ERBB2	SEMA4D_ERBB2_epithelial_stromal
Cancerous	epithelial	stromal	GNAS	ADCY2	GNAS_ADCY2_epithelial_stromal
Cancerous	epithelial	epithelial	CALR	TAP1	CALR_TAP1_epithelial_epithelial
Cancerous	epithelial	stromal	AREG	ERBB2	AREG_ERBB2_epithelial_stromal
Cancerous	epithelial	stromal	BMP7	BMPR1A	BMP7_BMPR1A_epithelial_stromal
Cancerous	epithelial	stromal	LAMB3	ITGB4	LAMB3_ITGB4_epithelial_stromal
Cancerous	epithelial	stromal	EFNA1	EPHB1	EFNA1_EPHB1_epithelial_stromal

Cancerous	epithelial	epithelial	EFNA1	EPHB1	EFNA1_EPHB1_epithelial_epithelial
Cancerous	epithelial	stromal	B2M	TAP1	B2M_TAP1_epithelial_stromal
Cancerous	epithelial	stromal	LAMB3	ITGA3	LAMB3_ITGA3_epithelial_stromal
Cancerous	epithelial	immune	PSAP	LRP1	PSAP_LRP1_epithelial_immune
Cancerous	epithelial	epithelial	TSPAN5	TSPAN13	TSPAN5_TSPAN13_epithelial_epithelial
Cancerous	epithelial	epithelial	TGFBI	ITGA3	TGFBI_ITGA3_epithelial_epithelial
Cancerous	epithelial	epithelial	AREG	EGFR	AREG_EGFR_epithelial_epithelial
Unaffected	epithelial	stromal	IHH	BOC	IHH_BOC_epithelial_stromal
Cancerous	epithelial	immune	B2M	TAP1	B2M_TAP1_epithelial_immune
Unaffected	epithelial	epithelial	CEACAM6	EGFR	CEACAM6_EGFR_epithelial_epithelial
Cancerous	epithelial	epithelial	GNAS	ADCY6	GNAS_ADCY6_epithelial_epithelial
Cancerous	epithelial	stromal	TGOLN2	BTN3A1	TGOLN2_BTN3A1_epithelial_stromal
Unaffected	epithelial	epithelial	CEACAM6	CEACAM1	CEACAM6_CEACAM1_epithelial_epithelial
Cancerous	epithelial	stromal	CEACAM6	EGFR	CEACAM6_EGFR_epithelial_stromal
Cancerous	epithelial	stromal	TGFBI	ITGB4	TGFBI_ITGB4_epithelial_stromal
Cancerous	epithelial	immune	B2M	LILRB1	B2M_LILRB1_epithelial_immune
Cancerous	epithelial	stromal	EFNA1	EPHA2	EFNA1_EPHA2_epithelial_stromal
Cancerous	epithelial	stromal	GNAS	ADCY6	GNAS_ADCY6_epithelial_stromal
Cancerous	epithelial	epithelial	ADAM15	ITGA9	ADAM15_ITGA9_epithelial_epithelial
Cancerous	epithelial	stromal	TGFBI	ITGA3	TGFBI_ITGA3_epithelial_stromal
Unaffected	epithelial	epithelial	S100A10	CFTR	S100A10_CFTR_epithelial_epithelial
Cancerous	epithelial	epithelial	CEACAM6	UXS1	CEACAM6_UXS1_epithelial_epithelial
Unaffected	epithelial	stromal	AREG	EGFR	AREG_EGFR_epithelial_stromal
Unaffected	epithelial	immune	EFNA1	EPHA4	EFNA1_EPHA4_epithelial_immune
Cancerous	epithelial	stromal	B2M	KLRD1	B2M_KLRD1_epithelial_stromal
Cancerous	epithelial	stromal	HMGB1	SDC1	HMGB1_SDC1_epithelial_stromal
Cancerous	epithelial	immune	HMGB1	CD163	HMGB1_CD163_epithelial_immune
Cancerous	epithelial	immune	GNAS	TSHR	GNAS_TSHR_epithelial_immune
Cancerous	epithelial	immune	LAMA2	ITGA2	LAMA2_ITGA2_epithelial_immune
Cancerous	epithelial	epithelial	LAMB3	ITGB1	LAMB3_ITGB1_epithelial_epithelial
Cancerous	epithelial	epithelial	TGFBI	ITGB5	TGFBI_ITGB5_epithelial_epithelial
Cancerous	epithelial	stromal	LAMA2	ITGA7	LAMA2_ITGA7_epithelial_stromal
Cancerous	epithelial	immune	CALR	TSHR	CALR_TSHR_epithelial_immune
Cancerous	epithelial	stromal	LAMA2	ITGA6	LAMA2_ITGA6_epithelial_stromal
Cancerous	epithelial	stromal	LAMA2	ITGA9	LAMA2_ITGA9_epithelial_stromal
Cancerous	epithelial	immune	LAMA2	ITGA6	LAMA2_ITGA6_epithelial_immune
Unaffected	epithelial	stromal	CEACAM6	CEACAM7	CEACAM6_CEACAM7_epithelial_stromal
Cancerous	epithelial	immune	HMGB1	CXCR4	HMGB1_CXCR4_epithelial_immune
Unaffected	epithelial	stromal	IHH	PTCH2	IHH_PTCH2_epithelial_stromal
Unaffected	epithelial	immune	CEACAM6	UXS1	CEACAM6_UXS1_epithelial_immune
Cancerous	epithelial	epithelial	SEMA4D	PLXNB2	SEMA4D_PLXNB2_epithelial_epithelial
Cancerous	epithelial	epithelial	GNAS	VIPR1	GNAS_VIPR1_epithelial_epithelial
Unaffected	epithelial	epithelial	LGALS3BP	ITGB1	LGALS3BP_ITGB1_epithelial_epithelial
Cancerous	epithelial	epithelial	TRAF2	TNFRSF1B	TRAF2_TNFRSF1B_epithelial_epithelial
Unaffected	epithelial	immune	TRAF2	MAP4K2	TRAF2_MAP4K2_epithelial_immune
Unaffected	epithelial	stromal	APOO	IL1RAPL1	APOO_IL1RAPL1_epithelial_stromal
Cancerous	epithelial	stromal	EREG	EGFR	EREG_EGFR_epithelial_stromal
Cancerous	epithelial	immune	PSAP	SORT1	PSAP_SORT1_epithelial_immune
Cancerous	epithelial	epithelial	TGFBI	ITGB1	TGFBI_ITGB1_epithelial_epithelial
Unaffected	epithelial	immune	CEACAM6	CEACAM7	CEACAM6_CEACAM7_epithelial_immun

Cancerous	epithelial	immune	BMP7	BMPR2	BMP7_BMPR2_epithelial_immune
Cancerous	epithelial	immune	LAMB3	ITGB4	LAMB3_ITGB4_epithelial_immune
Cancerous	epithelial	epithelial	LAMA2	ITGA9	LAMA2_ITGA9_epithelial_epithelial
Cancerous	epithelial	immune	HMGB1	SDC1	HMGB1_SDC1_epithelial_immune
Cancerous	epithelial	epithelial	B2M	TAP1	B2M_TAP1_epithelial_epithelial
Cancerous	epithelial	epithelial	BMP7	BMPR1A	BMP7_BMPR1A_epithelial_epithelial
Cancerous	epithelial	stromal	CALR	ITGA3	CALR_ITGA3_epithelial_stromal
Cancerous	epithelial	immune	CEACAM6	ITGA1	CEACAM6_ITGA1_epithelial_immune
Cancerous	epithelial	stromal	LFNG	NOTCH2	LFNG_NOTCH2_epithelial_stromal
Cancerous	epithelial	stromal	BMP7	ACVR2A	BMP7_ACVR2A_epithelial_stromal
Cancerous	epithelial	epithelial	GRN	SORT1	GRN_SORT1_epithelial_epithelial
Cancerous	epithelial	immune	SEMA4D	CD72	SEMA4D_CD72_epithelial_immune
Cancerous	epithelial	stromal	ZP3	MERTK	ZP3_MERTK_epithelial_stromal
Cancerous	epithelial	epithelial	LAMA2	ITGA3	LAMA2_ITGA3_epithelial_epithelial
Cancerous	epithelial	immune	TGFBI	ITGA1	TGFBI_ITGA1_epithelial_immune
Cancerous	epithelial	stromal	PAM	DPP4	PAM_DPP4_epithelial_stromal
Cancerous	epithelial	stromal	TRAF2	TNFRSF1B	TRAF2_TNFRSF1B_epithelial_stromal
Cancerous	epithelial	stromal	NRXN3	DAG1	NRXN3_DAG1_epithelial_stromal
Cancerous	epithelial	epithelial	BMP7	ACVR1	BMP7_ACVR1_epithelial_epithelial
Cancerous	epithelial	stromal	PSAP	SORT1	PSAP_SORT1_epithelial_stromal
Cancerous	epithelial	stromal	RPS19	C5AR1	RPS19_C5AR1_epithelial_stromal
Cancerous	epithelial	immune	CEACAM6	CEACAM1	CEACAM6_CEACAM1_epithelial_immun
Unaffected	epithelial	epithelial	PSAP	SORT1	PSAP_SORT1_epithelial_epithelial
Cancerous	epithelial	stromal	PSAP	LRP1	PSAP_LRP1_epithelial_stromal
Unaffected	epithelial	epithelial	GNAS	PTGDR	GNAS_PTGDR_epithelial_epithelial
Cancerous	epithelial	immune	COL27A1	ITGA1	COL27A1_ITGA1_epithelial_immune
Cancerous	epithelial	epithelial	EREG	EGFR	EREG_EGFR_epithelial_epithelial
Unaffected	epithelial	epithelial	GNAS	ADCY9	GNAS_ADCY9_epithelial_epithelial
Cancerous	epithelial	immune	TGFBI	ITGB4	TGFBI_ITGB4_epithelial_immune
Cancerous	epithelial	epithelial	ADAM15	ITGB1	ADAM15_ITGB1_epithelial_epithelial
Cancerous	epithelial	stromal	TGFBI	ITGA4	TGFBI_ITGA4_epithelial_stromal
Cancerous	epithelial	epithelial	TGFBI	ITGA1	TGFBI_ITGA1_epithelial_epithelial
Cancerous	epithelial	stromal	F11R	F11R	F11R_F11R_epithelial_stromal
Cancerous	epithelial	immune	SEMA4D	MET	SEMA4D_MET_epithelial_immune
Cancerous	epithelial	epithelial	PSAP	LRP1	PSAP_LRP1_epithelial_epithelial
Unaffected	epithelial	epithelial	GRN	EGFR	GRN_EGFR_epithelial_epithelial
Unaffected	epithelial	stromal	GRN	EGFR	GRN_EGFR_epithelial_stromal
Cancerous	epithelial	immune	BMP7	ACVR2A	BMP7_ACVR2A_epithelial_immune
Cancerous	epithelial	stromal	SEMA4D	MET	SEMA4D_MET_epithelial_stromal
Cancerous	epithelial	epithelial	TGFBI	ITGAV	TGFBI_ITGAV_epithelial_epithelial
Cancerous	epithelial	stromal	CEACAM6	CEACAM1	CEACAM6_CEACAM1_epithelial_stromal
Cancerous	epithelial	epithelial	PAM	DPP4	PAM_DPP4_epithelial_epithelial
Cancerous	epithelial	stromal	S100A10	CFTR	S100A10_CFTR_epithelial_stromal
Cancerous	epithelial	epithelial	CEACAM6	ITGA1	CEACAM6_ITGA1_epithelial_epithelial
Cancerous	epithelial	epithelial	COL27A1	ITGB1	COL27A1_ITGB1_epithelial_epithelial
Unaffected	epithelial	stromal	GNAS	ADCY5	GNAS_ADCY5_epithelial_stromal
Cancerous	epithelial	epithelial	SARAF	DAG1	SARAF_DAG1_epithelial_epithelial
Cancerous	epithelial	immune	SEMA4D	ERBB2	SEMA4D_ERBB2_epithelial_immune
Cancerous	epithelial	epithelial	CALR	ITGAV	CALR_ITGAV_epithelial_epithelial
Cancerous	epithelial	immune	S100A10	CFTR	S100A10_CFTR_epithelial_immune

Cancerous	epithelial	epithelial	LAMA2	ITGA1	LAMA2_ITGA1_epithelial_epithelial
Cancerous	epithelial	stromal	LAMA2	ITGB4	LAMA2_ITGB4_epithelial_stromal
Cancerous	epithelial	immune	GRN	TNFRSF1A	GRN_TNFRSF1A_epithelial_immune
Cancerous	epithelial	epithelial	LAMA2	ITGB1	LAMA2_ITGB1_epithelial_epithelial
Cancerous	epithelial	stromal	LAMA2	ITGA3	LAMA2_ITGA3_epithelial_stromal
Cancerous	epithelial	epithelial	PSAP	CELSR1	PSAP_CELSR1_epithelial_epithelial
Cancerous	epithelial	epithelial	COL27A1	ITGA1	COL27A1_ITGA1_epithelial_epithelial
Unaffected	epithelial	immune	F11R	JAM3	F11R_JAM3_epithelial_immune
Cancerous	epithelial	stromal	GRN	TNFRSF1B	GRN_TNFRSF1B_epithelial_stromal
Cancerous	epithelial	immune	IGFBP4	LRP6	IGFBP4_LRP6_epithelial_immune
Unaffected	epithelial	epithelial	GRN	TNFRSF1A	GRN_TNFRSF1A_epithelial_epithelial
Unaffected	epithelial	stromal	PSAP	CELSR1	PSAP_CELSR1_epithelial_stromal
Unaffected	epithelial	epithelial	IHH	CDON	IHH_CDON_epithelial_epithelial
Cancerous	epithelial	epithelial	GRN	TNFRSF1B	GRN_TNFRSF1B_epithelial_epithelial
Unaffected	epithelial	stromal	CD55	CR1	CD55_CR1_epithelial_stromal
Cancerous	epithelial	epithelial	RPS19	C5AR1	RPS19_C5AR1_epithelial_epithelial
Unaffected	epithelial	stromal	EREG	ERBB4	EREG_ERBB4_epithelial_stromal
Unaffected	epithelial	stromal	CD55	CR1L	CD55_CR1L_epithelial_stromal
Unaffected	epithelial	epithelial	CALR	SCARF1	CALR_SCARF1_epithelial_epithelial
Cancerous	epithelial	immune	LAMA2	ITGA1	LAMA2_ITGA1_epithelial_immune
Cancerous	epithelial	epithelial	BMP7	BMPR2	BMP7_BMPR2_epithelial_epithelial
Unaffected	epithelial	epithelial	LFNG	NOTCH2	LFNG_NOTCH2_epithelial_epithelial
Unaffected	epithelial	epithelial	IHH	PTCH1	IHH_PTCH1_epithelial_epithelial
Cancerous	epithelial	immune	BMP7	BMPR1A	BMP7_BMPR1A_epithelial_immune
Cancerous	epithelial	immune	LAMA2	ITGB4	LAMA2_ITGB4_epithelial_immune
Cancerous	epithelial	immune	ROBO1	NCAM1	ROBO1_NCAM1_epithelial_immune
Unaffected	epithelial	stromal	APOO	IL1RAPL2	APOO_IL1RAPL2_epithelial_stromal
Cancerous	epithelial	epithelial	IGFBP4	LRP6	IGFBP4_LRP6_epithelial_epithelial
Cancerous	epithelial	stromal	ANXA2	TLR2	ANXA2_TLR2_epithelial_stromal
Cancerous	epithelial	epithelial	BMP7	ACVR2A	BMP7_ACVR2A_epithelial_epithelial
Unaffected	epithelial	stromal	ROBO1	NCAM1	ROBO1_NCAM1_epithelial_stromal
Cancerous	epithelial	stromal	SARAF	DAG1	SARAF_DAG1_epithelial_stromal
Cancerous	epithelial	immune	GNAS	ADCY9	GNAS_ADCY9_epithelial_immune
Cancerous	epithelial	immune	PSAP	CELSR1	PSAP_CELSR1_epithelial_immune
Unaffected	epithelial	epithelial	HMGB1	CXCR4	HMGB1_CXCR4_epithelial_epithelial
Unaffected	epithelial	stromal	HMGB1	TLR2	HMGB1_TLR2_epithelial_stromal

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Supplementary Table 6-2 Ligand–receptor interactions with E1 module genes as
receptors

top_group	sender	receiver	ligand	receptor	id
Cancerous	stromal	epithelial	HSPG2	SDC1	HSPG2_SDC1_stromal_epithelial
Cancerous	stromal	epithelial	COL1A1	SDC1	COL1A1_SDC1_stromal_epithelial
Cancerous	stromal	epithelial	COL5A2	SDC1	COL5A2_SDC1_stromal_epithelial
Cancerous	immune	epithelial	ADGRE5	CD55	ADGRE5_CD55_immune_epithelial
Cancerous	stromal	epithelial	FN1	SDC1	FN1_SDC1_stromal_epithelial
Cancerous	stromal	epithelial	MMP14	SDC1	MMP14_SDC1_stromal_epithelial
Cancerous	stromal	epithelial	COL5A1	SDC1	COL5A1_SDC1_stromal_epithelial
Cancerous	immune	epithelial	TGFBI	ITGB4	TGFBI_ITGB4_immune_epithelial
Cancerous	stromal	epithelial	LAMB1	ITGB4	LAMB1_ITGB4_stromal_epithelial
Cancerous	stromal	epithelial	THBS1	SDC1	THBS1_SDC1_stromal_epithelial
Cancerous	stromal	epithelial	MCAM	FGFR4	MCAM_FGFR4_stromal_epithelial
Cancerous	stromal	epithelial	THBS2	SDC1	THBS2_SDC1_stromal_epithelial
Cancerous	epithelial	epithelial	ADGRE5	CD55	ADGRE5_CD55_epithelial_epithelial
Cancerous	stromal	epithelial	TIMP3	MET	TIMP3_MET_stromal_epithelial
Cancerous	epithelial	epithelial	F11R	F11R	F11R_F11R_epithelial_epithelial
Cancerous	stromal	epithelial	ADAM17	NOTCH1	ADAM17_NOTCH1_stromal_epithelial
Cancerous	stromal	epithelial	ANGPTL4	SDC1	ANGPTL4_SDC1_stromal_epithelial
Cancerous	epithelial	epithelial	LAMB3	ITGB4	LAMB3_ITGB4_epithelial_epithelial
Cancerous	stromal	epithelial	LAMB2	ITGB4	LAMB2_ITGB4_stromal_epithelial
Cancerous	stromal	epithelial	FGF2	SDC1	FGF2_SDC1_stromal_epithelial
Cancerous	stromal	epithelial	COL5A3	SDC1	COL5A3_SDC1_stromal_epithelial
Cancerous	stromal	epithelial	HSPG2	LRP1	HSPG2_LRP1_stromal_epithelial
Cancerous	stromal	epithelial	LAMA5	SDC1	LAMA5_SDC1_stromal_epithelial
Cancerous	stromal	epithelial	MPDZ	CLDN4	MPDZ_CLDN4_stromal_epithelial
Cancerous	epithelial	epithelial	SEMA4D	MET	SEMA4D_MET_epithelial_epithelial
Cancerous	stromal	epithelial	FGF2	FGFR4	FGF2_FGFR4_stromal_epithelial
Cancerous	stromal	epithelial	FGF7	FGFR4	FGF7_FGFR4_stromal_epithelial
Cancerous	stromal	epithelial	TNC	SDC1	TNC_SDC1_stromal_epithelial
Cancerous	epithelial	epithelial	LRIG1	MET	LRIG1_MET_epithelial_epithelial
Cancerous	stromal	epithelial	LAMB2	RPSA	LAMB2_RPSA_stromal_epithelial
Cancerous	epithelial	epithelial	SEMA4D	PLXNB1	SEMA4D_PLXNB1_epithelial_epithelial
Cancerous	epithelial	epithelial	TGFBI	ITGB4	TGFBI_ITGB4_epithelial_epithelial
Cancerous	epithelial	epithelial	HSPG2	SDC1	HSPG2_SDC1_epithelial_epithelial
Cancerous	epithelial	epithelial	LFNG	NOTCH1	LFNG_NOTCH1_epithelial_epithelial
Cancerous	stromal	epithelial	PLXNA1	NOTCH1	PLXNA1_NOTCH1_stromal_epithelial
Cancerous	stromal	epithelial	JAG1	CD46	JAG1_CD46_stromal_epithelial
Cancerous	stromal	epithelial	JAM3	F11R	JAM3_F11R_stromal_epithelial
Cancerous	stromal	epithelial	JAG2	NOTCH1	JAG2_NOTCH1_stromal_epithelial
Cancerous	stromal	epithelial	LAMA5	ITGB4	LAMA5_ITGB4_stromal_epithelial
Cancerous	stromal	epithelial	LAMC1	ITGB4	LAMC1_ITGB4_stromal_epithelial
Cancerous	stromal	epithelial	TGFBI	ITGB4	TGFBI_ITGB4_stromal_epithelial
Cancerous	immune	epithelial	FN1	SDC1	FN1_SDC1_immune_epithelial
Cancerous	stromal	epithelial	EFNB2	EPHB4	EFNB2_EPHB4_stromal_epithelial
Cancerous	immune	epithelial	MMP14	SDC1	MMP14_SDC1_immune_epithelial
Cancerous	stromal	epithelial	SLIT2	SDC1	SLIT2_SDC1_stromal_epithelial
Cancerous	epithelial	epithelial	LAMC2	ITGB4	LAMC2_ITGB4_epithelial_epithelial

Cancerous	stromal	epithelial	PLAT	LRP1	PLAT_LRP1_stromal_epithelial
Cancerous	immune	epithelial	EDA	EDAR	EDA_EDAR_immune_epithelial
Cancerous	stromal	epithelial	SERPINE1	LRP1	SERPINE1_LRP1_stromal_epithelial
Cancerous	epithelial	epithelial	HMGB1	SDC1	HMGB1_SDC1_epithelial_epithelial
Cancerous	stromal	epithelial	MPDZ	F11R	MPDZ_F11R_stromal_epithelial
Cancerous	epithelial	epithelial	EFNB1	EPHB4	EFNB1_EPHB4_epithelial_epithelial
Cancerous	stromal	epithelial	ADGRE5	CD55	ADGRE5_CD55_stromal_epithelial
Unaffected	epithelial	epithelial	SI	LRP1	SI_LRP1_epithelial_epithelial
Cancerous	stromal	epithelial	CCN1	SDC4	CCN1_SDC4_stromal_epithelial
Cancerous	epithelial	epithelial	SERPINE2	LRP1	SERPINE2_LRP1_epithelial_epithelial
Cancerous	stromal	epithelial	LAMA2	ITGB4	LAMA2_ITGB4_stromal_epithelial
Cancerous	stromal	epithelial	THBS1	SDC4	THBS1_SDC4_stromal_epithelial
Cancerous	epithelial	epithelial	AGRN	LRP1	AGRN_LRP1_epithelial_epithelial
Cancerous	immune	epithelial	GSTP1	TRAF2	GSTP1_TRAF2_immune_epithelial
Cancerous	epithelial	epithelial	NRXN3	FGFR4	NRXN3_FGFR4_epithelial_epithelial
Cancerous	stromal	epithelial	EFNB1	EPHB4	EFNB1_EPHB4_stromal_epithelial
Cancerous	epithelial	epithelial	CALR	LRP1	CALR_LRP1_epithelial_epithelial
Cancerous	immune	epithelial	HMGB1	SDC1	HMGB1_SDC1_immune_epithelial
Cancerous	stromal	epithelial	THBS1	LRP1	THBS1_LRP1_stromal_epithelial
Cancerous	stromal	epithelial	EFNB2	EPHB3	EFNB2_EPHB3_stromal_epithelial
Cancerous	stromal	epithelial	APP	LRP1	APP_LRP1_stromal_epithelial
Unaffected	immune	epithelial	CD44	EPCAM	CD44_EPCAM_immune_epithelial
Cancerous	immune	epithelial	HSP90B1	LRP1	HSP90B1_LRP1_immune_epithelial
Cancerous	epithelial	epithelial	LAMA5	SDC1	LAMA5_SDC1_epithelial_epithelial
Cancerous	stromal	epithelial	LAMA2	RPSA	LAMA2_RPSA_stromal_epithelial
Cancerous	stromal	epithelial	DCN	MET	DCN_MET_stromal_epithelial
Cancerous	stromal	epithelial	MDK	SDC1	MDK_SDC1_stromal_epithelial
Cancerous	immune	epithelial	COL1A1	SDC1	COL1A1_SDC1_immune_epithelial
Cancerous	stromal	epithelial	NRXN3	FGFR4	NRXN3_FGFR4_stromal_epithelial
Cancerous	immune	epithelial	PSAP	LRP1	PSAP_LRP1_immune_epithelial
Cancerous	epithelial	epithelial	LAMC1	ITGB4	LAMC1_ITGB4_epithelial_epithelial
Cancerous	stromal	epithelial	JAG1	NOTCH1	JAG1_NOTCH1_stromal_epithelial
Cancerous	stromal	epithelial	LAMA1	ITGB4	LAMA1_ITGB4_stromal_epithelial
Cancerous	stromal	epithelial	FGF2	SDC4	FGF2_SDC4_stromal_epithelial
Unaffected	epithelial	epithelial	LGALS3	ANXA2	LGALS3_ANXA2_epithelial_epithelial
Cancerous	stromal	epithelial	GPC6	FGFR4	GPC6_FGFR4_stromal_epithelial
Cancerous	epithelial	epithelial	LAMA2	ITGB4	LAMA2_ITGB4_epithelial_epithelial
Cancerous	immune	epithelial	ADAM17	NOTCH1	ADAM17_NOTCH1_immune_epithelial
Cancerous	immune	epithelial	SEMA4A	PLXNB1	SEMA4A_PLXNB1_immune_epithelial
Cancerous	epithelial	epithelial	JAG2	NOTCH1	JAG2_NOTCH1_epithelial_epithelial
Cancerous	stromal	epithelial	GSTP1	TRAF2	GSTP1_TRAF2_stromal_epithelial
Cancerous	immune	epithelial	LFNG	NOTCH1	LFNG_NOTCH1_immune_epithelial
Unaffected	stromal	epithelial	LAMA3	ITGB4	LAMA3_ITGB4_stromal_epithelial
Cancerous	epithelial	epithelial	SEMA4B	PLXNB1	SEMA4B_PLXNB1_epithelial_epithelial
Cancerous	stromal	epithelial	SEMA5A	MET	SEMA5A_MET_stromal_epithelial
Cancerous	immune	epithelial	TNFRSF14	TRAF2	TNFRSF14_TRAF2_immune_epithelial
Unaffected	immune	epithelial	TGFB1	ITGB8	TGFB1_ITGB8_immune_epithelial
Cancerous	stromal	epithelial	EFNB1	EPHB3	EFNB1_EPHB3_stromal_epithelial
Cancerous	epithelial	epithelial	COL1A1	SDC1	COL1A1_SDC1_epithelial_epithelial
Cancerous	stromal	epithelial	COL1A1	ITGB8	COL1A1_ITGB8_stromal_epithelial

Cancerous	stromal	epithelial	AGRN	LRP1	AGRN_LRP1_stromal_epithelial
Unaffected	immune	epithelial	SEMA4D	PLXNB1	SEMA4D_PLXNB1_immune_epithelial
Cancerous	epithelial	epithelial	SEMA5A	MET	SEMA5A_MET_epithelial_epithelial
Cancerous	epithelial	epithelial	LAMB1	ITGB4	LAMB1_ITGB4_epithelial_epithelial
Cancerous	immune	epithelial	THBS1	SDC1	THBS1_SDC1_immune_epithelial
Cancerous	stromal	epithelial	COL4A1	ITGB8	COL4A1_ITGB8_stromal_epithelial
Cancerous	epithelial	epithelial	LAMA5	ITGB4	LAMA5_ITGB4_epithelial_epithelial
Cancerous	stromal	epithelial	LAMA1	RPSA	LAMA1_RPSA_stromal_epithelial
Unaffected	stromal	epithelial	GPC6	LRP1	GPC6_LRP1_stromal_epithelial
Cancerous	epithelial	epithelial	FN1	SDC1	FN1_SDC1_epithelial_epithelial
Cancerous	stromal	epithelial	DLL1	NOTCH1	DLL1_NOTCH1_stromal_epithelial
Cancerous	stromal	epithelial	TGM2	SDC4	TGM2_SDC4_stromal_epithelial
Cancerous	epithelial	epithelial	LAMA2	RPSA	LAMA2_RPSA_epithelial_epithelial
Cancerous	stromal	epithelial	PLAU	LRP1	PLAU_LRP1_stromal_epithelial
Cancerous	stromal	epithelial	TFPI	SDC4	TFPI_SDC4_stromal_epithelial
Unaffected	stromal	epithelial	CD44	EPCAM	CD44_EPCAM_stromal_epithelial
Cancerous	immune	epithelial	FURIN	NOTCH1	FURIN_NOTCH1_immune_epithelial
Cancerous	stromal	epithelial	HMGB1	SDC1	HMGB1_SDC1_stromal_epithelial
Cancerous	immune	epithelial	AGRN	LRP1	AGRN_LRP1_immune_epithelial
Unaffected	stromal	epithelial	CCN2	LRP1	CCN2_LRP1_stromal_epithelial
Cancerous	immune	epithelial	CALR	LRP1	CALR_LRP1_immune_epithelial
Cancerous	stromal	epithelial	SERPINE2	LRP1	SERPINE2_LRP1_stromal_epithelial
Cancerous	stromal	epithelial	NLGN4Y	NRXN3	NLGN4Y_NRXN3_stromal_epithelial
Cancerous	epithelial	epithelial	JAG1	CD46	JAG1_CD46_epithelial_epithelial
Cancerous	stromal	epithelial	RTN4	LINGO1	RTN4_LINGO1_stromal_epithelial
Cancerous	stromal	epithelial	LFNG	NOTCH1	LFNG_NOTCH1_stromal_epithelial
Cancerous	stromal	epithelial	TFPI	LRP1	TFPI_LRP1_stromal_epithelial
Cancerous	epithelial	epithelial	GSTP1	TRAF2	GSTP1_TRAF2_epithelial_epithelial
Cancerous	epithelial	epithelial	HSPG2	LRP1	HSPG2_LRP1_epithelial_epithelial
Cancerous	epithelial	epithelial	EFNB1	EPHB3	EFNB1_EPHB3_epithelial_epithelial
Unaffected	epithelial	epithelial	DUSP18	ITGB4	DUSP18_ITGB4_epithelial_epithelial
Cancerous	immune	epithelial	SEMA4D	MET	SEMA4D_MET_immune_epithelial
Cancerous	stromal	epithelial	DLL4	NOTCH1	DLL4_NOTCH1_stromal_epithelial
Cancerous	immune	epithelial	RTN4	LINGO1	RTN4_LINGO1_immune_epithelial
Unaffected	stromal	epithelial	LRIG1	MET	LRIG1_MET_stromal_epithelial
Unaffected	epithelial	epithelial	LAMA3	ITGB4	LAMA3_ITGB4_epithelial_epithelial
Unaffected	stromal	epithelial	C3	LRP1	C3_LRP1_stromal_epithelial
Cancerous	stromal	epithelial	MDK	SDC4	MDK_SDC4_stromal_epithelial
Cancerous	stromal	epithelial	HSP90B1	LRP1	HSP90B1_LRP1_stromal_epithelial
Unaffected	stromal	epithelial	A2M	LRP1	A2M_LRP1_stromal_epithelial
Cancerous	stromal	epithelial	TGM2	ADGRG1	TGM2_ADGRG1_stromal_epithelial
Cancerous	epithelial	epithelial	TIMP3	MET	TIMP3_MET_epithelial_epithelial
Unaffected	epithelial	epithelial	APP	LRP1	APP_LRP1_epithelial_epithelial
Cancerous	stromal	epithelial	LPL	SDC1	LPL_SDC1_stromal_epithelial
Cancerous	stromal	epithelial	INHBA	TGFBR3	INHBA_TGFBR3_stromal_epithelial
Cancerous	stromal	epithelial	TIMP1	CD63	TIMP1_CD63_stromal_epithelial
Cancerous	immune	epithelial	APP	LRP1	APP_LRP1_immune_epithelial
Cancerous	stromal	epithelial	LAMB1	ITGB8	LAMB1_ITGB8_stromal_epithelial
Cancerous	epithelial	epithelial	HSP90B1	LRP1	HSP90B1_LRP1_epithelial_epithelial
Cancerous	epithelial	epithelial	FGF13	FGFR4	FGF13_FGFR4_epithelial_epithelial

Cancerous	stromal	epithelial	FN1	ITGB8	FN1_ITGB8_stromal_epithelial
Unaffected	epithelial	epithelial	SEMA4G	PLXNB1	SEMA4G_PLXNB1_epithelial_epithelial
Cancerous	immune	epithelial	CCL5	SDC1	CCL5_SDC1_immune_epithelial
Cancerous	immune	epithelial	FURIN	LRP1	FURIN_LRP1_immune_epithelial
Cancerous	epithelial	epithelial	DUSP18	RPSA	DUSP18_RPSA_epithelial_epithelial
Cancerous	stromal	epithelial	SEMA4A	PLXNB1	SEMA4A_PLXNB1_stromal_epithelial
Cancerous	epithelial	epithelial	LAMB2	ITGB4	LAMB2_ITGB4_epithelial_epithelial
Cancerous	epithelial	epithelial	C3	CD46	C3_CD46_epithelial_epithelial
Cancerous	stromal	epithelial	EPHA4	FGFR4	EPHA4_FGFR4_stromal_epithelial
Cancerous	stromal	epithelial	IGF1	ITGB4	IGF1_ITGB4_stromal_epithelial
Cancerous	immune	epithelial	PLAU	LRP1	PLAU_LRP1_immune_epithelial
Cancerous	stromal	epithelial	ADAM12	SDC4	ADAM12_SDC4_stromal_epithelial
Unaffected	stromal	epithelial	DCN	LRP1	DCN_LRP1_stromal_epithelial
Cancerous	immune	epithelial	IGF1	ITGB4	IGF1_ITGB4_immune_epithelial
Cancerous	stromal	epithelial	C3	CD46	C3_CD46_stromal_epithelial
Cancerous	immune	epithelial	PSEN1	NOTCH1	PSEN1_NOTCH1_immune_epithelial
Unaffected	stromal	epithelial	RSPO3	RNF43	RSPO3_RNF43_stromal_epithelial
Cancerous	epithelial	epithelial	JAG1	NOTCH1	JAG1_NOTCH1_epithelial_epithelial
Unaffected	stromal	epithelial	CP	SLC40A1	CP_SLC40A1_stromal_epithelial
Cancerous	immune	epithelial	LGALS3	ANXA2	LGALS3_ANXA2_immune_epithelial
Cancerous	stromal	epithelial	FAM3C	LAMP1	FAM3C_LAMP1_stromal_epithelial
Unaffected	immune	epithelial	COL4A3	ITGB8	COL4A3_ITGB8_immune_epithelial
Cancerous	immune	epithelial	NRXN3	FGFR4	NRXN3_FGFR4_immune_epithelial
Cancerous	stromal	epithelial	SAA1	SCARB1	SAA1_SCARB1_stromal_epithelial
Cancerous	epithelial	epithelial	LAMB2	RPSA	LAMB2_RPSA_epithelial_epithelial
Cancerous	stromal	epithelial	MDK	LRP1	MDK_LRP1_stromal_epithelial
Unaffected	epithelial	epithelial	EFNB2	EPHB3	EFNB2_EPHB3_epithelial_epithelial
Cancerous	stromal	epithelial	TGFB1	TGFBR3	TGFB1_TGFBR3_stromal_epithelial
Cancerous	immune	epithelial	ADAM12	SDC4	ADAM12_SDC4_immune_epithelial
Cancerous	stromal	epithelial	LGALS3	ANXA2	LGALS3_ANXA2_stromal_epithelial
Unaffected	stromal	epithelial	COL4A3	ITGB8	COL4A3_ITGB8_stromal_epithelial
Unaffected	stromal	epithelial	LAMC2	ITGB4	LAMC2_ITGB4_stromal_epithelial
Cancerous	epithelial	epithelial	EFNB2	EPHB4	EFNB2_EPHB4_epithelial_epithelial
Unaffected	immune	epithelial	UXS1	CEACAM6	UXS1_CEACAM6_immune_epithelial
Cancerous	stromal	epithelial	SEMA4D	MET	SEMA4D_MET_stromal_epithelial
Cancerous	immune	epithelial	THBS1	SDC4	THBS1_SDC4_immune_epithelial
Unaffected	epithelial	epithelial	EPHA4	FGFR4	EPHA4_FGFR4_epithelial_epithelial
Cancerous	epithelial	epithelial	UXS1	CEACAM6	UXS1_CEACAM6_epithelial_epithelial
Cancerous	stromal	epithelial	TGFB1	TGFBR1	TGFB1_TGFBR1_stromal_epithelial
Cancerous	stromal	epithelial	POSTN	PTK7	POSTN_PTK7_stromal_epithelial
Cancerous	stromal	epithelial	SEMA4D	PLXNB1	SEMA4D_PLXNB1_stromal_epithelial
Unaffected	stromal	epithelial	RSPO3	LGR5	RSPO3_LGR5_stromal_epithelial
Cancerous	stromal	epithelial	TNXB	SDC1	TNXB_SDC1_stromal_epithelial
Cancerous	immune	epithelial	ADAM10	NOTCH1	ADAM10_NOTCH1_immune_epithelial
Cancerous	immune	epithelial	THBS1	LRP1	THBS1_LRP1_immune_epithelial
Cancerous	immune	epithelial	CCL5	SDC4	CCL5_SDC4_immune_epithelial
Unaffected	epithelial	epithelial	PSEN1	NOTCH1	PSEN1_NOTCH1_epithelial_epithelial
Cancerous	immune	epithelial	FN1	ITGB8	FN1_ITGB8_immune_epithelial
Cancerous	epithelial	epithelial	PTDSS1	SCARB1	PTDSS1_SCARB1_epithelial_epithelial
Cancerous	immune	epithelial	TIMP1	CD63	TIMP1_CD63_immune_epithelial

Cancerous	stromal	epithelial	ADAM10	NOTCH1	ADAM10_NOTCH1_stromal_epithelial
Cancerous	immune	epithelial	HLA.DRA	CD63	HLA.DRA_CD63_immune_epithelial
Unaffected	stromal	epithelial	LIPC	LRP1	LIPC_LRP1_stromal_epithelial
Unaffected	epithelial	epithelial	THBS1	LRP1	THBS1_LRP1_epithelial_epithelial
Unaffected	epithelial	epithelial	CEACAM7	CEACAM6	CEACAM7_CEACAM6_epithelial_epithelial
Unaffected	epithelial	epithelial	LRRN2	TMEM123	LRRN2_TMEM123_epithelial_epithelial
Cancerous	stromal	epithelial	SLIT2	ROBO1	SLIT2_ROBO1_stromal_epithelial
Cancerous	stromal	epithelial	FGF13	FGFR4	FGF13_FGFR4_stromal_epithelial
Cancerous	epithelial	epithelial	OCLN	TGFB1	OCLN_TGFB1_epithelial_epithelial
Cancerous	stromal	epithelial	TGFB1	ITGB8	TGFB1_ITGB8_stromal_epithelial
Cancerous	immune	epithelial	HSPG2	SDC1	HSPG2_SDC1_immune_epithelial
Cancerous	immune	epithelial	JAG1	CD46	JAG1_CD46_immune_epithelial
Cancerous	stromal	epithelial	PSEN1	NOTCH1	PSEN1_NOTCH1_stromal_epithelial
Cancerous	immune	epithelial	ADAM10	TSPAN5	ADAM10_TSPAN5_immune_epithelial
Cancerous	immune	epithelial	PTDSS1	SCARB1	PTDSS1_SCARB1_immune_epithelial
Cancerous	stromal	epithelial	CALR	LRP1	CALR_LRP1_stromal_epithelial
Cancerous	stromal	epithelial	SERPING1	LRP1	SERPING1_LRP1_stromal_epithelial
Cancerous	stromal	epithelial	LPL	LRP1	LPL_LRP1_stromal_epithelial
Cancerous	stromal	epithelial	ADAM10	TSPAN5	ADAM10_TSPAN5_stromal_epithelial
Cancerous	stromal	epithelial	PSAP	LRP1	PSAP_LRP1_stromal_epithelial
Cancerous	epithelial	epithelial	LAMB1	ITGB8	LAMB1_ITGB8_epithelial_epithelial
Cancerous	stromal	epithelial	SEMA4B	PLXNB1	SEMA4B_PLXNB1_stromal_epithelial
Cancerous	immune	epithelial	COL1A1	ITGB8	COL1A1_ITGB8_immune_epithelial
Cancerous	epithelial	epithelial	CD44	EPCAM	CD44_EPCAM_epithelial_epithelial
Unaffected	stromal	epithelial	RSPO2	RNF43	RSPO2_RNF43_stromal_epithelial
Unaffected	stromal	epithelial	CEACAM7	CEACAM6	CEACAM7_CEACAM6_stromal_epithelial
Cancerous	epithelial	epithelial	ADAM10	NOTCH1	ADAM10_NOTCH1_epithelial_epithelial
Unaffected	immune	epithelial	SEMA4B	PLXNB1	SEMA4B_PLXNB1_immune_epithelial
Cancerous	immune	epithelial	A2M	LRP1	A2M_LRP1_immune_epithelial
Cancerous	epithelial	epithelial	C3	LRP1	C3_LRP1_epithelial_epithelial
Unaffected	stromal	epithelial	JAM2	F11R	JAM2_F11R_stromal_epithelial
Unaffected	immune	epithelial	CEACAM7	CEACAM6	CEACAM7_CEACAM6_immune_epithelial
Cancerous	stromal	epithelial	APOE	LDLR	APOE_LDLR_stromal_epithelial
Cancerous	immune	epithelial	SEMA5A	MET	SEMA5A_MET_immune_epithelial
Unaffected	stromal	epithelial	LTF	LRP1	LTF_LRP1_stromal_epithelial
Unaffected	stromal	epithelial	NLGN1	NRXN3	NLGN1_NRXN3_stromal_epithelial
Cancerous	epithelial	epithelial	ADAM17	NOTCH1	ADAM17_NOTCH1_epithelial_epithelial
Cancerous	stromal	epithelial	DUSP18	ITGB4	DUSP18_ITGB4_stromal_epithelial
Unaffected	stromal	epithelial	RSPO3	SDC4	RSPO3_SDC4_stromal_epithelial
Cancerous	epithelial	epithelial	FN1	ITGB8	FN1_ITGB8_epithelial_epithelial
Cancerous	epithelial	epithelial	TIMP1	CD63	TIMP1_CD63_epithelial_epithelial
Cancerous	epithelial	epithelial	FAM3C	LAMP1	FAM3C_LAMP1_epithelial_epithelial
Unaffected	stromal	epithelial	FGF14	FGFR4	FGF14_FGFR4_stromal_epithelial
Cancerous	stromal	epithelial	MFAP5	NOTCH1	MFAP5_NOTCH1_stromal_epithelial
Unaffected	stromal	epithelial	RSPO2	LGR5	RSPO2_LGR5_stromal_epithelial
Cancerous	immune	epithelial	JAG1	NOTCH1	JAG1_NOTCH1_immune_epithelial
Cancerous	stromal	epithelial	NLGN4X	NRXN3	NLGN4X_NRXN3_stromal_epithelial
Cancerous	stromal	epithelial	TNFRSF14	TRAF2	TNFRSF14_TRAF2_stromal_epithelial
Unaffected	stromal	epithelial	LRRC4C	LDLR	LRRC4C_LDLR_stromal_epithelial
Cancerous	epithelial	epithelial	RTN4	LINGO1	RTN4_LINGO1_epithelial_epithelial

Cancerous	stromal	epithelial	DUSP18	RPSA	DUSP18_RPSA_stromal_epithelial
Cancerous	immune	epithelial	TGFB1	TGFBR3	TGFB1_TGFBR3_immune_epithelial
Cancerous	epithelial	epithelial	PSAP	LRP1	PSAP_LRP1_epithelial_epithelial
Cancerous	stromal	epithelial	TNXB	SDC4	TNXB_SDC4_stromal_epithelial
Unaffected	stromal	epithelial	CNTN1	NOTCH1	CNTN1_NOTCH1_stromal_epithelial
Cancerous	stromal	epithelial	F11R	F11R	F11R_F11R_stromal_epithelial
Cancerous	immune	epithelial	CD72	SEMA4D	CD72_SEMA4D_immune_epithelial
Cancerous	epithelial	epithelial	TNFRSF14	TRAF2	TNFRSF14_TRAF2_epithelial_epithelial
Cancerous	immune	epithelial	TGFB1	TGFBR1	TGFB1_TGFBR1_immune_epithelial
Cancerous	epithelial	epithelial	EDA	EDAR	EDA_EDAR_epithelial_epithelial
Unaffected	immune	epithelial	EPHA4	FGFR4	EPHA4_FGFR4_immune_epithelial
Unaffected	immune	epithelial	LRIG1	MET	LRIG1_MET_immune_epithelial
Cancerous	epithelial	epithelial	ADAM10	TSPAN5	ADAM10_TSPAN5_epithelial_epithelial
Unaffected	immune	epithelial	JAM3	F11R	JAM3_F11R_immune_epithelial
Cancerous	immune	epithelial	HSPG2	LRP1	HSPG2_LRP1_immune_epithelial
Unaffected	stromal	epithelial	RSPO2	SDC4	RSPO2_SDC4_stromal_epithelial
Cancerous	immune	epithelial	FAM3C	LAMP1	FAM3C_LAMP1_immune_epithelial
Unaffected	stromal	epithelial	APOE	LRP1	APOE_LRP1_stromal_epithelial
Unaffected	immune	epithelial	TNR	SDC4	TNR_SDC4_immune_epithelial
Unaffected	stromal	epithelial	NCAM1	ROBO1	NCAM1_ROBO1_stromal_epithelial
Cancerous	epithelial	epithelial	GPC6	FGFR4	GPC6_FGFR4_epithelial_epithelial
Cancerous	epithelial	epithelial	THBS1	SDC1	THBS1_SDC1_epithelial_epithelial
Cancerous	stromal	epithelial	APOE	SCARB1	APOE_SCARB1_stromal_epithelial
Unaffected	epithelial	epithelial	THBS1	SDC4	THBS1_SDC4_epithelial_epithelial
Cancerous	stromal	epithelial	OCLN	TGFBR1	OCLN_TGFBR1_stromal_epithelial
Cancerous	stromal	epithelial	SLIT3	ROBO1	SLIT3_ROBO1_stromal_epithelial
Unaffected	epithelial	epithelial	GPC6	LRP1	GPC6_LRP1_epithelial_epithelial
Cancerous	immune	epithelial	NCAM1	ROBO1	NCAM1_ROBO1_immune_epithelial
Cancerous	epithelial	epithelial	TGFB1	TGFBR3	TGFB1_TGFBR3_epithelial_epithelial
Cancerous	epithelial	epithelial	TGFB1	TGFBR1	TGFB1_TGFBR1_epithelial_epithelial
Unaffected	epithelial	epithelial	TGFB1	ITGB8	TGFB1_ITGB8_epithelial_epithelial
Cancerous	immune	epithelial	OCLN	TGFBR1	OCLN_TGFBR1_immune_epithelial
Cancerous	stromal	epithelial	HLA.DRA	CD63	HLA.DRA_CD63_stromal_epithelial

Supplementary Table 6-3 Ligand–receptor interactions with E2 module
genes as ligands

top_group	sender	receiver	ligand	receptor	id
Unaffected	epithelial	epithelial	PLXNA2	SEMA6A	PLXNA2_SEMA6A_epithelial_epithelial
Unaffected	epithelial	epithelial	SEMA6A	PLXNA2	SEMA6A_PLXNA2_epithelial_epithelial
Unaffected	epithelial	epithelial	EFNB2	RHBDL2	EFNB2_RHBDL2_epithelial_epithelial
Unaffected	epithelial	epithelial	PTPRK	EGFR	PTPRK_EGFR_epithelial_epithelial
Unaffected	epithelial	epithelial	TGFA	PTPRD	TGFA_PTPRD_epithelial_epithelial
Unaffected	epithelial	epithelial	EFNA5	EPHA4	EFNA5_EPHA4_epithelial_epithelial
Unaffected	epithelial	epithelial	PSEN1	PSEN1	PSEN1_PSEN1_epithelial_epithelial
Unaffected	epithelial	epithelial	EFNB2	EPHA4	EFNB2_EPHA4_epithelial_epithelial
Unaffected	epithelial	epithelial	SEMA5A	PLXNA2	SEMA5A_PLXNA2_epithelial_epithelial
Unaffected	epithelial	stromal	LIPH	LPAR1	LIPH_LPAR1_epithelial_stromal
Unaffected	epithelial	immune	EFNB2	FCRL1	EFNB2_FCRL1_epithelial_immune
Unaffected	epithelial	epithelial	TGFA	EGFR	TGFA_EGFR_epithelial_epithelial
Unaffected	epithelial	epithelial	NEO1	RGMB	NEO1_RGMB_epithelial_epithelial
Unaffected	epithelial	stromal	PLXNA2	SEMA6A	PLXNA2_SEMA6A_epithelial_stromal
Unaffected	epithelial	stromal	TGFA	EGFR	TGFA_EGFR_epithelial_stromal
Unaffected	epithelial	stromal	SI	ITGAV	SI_ITGAV_epithelial_stromal
Unaffected	epithelial	epithelial	MUC4	ERBB2	MUC4_ERBB2_epithelial_epithelial
Unaffected	epithelial	epithelial	CNTN3	APP	CNTN3_APP_epithelial_epithelial
Unaffected	epithelial	epithelial	EFNB2	EPHA10	EFNB2_EPHA10_epithelial_epithelial
Unaffected	epithelial	epithelial	WNT2B	LRP6	WNT2B_LRP6_epithelial_epithelial
Unaffected	epithelial	stromal	EFNB2	EPHA3	EFNB2_EPHA3_epithelial_stromal
Unaffected	epithelial	stromal	PTPRK	EGFR	PTPRK_EGFR_epithelial_stromal
Unaffected	epithelial	epithelial	CNTN4	APP	CNTN4_APP_epithelial_epithelial
Unaffected	epithelial	epithelial	LIPH	LPAR1	LIPH_LPAR1_epithelial_epithelial
Unaffected	epithelial	epithelial	SPON1	APP	SPON1_APP_epithelial_epithelial
Unaffected	epithelial	stromal	EFNA5	EPHA3	EFNA5_EPHA3_epithelial_stromal
Unaffected	epithelial	epithelial	TGFA	ERBB2	TGFA_ERBB2_epithelial_epithelial
Unaffected	epithelial	stromal	NECTIN3	CADM1	NECTIN3_CADM1_epithelial_stromal
Unaffected	epithelial	stromal	EDIL3	ITGAV	EDIL3_ITGAV_epithelial_stromal
Unaffected	epithelial	epithelial	TGFA	ERBB3	TGFA_ERBB3_epithelial_epithelial
Unaffected	epithelial	immune	TGFA	ADAM17	TGFA_ADAM17_epithelial_immune
Unaffected	epithelial	epithelial	EFNA5	EPHB2	EFNA5_EPHB2_epithelial_epithelial
Unaffected	epithelial	stromal	EDIL3	ITGA5	EDIL3_ITGA5_epithelial_stromal
Unaffected	epithelial	epithelial	EFNB2	EPHB2	EFNB2_EPHB2_epithelial_epithelial
Unaffected	epithelial	stromal	EFNB2	EPHA6	EFNB2_EPHA6_epithelial_stromal
Unaffected	epithelial	epithelial	CNTN3	PTPRG	CNTN3_PTPRG_epithelial_epithelial
Unaffected	epithelial	epithelial	PSEN1	CDH1	PSEN1_CDH1_epithelial_epithelial
Unaffected	epithelial	immune	PLXNA2	SEMA6A	PLXNA2_SEMA6A_epithelial_immune
Unaffected	epithelial	stromal	EFNA5	EPHA6	EFNA5_EPHA6_epithelial_stromal
Unaffected	epithelial	epithelial	PSEN1	NOTCH2	PSEN1_NOTCH2_epithelial_epithelial
Unaffected	epithelial	epithelial	SI	ITGAV	SI_ITGAV_epithelial_epithelial
Unaffected	epithelial	stromal	EFNB2	PECAM1	EFNB2_PECAM1_epithelial_stromal
Unaffected	epithelial	epithelial	CNTN4	PTPRG	CNTN4_PTPRG_epithelial_epithelial
Unaffected	epithelial	immune	PSEN1	NOTCH2	PSEN1_NOTCH2_epithelial_immune
Unaffected	epithelial	stromal	EFNB2	EPHA4	EFNB2_EPHA4_epithelial_stromal
Unaffected	epithelial	stromal	TGFA	PTPRD	TGFA_PTPRD_epithelial_stromal

Unaffected	epithelial	epithelial	TGFA	ADAM17	TGFA_ADAM17_epithelial_epithelial
Unaffected	epithelial	stromal	EFNA5	EPHA7	EFNA5_EPHA7_epithelial_stromal
Unaffected	epithelial	epithelial	WNT2B	FZD5	WNT2B_FZD5_epithelial_epithelial
Unaffected	epithelial	stromal	EFNA5	EPHA4	EFNA5_EPHA4_epithelial_stromal
Unaffected	epithelial	stromal	SEMA6A	PLXNA2	SEMA6A_PLXNA2_epithelial_stromal
Unaffected	epithelial	stromal	PSEN1	NOTCH2	PSEN1_NOTCH2_epithelial_stromal
Unaffected	epithelial	stromal	CNTN3	PTPRG	CNTN3_PTPRG_epithelial_stromal
Unaffected	epithelial	epithelial	SI	LRP1	SI_LRP1_epithelial_epithelial
Unaffected	epithelial	epithelial	WNT2B	LRP5	WNT2B_LRP5_epithelial_epithelial
Unaffected	epithelial	stromal	CCL28	GRM7	CCL28_GRM7_epithelial_stromal
Unaffected	epithelial	stromal	WNT2B	LRP6	WNT2B_LRP6_epithelial_stromal
Unaffected	epithelial	epithelial	WNT2B	FZD6	WNT2B_FZD6_epithelial_epithelial
Unaffected	epithelial	stromal	CNTN4	PTPRG	CNTN4_PTPRG_epithelial_stromal
Unaffected	epithelial	stromal	SEMA5A	PLXNA2	SEMA5A_PLXNA2_epithelial_stromal
Unaffected	epithelial	immune	PSEN1	PSEN1	PSEN1_PSEN1_epithelial_immune
Unaffected	epithelial	stromal	EDIL3	ITGB1	EDIL3_ITGB1_epithelial_stromal
Unaffected	epithelial	stromal	SI	PDGFRA	SI_PDGFRA_epithelial_stromal
Unaffected	epithelial	stromal	TGFA	ERBB4	TGFA_ERBB4_epithelial_stromal
Unaffected	epithelial	epithelial	SEMA4G	PLXNB2	SEMA4G_PLXNB2_epithelial_epithelial
Unaffected	epithelial	stromal	WNT2B	FZD6	WNT2B_FZD6_epithelial_stromal
Cancerous	epithelial	epithelial	SEMA5A	MET	SEMA5A_MET_epithelial_epithelial
Unaffected	epithelial	epithelial	NECTIN3	NECTIN2	NECTIN3_NECTIN2_epithelial_epithelial
Unaffected	epithelial	stromal	SI	LRP1	SI_LRP1_epithelial_stromal
Unaffected	epithelial	stromal	PSEN1	PSEN1	PSEN1_PSEN1_epithelial_stromal
Cancerous	epithelial	immune	NECTIN3	CADM1	NECTIN3_CADM1_epithelial_immune
Cancerous	epithelial	stromal	NECTIN3	NECTIN2	NECTIN3_NECTIN2_epithelial_stromal
Unaffected	epithelial	epithelial	EDIL3	ITGB1	EDIL3_ITGB1_epithelial_epithelial
Unaffected	epithelial	immune	KITLG	KIT	KITLG_KIT_epithelial_immune
Unaffected	epithelial	stromal	CNTN4	LVRN	CNTN4_LVRN_epithelial_stromal
Unaffected	epithelial	stromal	EFNB2	EPHB2	EFNB2_EPHB2_epithelial_stromal
Unaffected	epithelial	stromal	CNTN3	APP	CNTN3_APP_epithelial_stromal
Unaffected	epithelial	stromal	TGFA	ADAM17	TGFA_ADAM17_epithelial_stromal
Unaffected	epithelial	immune	EFNA5	EPHA4	EFNA5_EPHA4_epithelial_immune
Unaffected	epithelial	epithelial	EDIL3	ITGAV	EDIL3_ITGAV_epithelial_epithelial
Unaffected	epithelial	stromal	EFNA5	EPHB2	EFNA5_EPHB2_epithelial_stromal
Unaffected	epithelial	stromal	CNTN4	APP	CNTN4_APP_epithelial_stromal
Cancerous	epithelial	epithelial	SEMA5A	PLXNA3	SEMA5A_PLXNA3_epithelial_epithelial
Unaffected	epithelial	stromal	SPON1	APP	SPON1_APP_epithelial_stromal
Unaffected	epithelial	epithelial	SEMA4G	PLXNB1	SEMA4G_PLXNB1_epithelial_epithelial
Cancerous	epithelial	immune	NECTIN3	NECTIN2	NECTIN3_NECTIN2_epithelial_immune
Unaffected	epithelial	immune	EFNB2	EPHA4	EFNB2_EPHA4_epithelial_immune
Unaffected	epithelial	stromal	WNT2B	LRP5	WNT2B_LRP5_epithelial_stromal
Unaffected	epithelial	epithelial	NECTIN3	PVR	NECTIN3_PVR_epithelial_epithelial
Unaffected	epithelial	immune	EFNB2	PECAM1	EFNB2_PECAM1_epithelial_immune
Cancerous	epithelial	stromal	SEMA5A	PLXNA1	SEMA5A_PLXNA1_epithelial_stromal
Unaffected	epithelial	epithelial	EFNB2	EPHB3	EFNB2_EPHB3_epithelial_epithelial
Cancerous	epithelial	epithelial	EFNB2	EPHB4	EFNB2_EPHB4_epithelial_epithelial
Unaffected	epithelial	stromal	NEO1	RGMB	NEO1_RGMB_epithelial_stromal
Unaffected	epithelial	epithelial	EDIL3	ITGB5	EDIL3_ITGB5_epithelial_epithelial
Unaffected	epithelial	stromal	PSEN1	CDH1	PSEN1_CDH1_epithelial_stromal

Unaffected	epithelial	epithelial	CCL28	GRM7	CCL28_GRM7_epithelial_epithelial
Unaffected	epithelial	stromal	EFNB2	EPHB1	EFNB2_EPHB1_epithelial_stromal
Unaffected	epithelial	stromal	SEMA4G	PLXNB2	SEMA4G_PLXNB2_epithelial_stromal
Unaffected	epithelial	epithelial	PSEN1	NOTCH1	PSEN1_NOTCH1_epithelial_epithelial
Unaffected	epithelial	stromal	EFNA5	EPHB1	EFNA5_EPHB1_epithelial_stromal
Cancerous	epithelial	stromal	PSEN1	NOTCH1	PSEN1_NOTCH1_epithelial_stromal
Unaffected	epithelial	immune	CNTN3	PTPRG	CNTN3_PTPRG_epithelial_immune
Unaffected	epithelial	immune	CNTN4	PTPRG	CNTN4_PTPRG_epithelial_immune
Unaffected	epithelial	stromal	EDIL3	ITGB5	EDIL3_ITGB5_epithelial_stromal
Cancerous	epithelial	epithelial	NECTIN3	NECTIN1	NECTIN3_NECTIN1_epithelial_epithelial
Cancerous	epithelial	immune	EFNB2	EPHB2	EFNB2_EPHB2_epithelial_immune
Unaffected	epithelial	stromal	WNT2B	FZD4	WNT2B_FZD4_epithelial_stromal
Unaffected	epithelial	immune	TGFA	PTPRD	TGFA_PTPRD_epithelial_immune
Unaffected	epithelial	immune	SPON1	LRP8	SPON1_LRP8_epithelial_immune
Unaffected	epithelial	stromal	SEMA6A	PLXNA4	SEMA6A_PLXNA4_epithelial_stromal
Cancerous	epithelial	epithelial	LIPH	LPAR2	LIPH_LPAR2_epithelial_epithelial
Cancerous	epithelial	stromal	EFNB2	EPHB4	EFNB2_EPHB4_epithelial_stromal
Unaffected	epithelial	immune	LIPH	LPAR2	LIPH_LPAR2_epithelial_immune
Cancerous	epithelial	immune	EFNB2	EPHB3	EFNB2_EPHB3_epithelial_immune
Unaffected	epithelial	stromal	EFNB2	RHBDL2	EFNB2_RHBDL2_epithelial_stromal
Unaffected	epithelial	epithelial	EFNA5	EPHA2	EFNA5_EPHA2_epithelial_epithelial
Unaffected	epithelial	epithelial	WNT2B	FZD3	WNT2B_FZD3_epithelial_epithelial
Unaffected	epithelial	stromal	SI	PDGFRB	SI_PDGFRB_epithelial_stromal
Unaffected	epithelial	immune	SPON1	APP	SPON1_APP_epithelial_immune
Unaffected	epithelial	immune	LIPH	LPAR1	LIPH_LPAR1_epithelial_immune
Unaffected	epithelial	immune	CNTN3	APP	CNTN3_APP_epithelial_immune
Unaffected	epithelial	stromal	SEMA4G	PLXNB1	SEMA4G_PLXNB1_epithelial_stromal
Unaffected	epithelial	stromal	PSEN1	NOTCH4	PSEN1_NOTCH4_epithelial_stromal
Unaffected	epithelial	immune	EDIL3	ITGAV	EDIL3_ITGAV_epithelial_immune
Unaffected	epithelial	immune	EDIL3	ITGB1	EDIL3_ITGB1_epithelial_immune
Unaffected	epithelial	stromal	NTN4	DCC	NTN4_DCC_epithelial_stromal
Unaffected	epithelial	epithelial	PSEN1	NCSTN	PSEN1_NCSTN_epithelial_epithelial
Unaffected	epithelial	immune	CNTN4	APP	CNTN4_APP_epithelial_immune
Cancerous	epithelial	epithelial	EFNB2	EPHB1	EFNB2_EPHB1_epithelial_epithelial
Unaffected	epithelial	epithelial	NECTIN3	CADM1	NECTIN3_CADM1_epithelial_epithelial
Unaffected	epithelial	immune	SEMA6A	PLXNA2	SEMA6A_PLXNA2_epithelial_immune
Unaffected	epithelial	immune	PSEN1	NCSTN	PSEN1_NCSTN_epithelial_immune
Cancerous	epithelial	immune	SEMA5A	PLXNA3	SEMA5A_PLXNA3_epithelial_immune
Unaffected	epithelial	stromal	EFNA5	EPHA2	EFNA5_EPHA2_epithelial_stromal
Unaffected	epithelial	immune	PSEN1	CDH1	PSEN1_CDH1_epithelial_immune
Unaffected	epithelial	immune	SEMA5A	PLXNA2	SEMA5A_PLXNA2_epithelial_immune
Unaffected	epithelial	stromal	TGFA	ERBB2	TGFA_ERBB2_epithelial_stromal
Unaffected	epithelial	immune	SI	ITGAV	SI_ITGAV_epithelial_immune
Cancerous	epithelial	immune	NTN4	DCC	NTN4_DCC_epithelial_immune
Unaffected	epithelial	stromal	SEMA5A	MET	SEMA5A_MET_epithelial_stromal
Cancerous	epithelial	stromal	SEMA5A	PLXNA3	SEMA5A_PLXNA3_epithelial_stromal
Unaffected	epithelial	stromal	MUC4	ERBB2	MUC4_ERBB2_epithelial_stromal
Cancerous	epithelial	stromal	PSEN1	NOTCH3	PSEN1_NOTCH3_epithelial_stromal
Unaffected	epithelial	stromal	WNT2B	FZD5	WNT2B_FZD5_epithelial_stromal
Unaffected	epithelial	immune	PSEN1	NOTCH1	PSEN1_NOTCH1_epithelial_immune

Unaffected	epithelial	immune	EDIL3	ITGB5	EDIL3_ITGB5_epithelial_immune
Unaffected	epithelial	stromal	PSEN1	NCSTN	PSEN1_NCSTN_epithelial_stromal
Unaffected	epithelial	immune	TGFA	ERBB2	TGFA_ERBB2_epithelial_immune
Unaffected	epithelial	immune	SEMA5A	MET	SEMA5A_MET_epithelial_immune
Unaffected	epithelial	immune	WNT2B	LRP5	WNT2B_LRP5_epithelial_immune
Unaffected	epithelial	immune	EFNA5	EPHB2	EFNA5_EPHB2_epithelial_immune
Unaffected	epithelial	immune	MUC4	ERBB2	MUC4_ERBB2_epithelial_immune

Supplementary Table 6-4 Ligand–receptor interactions with E2 module genes as
receptors

top_group	sender	receiver	ligand	receptor	id
Unaffected	epithelial	epithelial	SEMA3C	PLXNA2	SEMA3C_PLXNA2_epithelial_epithelial
Unaffected	epithelial	epithelial	PLXNA2	SEMA6A	PLXNA2_SEMA6A_epithelial_epithelial
Unaffected	epithelial	epithelial	SEMA6A	PLXNA2	SEMA6A_PLXNA2_epithelial_epithelial
Unaffected	epithelial	epithelial	LRIG2	EGFR	LRIG2_EGFR_epithelial_epithelial
Unaffected	epithelial	epithelial	EFNB2	RHBDL2	EFNB2_RHBDL2_epithelial_epithelial
Unaffected	epithelial	epithelial	CEACAM1	EGFR	CEACAM1_EGFR_epithelial_epithelial
Unaffected	stromal	epithelial	FGF13	SCN9A	FGF13_SCN9A_stromal_epithelial
Unaffected	epithelial	epithelial	PTPRK	EGFR	PTPRK_EGFR_epithelial_epithelial
Unaffected	immune	epithelial	LRIG2	EGFR	LRIG2_EGFR_immune_epithelial
Unaffected	epithelial	epithelial	PSEN1	PSEN1	PSEN1_PSEN1_epithelial_epithelial
Unaffected	epithelial	epithelial	LGALS3	PTPRK	LGALS3_PTPRK_epithelial_epithelial
Unaffected	stromal	epithelial	SEMA3C	PLXNA2	SEMA3C_PLXNA2_stromal_epithelial
Unaffected	epithelial	epithelial	SEMA5A	PLXNA2	SEMA5A_PLXNA2_epithelial_epithelial
Unaffected	epithelial	epithelial	TGFA	EGFR	TGFA_EGFR_epithelial_epithelial
Unaffected	stromal	epithelial	FGF14	SCN9A	FGF14_SCN9A_stromal_epithelial
Unaffected	stromal	epithelial	LRIG1	EGFR	LRIG1_EGFR_stromal_epithelial
Unaffected	stromal	epithelial	SEMA6A	PLXNA2	SEMA6A_PLXNA2_stromal_epithelial
Unaffected	epithelial	epithelial	CDCP1	EGFR	CDCP1_EGFR_epithelial_epithelial
Unaffected	stromal	epithelial	FGF13	EGFR	FGF13_EGFR_stromal_epithelial
Unaffected	immune	epithelial	ST6GAL1	EGFR	ST6GAL1_EGFR_immune_epithelial
Unaffected	stromal	epithelial	SEMA5A	PLXNA2	SEMA5A_PLXNA2_stromal_epithelial
Unaffected	stromal	epithelial	NRG3	EGFR	NRG3_EGFR_stromal_epithelial
Unaffected	epithelial	epithelial	LIPH	LPAR1	LIPH_LPAR1_epithelial_epithelial
Unaffected	stromal	epithelial	SEMA3A	PLXNA2	SEMA3A_PLXNA2_stromal_epithelial
Unaffected	stromal	epithelial	NTN1	NEO1	NTN1_NEO1_stromal_epithelial
Unaffected	stromal	epithelial	NRG1	EGFR	NRG1_EGFR_stromal_epithelial
Unaffected	epithelial	epithelial	CMTM8	EGFR	CMTM8_EGFR_epithelial_epithelial
Unaffected	stromal	epithelial	PTPRK	EGFR	PTPRK_EGFR_stromal_epithelial
Unaffected	stromal	epithelial	DSCAML1	PTPRK	DSCAML1_PTPRK_stromal_epithelial
Unaffected	stromal	epithelial	DCN	EGFR	DCN_EGFR_stromal_epithelial
Unaffected	stromal	epithelial	RSPO3	LGR4	RSPO3_LGR4_stromal_epithelial
Unaffected	epithelial	epithelial	EGF	EGFR	EGF_EGFR_epithelial_epithelial
Unaffected	stromal	epithelial	SEMA3D	PLXNA2	SEMA3D_PLXNA2_stromal_epithelial
Unaffected	stromal	epithelial	RGMA	NEO1	RGMA_NEO1_stromal_epithelial
Unaffected	epithelial	epithelial	CDH1	EGFR	CDH1_EGFR_epithelial_epithelial
Unaffected	epithelial	epithelial	NRG4	EGFR	NRG4_EGFR_epithelial_epithelial
Unaffected	stromal	epithelial	PLXNA2	SEMA6A	PLXNA2_SEMA6A_stromal_epithelial
Unaffected	stromal	epithelial	CADM1	NECTIN3	CADM1_NECTIN3_stromal_epithelial
Unaffected	immune	epithelial	CMTM8	EGFR	CMTM8_EGFR_immune_epithelial
Unaffected	immune	epithelial	SEMA6A	PLXNA2	SEMA6A_PLXNA2_immune_epithelial
Unaffected	epithelial	epithelial	SEMA3B	PLXNA2	SEMA3B_PLXNA2_epithelial_epithelial
Unaffected	immune	epithelial	PTPRK	EGFR	PTPRK_EGFR_immune_epithelial
Cancerous	immune	epithelial	CADM1	NECTIN3	CADM1_NECTIN3_immune_epithelial
Unaffected	epithelial	epithelial	NECTIN2	NECTIN3	NECTIN2_NECTIN3_epithelial_epithelial
Unaffected	stromal	epithelial	RSPO2	LGR4	RSPO2_LGR4_stromal_epithelial
Unaffected	epithelial	epithelial	LRIG1	EGFR	LRIG1_EGFR_epithelial_epithelial

Unaffected	immune	epithelial	PSEN1	PSEN1	PSEN1_PSEN1_immune_epithelial
Unaffected	stromal	epithelial	ANXA2	EGFR	ANXA2_EGFR_stromal_epithelial
Unaffected	stromal	epithelial	PDCD1LG2	TNFRSF11A	PDCD1LG2_TNFRSF11A_stromal_epithelial
Unaffected	immune	epithelial	GNAS	ADCY9	GNAS_ADCY9_immune_epithelial
Unaffected	stromal	epithelial	TNC	EGFR	TNC_EGFR_stromal_epithelial
Unaffected	epithelial	epithelial	BTC	EGFR	BTC_EGFR_epithelial_epithelial
Cancerous	stromal	epithelial	S100A10	CFTR	S100A10_CFTR_stromal_epithelial
Unaffected	stromal	epithelial	ST6GAL1	EGFR	ST6GAL1_EGFR_stromal_epithelial
Unaffected	epithelial	epithelial	ANXA2	EGFR	ANXA2_EGFR_epithelial_epithelial
Cancerous	epithelial	epithelial	ZP3	EGFR	ZP3_EGFR_epithelial_epithelial
Cancerous	stromal	epithelial	NECTIN2	NECTIN3	NECTIN2_NECTIN3_stromal_epithelial
Unaffected	stromal	epithelial	PSEN1	PSEN1	PSEN1_PSEN1_stromal_epithelial
Unaffected	epithelial	epithelial	PLA2G2A	EGFR	PLA2G2A_EGFR_epithelial_epithelial
Unaffected	stromal	epithelial	TNFSF11	TNFRSF11A	TNFSF11_TNFRSF11A_stromal_epithelial
Unaffected	stromal	epithelial	EFNB2	RHBDL2	EFNB2_RHBDL2_stromal_epithelial
Unaffected	immune	epithelial	LRIG1	EGFR	LRIG1_EGFR_immune_epithelial
Unaffected	epithelial	epithelial	DSCAML1	PTPRK	DSCAML1_PTPRK_epithelial_epithelial
Cancerous	immune	epithelial	S100A10	CFTR	S100A10_CFTR_immune_epithelial
Cancerous	immune	epithelial	ANXA2	EGFR	ANXA2_EGFR_immune_epithelial
Unaffected	stromal	epithelial	SEMA3B	PLXNA2	SEMA3B_PLXNA2_stromal_epithelial
Cancerous	stromal	epithelial	VCAN	EGFR	VCAN_EGFR_stromal_epithelial
Unaffected	stromal	epithelial	LRIG2	EGFR	LRIG2_EGFR_stromal_epithelial
Unaffected	stromal	epithelial	ANXA1	EGFR	ANXA1_EGFR_stromal_epithelial
Unaffected	epithelial	epithelial	PVR	NECTIN3	PVR_NECTIN3_epithelial_epithelial
Cancerous	immune	epithelial	NECTIN2	NECTIN3	NECTIN2_NECTIN3_immune_epithelial
Unaffected	epithelial	epithelial	EDN1	EGFR	EDN1_EGFR_epithelial_epithelial
Unaffected	stromal	epithelial	EFEMP1	EGFR	EFEMP1_EGFR_stromal_epithelial
Cancerous	immune	epithelial	EREG	EGFR	EREG_EGFR_immune_epithelial
Unaffected	stromal	epithelial	S100A4	EGFR	S100A4_EGFR_stromal_epithelial
Cancerous	stromal	epithelial	MMP2	EGFR	MMP2_EGFR_stromal_epithelial
Cancerous	epithelial	epithelial	AREG	EGFR	AREG_EGFR_epithelial_epithelial
Unaffected	immune	epithelial	CEACAM1	EGFR	CEACAM1_EGFR_immune_epithelial
Unaffected	stromal	epithelial	GNAS	ADCY9	GNAS_ADCY9_stromal_epithelial
Cancerous	immune	epithelial	ANXA1	EGFR	ANXA1_EGFR_immune_epithelial
Unaffected	epithelial	epithelial	CEACAM6	EGFR	CEACAM6_EGFR_epithelial_epithelial
Unaffected	stromal	epithelial	EDN1	EGFR	EDN1_EGFR_stromal_epithelial
Unaffected	stromal	epithelial	TGFB2	ACVR1C	TGFB2_ACVR1C_stromal_epithelial
Unaffected	stromal	epithelial	CDH1	EGFR	CDH1_EGFR_stromal_epithelial
Unaffected	epithelial	epithelial	S100A10	CFTR	S100A10_CFTR_epithelial_epithelial
Unaffected	stromal	epithelial	LGALS3	PTPRK	LGALS3_PTPRK_stromal_epithelial
Cancerous	stromal	epithelial	SEMA3F	PLXNA2	SEMA3F_PLXNA2_stromal_epithelial
Unaffected	epithelial	epithelial	NECTIN1	NECTIN3	NECTIN1_NECTIN3_epithelial_epithelial
Unaffected	immune	epithelial	SEMA4A	PLXNA2	SEMA4A_PLXNA2_immune_epithelial
Cancerous	stromal	epithelial	CD34	NECTIN3	CD34_NECTIN3_stromal_epithelial
Cancerous	immune	epithelial	GRN	EGFR	GRN_EGFR_immune_epithelial
Cancerous	stromal	epithelial	AREG	EGFR	AREG_EGFR_stromal_epithelial
Cancerous	epithelial	epithelial	SPINK1	EGFR	SPINK1_EGFR_epithelial_epithelial
Cancerous	stromal	epithelial	IGFBP3	EGFR	IGFBP3_EGFR_stromal_epithelial
Unaffected	stromal	epithelial	CEACAM1	EGFR	CEACAM1_EGFR_stromal_epithelial
Unaffected	epithelial	epithelial	ST6GAL1	EGFR	ST6GAL1_EGFR_epithelial_epithelial

Cancerous	stromal	epithelial	ICAM1	EGFR	ICAM1_EGFR_stromal_epithelial
Unaffected	immune	epithelial	SEMA5A	PLXNA2	SEMA5A_PLXNA2_immune_epithelial
Cancerous	immune	epithelial	HBEGF	EGFR	HBEGF_EGFR_immune_epithelial
Unaffected	immune	epithelial	CEACAM6	EGFR	CEACAM6_EGFR_immune_epithelial
Unaffected	immune	epithelial	LIPH	LPAR1	LIPH_LPAR1_immune_epithelial
Unaffected	immune	epithelial	SEMA3C	PLXNA2	SEMA3C_PLXNA2_immune_epithelial
Cancerous	immune	epithelial	VCAN	EGFR	VCAN_EGFR_immune_epithelial
Unaffected	immune	epithelial	EFNB2	RHBDL2	EFNB2_RHBDL2_immune_epithelial
Unaffected	immune	epithelial	LGALS3	PTPRK	LGALS3_PTPRK_immune_epithelial
Unaffected	immune	epithelial	PLXNA2	SEMA6A	PLXNA2_SEMA6A_immune_epithelial
Cancerous	immune	epithelial	ICAM1	EGFR	ICAM1_EGFR_immune_epithelial
Unaffected	stromal	epithelial	LIPH	LPAR1	LIPH_LPAR1_stromal_epithelial
Cancerous	epithelial	epithelial	EREG	EGFR	EREG_EGFR_epithelial_epithelial
Unaffected	epithelial	epithelial	GNAS	ADCY9	GNAS_ADCY9_epithelial_epithelial
Unaffected	immune	epithelial	TGFA	EGFR	TGFA_EGFR_immune_epithelial
Unaffected	epithelial	epithelial	SEMA3F	PLXNA2	SEMA3F_PLXNA2_epithelial_epithelial
Unaffected	epithelial	epithelial	GRN	EGFR	GRN_EGFR_epithelial_epithelial
Cancerous	immune	epithelial	AREG	EGFR	AREG_EGFR_immune_epithelial
Cancerous	immune	epithelial	CDH1	EGFR	CDH1_EGFR_immune_epithelial
Unaffected	epithelial	epithelial	FGF13	SCN9A	FGF13_SCN9A_epithelial_epithelial
Cancerous	epithelial	epithelial	SEMA3A	PLXNA2	SEMA3A_PLXNA2_epithelial_epithelial
Cancerous	stromal	epithelial	CMTM8	EGFR	CMTM8_EGFR_stromal_epithelial
Unaffected	immune	epithelial	NRG1	EGFR	NRG1_EGFR_immune_epithelial
Unaffected	stromal	epithelial	SEMA4A	PLXNA2	SEMA4A_PLXNA2_stromal_epithelial
Unaffected	stromal	epithelial	CEACAM6	EGFR	CEACAM6_EGFR_stromal_epithelial
Unaffected	immune	epithelial	CDCP1	EGFR	CDCP1_EGFR_immune_epithelial
Cancerous	stromal	epithelial	SPINK1	EGFR	SPINK1_EGFR_stromal_epithelial
Cancerous	stromal	epithelial	SEMA6B	PLXNA2	SEMA6B_PLXNA2_stromal_epithelial
Unaffected	epithelial	epithelial	FGF13	EGFR	FGF13_EGFR_epithelial_epithelial
Unaffected	epithelial	epithelial	CADM1	NECTIN3	CADM1_NECTIN3_epithelial_epithelial
Unaffected	stromal	epithelial	GRN	EGFR	GRN_EGFR_stromal_epithelial
Unaffected	stromal	epithelial	CDCP1	EGFR	CDCP1_EGFR_stromal_epithelial

Supplementary Table 6-5 Ligand–receptor interactions with E3 module genes as ligands

top_group	sender	receiver	ligand	receptor	id
Unaffected	epithelial	epithelial	CEACAM1	EGFR	CEACAM1_EGFR_epithelial_epithelial
Unaffected	epithelial	stromal	IL18	IL1RAPL1	IL18_IL1RAPL1_epithelial_stromal
Unaffected	epithelial	epithelial	LGALS3	PTPRK	LGALS3_PTPRK_epithelial_epithelial
Unaffected	epithelial	stromal	ATP1B1	NEGR1	ATP1B1_NEGR1_epithelial_stromal
Unaffected	epithelial	stromal	CEACAM1	EGFR	CEACAM1_EGFR_epithelial_stromal
Unaffected	epithelial	stromal	SLC6A8	LIFR	SLC6A8_LIFR_epithelial_stromal
Unaffected	epithelial	epithelial	DSC2	DSG2	DSC2_DSG2_epithelial_epithelial
Unaffected	epithelial	epithelial	GUCA2A	GUCY2C	GUCA2A_GUCY2C_epithelial_epithelial
Unaffected	epithelial	immune	NETO2	FCRL1	NETO2_FCRL1_epithelial_immune
Unaffected	epithelial	epithelial	LAMA3	ITGA3	LAMA3_ITGA3_epithelial_epithelial
Unaffected	epithelial	immune	LGALS9	PTPRC	LGALS9_PTPRC_epithelial_immune
Cancerous	epithelial	stromal	SEMA3B	NRP1	SEMA3B_NRP1_epithelial_stromal
Cancerous	epithelial	immune	SEMA3B	NRP2	SEMA3B_NRP2_epithelial_immune
Unaffected	epithelial	epithelial	IGSF3	PTGFRN	IGSF3_PTGFRN_epithelial_epithelial
Unaffected	epithelial	immune	LGALS9	CD47	LGALS9_CD47_epithelial_immune
Cancerous	epithelial	immune	SEMA3B	NRP1	SEMA3B_NRP1_epithelial_immune
Unaffected	epithelial	stromal	SEMA4B	DCBLD2	SEMA4B_DCBLD2_epithelial_stromal
Unaffected	epithelial	immune	TNFSF10	TNFRSF10A	TNFSF10_TNFRSF10A_epithelial_immune
Unaffected	epithelial	immune	TSPAN3	ADAM10	TSPAN3_ADAM10_epithelial_immune
Unaffected	epithelial	epithelial	EZR	SLC9A1	EZR_SLC9A1_epithelial_epithelial
Cancerous	epithelial	epithelial	SEMA3B	PLXNA3	SEMA3B_PLXNA3_epithelial_epithelial
Unaffected	epithelial	stromal	LGALS3	PTPRK	LGALS3_PTPRK_epithelial_stromal
Unaffected	epithelial	epithelial	LAMA3	ITGA6	LAMA3_ITGA6_epithelial_epithelial
Unaffected	epithelial	epithelial	LAMC2	ITGA3	LAMC2_ITGA3_epithelial_epithelial
Cancerous	epithelial	stromal	SEMA3B	PLXNA1	SEMA3B_PLXNA1_epithelial_stromal
Unaffected	epithelial	stromal	LAMA3	SDC2	LAMA3_SDC2_epithelial_stromal
Cancerous	epithelial	stromal	SEMA3B	PLXNA4	SEMA3B_PLXNA4_epithelial_stromal
Cancerous	epithelial	stromal	LAMC2	ITGA2	LAMC2_ITGA2_epithelial_stromal
Unaffected	epithelial	immune	LGALS9	CD44	LGALS9_CD44_epithelial_immune
Unaffected	epithelial	stromal	COL17A1	ITGA1	COL17A1_ITGA1_epithelial_stromal
Cancerous	epithelial	epithelial	LAMC2	ITGB4	LAMC2_ITGB4_epithelial_epithelial
Unaffected	epithelial	immune	IL18	IL18R1	IL18_IL18R1_epithelial_immune
Unaffected	epithelial	immune	CD58	CD2	CD58_CD2_epithelial_immune
Cancerous	epithelial	immune	LAMC2	ITGB1	LAMC2_ITGB1_epithelial_immune
Unaffected	epithelial	stromal	CD58	PTPRT	CD58_PTPRT_epithelial_stromal
Cancerous	epithelial	epithelial	LAMC2	ITGA2	LAMC2_ITGA2_epithelial_epithelial
Unaffected	epithelial	stromal	LAMC2	ITGA9	LAMC2_ITGA9_epithelial_stromal
Cancerous	epithelial	stromal	LAMC2	ITGB1	LAMC2_ITGB1_epithelial_stromal
Cancerous	epithelial	stromal	PRSS3	F2R	PRSS3_F2R_epithelial_stromal
Unaffected	epithelial	epithelial	SEMA4B	PLXNB2	SEMA4B_PLXNB2_epithelial_epithelial
Unaffected	epithelial	epithelial	SEMA3B	PLXNA2	SEMA3B_PLXNA2_epithelial_epithelial
Unaffected	epithelial	stromal	COL17A1	ITGB1	COL17A1_ITGB1_epithelial_stromal
Unaffected	epithelial	stromal	LGALS3	ANXA2	LGALS3_ANXA2_epithelial_stromal
Cancerous	epithelial	stromal	SEMA3B	PLXNA2	SEMA3B_PLXNA2_epithelial_stromal
Unaffected	epithelial	epithelial	COL17A1	ITGB1	COL17A1_ITGB1_epithelial_epithelial
Unaffected	epithelial	epithelial	SEMA4B	DCBLD2	SEMA4B_DCBLD2_epithelial_epithelial
Unaffected	epithelial	epithelial	BMP1	BMPR1A	BMP1_BMPR1A_epithelial_epithelial

Cancerous	epithelial	stromal	LGALS9	MRC2	LGALS9_MRC2_epithelial_stromal
Unaffected	epithelial	epithelial	TSPAN3	ADAM10	TSPAN3_ADAM10_epithelial_epithelial
Cancerous	epithelial	stromal	SEMA3B	NRP2	SEMA3B_NRP2_epithelial_stromal
Unaffected	epithelial	epithelial	LGALS3	ANXA2	LGALS3_ANXA2_epithelial_epithelial
Cancerous	epithelial	epithelial	SEMA4B	PLXNB1	SEMA4B_PLXNB1_epithelial_epithelial
Unaffected	epithelial	epithelial	LAMC2	ITGA6	LAMC2_ITGA6_epithelial_epithelial
Cancerous	epithelial	immune	LGALS9	HAVCR2	LGALS9_HAVCR2_epithelial_immune
Cancerous	epithelial	epithelial	LAMC2	CD151	LAMC2_CD151_epithelial_epithelial
Unaffected	epithelial	immune	ST14	BTN3A1	ST14_BTN3A1_epithelial_immune
Unaffected	epithelial	stromal	LGALS9	CD44	LGALS9_CD44_epithelial_stromal
Unaffected	epithelial	stromal	LAMA3	ITGB1	LAMA3_ITGB1_epithelial_stromal
Unaffected	epithelial	epithelial	LAMA3	ITGB1	LAMA3_ITGB1_epithelial_epithelial
Cancerous	epithelial	stromal	LAMC2	CD151	LAMC2_CD151_epithelial_stromal
Unaffected	epithelial	stromal	CDH13	NCAM2	CDH13_NCAM2_epithelial_stromal
Unaffected	epithelial	stromal	BMP1	BMPR1A	BMP1_BMPR1A_epithelial_stromal
Cancerous	epithelial	stromal	SEMA4B	PLXNB2	SEMA4B_PLXNB2_epithelial_stromal
Cancerous	epithelial	immune	LAMC2	ITGA9	LAMC2_ITGA9_epithelial_immune
Unaffected	epithelial	immune	BTNL8	LILRB1	BTNL8_LILRB1_epithelial_immune
Cancerous	epithelial	immune	SEMA3B	PLXNA3	SEMA3B_PLXNA3_epithelial_immune
Unaffected	epithelial	epithelial	COL17A1	ITGA2	COL17A1_ITGA2_epithelial_epithelial
Cancerous	epithelial	stromal	ST14	PLAU	ST14_PLAU_epithelial_stromal
Cancerous	epithelial	immune	LAMC2	ITGA2	LAMC2_ITGA2_epithelial_immune
Cancerous	epithelial	stromal	LGALS3	ENG	LGALS3_ENG_epithelial_stromal
Unaffected	epithelial	immune	NETO2	IL18R1	NETO2_IL18R1_epithelial_immune
Unaffected	epithelial	epithelial	LAMA3	ITGB4	LAMA3_ITGB4_epithelial_epithelial
Unaffected	epithelial	immune	SEMA6D	PLXNC1	SEMA6D_PLXNC1_epithelial_immune
Unaffected	epithelial	stromal	TSPAN3	ADAM10	TSPAN3_ADAM10_epithelial_stromal
Cancerous	epithelial	immune	LAMC2	ITGA6	LAMC2_ITGA6_epithelial_immune
Unaffected	epithelial	immune	LGALS3	PTPRK	LGALS3_PTPRK_epithelial_immune
Cancerous	epithelial	immune	LGALS3	ANXA2	LGALS3_ANXA2_epithelial_immune
Cancerous	epithelial	stromal	LAMC2	ITGA6	LAMC2_ITGA6_epithelial_stromal
Cancerous	epithelial	immune	CEACAM1	HAVCR2	CEACAM1_HAVCR2_epithelial_immune
Cancerous	epithelial	stromal	SEMA3B	PLXNA3	SEMA3B_PLXNA3_epithelial_stromal
Unaffected	epithelial	epithelial	LAMC2	ITGB1	LAMC2_ITGB1_epithelial_epithelial
Unaffected	epithelial	epithelial	PRSS3	F2RL1	PRSS3_F2RL1_epithelial_epithelial
Cancerous	epithelial	stromal	LGALS3	MCAM	LGALS3_MCAM_epithelial_stromal
Cancerous	epithelial	immune	LGALS9	MRC2	LGALS9_MRC2_epithelial_immune
Cancerous	epithelial	immune	LAMA3	ITGB1	LAMA3_ITGB1_epithelial_immune
Unaffected	epithelial	stromal	LGALS9	CD47	LGALS9_CD47_epithelial_stromal
Unaffected	epithelial	stromal	LAMA3	ITGB4	LAMA3_ITGB4_epithelial_stromal
Unaffected	epithelial	immune	BMP1	BMPR1A	BMP1_BMPR1A_epithelial_immune
Cancerous	epithelial	immune	ST14	PLAU	ST14_PLAU_epithelial_immune
Cancerous	epithelial	stromal	CDHR2	KIRREL1	CDHR2_KIRREL1_epithelial_stromal
Unaffected	epithelial	immune	COL17A1	ITGA1	COL17A1_ITGA1_epithelial_immune
Unaffected	epithelial	stromal	IGSF3	PTGFRN	IGSF3_PTGFRN_epithelial_stromal
Unaffected	epithelial	epithelial	TNFSF10	TNFRSF10D	TNFSF10_TNFRSF10D_epithelial_epithelial
Cancerous	epithelial	stromal	LGALS9	SLC1A5	LGALS9_SLC1A5_epithelial_stromal
Cancerous	epithelial	stromal	SEMA4B	PLXNB1	SEMA4B_PLXNB1_epithelial_stromal
Cancerous	epithelial	immune	LGALS3	ENG	LGALS3_ENG_epithelial_immune
Unaffected	epithelial	stromal	LGALS9	PTPRC	LGALS9_PTPRC_epithelial_stromal

Unaffected	epithelial	stromal	TNFSF10	TNFRSF10D	TNFSF10_TNFRSF10D_epithelial_stromal
Unaffected	epithelial	epithelial	CEACAM7	CEACAM6	CEACAM7_CEACAM6_epithelial_epithelial
Unaffected	epithelial	epithelial	LGALS9	PTPRC	LGALS9_PTPRC_epithelial_epithelial
Cancerous	epithelial	epithelial	ST14	BTN3A1	ST14_BTN3A1_epithelial_epithelial
Unaffected	epithelial	stromal	LAMC2	ITGB4	LAMC2_ITGB4_epithelial_stromal
Unaffected	epithelial	epithelial	TNFSF10	TNFRSF10A	TNFSF10_TNFRSF10A_epithelial_epithelial
Unaffected	epithelial	epithelial	BMP1	BMPR2	BMP1_BMPR2_epithelial_epithelial
Cancerous	epithelial	immune	BTNL8	LILRB3	BTNL8_LILRB3_epithelial_immune
Cancerous	epithelial	immune	LAMA3	SDC2	LAMA3_SDC2_epithelial_immune
Unaffected	epithelial	stromal	LAMA3	ITGA6	LAMA3_ITGA6_epithelial_stromal
Unaffected	epithelial	epithelial	LGALS9	CD44	LGALS9_CD44_epithelial_epithelial
Cancerous	epithelial	epithelial	LGALS9	SLC1A5	LGALS9_SLC1A5_epithelial_epithelial
Cancerous	epithelial	stromal	LAMC2	ITGA3	LAMC2_ITGA3_epithelial_stromal
Unaffected	epithelial	stromal	NETO2	IL18R1	NETO2_IL18R1_epithelial_stromal
Unaffected	epithelial	epithelial	TNFSF10	TNFRSF10B	TNFSF10_TNFRSF10B_epithelial_epithelial
Unaffected	epithelial	stromal	IL18	IL18R1	IL18_IL18R1_epithelial_stromal
Unaffected	epithelial	stromal	BMP1	BMPR2	BMP1_BMPR2_epithelial_stromal
Unaffected	epithelial	epithelial	COL17A1	ITGA1	COL17A1_ITGA1_epithelial_epithelial
Unaffected	epithelial	epithelial	IL18	IL1RL2	IL18_IL1RL2_epithelial_epithelial
Cancerous	epithelial	epithelial	LAMC2	ITGA9	LAMC2_ITGA9_epithelial_epithelial
Unaffected	epithelial	stromal	COL17A1	ITGA10	COL17A1_ITGA10_epithelial_stromal
Cancerous	epithelial	stromal	COL17A1	ITGA2	COL17A1_ITGA2_epithelial_stromal
Cancerous	epithelial	stromal	COL17A1	ITGA11	COL17A1_ITGA11_epithelial_stromal
Unaffected	epithelial	epithelial	LGALS9	CD47	LGALS9_CD47_epithelial_epithelial
Cancerous	epithelial	immune	LAMA3	ITGA6	LAMA3_ITGA6_epithelial_immune
Cancerous	epithelial	immune	SEMA4B	PLXNB2	SEMA4B_PLXNB2_epithelial_immune
Unaffected	epithelial	epithelial	SEMA6D	PLXNC1	SEMA6D_PLXNC1_epithelial_epithelial
Cancerous	epithelial	stromal	TNFSF10	TNFRSF10B	TNFSF10_TNFRSF10B_epithelial_stromal
Cancerous	epithelial	stromal	ST14	BTN3A1	ST14_BTN3A1_epithelial_stromal
Unaffected	epithelial	immune	CEACAM7	CEACAM6	CEACAM7_CEACAM6_epithelial_immune
Cancerous	epithelial	stromal	DSC2	DSG2	DSC2_DSG2_epithelial_stromal
Cancerous	epithelial	stromal	EZR	SLC9A1	EZR_SLC9A1_epithelial_stromal
Unaffected	epithelial	immune	COL17A1	ITGB1	COL17A1_ITGB1_epithelial_immune
Unaffected	epithelial	stromal	SEMA6D	PLXNA4	SEMA6D_PLXNA4_epithelial_stromal
Cancerous	epithelial	stromal	SEMA6D	PLXNA1	SEMA6D_PLXNA1_epithelial_stromal
Cancerous	epithelial	immune	LAMC2	ITGB4	LAMC2_ITGB4_epithelial_immune
Unaffected	epithelial	immune	BMP1	BMPR2	BMP1_BMPR2_epithelial_immune
Unaffected	epithelial	immune	DSC2	DSG2	DSC2_DSG2_epithelial_immune
Unaffected	epithelial	stromal	LAMA3	ITGA3	LAMA3_ITGA3_epithelial_stromal
Cancerous	epithelial	immune	COL17A1	ITGA2	COL17A1_ITGA2_epithelial_immune
Unaffected	epithelial	stromal	CEACAM7	CEACAM6	CEACAM7_CEACAM6_epithelial_stromal
Unaffected	epithelial	immune	TNFSF10	TNFRSF10B	TNFSF10_TNFRSF10B_epithelial_immune
Unaffected	epithelial	stromal	SEMA6D	PLXNC1	SEMA6D_PLXNC1_epithelial_stromal
Unaffected	epithelial	immune	GUCA2A	GUCY2C	GUCA2A_GUCY2C_epithelial_immune
Unaffected	epithelial	immune	EZR	SLC9A1	EZR_SLC9A1_epithelial_immune
Cancerous	epithelial	immune	LAMA3	ITGB4	LAMA3_ITGB4_epithelial_immune

Supplementary Table 6-6 Ligand–receptor interactions with E3 module genes as
receptors

top_group	sender	receiver	ligand	receptor	id
Unaffected	epithelial	epithelial	CALM1	MYLK	CALM1_MYLK_epithelial_epithelial
Unaffected	epithelial	epithelial	APP	SORL1	APP_SORL1_epithelial_epithelial
Unaffected	epithelial	epithelial	MUC4	ERBB2	MUC4_ERBB2_epithelial_epithelial
Unaffected	epithelial	epithelial	EFNB2	EPHA10	EFNB2_EPHA10_epithelial_epithelial
Unaffected	immune	epithelial	ADAM10	TSPAN15	ADAM10_TSPAN15_immune_epithelial
Unaffected	epithelial	epithelial	APP	TNFRSF21	APP_TNFRSF21_epithelial_epithelial
Unaffected	immune	epithelial	MSN	SLC9A1	MSN_SLC9A1_immune_epithelial
Unaffected	immune	epithelial	CALM1	MYLK	CALM1_MYLK_immune_epithelial
Unaffected	epithelial	epithelial	TGFA	ERBB2	TGFA_ERBB2_epithelial_epithelial
Unaffected	immune	epithelial	SEMA4D	ERBB2	SEMA4D_ERBB2_immune_epithelial
Unaffected	immune	epithelial	EZR	SLC9A1	EZR_SLC9A1_immune_epithelial
Unaffected	stromal	epithelial	LRIG1	ERBB2	LRIG1_ERBB2_stromal_epithelial
Unaffected	epithelial	epithelial	CDH1	PTPRF	CDH1_PTPRF_epithelial_epithelial
Unaffected	immune	epithelial	ADAM17	IL6R	ADAM17_IL6R_immune_epithelial
Unaffected	stromal	epithelial	NID1	PTPRF	NID1_PTPRF_stromal_epithelial
Unaffected	stromal	epithelial	NRG3	ERBB2	NRG3_ERBB2_stromal_epithelial
Unaffected	epithelial	epithelial	EZR	SLC9A1	EZR_SLC9A1_epithelial_epithelial
Unaffected	epithelial	epithelial	SPINT1	ST14	SPINT1_ST14_epithelial_epithelial
Unaffected	stromal	epithelial	NRG1	ERBB2	NRG1_ERBB2_stromal_epithelial
Unaffected	stromal	epithelial	SYT1	STX3	SYT1_STX3_stromal_epithelial
Unaffected	immune	epithelial	CD44	CLDN7	CD44_CLDN7_immune_epithelial
Unaffected	stromal	epithelial	NRG2	ERBB2	NRG2_ERBB2_stromal_epithelial
Unaffected	epithelial	epithelial	ADAM17	IL6R	ADAM17_IL6R_epithelial_epithelial
Unaffected	epithelial	epithelial	EGF	ERBB2	EGF_ERBB2_epithelial_epithelial
Unaffected	epithelial	epithelial	EPCAM	CLDN7	EPCAM_CLDN7_epithelial_epithelial
Cancerous	stromal	epithelial	FN1	PLAUR	FN1_PLAUR_stromal_epithelial
Unaffected	epithelial	epithelial	NRG4	ERBB2	NRG4_ERBB2_epithelial_epithelial
Cancerous	stromal	epithelial	SERPINE1	PLAUR	SERPINE1_PLAUR_stromal_epithelial
Cancerous	immune	epithelial	EREG	ERBB2	EREG_ERBB2_immune_epithelial
Unaffected	stromal	epithelial	CD44	CLDN7	CD44_CLDN7_stromal_epithelial
Unaffected	stromal	epithelial	LRFN5	PTPRF	LRFN5_PTPRF_stromal_epithelial
Unaffected	stromal	epithelial	MSN	SLC9A1	MSN_SLC9A1_stromal_epithelial
Cancerous	stromal	epithelial	PLAU	PLAUR	PLAU_PLAUR_stromal_epithelial
Cancerous	stromal	epithelial	LRP1B	PLAUR	LRP1B_PLAUR_stromal_epithelial
Cancerous	epithelial	epithelial	AREG	ERBB2	AREG_ERBB2_epithelial_epithelial
Cancerous	stromal	epithelial	ICAM1	EZR	ICAM1_EZR_stromal_epithelial
Cancerous	immune	epithelial	MMP12	PLAUR	MMP12_PLAUR_immune_epithelial
Unaffected	stromal	epithelial	MUC4	ERBB2	MUC4_ERBB2_stromal_epithelial
Unaffected	stromal	epithelial	SDC2	EZR	SDC2_EZR_stromal_epithelial
Unaffected	immune	epithelial	GNAS	VIPR1	GNAS_VIPR1_immune_epithelial
Cancerous	immune	epithelial	HLA.A	ERBB2	HLA.A_ERBB2_immune_epithelial
Unaffected	stromal	epithelial	APP	SORL1	APP_SORL1_stromal_epithelial
Unaffected	epithelial	epithelial	ADAM10	TSPAN15	ADAM10_TSPAN15_epithelial_epithelial
Cancerous	epithelial	epithelial	AGRN	LRP4	AGRN_LRP4_epithelial_epithelial
Cancerous	stromal	epithelial	HAS2	EZR	HAS2_EZR_stromal_epithelial
Cancerous	immune	epithelial	SDC2	EZR	SDC2_EZR_immune_epithelial
Unaffected	stromal	epithelial	ADAM10	TSPAN15	ADAM10_TSPAN15_stromal_epithelial

Unaffected	immune	epithelial	LTB	TNFRSF1A	LTB_TNFRSF1A_immune_epithelial
Unaffected	stromal	epithelial	APP	TNFRSF21	APP_TNFRSF21_stromal_epithelial
Cancerous	epithelial	epithelial	SEMA4D	ERBB2	SEMA4D_ERBB2_epithelial_epithelial
Cancerous	immune	epithelial	ICAM1	EZR	ICAM1_EZR_immune_epithelial
Cancerous	stromal	epithelial	THBS2	LRP4	THBS2_LRP4_stromal_epithelial
Cancerous	epithelial	epithelial	LRIG1	ERBB2	LRIG1_ERBB2_epithelial_epithelial
Cancerous	immune	epithelial	FN1	PLAUR	FN1_PLAUR_immune_epithelial
Cancerous	epithelial	epithelial	EFNB1	ERBB2	EFNB1_ERBB2_epithelial_epithelial
Unaffected	immune	epithelial	MUC4	ERBB2	MUC4_ERBB2_immune_epithelial
Cancerous	stromal	epithelial	AREG	ERBB2	AREG_ERBB2_stromal_epithelial
Unaffected	stromal	epithelial	ADAM17	IL6R	ADAM17_IL6R_stromal_epithelial
Cancerous	stromal	epithelial	HLA.A	ERBB2	HLA.A_ERBB2_stromal_epithelial
Cancerous	stromal	epithelial	GDF15	ERBB2	GDF15_ERBB2_stromal_epithelial
Unaffected	stromal	epithelial	VCAM1	EZR	VCAM1_EZR_stromal_epithelial
Unaffected	stromal	epithelial	PI16	TNFRSF21	PI16_TNFRSF21_stromal_epithelial
Cancerous	immune	epithelial	PLAU	PLAUR	PLAU_PLAUR_immune_epithelial
Cancerous	stromal	epithelial	EFNB1	ERBB2	EFNB1_ERBB2_stromal_epithelial
Cancerous	stromal	epithelial	AGRN	LRP4	AGRN_LRP4_stromal_epithelial
Unaffected	stromal	epithelial	SDC2	PTPRJ	SDC2_PTPRJ_stromal_epithelial
Unaffected	epithelial	epithelial	EFNB1	TRHDE	EFNB1_TRHDE_epithelial_epithelial
Cancerous	immune	epithelial	HBEGF	ERBB2	HBEGF_ERBB2_immune_epithelial
Unaffected	stromal	epithelial	TNC	PTPRB	TNC_PTPRB_stromal_epithelial
Cancerous	immune	epithelial	NAMPT	INSR	NAMPT_INSR_immune_epithelial
Cancerous	stromal	epithelial	HAS2	ERBB2	HAS2_ERBB2_stromal_epithelial
Unaffected	epithelial	epithelial	BTC	ERBB2	BTC_ERBB2_epithelial_epithelial
Cancerous	immune	epithelial	AGRN	LRP4	AGRN_LRP4_immune_epithelial
Cancerous	epithelial	epithelial	HLA.A	ERBB2	HLA.A_ERBB2_epithelial_epithelial
Unaffected	stromal	epithelial	IGF1	INSR	IGF1_INSR_stromal_epithelial
Cancerous	stromal	epithelial	PLAU	ST14	PLAU_ST14_stromal_epithelial
Cancerous	epithelial	epithelial	EREG	ERBB2	EREG_ERBB2_epithelial_epithelial
Unaffected	stromal	epithelial	F8	LRP4	F8_LRP4_stromal_epithelial
Unaffected	stromal	epithelial	APOE	SORL1	APOE_SORL1_stromal_epithelial
Unaffected	epithelial	epithelial	ENPP1	INSR	ENPP1_INSR_epithelial_epithelial
Cancerous	stromal	epithelial	BDNF	ERBB2	BDNF_ERBB2_stromal_epithelial
Unaffected	epithelial	epithelial	CEACAM6	CEACAM7	CEACAM6_CEACAM7_epithelial_epithelial
Cancerous	epithelial	epithelial	GDF15	ERBB2	GDF15_ERBB2_epithelial_epithelial
Unaffected	immune	epithelial	LRIG1	ERBB2	LRIG1_ERBB2_immune_epithelial
Cancerous	epithelial	epithelial	FN1	PLAUR	FN1_PLAUR_epithelial_epithelial
Unaffected	stromal	epithelial	PTN	PTPRB	PTN_PTPRB_stromal_epithelial
Unaffected	stromal	epithelial	EFNB2	EPHA10	EFNB2_EPHA10_stromal_epithelial
Unaffected	stromal	epithelial	GNAS	VIPR1	GNAS_VIPR1_stromal_epithelial
Cancerous	immune	epithelial	AREG	ERBB2	AREG_ERBB2_immune_epithelial
Unaffected	stromal	epithelial	CDH1	PTPRF	CDH1_PTPRF_stromal_epithelial
Cancerous	stromal	epithelial	NAMPT	INSR	NAMPT_INSR_stromal_epithelial
Unaffected	stromal	epithelial	EZR	SLC9A1	EZR_SLC9A1_stromal_epithelial
Cancerous	immune	epithelial	SDC2	PTPRJ	SDC2_PTPRJ_immune_epithelial
Unaffected	epithelial	epithelial	CEACAM6	CEACAM1	CEACAM6_CEACAM1_epithelial_epithelial
Unaffected	stromal	epithelial	S100A4	ERBB2	S100A4_ERBB2_stromal_epithelial
Cancerous	immune	epithelial	PLAU	ST14	PLAU_ST14_immune_epithelial
Unaffected	stromal	epithelial	CALM1	MYLK	CALM1_MYLK_stromal_epithelial

Unaffected	epithelial	epithelial	EDN1	ECE1	EDN1_ECE1_epithelial_epithelial
Unaffected	epithelial	epithelial	NAMPT	INSR	NAMPT_INSR_epithelial_epithelial
Unaffected	immune	epithelial	CEACAM6	CEACAM7	CEACAM6_CEACAM7_immune_epithelial
Unaffected	epithelial	epithelial	MSN	SLC9A1	MSN_SLC9A1_epithelial_epithelial
Unaffected	epithelial	epithelial	CD44	CLDN7	CD44_CLDN7_epithelial_epithelial
Unaffected	immune	epithelial	APP	SORL1	APP_SORL1_immune_epithelial
Cancerous	epithelial	epithelial	GNAS	VIPR1	GNAS_VIPR1_epithelial_epithelial
Unaffected	immune	epithelial	APP	TNFRSF21	APP_TNFRSF21_immune_epithelial
Unaffected	stromal	epithelial	EPCAM	CLDN7	EPCAM_CLDN7_stromal_epithelial
Cancerous	immune	epithelial	CEACAM6	CEACAM1	CEACAM6_CEACAM1_immune_epithelial
Cancerous	immune	epithelial	FURIN	INSR	FURIN_INSR_immune_epithelial
Unaffected	stromal	epithelial	EDN1	ECE1	EDN1_ECE1_stromal_epithelial
Unaffected	stromal	epithelial	SEMA4D	ERBB2	SEMA4D_ERBB2_stromal_epithelial
Cancerous	stromal	epithelial	EFNB1	TRHDE	EFNB1_TRHDE_stromal_epithelial
Cancerous	immune	epithelial	NRG1	ERBB2	NRG1_ERBB2_immune_epithelial
Unaffected	immune	epithelial	EPCAM	CLDN7	EPCAM_CLDN7_immune_epithelial
Cancerous	epithelial	epithelial	HAS2	EZR	HAS2_EZR_epithelial_epithelial
Unaffected	epithelial	epithelial	BTNL9	IL6R	BTNL9_IL6R_epithelial_epithelial
Unaffected	stromal	epithelial	ENPP1	INSR	ENPP1_INSR_stromal_epithelial
Unaffected	immune	epithelial	EFNB2	EPHA10	EFNB2_EPHA10_immune_epithelial
Unaffected	immune	epithelial	IL18BP	IL6R	IL18BP_IL6R_immune_epithelial
Unaffected	stromal	epithelial	CEACAM6	CEACAM7	CEACAM6_CEACAM7_stromal_epithelial
Unaffected	immune	epithelial	CDH1	PTPRF	CDH1_PTPRF_immune_epithelial
Unaffected	immune	epithelial	IGF1	INSR	IGF1_INSR_immune_epithelial
Cancerous	immune	epithelial	GRN	TNFRSF1A	GRN_TNFRSF1A_immune_epithelial
Unaffected	stromal	epithelial	CALM3	MYLK	CALM3_MYLK_stromal_epithelial
Cancerous	epithelial	epithelial	HAS2	ERBB2	HAS2_ERBB2_epithelial_epithelial
Unaffected	immune	epithelial	SPINT1	ST14	SPINT1_ST14_immune_epithelial
Unaffected	stromal	epithelial	LTB	TNFRSF1A	LTB_TNFRSF1A_stromal_epithelial
Unaffected	stromal	epithelial	CEACAM6	CEACAM1	CEACAM6_CEACAM1_stromal_epithelial
Unaffected	epithelial	epithelial	GRN	TNFRSF1A	GRN_TNFRSF1A_epithelial_epithelial
Cancerous	epithelial	epithelial	NID1	PTPRF	NID1_PTPRF_epithelial_epithelial
Cancerous	stromal	epithelial	SPINT1	ST14	SPINT1_ST14_stromal_epithelial
Unaffected	immune	epithelial	SYT1	STX3	SYT1_STX3_immune_epithelial
Cancerous	stromal	epithelial	MDK	PTPRB	MDK_PTPRB_stromal_epithelial
Unaffected	stromal	epithelial	GRN	TNFRSF1A	GRN_TNFRSF1A_stromal_epithelial

Supplementary Table 6-7 Ligand–receptor interactions with E5 module
genes as ligands

top_group	sender	receiver	ligand	receptor	id
Cancerous	epithelial	stromal	BACE2	APP	BACE2_APP_epithelial_stromal
Cancerous	epithelial	stromal	ZNRF3	LRP6	ZNRF3_LRP6_epithelial_stromal
Cancerous	epithelial	stromal	ZNRF3	FZD4	ZNRF3_FZD4_epithelial_stromal
Cancerous	epithelial	epithelial	ZNRF3	FZD6	ZNRF3_FZD6_epithelial_epithelial
Cancerous	epithelial	epithelial	LAMC1	ITGB4	LAMC1_ITGB4_epithelial_epithelial
Cancerous	epithelial	stromal	LAMC1	ITGA2	LAMC1_ITGA2_epithelial_stromal
Cancerous	epithelial	epithelial	LAMC1	ITGA2	LAMC1_ITGA2_epithelial_epithelial
Cancerous	epithelial	immune	LAMC1	ITGB1	LAMC1_ITGB1_epithelial_immune
Cancerous	epithelial	stromal	LAMC1	ITGB1	LAMC1_ITGB1_epithelial_stromal
Unaffected	epithelial	epithelial	ZNRF3	LRP6	ZNRF3_LRP6_epithelial_epithelial
Cancerous	epithelial	stromal	LAMC1	ITGA1	LAMC1_ITGA1_epithelial_stromal
Cancerous	epithelial	epithelial	BACE2	APP	BACE2_APP_epithelial_epithelial
Cancerous	epithelial	immune	BACE2	APP	BACE2_APP_epithelial_immune
Cancerous	epithelial	epithelial	ZNRF3	FZD5	ZNRF3_FZD5_epithelial_epithelial
Cancerous	epithelial	stromal	ZNRF3	FZD6	ZNRF3_FZD6_epithelial_stromal
Cancerous	epithelial	stromal	ITM2B	ROR2	ITM2B_ROR2_epithelial_stromal
Cancerous	epithelial	epithelial	LAMC1	ITGA6	LAMC1_ITGA6_epithelial_epithelial
Cancerous	epithelial	immune	CD47	SIGLEC1	CD47_SIGLEC1_epithelial_immune
Cancerous	epithelial	immune	LAMC1	ITGA2	LAMC1_ITGA2_epithelial_immune
Cancerous	epithelial	immune	LAMC1	ITGAV	LAMC1_ITGAV_epithelial_immune
Cancerous	epithelial	immune	LAMC1	ITGA6	LAMC1_ITGA6_epithelial_immune
Cancerous	epithelial	immune	FAM3C	LAMP1	FAM3C_LAMP1_epithelial_immune
Cancerous	epithelial	stromal	LAMC1	ITGA6	LAMC1_ITGA6_epithelial_stromal
Cancerous	epithelial	stromal	LAMC1	ITGAV	LAMC1_ITGAV_epithelial_stromal
Unaffected	epithelial	immune	CD47	SIRPG	CD47_SIRPG_epithelial_immune
Cancerous	epithelial	stromal	LAMC1	ITGA7	LAMC1_ITGA7_epithelial_stromal
Unaffected	epithelial	epithelial	CD44	CLDN7	CD44_CLDN7_epithelial_epithelial
Cancerous	epithelial	stromal	CD44	HAS2	CD44_HAS2_epithelial_stromal
Cancerous	epithelial	immune	CD44	EPCAM	CD44_EPCAM_epithelial_immune
Unaffected	epithelial	stromal	FAM3C	LIFR	FAM3C_LIFR_epithelial_stromal
Cancerous	epithelial	epithelial	CD44	EPCAM	CD44_EPCAM_epithelial_epithelial
Cancerous	epithelial	immune	CD47	SIRPA	CD47_SIRPA_epithelial_immune
Cancerous	epithelial	epithelial	LAMC1	ITGA3	LAMC1_ITGA3_epithelial_epithelial
Cancerous	epithelial	immune	ZNRF3	LRP6	ZNRF3_LRP6_epithelial_immune
Cancerous	epithelial	stromal	FAM3C	LAMP1	FAM3C_LAMP1_epithelial_stromal
Cancerous	epithelial	stromal	LAMC1	ITGB4	LAMC1_ITGB4_epithelial_stromal
Unaffected	epithelial	immune	FAM3C	CLEC2D	FAM3C_CLEC2D_epithelial_immune
Cancerous	epithelial	epithelial	CD44	ACVR2B	CD44_ACVR2B_epithelial_epithelial
Cancerous	epithelial	epithelial	FAM3C	LAMP1	FAM3C_LAMP1_epithelial_epithelial
Cancerous	epithelial	stromal	LAMC1	ITGA3	LAMC1_ITGA3_epithelial_stromal
Unaffected	epithelial	immune	FAM3C	ADGRG5	FAM3C_ADGRG5_epithelial_immune
Unaffected	epithelial	epithelial	FAM3C	GLRA2	FAM3C_GLRA2_epithelial_epithelial
Cancerous	epithelial	epithelial	LAMC1	ITGB1	LAMC1_ITGB1_epithelial_epithelial
Cancerous	epithelial	stromal	ZNRF3	FZD5	ZNRF3_FZD5_epithelial_stromal
Cancerous	epithelial	immune	LAMC1	ITGA1	LAMC1_ITGA1_epithelial_immune
Cancerous	epithelial	stromal	CD44	EPCAM	CD44_EPCAM_epithelial_stromal

Cancerous	epithelial	epithelial	LAMC1	ITGA1	LAMC1_ITGA1_epithelial_epithelial
Cancerous	epithelial	immune	LAMC1	ITGB4	LAMC1_ITGB4_epithelial_immune
Cancerous	epithelial	epithelial	ITM2B	ROR2	ITM2B_ROR2_epithelial_epithelial
Cancerous	epithelial	epithelial	LAMC1	ITGAV	LAMC1_ITGAV_epithelial_epithelial
Unaffected	epithelial	stromal	FAM3C	CLEC2D	FAM3C_CLEC2D_epithelial_stromal
Cancerous	epithelial	epithelial	CD44	HAS2	CD44_HAS2_epithelial_epithelial
Unaffected	epithelial	epithelial	FAM3C	CLEC2D	FAM3C_CLEC2D_epithelial_epithelial

Supplementary Table 6-8 Ligand–receptor interactions with E5 module
genes as receptors

top_group	sender	receiver	ligand	receptor	id
Cancerous	stromal	epithelial	COL1A2	ITGA2	COL1A2_ITGA2_stromal_epithelial
Cancerous	stromal	epithelial	COL4A1	ITGA2	COL4A1_ITGA2_stromal_epithelial
Cancerous	stromal	epithelial	HSPG2	ITGA2	HSPG2_ITGA2_stromal_epithelial
Cancerous	stromal	epithelial	COL18A1	ITGA2	COL18A1_ITGA2_stromal_epithelial
Cancerous	stromal	epithelial	COL7A1	ITGA2	COL7A1_ITGA2_stromal_epithelial
Cancerous	stromal	epithelial	COL4A2	ITGA2	COL4A2_ITGA2_stromal_epithelial
Cancerous	stromal	epithelial	COL12A1	ITGA2	COL12A1_ITGA2_stromal_epithelial
Cancerous	stromal	epithelial	COL1A1	ITGA2	COL1A1_ITGA2_stromal_epithelial
Cancerous	stromal	epithelial	COL5A2	ITGA2	COL5A2_ITGA2_stromal_epithelial
Cancerous	stromal	epithelial	LAMB1	ITGA2	LAMB1_ITGA2_stromal_epithelial
Cancerous	stromal	epithelial	FN1	ITGA2	FN1_ITGA2_stromal_epithelial
Cancerous	epithelial	epithelial	COL19A1	ITGA2	COL19A1_ITGA2_epithelial_epithelial
Cancerous	stromal	epithelial	COL5A1	ITGA2	COL5A1_ITGA2_stromal_epithelial
Cancerous	epithelial	epithelial	LAMB3	ITGA2	LAMB3_ITGA2_epithelial_epithelial
Cancerous	stromal	epithelial	COL11A1	ITGA2	COL11A1_ITGA2_stromal_epithelial
Cancerous	stromal	epithelial	COL16A1	ITGA2	COL16A1_ITGA2_stromal_epithelial
Cancerous	stromal	epithelial	COL6A3	ITGA2	COL6A3_ITGA2_stromal_epithelial
Cancerous	stromal	epithelial	COL6A2	ITGA2	COL6A2_ITGA2_stromal_epithelial
Cancerous	stromal	epithelial	COL8A1	ITGA2	COL8A1_ITGA2_stromal_epithelial
Cancerous	stromal	epithelial	COL3A1	ITGA2	COL3A1_ITGA2_stromal_epithelial
Cancerous	stromal	epithelial	COL27A1	ITGA2	COL27A1_ITGA2_stromal_epithelial
Cancerous	stromal	epithelial	COL4A5	ITGA2	COL4A5_ITGA2_stromal_epithelial
Cancerous	stromal	epithelial	COL5A3	ITGA2	COL5A3_ITGA2_stromal_epithelial
Cancerous	stromal	epithelial	LAMA5	ITGA2	LAMA5_ITGA2_stromal_epithelial
Cancerous	stromal	epithelial	LAMC1	ITGA2	LAMC1_ITGA2_stromal_epithelial
Cancerous	epithelial	epithelial	HSPG2	ITGA2	HSPG2_ITGA2_epithelial_epithelial
Cancerous	epithelial	epithelial	LAMC2	ITGA2	LAMC2_ITGA2_epithelial_epithelial
Cancerous	epithelial	epithelial	COL28A1	ITGA2	COL28A1_ITGA2_epithelial_epithelial
Cancerous	stromal	epithelial	LAMA2	ITGA2	LAMA2_ITGA2_stromal_epithelial
Cancerous	epithelial	epithelial	COL27A1	ITGA2	COL27A1_ITGA2_epithelial_epithelial
Cancerous	stromal	epithelial	COL15A1	ITGA2	COL15A1_ITGA2_stromal_epithelial
Cancerous	immune	epithelial	FN1	ITGA2	FN1_ITGA2_immune_epithelial
Cancerous	stromal	epithelial	COL6A1	ITGA2	COL6A1_ITGA2_stromal_epithelial
Cancerous	epithelial	epithelial	LAMC1	ITGA2	LAMC1_ITGA2_epithelial_epithelial
Cancerous	stromal	epithelial	LAMA1	ITGA2	LAMA1_ITGA2_stromal_epithelial
Cancerous	immune	epithelial	COL1A2	ITGA2	COL1A2_ITGA2_immune_epithelial
Cancerous	epithelial	epithelial	LAMA2	ITGA2	LAMA2_ITGA2_epithelial_epithelial
Cancerous	epithelial	epithelial	COL16A1	ITGA2	COL16A1_ITGA2_epithelial_epithelial
Cancerous	stromal	epithelial	COL14A1	ITGA2	COL14A1_ITGA2_stromal_epithelial
Cancerous	stromal	epithelial	COL1A2	CD44	COL1A2_CD44_stromal_epithelial
Cancerous	epithelial	epithelial	LAMB1	ITGA2	LAMB1_ITGA2_epithelial_epithelial
Cancerous	epithelial	epithelial	LAMA5	ITGA2	LAMA5_ITGA2_epithelial_epithelial
Cancerous	immune	epithelial	COL1A1	ITGA2	COL1A1_ITGA2_immune_epithelial
Unaffected	epithelial	epithelial	COL17A1	ITGA2	COL17A1_ITGA2_epithelial_epithelial
Unaffected	stromal	epithelial	COL4A4	ITGA2	COL4A4_ITGA2_stromal_epithelial
Unaffected	immune	epithelial	COL19A1	ITGA2	COL19A1_ITGA2_immune_epithelial

Cancerous	epithelial	epithelial	COL1A1	ITGA2	COL1A1_ITGA2_epithelial_epithelial
Unaffected	epithelial	epithelial	DUSP18	ITGA2	DUSP18_ITGA2_epithelial_epithelial
Cancerous	stromal	epithelial	VCAN	CD44	VCAN_CD44_stromal_epithelial
Cancerous	epithelial	epithelial	COL1A2	ITGA2	COL1A2_ITGA2_epithelial_epithelial
Cancerous	epithelial	epithelial	FN1	ITGA2	FN1_ITGA2_epithelial_epithelial
Cancerous	stromal	epithelial	COL1A1	CD44	COL1A1_CD44_stromal_epithelial
Cancerous	stromal	epithelial	THBS1	CD47	THBS1_CD47_stromal_epithelial
Cancerous	stromal	epithelial	THBS2	CD47	THBS2_CD47_stromal_epithelial
Cancerous	stromal	epithelial	COL21A1	ITGA2	COL21A1_ITGA2_stromal_epithelial
Cancerous	stromal	epithelial	FN1	CD44	FN1_CD44_stromal_epithelial
Cancerous	stromal	epithelial	TIMP2	CD44	TIMP2_CD44_stromal_epithelial
Unaffected	stromal	epithelial	COL4A3	ITGA2	COL4A3_ITGA2_stromal_epithelial
Unaffected	immune	epithelial	COL4A3	ITGA2	COL4A3_ITGA2_immune_epithelial
Cancerous	stromal	epithelial	MMP14	CD44	MMP14_CD44_stromal_epithelial
Cancerous	immune	epithelial	COL6A2	ITGA2	COL6A2_ITGA2_immune_epithelial
Cancerous	immune	epithelial	SIGLEC1	CD47	SIGLEC1_CD47_immune_epithelial
Cancerous	stromal	epithelial	COL4A5	CD47	COL4A5_CD47_stromal_epithelial
Cancerous	stromal	epithelial	TIMP3	CD44	TIMP3_CD44_stromal_epithelial
Unaffected	stromal	epithelial	NCAM1	CACNA1C	NCAM1_CACNA1C_stromal_epithelial
Cancerous	stromal	epithelial	COL9A3	ITGA2	COL9A3_ITGA2_stromal_epithelial
Unaffected	stromal	epithelial	LAMC2	ITGA2	LAMC2_ITGA2_stromal_epithelial
Cancerous	immune	epithelial	TIMP2	CD44	TIMP2_CD44_immune_epithelial
Cancerous	stromal	epithelial	FGF2	CD44	FGF2_CD44_stromal_epithelial
Unaffected	immune	epithelial	IL16	GRIN2B	IL16_GRIN2B_immune_epithelial
Cancerous	immune	epithelial	SIRPB2	CD47	SIRPB2_CD47_immune_epithelial
Cancerous	stromal	epithelial	COL19A1	ITGA2	COL19A1_ITGA2_stromal_epithelial
Unaffected	stromal	epithelial	SYT1	CACNA1C	SYT1_CACNA1C_stromal_epithelial
Unaffected	stromal	epithelial	COL13A1	ITGA2	COL13A1_ITGA2_stromal_epithelial
Unaffected	epithelial	epithelial	LGALS9	CD44	LGALS9_CD44_epithelial_epithelial
Cancerous	immune	epithelial	HBEGF	CD44	HBEGF_CD44_immune_epithelial
Unaffected	immune	epithelial	ADAM10	CD44	ADAM10_CD44_immune_epithelial
Cancerous	stromal	epithelial	HAS2	CD44	HAS2_CD44_stromal_epithelial
Unaffected	epithelial	epithelial	COL9A2	ITGA2	COL9A2_ITGA2_epithelial_epithelial
Cancerous	immune	epithelial	VCAN	CD44	VCAN_CD44_immune_epithelial
Cancerous	immune	epithelial	SIRPA	CD47	SIRPA_CD47_immune_epithelial
Cancerous	immune	epithelial	FN1	CD44	FN1_CD44_immune_epithelial
Cancerous	immune	epithelial	MMP14	CD44	MMP14_CD44_immune_epithelial
Cancerous	immune	epithelial	HSPG2	ITGA2	HSPG2_ITGA2_immune_epithelial
Unaffected	epithelial	epithelial	LGALS9	CD47	LGALS9_CD47_epithelial_epithelial
Unaffected	immune	epithelial	SIRPG	CD47	SIRPG_CD47_immune_epithelial
Unaffected	immune	epithelial	COL4A4	ITGA2	COL4A4_ITGA2_immune_epithelial
Unaffected	stromal	epithelial	COL28A1	ITGA2	COL28A1_ITGA2_stromal_epithelial
Cancerous	stromal	epithelial	BOC	PTCH1	BOC_PTCH1_stromal_epithelial
Unaffected	stromal	epithelial	COL4A4	CD47	COL4A4_CD47_stromal_epithelial
Cancerous	stromal	epithelial	LAMA1	CD44	LAMA1_CD44_stromal_epithelial
Cancerous	immune	epithelial	COL1A2	CD44	COL1A2_CD44_immune_epithelial
Cancerous	stromal	epithelial	DUSP18	ITGA2	DUSP18_ITGA2_stromal_epithelial
Cancerous	stromal	epithelial	LGALS9	CD47	LGALS9_CD47_stromal_epithelial
Cancerous	epithelial	epithelial	COL4A2	ITGA2	COL4A2_ITGA2_epithelial_epithelial
Cancerous	immune	epithelial	THBS1	CD47	THBS1_CD47_immune_epithelial

Cancerous	stromal	epithelial	COL14A1	CD44	COL14A1_CD44_stromal_epithelial
Cancerous	stromal	epithelial	SLIT2	ROBO2	SLIT2_ROBO2_stromal_epithelial
Cancerous	immune	epithelial	COL1A1	CD44	COL1A1_CD44_immune_epithelial
Cancerous	stromal	epithelial	LGALS9	CD44	LGALS9_CD44_stromal_epithelial
Unaffected	stromal	epithelial	COL4A3	CD47	COL4A3_CD47_stromal_epithelial
Unaffected	immune	epithelial	COL4A3	CD47	COL4A3_CD47_immune_epithelial
Cancerous	epithelial	epithelial	COL1A1	CD44	COL1A1_CD44_epithelial_epithelial
Unaffected	stromal	epithelial	IL16	GRIN2B	IL16_GRIN2B_stromal_epithelial
Cancerous	epithelial	epithelial	COL1A2	CD44	COL1A2_CD44_epithelial_epithelial
Cancerous	epithelial	epithelial	FN1	CD44	FN1_CD44_epithelial_epithelial
Cancerous	epithelial	epithelial	TIMP3	CD44	TIMP3_CD44_epithelial_epithelial
Unaffected	stromal	epithelial	GPC6	PTCH1	GPC6_PTCH1_stromal_epithelial
Unaffected	epithelial	epithelial	THBS1	CD47	THBS1_CD47_epithelial_epithelial
Cancerous	stromal	epithelial	ADAM10	CD44	ADAM10_CD44_stromal_epithelial
Unaffected	epithelial	epithelial	IHH	PTCH1	IHH_PTCH1_epithelial_epithelial
Unaffected	epithelial	epithelial	ADAM10	CD44	ADAM10_CD44_epithelial_epithelial
Cancerous	immune	epithelial	IHH	PTCH1	IHH_PTCH1_immune_epithelial
Unaffected	stromal	epithelial	SLIT3	ROBO2	SLIT3_ROBO2_stromal_epithelial
Unaffected	immune	epithelial	COL4A4	CD47	COL4A4_CD47_immune_epithelial
Cancerous	epithelial	epithelial	HBEGF	CD44	HBEGF_CD44_epithelial_epithelial
Cancerous	epithelial	epithelial	HAS2	CD44	HAS2_CD44_epithelial_epithelial
Cancerous	immune	epithelial	NCAM1	CACNA1C	NCAM1_CACNA1C_immune_epithelial

Supplementary Table 7 The enrichment analysis of discovery
LRPs across the ones identified in four validation datasets

Category	Validation dataset	FDR
E1_sender	GSE178341	9.64E-266
E1_sender	new_KUL3	2.71E-247
E1_sender	KUL5	2.18E-278
E1_sender	SG1	9.64E-266
E1_receiver	GSE178341	7.44E-261
E1_receiver	new_KUL3	2.03E-242
E1_receiver	KUL5	1.44E-250
E1_receiver	SG1	7.98E-252
E2_sender	GSE178341	7.94E-158
E2_sender	new_KUL3	1.67E-164
E2_sender	KUL5	1.97E-186
E2_sender	SG1	1.32E-174
E2_receiver	GSE178341	3.37E-152
E2_receiver	new_KUL3	1.93E-163
E2_receiver	KUL5	5.62E-164
E2_receiver	SG1	1.30E-161