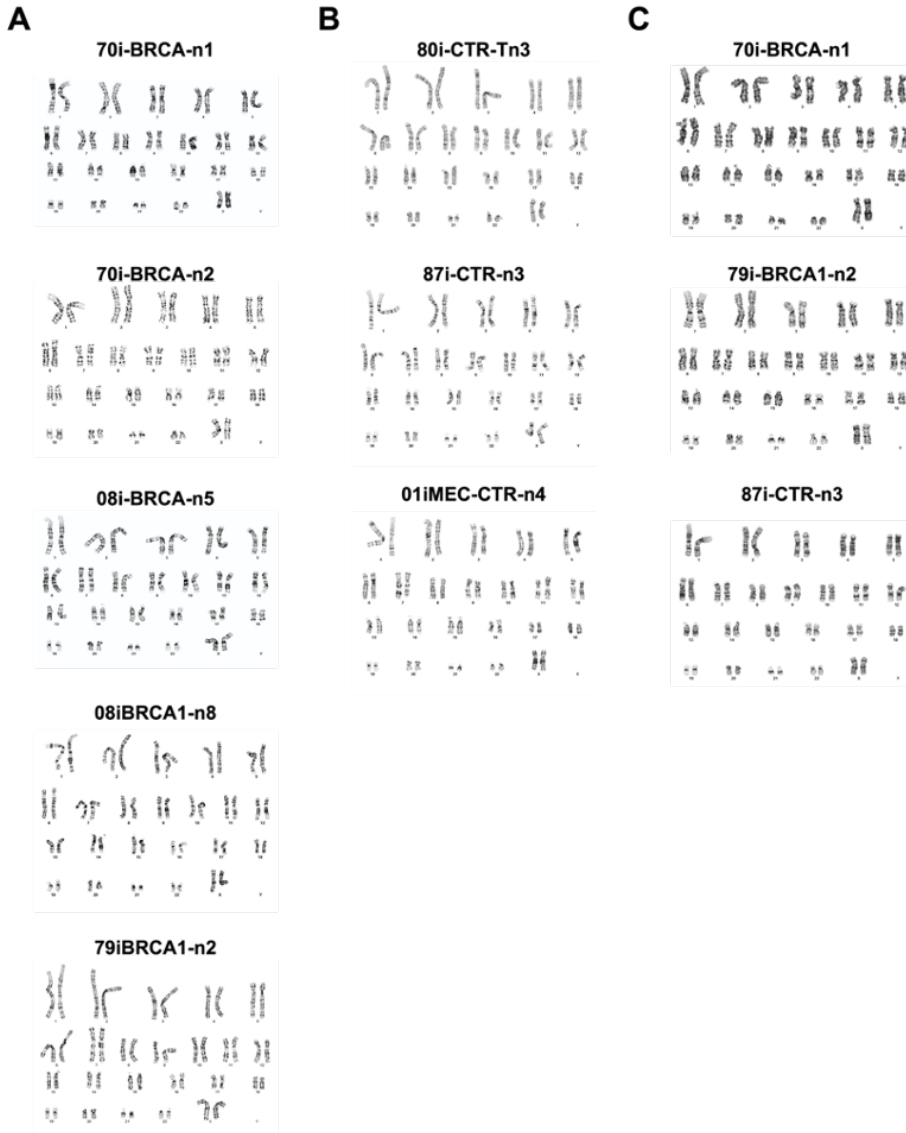


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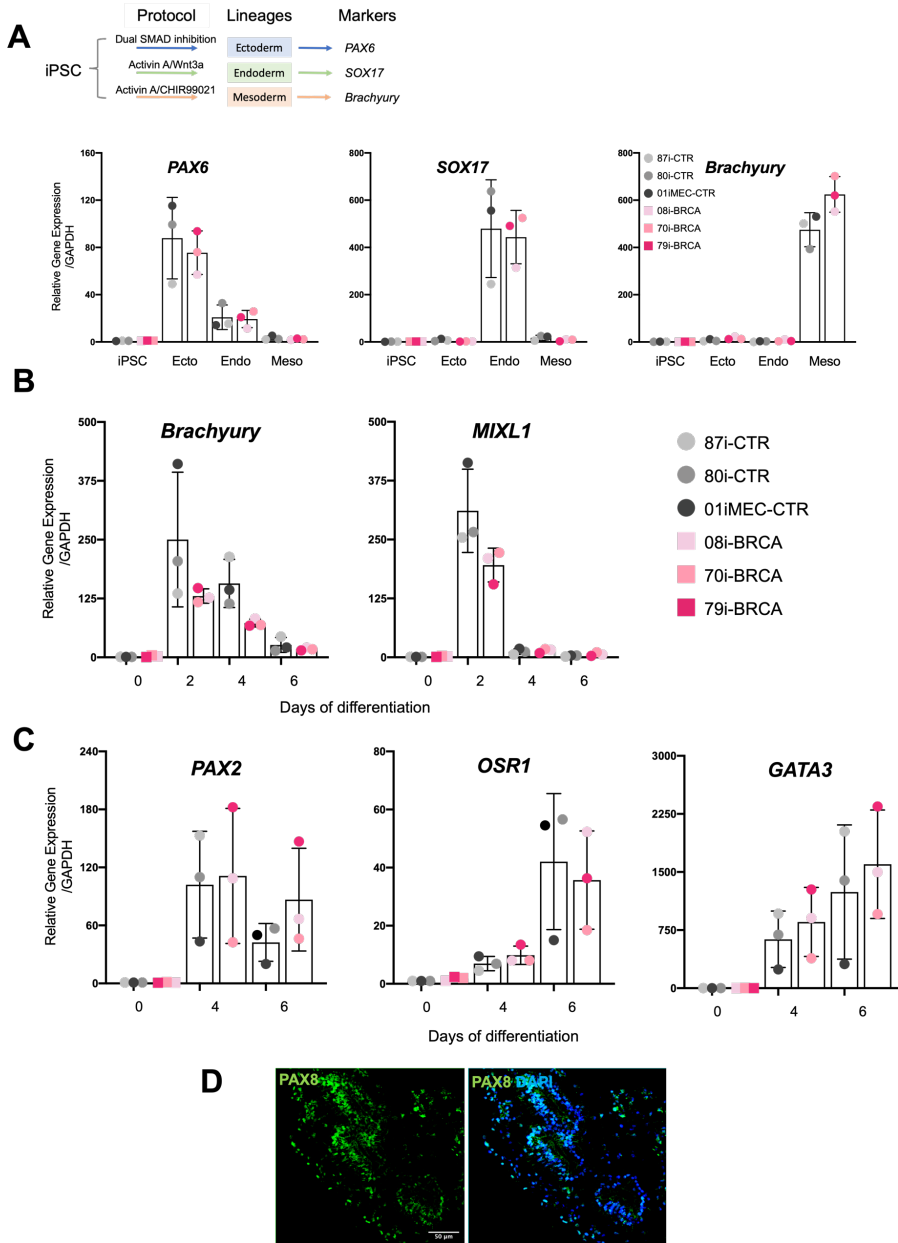
**Supplemental information**

**Human iPSC-derived fallopian tube organoids  
with *BRCA1* mutation recapitulate  
early-stage carcinogenesis**

**Nur Yucer, Rodney Ahdoot, Michael J. Workman, Alexander H. Laperle, Maria S. Recouvreux, Kathleen Kurowski, Diana J. Naboulsi, Victoria Liang, Ying Qu, Jasmine T. Plummer, Simon A. Gayther, Sandra Orsulic, Beth Y. Karlan, and Clive N. Svendsen**



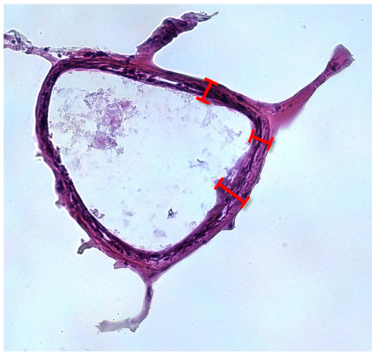
**Figure S1 (Related to Figure1). *BRCA1*<sup>mut</sup>-iPSC lines exhibit normal karyotypes, even after extensive culturing.** G-banded analysis of karyotype for (A) *BRCA1*<sup>mut</sup>-iPSC lines and (B) control iPSC lines at passage 9. (C) Karyotype analysis for 87i-CTR-n3 control and *BRCA1* mutant 70i-BRCA-n1 and 79i-BRCA-n2 at passage 32.



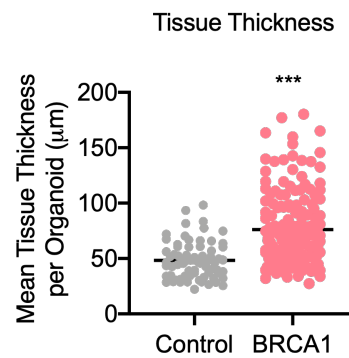
**Figure S2 (Related to Figure1). *BRCA1<sup>mut</sup>*-iPSC lines have the capacity to differentiate into three germ layers and (Related to Figure2) to differentiate of *BRCA1<sup>mut</sup>*-iPSC into Intermediate Mesoderm-Like Cells. (A) The factors and markers involved in the differentiation of three different germ layers (Chambers et al., 2009; Mae et al., 2013; Teo et al., 2014; Yucer et al., 2017). Expression of ectoderm marker *PAX6*, mesoderm marker *BRACHYURY*, and endoderm marker *SOX17* during course of differentiations. Relative gene expression to iPSC stage (day 0) was calculated using the  $\Delta\Delta Ct$  method and normalized to endogenous *GAPDH* level. Error bars are Standard Error of the Mean (SEM) ( $n = 3$  independent biological experiments and each dot represents the average of 3 independent**

biological experiments per line). (B) Expression kinetics of mesoderm markers *BRACHYURY* and *MIXL1* during the 6-day differentiation course using established protocol (Yucer et al., 2017). (C) Expression of intermediate mesoderm markers, *PAX2*, *OSR1*, and *GATA3* during the 6-day differentiation course. (D) Immunocytochemistry for FTE marker PAX8 in *BRCA1<sup>mut</sup>*-FTE organoid (70i-BRCA line) at day 30 in culture. Scale bars, 50  $\mu\text{m}$ . Relative gene expression at iPSC stage (day 0) was calculated using the  $\Delta\Delta\text{Ct}$  method and normalized to endogenous *GAPDH* level. Error bars are Standard Error of the Mean (SEM) ( $n = 3$  independent biological experiments and each dot represents the average of 3 independent biological experiments per line).

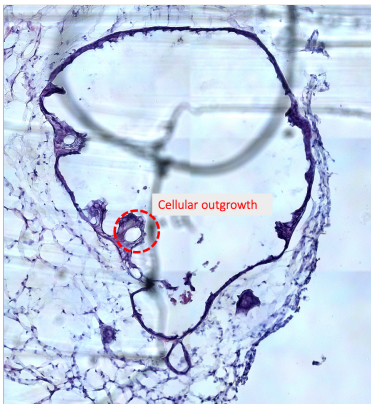
**A**



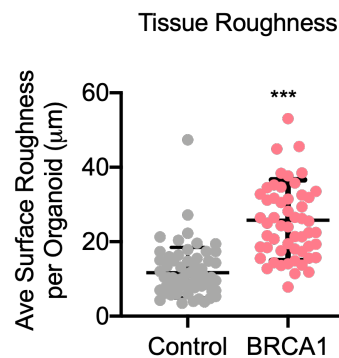
**B**



**C**



**D**



The arithmetic average roughness (cellular outgrowths),  $R_a$ ,

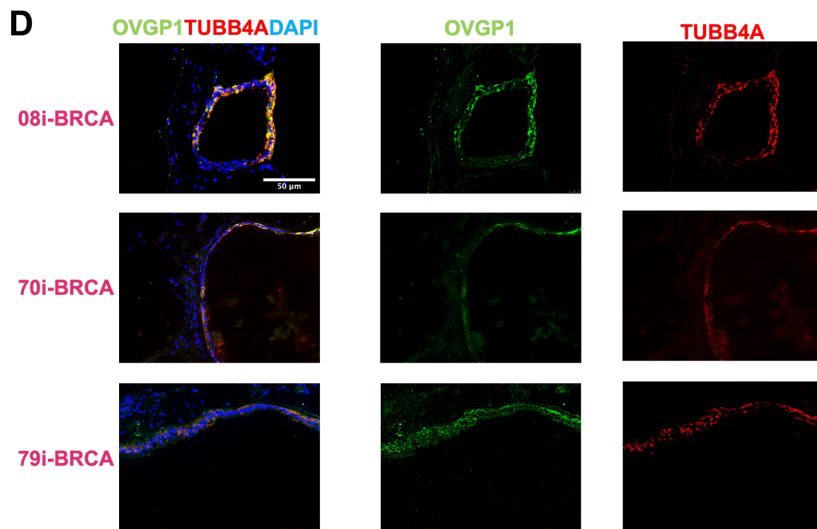
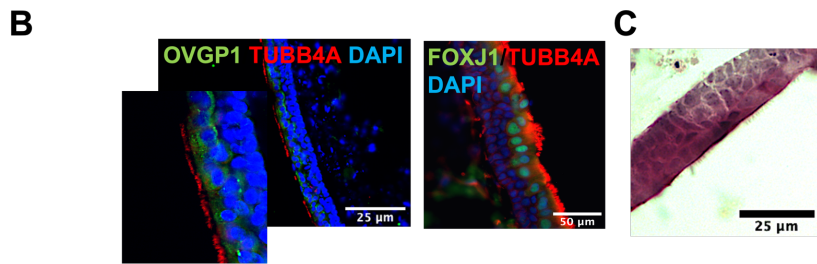
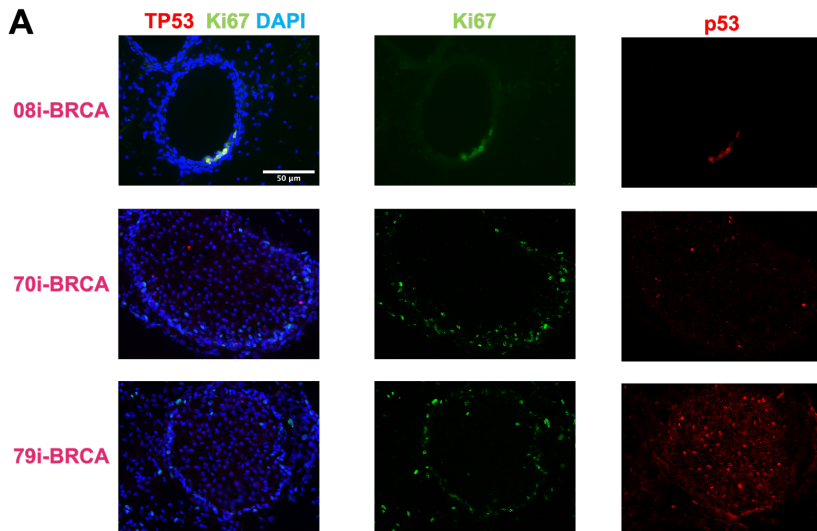
$$R_a = \frac{1}{n} \sum_{i=1}^n |y_i|$$

**Figure S3 (Related to Figure3). Histological characterization of controls and *BRCA1<sup>mut</sup>* FTE organoids. (A) H&E staining of normal FTE organoids at 4-months and quantification tissue thickness distribution. (B) FTE organoids thickness distribution by genotype. (C) H&E staining image, which was stitched using Stereo**

Investigator to indicate the cellular outgrowth (D) Cellular outgrowth measured as arithmetic average roughness by genotype.

$$R_a = \frac{1}{n} \sum_{i=1}^n |y_i|$$

Significance calculated using student t-test, \*\*\*p<0.00



**Figure S4 (Related to Figure4). *BRCA1*<sup>mut</sup>-iPSC-derived fallopian tube organoids present cellular signature of**

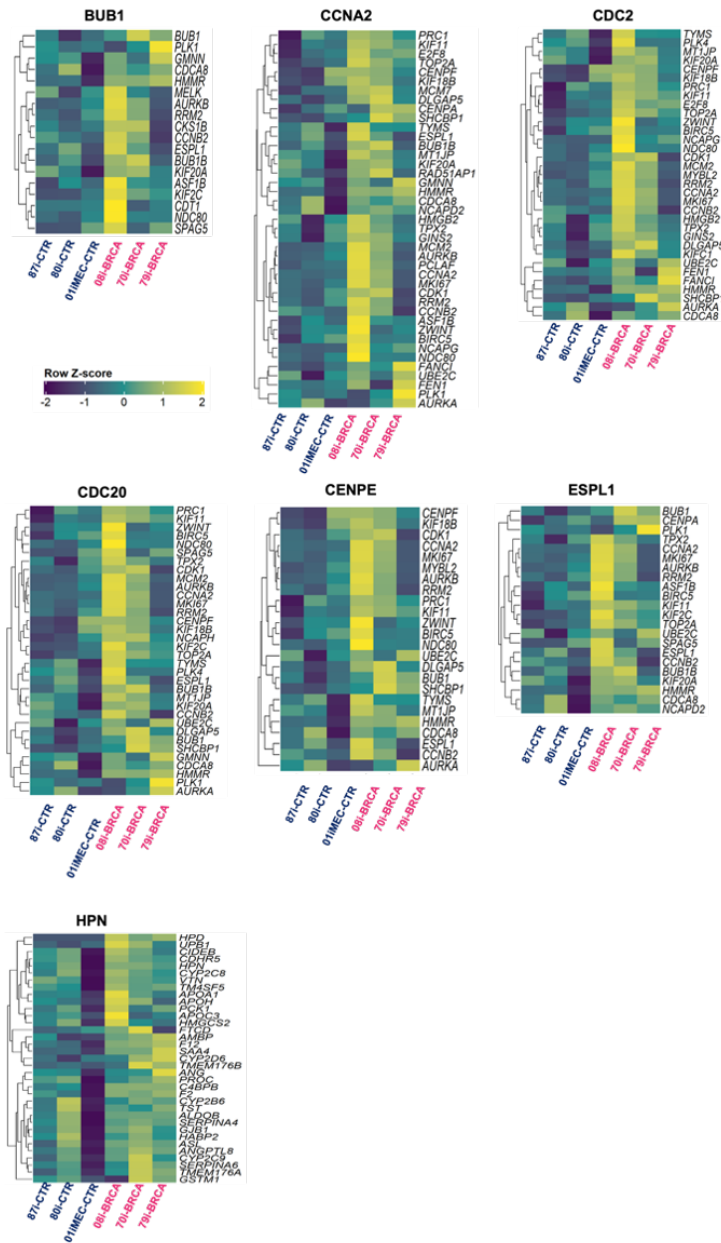
**STIC pathology *in vitro*.** (A) Immunocytochemistry for TP53 and Ki67 for 3 different *BRCA1*<sup>mut</sup>-FTE-organoids.

Scale bars, 50  $\mu$ m. Cilia formation at 6-months shown by (B) immunocytochemistry for FTE secretory cell marker

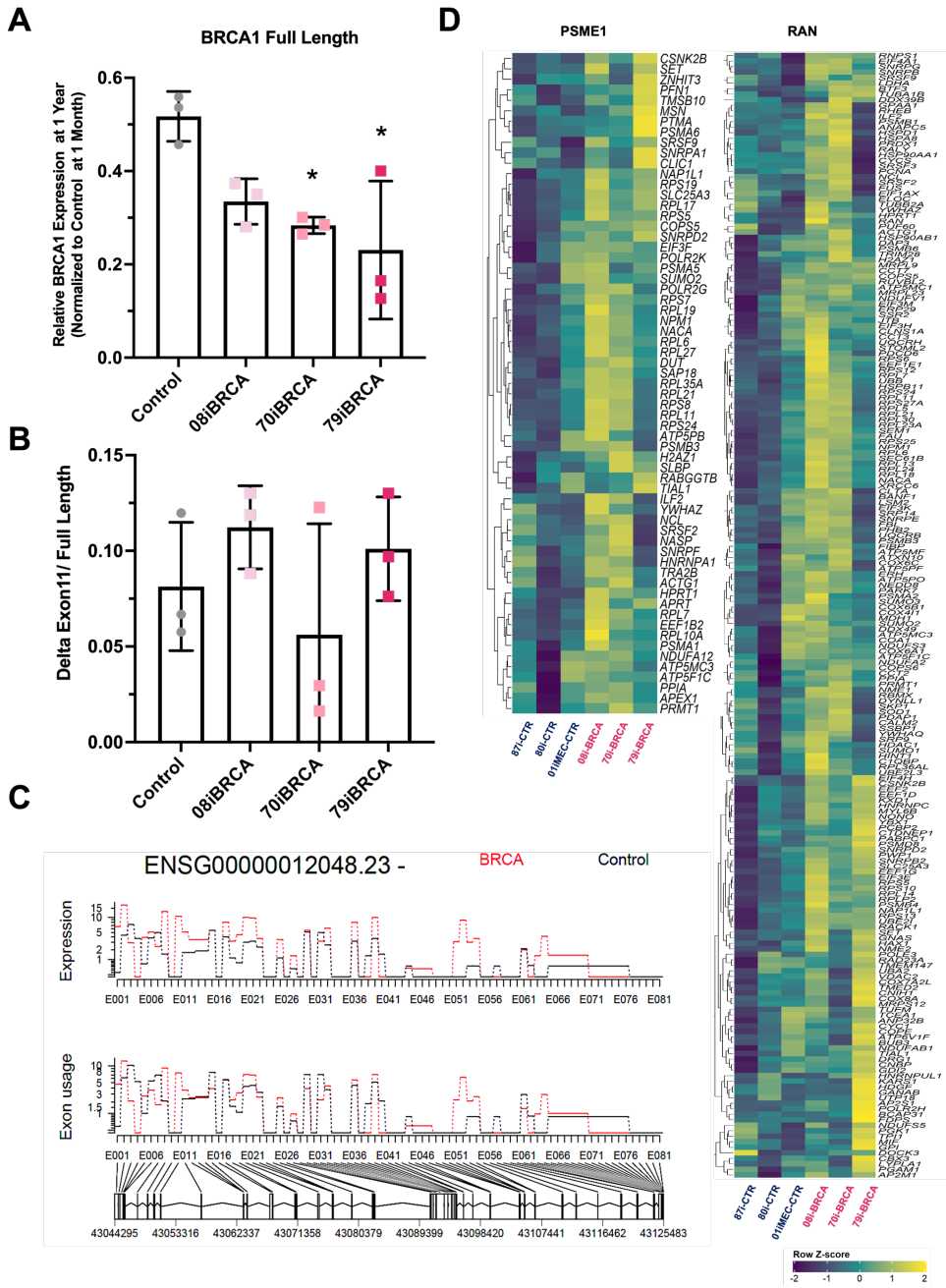
OVGP1 and ciliated cell marker TUBB4A and FOXJ1 and (C) H&E staining in 80iCTR line organoids. Scale bars,

25  $\mu$ m and 50  $\mu$ m. (D) Immunocytochemistry for FTE secretory cell marker OVGP1 and ciliated cell marker

TUBB4A in for 3 different *BRCA1*<sup>mut</sup>-FTE organoids at 4 months. Scale bars, 50  $\mu$ m.

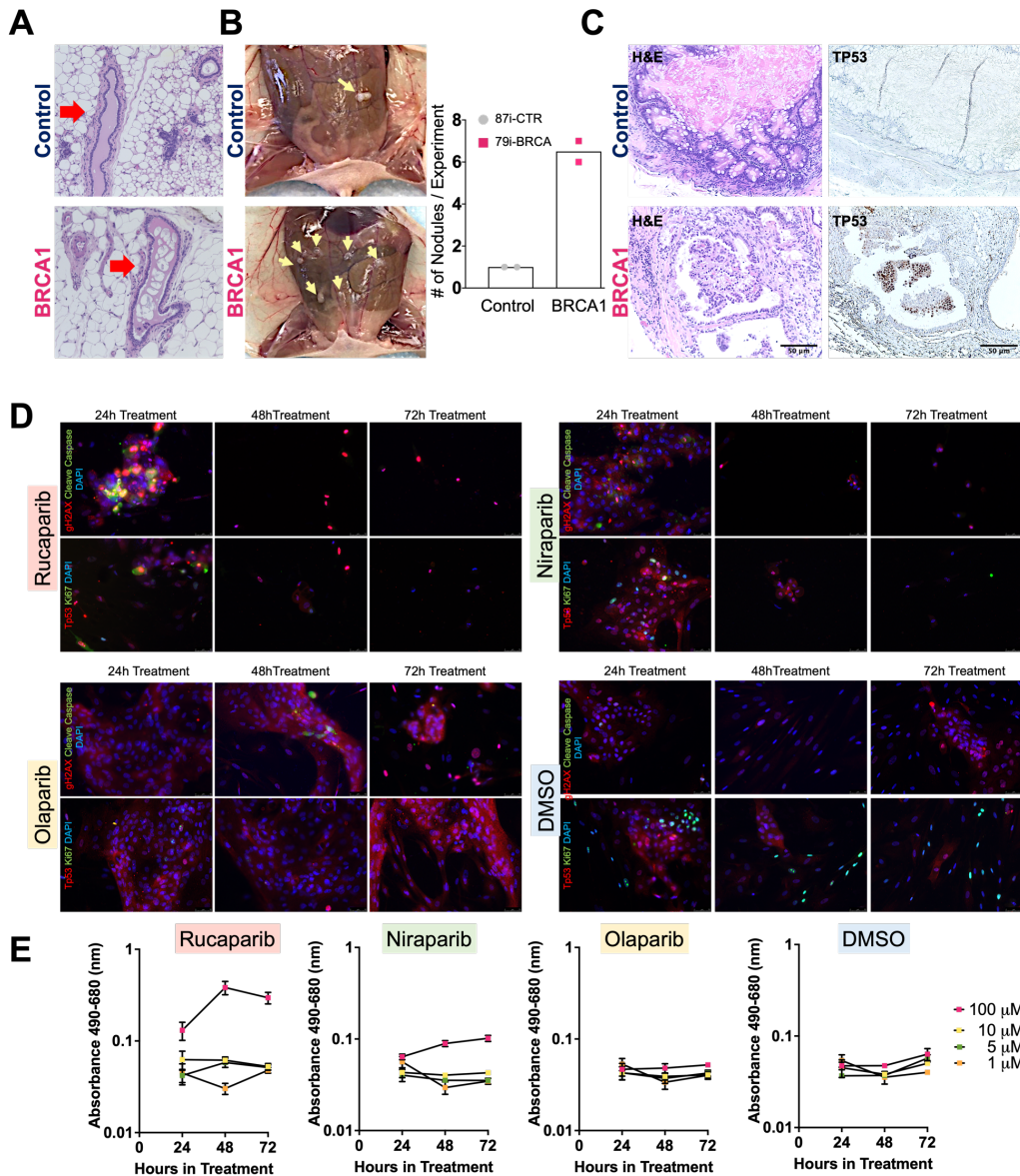


**Figure S5 (Related to Figure4). *BRCA1*<sup>mut</sup>-iPSC-derived fallopian tube organoids exhibit the molecular basis for STIC pathology *in vitro*.** Differential gene expression and GSEA for control and *BRCA1*<sup>mut</sup>-FTE organoids at 4-month in culture. FDR value is < 0.05. Z-scores of the leading-edge genes were calculated and used to construct a heatmap.



**Figure S6 (Related to Figure 5). The decrease in *BRCA1* expression in *BRCA1*<sup>mut</sup>-iPSC-derived fallopian tube organoid is not due to loss of heterozygosity (LOH).** (A) qRT-PCR quantification of full-length *BRCA1* gene expression at 1 month and 1 year. (B) qRT-PCR quantification of Delta exon 11 *BRCA1* gene expression. (C) Fragment mapping for the *BRCA1* gene on RNA sequencing data at 1-year culture. Relative gene expression to 87i-CTR was calculated using  $\Delta\Delta C_t$  method and normalized to endogenous *GAPDH* level. Error bars are Standard Error of the Mean (SEM) (n = 3 independent biological experiments and each dot represents the average of 3 independent biological experiments per line). Significance calculated using One-way ANOVA, Dunnett Multiple comparisons, \*p<0.05. (D) Differential gene expression and GSEA for control and *BRCA1*<sup>mut</sup>-FTE organoids at 1 year in culture. FDR value is < 0.05. Z-scores of the leading-edge genes were calculated and used to construct a heatmap.





**Figure S7 (Related to Figure6). *BRCA1<sup>mut</sup>*-iPSC-derived fallopian tube organoids demonstrate cancerous characteristics *in vivo*.** (A) H&E images for normal control and *BRCA1<sup>mut</sup>*-FTE organoids within the mammary gland. (B) Brightfield images at 3 months post-transplantation of 87i-CTR FTE organoids and 79i-BRCA FTE organoids (after 4 months in culture), and total number of nodules per experiment. (C) H&E and TP53 immunohistochemistry images at 3 months post-transplantation. Scale bars, 50 μm. (D) Immunocytochemistry for TP53, Ki67, gH2AX and Cleaved Caspase3 in response to 100 mM DMSO, Rucaparib, Niraparib and Olaparib at 24, 48 and 72 hours treatment of primary cells from *BRCA1<sup>mut</sup>* tumor lesions. (E) Time course of cellular

cytotoxicity assay (LDH assay) in response to 100, 10, 5 and 1 mM DMSO, Rucaparib, Niraparib and Olaparib at 24, 48 and 72 hours treatment of primary cells from *BRCA1<sup>mut</sup>* tumor lesions.

**Table S1 (Related to Figure3). Gene enrichment sets for control vs *BRCA1<sup>mut</sup>*-FTE organoids at 4-month culture**

NAME	SIZE	ES	NES	NOM p-val	FDR q-val	FWER p-val	RANK AT MAX	LEADING EDGE
CAR_HPX	58	0.6686738	2.296964	0	0	0	1512	tags=36%, list=8%, signal=39%
GNF2_CCNA2	67	0.65380585	2.2726195	0	0	0	3785	tags=61%, list=19%, signal=76%
GNF2_CCNB2	56	0.6678471	2.2662804	0	0	0	3653	tags=61%, list=19%, signal=75%
GNF2_CDC20	55	0.66336524	2.2533634	0	0	0	3785	tags=62%, list=19%, signal=77%
GNF2_HMMR	47	0.6797286	2.2286162	0	0	0	3785	tags=68%, list=19%, signal=84%
GNF2_CDC2	61	0.6328634	2.2126033	0	0	0	3653	tags=54%, list=19%, signal=66%
GNF2_CENPF	61	0.636856	2.1734078	0	1.60E-04	0.001	3653	tags=56%, list=19%, signal=68%
GNF2_CENPE	40	0.6784023	2.1681633	0	1.40E-04	0.001	3653	tags=60%, list=19%, signal=74%
GNF2_HPX	111	0.562162	2.148408	0	1.25E-04	0.001	1688	tags=32%, list=9%, signal=34%
MODULE_24	404	0.48340335	2.1414783	0	1.12E-04	0.001	2470	tags=31%, list=13%, signal=35%
GNF2_HP1	111	0.5525837	2.114176	0	2.00E-04	0.002	1688	tags=32%, list=9%, signal=34%
GNF2_TST	92	0.5701473	2.1135342	0	1.84E-04	0.002	1688	tags=33%, list=9%, signal=36%
MODULE_342	202	0.5081765	2.1120644	0	2.52E-04	0.003	1930	tags=34%, list=10%, signal=38%
GNF2_MKI67	28	0.71962315	2.095437	0	3.16E-04	0.004	3652	tags=71%, list=19%, signal=88%
GNF2_PCNA	67	0.5948131	2.0905054	0	3.72E-04	0.005	4503	tags=60%, list=23%, signal=77%
GNF2_LCAT	105	0.5475117	2.084383	0	3.49E-04	0.005	2034	tags=33%, list=10%, signal=37%
GNF2_BUB1	26	0.70440525	2.075836	0	3.95E-04	0.006	4113	tags=65%, list=21%, signal=83%
GNF2_RRM2	39	0.6553588	2.0745828	0	3.73E-04	0.006	3785	tags=64%, list=19%, signal=79%
GNF2_ESPL1	35	0.6514922	2.0113218	0	0.001224449	0.02	3785	tags=63%, list=19%, signal=78%
GNF2_GSTM1	93	0.5400912	2.004573	0	0.001499126	0.026	1688	tags=30%, list=9%, signal=33%
MODULE_180	115	0.5121064	1.989555	0	0.001798731	0.033	2229	tags=39%, list=11%, signal=44%
GNF2_MCM4	53	0.58221394	1.9832239	0.001941748	0.001918978	0.037	3886	tags=55%, list=20%, signal=68%

**Table S2 (Related to Figure 3). Functional annotation for control vs BRCA1<sup>mut</sup>-FTE organoids at 4 months by IPA software**

	Categories	Diseases or Functions Annotation	p-value	z-score	Gene List	# Molecules
1	Cancer,Organismal Injury and Abnormalities	Extracranial solid tumor	2.56-48	1.023	AT1FC ABCB11,ABCC3	1591
2	Cancer,Organismal Injury and Abnormalities	Solid tumor	7.95E-48	0.139	AT1FC ABCB11,ABCC3	1598
3	Cancer,Organismal Injury and Abnormalities	Cancer	1.5E-47	0.821	AT1FC ABCB11,ABCC3	1597
4	Cancer,Organismal Injury and Abnormalities	Malignant solid tumor	1.92E-47	0.327	AT1FC ABCB11,ABCC3	1590
5	Cancer,Organismal Injury and Abnormalities	Non-hematological solid tumor	5.85E-44	0.351	AT1FC ABCB11,ABCC3	1562
6	Cancer,Organismal Injury and Abnormalities	Nonhematologic malignant neoplasm	1.15E-43	0.587	AT1FC ABCB11,ABCC3	1557
7	Cancer,Organismal Injury and Abnormalities	Tumorigenesis of tissue	1.52E-42	0.898	AT1FC ABCB11,ABCC3	1544
8	Cancer,Organismal Injury and Abnormalities	Abdominal neoplasm	2.38E-41	1.665	AT1FC ABCB11,ABCC3	1541
9	Cancer,Organismal Injury and Abnormalities	Non-melanoma solid tumor	1.53E-40	-0.481	AT1FC ABCB11,ABCC3	1544
10	Cancer,Organismal Injury and Abnormalities	Carcinoma	6.19E-40	0.771	AT1FC ABCB11,ABCC3	1531
11	Cancer,Organismal Injury and Abnormalities	Epithelial neoplasm	7.53E-40	0.511	AT1FC ABCB11,ABCC3	1533
12	Cancer,Organismal Injury and Abnormalities	Abdominal cancer	2.81E-39	2.458	AT1FC ABCB11,ABCC3	1460
13	Cancer,Organismal Injury and Abnormalities	Adenocarcinoma	3.78E-34	1.986	AT1FC ABCB11,ABCC3	1363
14	Cancer,Organismal Injury and Abnormalities	Abdominal carcinoma	1.30E-32	2.431	AT1FC ABCB11,ABCC3	1402
15	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Digestive organ tumor	2.73E-32	1.602	AT1FC ABCB11,ABCC3	1394
16	Cancer,Organismal Injury and Abnormalities	Abdominal adenocarcinoma	2.97E-31	1.673	AT1FC ABCB11,ABCC3	1329
17	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Digestive system cancer	1.81E-29	2.298	AT1FC ABCB11,ABCC3	1359
18	Cancer,Organismal Injury and Abnormalities	Genitourinary tumor	5.49E-28	0.512	AT1FC ABCB3,ABCF2,F	1078
19	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Gastrointestinal tumor	8.6E-28	0.255	ABCB11,ABCC3,ABCF	1266
20	Cancer,Organismal Injury and Abnormalities	Malignant genitourinary solid tumor	3.74E-27	1.320	AT1FC ABCB3,ABCF2,F	1049
21	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Gastrointestinal tract cancer	1.21E-25	1.388	ABCB11,ABCC3,ABCF	1253
22	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Intestinal tumor	2.87E-25	0.722	ABCB11,ABCC3,ABCF	1211
23	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Large intestine neoplasm	5.19E-25	1.497	ABCB11,ABCC3,ABCF	1209
24	Cancer,Organismal Injury and Abnormalities	Head and neck tumor	7.29E-25	-0.343	AT1FC ABCB11,ABCC3	1248
25	Cancer,Organismal Injury and Abnormalities	Incidence of tumor	3.8E-24	0.537	AT1FC ABCB11,ABCC3	1084
26	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Intestinal cancer	1.9E-23	1.585	ABCB11,ABCC3,ABCF	1199
27	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Malignant neoplasm of large intestine	2.28E-23	1.913	ABCB11,ABCC3,ABCF	1198
28	Cancer,Organismal Injury and Abnormalities	Anogenital cancer	3.48E-23	-0.248	AT1FC ABCB3,ABCF2,F	978
29	Cancer,Organismal Injury and Abnormalities	Head and neck cancer	4.48E-23	0.026	AT1FC ABCB11,ABCC3	1229
30	Cancer,Organismal Injury and Abnormalities	Head and neck carcinoma	2.34E-22	0	AT1FC ABCB11,ABCC3	1220
31	Cancer,Organismal Injury and Abnormalities	Cancer of secretory structure	2.81E-22	0.28	AT1FC ABCB11,ABCC3	1220
32	Cancer,Endocrine System Disorders,Organismal Injury and Abnormalities	Endocrine gland tumor	6.67E-22	0.072	AT1FC ABCB11,ABCC3	1183
33	Cancer,Organismal Injury and Abnormalities	Pelvic tumor	7.89E-22	-0.242	AT1FC ABCB3,ABCF2,F	947
34	Cancer,Organismal Injury and Abnormalities	Breast or gynecological cancer	9.88E-22	1.363	AT1FC ABCB3,ABCF2,F	933
35	Cancer,Organismal Injury and Abnormalities	Pelvic cancer	1.37E-21	0.114	AT1FC ABCB3,ABCF2,F	933
36	Cancer,Organismal Injury and Abnormalities	Frequency of tumor	1.85E-21	1.137	AT1FC ABCB11,ABCC3	1045
37	Cancer,Organismal Injury and Abnormalities	Tumorigenesis of epithelial neoplasm	2.81E-21	1.111	AT1FC ABCB11,ABCC3	1045
38	Cancer,Organismal Injury and Abnormalities	Nonlipitular endocrine tumor	2.78E-21	0.179	AT1FC ABCB11,ABCC3	1175
39	Cancer,Organismal Injury and Abnormalities	Development of carcinoma	4.96E-21	1.388	AT1FC ABCB11,ABCC3	1018
40	Cancer,Organismal Injury and Abnormalities	Genitourinary cancer	6.28E-21	1.445	AT1FC ABCB3,ABCF2,F	922
41	Cancer,Organismal Injury and Abnormalities	Development of malignant tumor	7.19E-21	1.189	AT1FC ABCB11,ABCC3	1028
42	Cancer,Organismal Injury and Abnormalities	Tumorigenesis of reproductive tract	8.6E-21	0.239	AT1FC ABCB3,ABCF2,F	664
43	Cancer,Organismal Injury and Abnormalities	Female genital neoplasm	8.89E-21	0.239	AT1FC ABCB3,ABCF2,F	664
44	Cancer,Organismal Injury and Abnormalities	Female genital tract cancer	1.33E-20	0.137	AT1FC ABCB3,ABCF2,F	646
45	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Gastrointestinal carcinoma	1.87E-20	0.426	ABCB11,ABCC3,ABCF	1187
46	Cancer,Organismal Injury and Abnormalities	Neck neoplasm	2.01E-20	0.141	AT1FC ABCB11,ABCC3	1172
47	Cancer,Endocrine System Disorders,Organismal Injury and Abnormalities	Thyroid gland tumor	8.8E-20	0.239	AT1FC ABCB11,ABCC3	1159
48	Inflammatory Response,Organismal Injury and Abnormalities	Inflammation of organ	1.06E-19	-1.399	ABCB11,ACE2,ACKR4	275
49	Cancer,Organismal Injury and Abnormalities	Genital tumor	1.83E-19	-0.223	AT1FC ABCB3,ABCF2,F	896
50	Organismal Development	Morphology of body cavity	2.8E-19	0.114	ABCB11,ACE2,ACSL1	319
51	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Gastrointestinal adenocarcinoma	3.69E-19	0.555	ABCB11,ABCC3,ABCF	1147
52	Cancer,Organismal Injury and Abnormalities	Genital tract cancer	3.84E-19	-0.655	AT1FC ABCB3,ABCF2,F	896
53	Cancer,Endocrine System Disorders,Organismal Injury and Abnormalities	Endocrine cancer	7.15E-19	0.137	AT1FC ABCB11,ABCC3	1158
54	Cancer,Endocrine System Disorders,Organismal Injury and Abnormalities	Endocrine carcinoma	7.82E-19	0.137	AT1FC ABCB11,ABCC3	1154
55	Cancer,Organismal Injury and Abnormalities	Thyroid cancer	1.31E-19	0.137	AT1FC ABCB11,ABCC3	1154
56	Cancer,Endocrine System Disorders,Organismal Injury and Abnormalities	Thyroid carcinoma	1.69E-18	0.137	AT1FC ABCB11,ABCC3	1149
57	Cancer,Organismal Injury and Abnormalities	Genitourinary adenocarcinoma	5.73E-18	1.709	AT1FC ABCB3,ABCF2,F	924
58	Organismal Development	Abnormal morphology of abdomen	1.87E-17	0.816	ABCB11,ABCC3,ABCF	1122
59	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Intestinal carcinoma	1.87E-17	0.816	ABCB11,ABCC3,ABCF	1122
60	Cancer,Organismal Injury and Abnormalities	Large intestine carcinoma	2.48E-17	0.265	ABCB11,ABCC3,ABCF	1121
61	Cancer,Organismal Injury and Abnormalities	Breast or pancreatic cancer	2.9E-17	0.13	AT1FC ABCB3,ABCF2,F	627
62	Cancer,Organismal Injury and Abnormalities	Development of genital tumor	3.55E-17	0.13	AT1FC ABCB3,ABCF2,F	627
63	Cancer,Organismal Injury and Abnormalities	Neoplasia of cells	9.27E-17	0.896	AT1FC ABCB11,ABCC3	768
64	Cancer,Organismal Injury and Abnormalities	Female genital tract sarcoma carcinoma	1.0E-16	0.249	AGER,ALDH1A3,ANKX	127
65	Dermatological Diseases and Conditions,Organismal Injury and Abnormalities	Psoriasis	1.85E-16	2.449	AGER,ALDH1A3,ANKX	127
66	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Intestinal adenocarcinoma	1.95E-16	0.9	ABCB11,ABCC3,ABCF	1109
67	Cancer,Organismal Injury and Abnormalities	Chronic inflammatory disorder	2.59E-16	1.247	AGER,ACTA1,ADCY8	1109
68	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Large intestine adenocarcinoma	2.72E-16	0.9	ABCB11,ABCC3,ABCF	1108
69	Cancer,Organismal Injury and Abnormalities	Breast or ovarian cancer	5.02E-16	-0.063	ABCB3,ABCF2,ABLIM1	527
70	Cancer,Organismal Injury and Abnormalities	Breast or colorectal cancer	5.5E-16	1.148	ABCB3,ABCF2,ABLIM1	527
71	Digestive System Development and Function	Morphology of digestive system	1.02E-15	0.137	ABCB11,ACGR2,ACTR2	155
72	Organismal Development	Abnormal morphology of body cavity	1.1E-15	-0.137	AGER,ACE2,ACSL1	144
73	Cellular Movement	Cell movement	3.22E-15	-0.801	ACE2,ACKR4,ADAMT5	407
74	Cancer,Organismal Injury and Abnormalities	Development of adenocarcinoma	3.33E-15	1.522	ABCB11,ABCC3,ABCF	684
75	Gastrointestinal Disease,Organismal Injury and Abnormalities	Colorectal cancer	3.74E-15	0.935	ABCB3,ABCF2,ABLIM1	527
76	Cancer,Organismal Injury and Abnormalities	Advanced malignant tumor	8.5E-15	0.791	ABCB3,ABLIM1,AFAP1	216
77	Digestive System Development and Function,Gastrointestinal Disease	Abnormal morphology of digestive system	2.07E-14	0.137	ABCB11,AGR2,ACTR2	126
78	Cancer,Organismal Injury and Abnormalities	Melanoma	3.27E-14	-0.651	AT1FC ABCB11,ABCC3	968
79	Cancer,Organismal Injury and Abnormalities	Uterine tumor	6.66E-14	0.137	AT1FC ACSL1,ACSM3,J	505
80	Cancer,Organismal Injury and Abnormalities	Female genital tract adenocarcinoma	6.8E-14	0.137	ABCB3,ABCF2,ABLIM1	525
81	Cellular Movement	Migration of cell	1.02E-13	-0.95	AT1FC ADAR1,ADCY8	364
82	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Colorectal cancer	1.06E-13	1.497	ABCB3,ABCF2,ABLIM1	725
83	Cancer,Organismal Injury and Abnormalities	Pelvic adenocarcinoma	2.19E-13	0.137	AT1FC ABCB3,ABCF2,F	733
84	Inflammatory Response	Inflammation of anatomic region	2.40E-13	-1.028	ABCB11,ACE2,ACKR4	223
85	Cancer,Organismal Injury and Abnormalities	Serous adenocarcinoma	3.39E-13	0.137	ABLIM2,ACT2,ADCY2	171
86	Cancer,Organismal Injury and Abnormalities	Advanced malignant solid tumor	4.13E-13	0.998	ABCB3,AFAP1,LAGR5	153
87	Cancer,Organismal Injury and Abnormalities	Uterine cancer	5.25E-13	0.137	AT1FC ACSL1,ACSM3,J	505
88	Cancer,Organismal Injury and Abnormalities	Extraadrenal retroperitoneal tumor	1.03E-12	0.17	ABCB11,ABCC3,ABOJ	507
89	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Colorectal cancer	1.08E-12	1.913	ABCB11,ABCF2,ABLIM1	708
90	Inflammatory Response	Inflammation of body cavity	1.81E-12	-1.166	ABCB11,ACE2,ACKR4	223
91	Endocrine System Disorders,Organismal Injury and Abnormalities,Reproductive System	Gonadal tumor	2.19E-12	0.647	ABCB3,ABCF2,ABLIM1	301
92	Cancer,Organismal Injury and Abnormalities,Reproductive System	Respiratory system tumor	3.66E-12	1.322	ABCB11,ABCC3,ABOJ	460
93	Endocrine System Disorders,Organismal Injury and Abnormalities,Reproductive System	Ovarian lesion	4.81E-12	0.137	ABCB3,ABCF2,ABLIM1	289
94	Endocrine System Disorders,Organismal Injury and Abnormalities,Reproductive System	Ovarian tumor	8.7E-12	0.447	ABCB3,ABCF2,ABLIM1	289
95	Dermatological Diseases and Conditions,Organismal Injury and Abnormalities	Skin lesion	8.7E-12	0.113	AT1FC ABCB11,ABCC3	877
96	Endocrine System Disorders,Organismal Injury and Abnormalities,Reproductive System	Ovarian cancer	8.8E-12	0.137	ABCB3,ABCF2,ABLIM1	289
97	Cancer,Organismal Injury and Abnormalities	Advanced extracranial solid tumor	1.02E-11	1.12	ABCB3,ANKX,ANKX8	125
98	Cancer,Organismal Injury and Abnormalities	Malignant neoplasm of male genital organ	1.24E-11	0.13	AT1FC ABO,ACSM3,AD	530
99	Organismal Development	Abnormal growth in endocrine system	1.44E-11	0.137	ADAM2,AFOPH,BCAN	88
100	Cell-To-Cell Signaling and Interaction	Interaction of tumor cell lines	1.63E-11	0.85	ADAM2,AFOPH,BCAN	92
101	Organismal Injury and Abnormalities,Reproductive System	Abnormality of endometrium	1.89E-11	-0.359	AT1FC ACSL1,ACSM3,J	449
102	Cancer,Organismal Injury and Abnormalities	Malignant neoplasm	2.44E-11	0.137	AT1FC ABO,ACSM3,AD	449
103	Cancer,Organismal Injury and Abnormalities	Cancer of cells	2.82E-11	0.579	ABCB11,ABCC3,ABLIM1	630
104	Cancer,Organismal Injury and Abnormalities	Prostate cancer	3E-11	0.762	AT1FC ABO,ACSM3,AD	522
105	Cancer,Organismal Injury and Abnormalities	Malignant solid organ tumor	3.13E-11	0.423	ABCB3,ABCF2,ABLIM1	420
106	Endocrine System Disorders,Organismal Injury and Abnormalities,Reproductive System	Primary ovarian cancer	4.14E-11	0.137	AGER,ANXA10,ACOL1	26
107	Organismal Survival	Organismal death	5.24E-11	-0.83	ABCB11,ACE2,ACTA1	393
108	Cancer,Organismal Injury and Abnormalities	Malignant solid organ tumor	6.27E-11	1.13	AT1FC ABCB11,ABCC3	875
109	Cancer,Organismal Injury and Abnormalities	Prostatic tumor	5.34E-11	-0.599	AT1FC ABO,ACSM3,AD	523
110	Organismal Survival	Mortality or mortality	6.21E-11	-0.726	ABCB11,ACE2,ACTA1	397
111	Cell-To-Cell Signaling and Interaction	Binding of tumor cell lines	7E-11	0.731	ADAM2,AFOPH,BCAN	88
112	Disorders,Inflammatory Disease,Organismal Injury and Abnormalities,Skeletal and M	Rheumatic Disease	7.99E-11	-1.805	ACSL1,ACSL5,ACTA1	225
113	Cancer,Dermatological Diseases and Conditions,Organismal Injury and Abnormalities	Skin tumor	8.45E-11	1.322	AT1FC ABCB11,ABCC3	864
114	Gastrointestinal Disease,Hepatic System Disease,Organismal Injury and Abnormalities	Liver lesion	9.37E-11	0.931	AT1FC ABCB11,ABCC3	728
115	Cancer,Dermatological Diseases and Conditions,Organismal Injury and Abnormalities	Skin cancer	1.07E-10	-0.6	AT1FC ABCB11,ABCC3	859
116	Cancer,Organismal Injury and Abnormalities	Malignant neoplasm of retroperitoneum	1.11E-10	0.862	ABCB11,ABO,ACOL1	455
117	Tissue Development	Growth of epithelial tissue	1.15E-10	1.111	AGER,AGR2,ACTR2,A	138
118	Cancer,Organismal Injury and Abnormalities	Endometrium tumor	1.3E-10	0.137	AT1FC ACSL1,ACSM3,J	441
119	Endocrine System Disorders,Organismal Injury and Abnormalities,Reproductive System	Advanced ovarian carcinoma	1.3E-10	0.137	ANKX8,ANKX11,ARL1	37
120	Protein Synthesis	Metabolism of cellular protein	1.33E-10	0.137	AFP,APPA1,APPA2,AF	47
121	Cancer,Organismal Injury and Abnormalities	Endometrial cancer	1.43E-10	0.137	AT1FC ACSL1,ACSM3,J	440
122	Cellular Growth and Proliferation,Tissue Development	Quantity of cells	1.78E-10	0.37	AGER,AGR2,AREGA	104
123	Endocrine System Disorders,Organismal Injury and Abnormalities,Reproductive System	Proliferation of epithelial cells	1.86E-10	-1.518	AGER,AGR2,AREGA	104
124	Organismal Survival	Advanced ovarian cancer	1.9E-10	0.137	ANKX8,ANKX11,ARL1	39
125	Inflammatory Response	Systemic autoinflammatory syndrome	1.96E-10	0.164	ACSL1,ACSL5,ACTA1	231
126	Cancer,Organismal Injury and Abnormalities	Squamous cell tumor	2.4E-10	0.96	ABCB11,ABCC3,ABOJ	474
127	Endocrine System Disorders,Organismal Injury and Abnormalities,Reproductive System	Advanced ovarian adenocarcinoma	2.95E-10	0.137	ANKX8,ANKX11,ARL1	33
128	Digestive System Development and Function,Gastrointestinal Disease	Morphology of Intestine	3.69E-10	0.137	AGER,AFAP1,AFAP2	192
129	Endocrine System Disorders,Organismal Injury and Abnormalities,Reproductive System	Serous ovarian adenocarcinoma	3.09E-10	0.137	ANKX8,ANKX11,ARL1	55
130	Cancer,Organismal Injury and Abnormalities	Squamous cell carcinoma	3.37E-10	1.119	ABCB11,ABCC3,ABOJ	473
131	Lipid Metabolism,Biochemistry	Metabolism of cholesterol	3.79E-10	0.599	ACSL1,ACSL5,ALDH1	192
132	Cancer,Organismal Injury and Abnormalities	Primary tumor	4.11E-10	0.8	AFAP1,LAGR2,ANKX	86
133	Organismal Injury and Abnormalities	Benign lesion	4.16E-10	-0.192	ADAR1,AGER,AJUB	173
134	Cancer,Dermatological Diseases and Conditions,Organismal Injury and Abnormalities	Cutaneous melanoma	5.08E-10	0.137	ABCB11,ABCC3,ABCF2,F	924
135	nc Function,Gastrointestinal Disease,Organ Morphology,Organismal Development,Org	Abnormal morphology of intestine	5.44E-10	0.137	AGER,AFAP1,AFAP2	53
136	Cancer,Organismal Injury and Abnormalities	Lymphohematopoietic cancer	6.93E-10	-0.338	AT1FC ABCB11,ABCC3	464
137	Cancer,Organismal Injury and Abnormalities	Uterine serous papillary cancer	7.37E-10	0.137	AGER,AGR2,AREGA	104
138	Cellular Movement	Invasion of cells	7.37E-10	0.027	ABLIM1,AFAP1,LAGR5	189
139	Gastrointestinal Disease,Inflammatory Disease	Inflammatory Bowel Disease	7.82E-10	1.628	ACSL1,AGER,B3GAT1	85
140	Cancer,Organismal Injury and Abnormalities	Thoracic neoplasm	7.84E-10	0.705	AT1FC ABCB11,ABCC3	875
141	Cellular Development,Tissue Development	Inflammation of epithelial tissue	9.56E-10	1.571	AGER,AGR2,AREGA,AFAP1	84
142	Cancer,Organismal Injury and Abnormalities,Reproductive System	Lung tumor	1.11E-09	1.467	AT1FC ABCB3,ABCF2,F	387
143	Cancer,Organismal Injury and Abnormalities	Lymphohematopoietic neoplasia	1.17E-09	-0.163	AT1FC ABCB11,ABCC3	468
144	Cancer,Organismal Injury and Abnormalities	Advanced adenocarcinoma	1.19E-09	0.137	ABCB3,ANKX8,ANKX11	53
145	Cellular Development,Tissue Development	Differentiation of epithelial cells	1.21			

151	Cancer,Organismal Injury and Abnormalities	Intraothacic malignant tumor	2.05E-09	1.507		ABC811.ABCC3.ABOJ	380
152	Organismal Injury and Abnormalities,Reproductive System Disease	Benign pelvic disease	2.23E-09			ADARB1.ALDH1A1.AL	110
153	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Hepatolytic carcinoma	2.39E-09	2.282	-0.855	A1CF.ABC811.ABCC3	619
154	Cancer,Hematological Disease,Organismal Injury and Abnormalities	Hematopoietic neoplasm	2.32E-09	-0.162		A1CF.ABC811.ABCC3	464
155	Cancer,Hematological Disease,Organismal Injury and Abnormalities	Hematologic cancer	2.89E-09	-0.338		A1CF.ABC811.ABCC3	458
156	Cellular Development and Proliferation	Cell proliferation of cell lines	2.69E-09	0.988		ABL1M1.ACCLS.ADM	293
157	Lipid Metabolism,Molecular Transport,Small Molecule Biochemistry	Concentration of triacylglycerol	2.64E-09	0.848		ACSL1.ADCYAP1.AGT	71
158	Cancer,Organismal Injury and Abnormalities,Respiratory Disease	Lung carcinoma	2.69E-09	0.51		ABC811.ABCC3.ABOJ	353
159	Cancer,Organismal Injury and Abnormalities,Respiratory Disease	Lung cancer	2.71E-09	1.37		ABC811.ABCC3.ABOJ	377
160	Cancer,Organismal Injury and Abnormalities	Primary solid tumor	2.77E-09			AFAP11.AGR2.ANXA	83
161	Cancer,Gastrointestinal Disease,Hepatic System Disease,Organismal Injury and Abnormal	Hepatobiliary system cancer	2.99E-09	1.774		A1CF.ABC811.ABCC3	637
162	Cell-To-Cell Signaling and Interaction	Adhesion of tumor cell lines	3.21E-09	1.266		ADAM28.APOH.BCAN	69
163	Cancer,Hematological Disease,Organismal Injury and Abnormalities	Neoplasia of carcinoma	3.25E-09			AGR2.APOA4.AREG.B	459
164	Lipid Metabolism,Molecular Transport,Small Molecule Biochemistry	Concentration of lipid	3.29E-09	0.856		ABC811.ABCC3.ACS	151
165	Lipid Metabolism,Molecular Transport,Small Molecule Biochemistry	Concentration of acylglycerol	4.03E-09	0.418		ACSL1.ADCYAP1.AGT	75
166	Gastrointestinal Disease,Inflammatory Response	Inflammation of gastrointestinal tract	4.09E-09	-1.518		AGR2.APOA4.APOBEC	96
167	Cancer,Organismal Injury and Abnormalities	Benign tumors	4.87E-09	0.208		ADARB1.AGER.AJUB	152
168	Cancer,Organismal Injury and Abnormalities,Reproductive System Disease	Uterine carcinoma	5.04E-09			A1CF.ACSL1.ACSM3.J	430
169	Endocrine System Disorders,Gastrointestinal Disease,Organismal Injury and Abnorm	Pancreatic tumor	5.4E-09	-0.181		ABC811.ABCC3.ABOJ	388
170	Gastrointestinal Disease,Organismal Injury and Abnormalities	Abnormality of large intestine	5.89E-09	-0.182		AGR2.APOA4.AREG.B	459
171	Cancer,Organismal Injury and Abnormalities,Reproductive System Disease	Breast cancer	6.74E-09	-0.048		ABL1M1.ABO.ADM28	35
172	Lipid Metabolism,Small Molecule Biochemistry	Metabolism of triacylglycerol	6.81E-09	1.269		ACSL1.ACCLS.ALDH1	31
173	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Colon tumor	7.48E-09	0.792		ABC3.ABCF2.ABLM	608
174	Cancer,Organismal Injury and Abnormalities	Benign solid tumor	8.02E-09	0.208		ADARB1.AGER.AJUB	150
175	Cardiovascular Disease	Occlusion of blood vessel	8.48E-09	-0.562		ABO.AGER.ANGPTL3	102
176	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Development of digestive organ tumor	9.12E-09	1.379		ABC3.ABCF2.ABLM	677
177	Cancer,Organismal Injury and Abnormalities,Renal and Urological Disease	Urinary tract cancer	1.07E-08	0.151		AC0040692.ADM28.J	314
178	Development,Cellular Function and Interaction,Organismal Injury and Abnormalities,Tu	Proliferation of tumor cells	1.092	1.092		ADAM28.APCDD1.AP	83
179	Cancer,Organismal Injury and Abnormalities	Primary neoplasm	1.37E-08	0.11		AFAP11.AGR2.ANXA	94
180	Cell-To-Cell Signaling and Interaction	Activation of cells	1.57E-08	-0.798		ACSL5.ADCYAP1.AFP	174
181	Dermatological Diseases and Conditions,Organismal Injury and Abnormalities	Exanthem of skin	0.00000016			C3.CHAC4B.CCL20.C	37
182	Neurological Disease,Organismal Injury and Abnormalities	Epilepsy	1.69E-08	0.282		ADCYAP1.AL.G13.ANC	74
183	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Colon cancer	1.81E-08	1.109		ABC3.ABCF2.ABLM	599
184	Neurological Disease	Epilepsy or neurodevelopmental disorder	2.17E-08	-0.262		ADYAP1.AL.G13.ANC	91
185	Cancer,Gastrointestinal Disease,Hepatic System Disease,Organismal Injury and Abnorma	Liver cancer	2.24E-08	1.626		A1CF.ABC811.ABCC3	600
186	Cardiovascular Disease,Organismal Injury and Abnormalities	Abnormal morphology of skin	2.24E-08			AP0A1.AREG.BCL2L1	52
187	Cancer,Organismal Injury and Abnormalities,Respiratory Disease	Non-small cell lung carcinoma	0.00000023	1.938		ABC811.ABCC3.ACE2	307
188	Cardiovascular Disease,Organismal Injury and Abnormalities	Cell movement of tumor cell lines	2.45E-08	0.151		ACKR4.ADM28.AGE	182
189	Cardiovascular Disease,Organismal Injury and Abnormalities	Occlusion of artery	0.00000025	-0.562		AGER.ANGPTL3.APOF	99
190	Cancer,Gastrointestinal Disease,Hepatic System Disease,Organismal Injury and Abnorma	Liver carcinoma	2.75E-08	1.213		A1CF.ABC811.ABCC3	580
191	Cell Death and Survival	Necrosis	2.87E-08	-0.273		ABC3.ACE2.ACSL.J	410
192	Cancer,Organismal Injury and Abnormalities,Renal and Urological Disease	Urinary tract tumor	2.89E-08	0.318		AC0040692.ADM28.J	314
193	Cancer,Organismal Injury and Abnormalities	Lymphoreticular neoplasm	2.98E-08	-0.061		A1CF.ABC811.ABCC3	405
194	Digestive System Development and Function	Development of digestive system	3.24E-08	2.2		AGR2.ALDH1A1.APO3	82
195	Inflammatory Disease,Inflammatory Response,Organismal Injury and Abnormalities,Sk	Inflammation of joint	3.83E-08	-1.614		ACSL1.ACTA1.ADM28	172
196	Cancer,Organismal Injury and Abnormalities	Extrapulmonary squamous cell carcinoma	4.01E-08	-0.577		ABC811.ABCC3.ABOJ	427
197	Diseases and Conditions,Inflammatory Disease,Inflammatory Response,Organismal Inju	Dermatits	4.07E-08	0.02		ACKR4.AGER.AREG.B	82
198	Cancer,Organismal Injury and Abnormalities	Advanced stage carcinoma	4.39E-08			ABC3.ANXA.ANXAE	61
199	Organ Morphology	Abnormal morphology of epithelial tissue	4.39E-08			ABC811.ADCYAP1.AG	82
200	Dermatological Diseases and Conditions,Organismal Injury and Abnormalities	Plaque psoriasis	4.46E-08			CCL20.CSTA.CXCL6.C	33
201	Active Tissue Disorders,Organismal Injury and Abnormalities,Skeletal and Muscular Dis	Non-traumatic arthropathy	4.81E-08	0.207		ACSL1.ACTA1.ADM28	150
202	Immune System Disorders,Organismal Injury and Abnormalities,Reproductive System	Ovarian serous tumor	5.01E-08			ABL.M2.ADCY2.AHAN	125
203	Hematological System Development and Function,Tissue Morphology	Quantity of leukocytes	5.16E-08	-0.938		ACKR4.ADCYAP1.AGE	176
204	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Upper gastrointestinal tract cancer	6.12E-08	0		ADAM28.ADARB1.ADC	416
205	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Upper gastrointestinal tract cancer	6.59E-08	-0.571		ADAM28.ADARB1.ADC	418
206	Neurological Disease,Organismal Injury and Abnormalities	Epilepsy	6.71E-08	0.152		ADCYAP1.ANOS1	45
207	Embryonic Development,Organismal Development	Development of abdomen	6.97E-08	1.268		ADCYAP1.AGER.AGT	112
208	Digestive System Development and Function	Development of gastrointestinal tract	7.08E-08	1.864		AGR2.APO3.BCL2L1	60
209	Endocrine System Disorders,Organismal Injury and Abnormalities,Reproductive System	Advanced serous ovarian adenocarcinoma	7.19E-08			ANXA.ANXA11.ARL	28
210	Cancer,Organismal Injury and Abnormalities,Respiratory Disease	Development of lung tumor	8.19E-08	1.856		ABC811.ABCC3.ABOJ	354
211	Organ Morphology	Abnormal morphology of gland	9.56E-08			AGR2.AGTR2.ALDH1A	64
212	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Upper gastrointestinal carcinoma	0.000000103			ADAM28.ADARB1.ADC	397
213	Cancer,Organismal Injury and Abnormalities,Reproductive System Disease	Prostatic carcinoma	0.000000107	1		ACKR4.ADM28.AGE	182
214	Embryonic Development,Organismal Development	Development of body trunk	0.000000112	1.29		ACE2.ADAP2.ADCYAF	205
215	Immunological Disease	Hypersensitivity reaction	0.000000114	0.318		ACKR4.AGER.BCL2L1	82
216	Cancer,Organismal Injury and Abnormalities	Metastatic solid tumor	0.000000116	0.851		ABC3.AFAP11.AGR	120
217	Cancer,Gastrointestinal Disease,Inflammatory Response	Chronic gastritis	0.000000126	0.059		A1CF.AGER.BCCL2	58
218	al Disease,Inflammatory Disease,Inflammatory Response,Organismal Injury and Abno	Rheumatoid arthritis	0.000000133	0.077		ACSL1.ACTA1.ADCYB	131
219	Cellular Movement	Invasion of tumor cell lines	0.000000131	-0.004		ABL.M1.AFAP11.AGE	149
220	Cancer,Organismal Injury and Abnormalities	Endometrial carcinoma	0.000000139			ABC3.ABCF2.ACE2.J	419
221	Gastrointestinal Disease,Organismal Injury and Abnormalities	Gastric cancer	0.000000144	-0.708		ADAM28.ADARB1.ADC	236
222	Cancer,Organismal Injury and Abnormalities	Ductal carcinoma	0.00000015	1.709		ABC811.ABO.ACAP1.J	377
223	Cancer,Organismal Injury and Abnormalities,Reproductive System Disease	HER2-negative breast cancer	0.000000153			AGER.BRC1.CAV1.C	42
224	Molecular Transport	Quantity of metal	0.00000016	-0.396		ABC3.ABCC3.ABOJ	83
225	Cancer,Organismal Injury and Abnormalities	HER2-negative cancer	0.000000163			AGER.BRC1.CAV1.C	44
226	Cancer,Organismal Injury and Abnormalities,Reproductive System Disease	Endometrial carcinoma	0.000000164			A1CF.ACSL1.ACSM3.J	397
227	Gastrointestinal Disease,Inflammatory Response	Gastroenteritis	0.000000167	-1.647		AGR2.APOA4.APOH.A	84
228	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Gastroesophageal cancer	0.000000176	0		ADAM28.ADARB1.ADC	258
229	Hematological System Development and Function,Tissue Morphology	Quantity of blood cells	0.000000182	-0.977		ACKR4.ADCYAP1.AGE	176
230	Cancer,Organismal Injury and Abnormalities	HER2 negative solid tumor	0.000000183			AGER.BRC1.CAV1.C	44
231	Cardiovascular System Development and Function,Organismal Development	Angiogenesis	0.000000186	0.486		A1CF.AGER.AGTR2	165
232	Dermatological Diseases and Conditions,Organismal Injury and Abnormalities	Disorder of hair	0.000000287	-2.431		APCDD1.AREG.BCL2	47
233	Organ Morphology	Morphology of skin	0.000000292			ACE2.APOA1.AREG.A	61
234	Cellular Movement	Homing of cells	0.000000297	-0.804		ACKR4.AFP.AGER.AN	106
235	Organ Morphology	Concentration of ADCYAP1	0.000000301	1.437		CSBG1.ADCYAP1.AG	79
236	Cancer,Organismal Injury and Abnormalities,Respiratory Disease	Development of lung carcinoma	0.000000304	1		ABC811.ABCC3.ACE2	248
237	Cardiovascular System Development and Function,Organismal Development	Vasculogenesis	0.000000305	0.454		A1CF.AGER.AGTR2.A	138
238	Development,Cellular Function and Interaction,Organismal Injury and Abnormalities,Tu	Proliferation of tumor cells	0.000000314	1.405		ABC3.ABCF2.ABLM	608
239	Neurological Disease,Organismal Injury and Abnormalities	Seizure disorder	0.000000325	-0.549		ADARB1.ADCYAP1.AL	97
240	Cellular Function and Maintenance	Cellular homeostasis	0.000000328	-0.188		ABC3.ACAP1.ACSL1	259
241	Lipid Metabolism,Molecular Transport,Small Molecule Biochemistry	Quantity of steroid	0.000000329	0.891		ABC811.ABCC3.ACS	88
242	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Stomach tumor	0.000000339	-0.685		ADAM28.ADARB1.ADC	233
243	Organismal Injury and Abnormalities,Reproductive System Disease	Endometriosis	0.000000388			ALDH1A3.ANK3.BRCA	73
244	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Gastric cancer	0.000000424			ADAM28.ADARB1.ADC	230
245	Cancer,Organismal Injury and Abnormalities,Reproductive System Disease	Angiogenesis of uterine tumor	0.000000435			ABC3.ABCF2.ABLM	599
246	Active Tissue Disorders,Organismal Injury and Abnormalities,Skeletal and Muscular Dia	Abnormality of cartilage tissue	0.000000437	0.388		ADAMTSS.BMPER.CA	41
247	al Disease,Inflammatory Disease,Inflammatory Response,Organismal Injury and Ab	Enteritis	0.000000484	-1.558		AGR2.APOA4.APOH.A	79
248	Cancer,Organismal Injury and Abnormalities,Respiratory Disease	Lung adenocarcinoma	0.000000487	1.414		ABC811.ABCC3.ACE2	246
249	Lipid Metabolism,Molecular Transport,Small Molecule Biochemistry	Quantity of lipid	0.000000491	-1.109		AGER.APOA1.AREG.	31
250	al Disease,Inflammatory Disease,Inflammatory Response,Organismal Injury and Ab	Inflammation of large intestine	0.000000492	-1.182		AGR2.APOA4.AREG.B	73
251	al Disease,Inflammatory Disease,Inflammatory Response,Organismal Injury and Ab	Colitis	0.00000052	-1.054		AGR2.APOA4.AREG.B	73
252	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Development of colorectal tumor	0.000000525			ABC3.ABCF2.ABLM	599
253	Endocrine System Disorders,Gastrointestinal Disease,Organismal Injury and Abnorm	Pancreatic cancer	0.00000058	0.518		ABC811.ABO.ACAP1.J	331
254	Cancer,Dermatological Diseases and Conditions,Organismal Injury and Abnormalities	Hyperplasia of epidermis	0.000000582	-1.432		AGER.AGER.CAV1.CD	31
255	Neurological Disease,Organismal Injury and Abnormalities	Seizures	0.000000589	-0.686		ADARB1.ADCYAP1.AL	87
256	Cancer,Organismal Injury and Abnormalities	Papillary adenocarcinoma	0.000000593			ABC3.ANXA.ANXAE	66
257	Cancer,Organismal Injury and Abnormalities	Papillary carcinoma	0.000000611			ABC3.ANXA.ANXAE	67
258	Cardiovascular System Development and Function	Development of vasculature	0.000000642	0.519		ACE2.AGER.AGTR2.A	181
259	Cellular Movement	Chemotaxis	0.000000664	-0.485		ACKR4.AFP.AGER.AN	100
260	Organ Morphology	Morphology of gland	0.000000668			AGR2.AGTR2.ALDH1A	79
261	Cardiovascular Disease,Organismal Injury and Abnormalities	Atherosclerosis	0.00000072	-0.906		AGER.ANGPTL3.APOF	85
262	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Lower respiratory tract disorder	0.000000766	-0.516		ABC3.AGER.ANKS1E	76
263	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Colorectal carcinoma	0.00000081			ABC3.ABCF2.ABLM	597
264	ncer,Hematological Disease,Immunological Disease,Organismal Injury and Abnorma	Leukemia	0.000000821	0.464		A1CF.ABC811.ABCC3	310
265	Cancer,Organismal Injury and Abnormalities,Reproductive System Disease	Hormone receptor negative breast cancer	0.000000827			AGER.BRC1.CAV1.C	38
266	Cancer,Dermatological Diseases and Conditions,Organismal Injury and Abnormalities	Hyperplasia of skin	0.000000877	-1.368		AGER.AGER.CAV1.CD	32
267	Cancer,Organismal Injury and Abnormalities,Reproductive System Disease	Progesterone receptor negative breast tumor	0.000000878			AGER.BRC1.CAV1.C	38
268	Cancer,Organismal Injury and Abnormalities	Growth of malignant tumor	0.000000887	0.627		ADAM28.APCDD1.APC	81
269	Cell Death and Survival	Apoptosis	0.000000941	-0.119		ABO.ACE2.ACSL1.ADJ	399
270	Digestive System Development and Function,Hepatic System Development and Functi	Differentiation of hepatocytes	0.000000956			BMP4.EZF1.FGF1.FOS	10
271	Cancer,Organismal Injury and Abnormalities,Reproductive System Disease	Abnormality of limb	0.000000956	-0.893		ATL1.BMP4.BMPER.CA	64
272	Cell-To-Cell Signaling and Interaction,Cellular Assembly and Organization	Prostatic adenocarcinoma	0.000000973			A1CF.ABO.ACSM3.AD	415
273	Cardiovascular System Development and Function,Cellular Movement	Cell movement of endothelial cells	0.000000985	1.037		AJUBA.AMPH.ANK3.AJ	114
274	Cardiovascular System Development and Function,Cellular Movement	Quantity of small intestine cells	0.000000985	-0.333		ADCYAP1.APOC3.ASII	80
275	Molecular Transport	Quantity of lipid	0.000000985			ABC3.ABCF2.ABLM	222
276	Endocrine System Disorders,Organismal Injury and Abnormalities,Reproductive System	Ovarian adenocarcinoma	0.00000114			ADCYAP1.ASIF.CCL2	35
277	Cell-To-Cell Signaling and Interaction	Intracellular communication	0.00000121			A1CF.ABC811.ABCC3	242
278	ncer,Hematological Disease,Immunological Disease,Organismal Injury and Abnorma	Acute myeloid leukemia	0.00000123	0.059		A1CF.ABC811.ABCC3	222
279	ncer,Hematological Disease,Immunological Disease,Organismal Injury and Abnorma	Abnormal morphology of bone	0.00000123			AGTR2.AREG.BMP4.B	80
280	nd Function,Gastrointestinal Disease,Organ Morphology,Organismal Development,Org	Abnormal morphology of small intestine	0.00000123			AGER.AP1.M2.AREG.C	25
281	ncer,Hematological Disease,Immunological Disease,Organismal Injury and Abnorma	Cell movement of leukocytes	0.00000126	0.864		A1CF.ABC811.ABCC3	247
282	Cellular Movement	Migration of tumor cell lines	0.00000129	-0.067		AGER.AGER.ARHGAP	150
283	Digestive System Development and Function,Gastrointestinal Disease	Abnormal morphology of midgut	0.00000134			AGER.AP1.M2.AREG.C	26
284	ular Movement,Hematological System Development and Function,Immune Cell Traffi	Cell movement of granulocytes	0.00000139	-0.771		A1CF.ADCYAP1.AGEF	79
285	Cancer,Organismal Injury and Abnormalities,Renal and Urological Disease	Bleat cancer	0.00000142			AGER.AHNAK2.AJUB	185
286	Cardiovascular Disease,Hepatic System Disease,Organismal Injury and Abnorma	Hepatocellular carcinoma	0.00000147	2.123		ABC811.ACSM3.ADA	144
287	ystem Disorders,Gastrointestinal Disease,Metabolic Disease,Organismal Injury and A	Diabetes mellitus	0.00000153	0.339		A1CF.ACS1.ACSM3.J	198
288	Cardiovascular Disease,Organismal Injury and Abnormalities	Atherosclerosis	0.00000155	-0.747		AGER.ANGPTL3.APOF	85
289	Cellular Movement,Immune Cell Trafficking	Leukocyte migration	0.00000156	-1.555		A1CF.ADCYAP1.ADJ	163
290	Tissue Development	Development of epithelial tissue	0.00000164	0.63		AGER.AGTR2.APOA1	97
291	Organismal Injury and Abnormalities,Tissue Morphology	Size of lesion	0.00000167			ADCYAP1.AGER	

303	Hair and Skin Development and Function,Organ Development,Organismal Development	Formation of epidermis	0.0000231	-1.054	APCCD1,ENC1,CDH1,	36
304	Cancer,Organismal Injury and Abnormalities	Metastasis of carcinoma	0.0000232	-1.254	ADCCY,ADCYAP1,AGEF	39
305	System Development and Function,Lymphoid Tissue Structure and Development,Tissu	Head and neck squamous cell carcinoma	0.0000241		ABCDC3,ABCO,ADAM28,	329
306	Lipid Metabolism,Molecular Transport,Small Molecule Biochemistry	Morphology of lipid	0.0000246	0.156	ABCBD1,ADH1C,ALDH,	14
307	Cellular Assembly and Organization,Cellular Assembly and Organization,Cellular Ass	Cleavage of lipid	0.0000248	0.295	ADCCYAP1,AGEF,AGEF,	19
308	nd Function,Gastrointestinal Disease,Organ Morphology,Organismal Development,Org	Abnormal morphology of stomach	0.0000318		AGR2,IRCE1,CAM,CA,	10
309	System Development and Function,Hepatic System Disease,Inflammatory Disease,Inf	Cell motility of myoid cells	0.0000361	-1.119	ABCBD1,APCA1,APCA,	64
310	Lipid Metabolism,Molecular Transport,Small Molecule Biochemistry	Inflammation of stromal	0.0000361	0.932	ABCBD1,ADCVY1,AN,	60
311	ular Growth and Proliferation,Hair and Skin Development,Organ Development	Proliferation of dermal cells	0.0000441	1.424	AGTR2,AREG,CASR,C,	45
312	Lipid Metabolism,Molecular Transport,Small Molecule Biochemistry	Concentration of cholesterol	0.0000376	1.009	ABCBD1,ADCVY1,AN,	58
313	Hair and Skin Development and Function,Organ Morphology,Organismal Developme	Growth of hair	0.0000376	1.148	AGTR2,AREG,CASR,C,	45
314	Cell Signaling,Molecular Transport,Vitamin and Mineral Metabolism	Quantity of Ca <sup>2+</sup>	0.0000376	-0.216	ADCVY1,APCC3,AGEF,	72
315	Cellular Assembly and Organization,Cellular Assembly and Organization,Cellular Ass	Formation of plasma membrane	0.0000383		BCAN,BRRB,BLH,CA,	68
316	tion,Connective Tissue Development and Function,Hair and Skin Development and F	Proliferation of keratinocytes	0.0000397	-1.421	AGTR2,AREG,CASR,C,	35
317	Hair and Skin Development and Function,Organ Development,Organismal Developm	Formation of skin	0.0000405	0.433	AGTR2,ADCCY1,AGEF,	73
318	Metabolic Disease,Organismal Injury and Abnormalities	Glucose metabolism disorder	0.0000408	0.3	ACE2,ACSL1,ACMS3,	231
319	ndocrine System Disorders,Organismal Injury and Abnormalities,Reproductive System	Early stage senescence	0.0000447		ABCBD1,APCA1,APCA,	64
320	Neurological Disease,Skeletal and Muscular Disorders	Neurovascular disease	0.0000424	0.379	ADCVY1,AGEF,APCC,	74
321	ndocrine System Disorders,Organismal Injury and Abnormalities,Reproductive System	Grade 3 primary serous ovarian carcinoma	0.0000441		CELSR3,MSLN,MUC1,	6
322	Respiratory Disease,Respiratory System Development and Function	Abnormal morphology of respiratory system	0.0000459		ALDH1A1,ALDH3A1,A,	55
323	Conditions,Immunological Disease,Inflammatory Disease,Inflammatory Response,Orga	Abscess dermatitis	0.0000482		AGTR2,AREG,CASR,C,	37
324	ular Growth and Proliferation,Hair and Skin Development and Function,Organ Develop	Proliferation of epidermal cells	0.0000479	-1.577	ABCBD1,ADCVY1,AN,	58
325	Cancer,Hematological Disease,Organismal Injury and Abnormalities	Malignant myeloid neoplasm	0.0000482	0.059	A1CF,ABCBD1,ABCC3,	258
326	Organismal Injury and Abnormalities	Morphology of head	0.0000506		ADCVY1,AGEF,CASR,	165
327	Cancer,Organismal Injury and Abnormalities,Renal and Urological Disease	Bladder tumor	0.0000506		ADCVY1,AGEF,CASR,	165
328	Organismal Injury and Abnormalities	Visceromegaly	0.0000548	-1.045	CAV1,CD25B,CXCL6,	26
329	ular Development,Embryonic Development,Organ Development,Tissue Developm	Migration of hepatoma cell lines	0.0000537	2.135	ALB,ABCC2,AMP,BF,	55
330	Development and Function,Lymphoid Tissue Structure and Development,Organ Morpho	Morphology of lymphoid organ	0.000054		ARHGDB,ARHGFE,A,	86
331	Lipid Metabolism,Small Molecule Biochemistry,Vitamin and Mineral Metabolism	Steroid metabolism	0.0000554	1.351	ADCVY1,AGEF,AGEF,	51
332	Cardiovascular System Development and Function,Cellular Movement	Migration of endothelial cells	0.0000556	0.703	ADCVY1,AGEF,AGEF,	51
333	on,Organ Morphology,Organismal Development,Skeletal and Muscular System Devel	Morphology of rib	0.0000584		BMP4,CDX1,CDX2,CR,	19
334	Cellular Development,Connective Tissue Development and Function,Connective Tis	Stabilization of cellular junctions	0.0000625	-0.518	ALB,ABCC2,AMP,BF,	55
335	Cellular Development,Connective Tissue Development and Function,Connective Tis	Differentiation of connective tissue cells	0.0000625	1.408	AGER,AREG,ASXL2,A,	110
336	Cellular Development,Connective Tissue Development and Function,Connective Tis	Uterine endometriosis	0.0000666		ALB,ABCC2,AMP,BF,	55
337	Cell-Cell Signaling and Interaction,Cellular Assembly and Organization	Formation of intercellular junctions	0.0000666	0.46	ALB,ABCC2,AMP,BF,	55
338	ndocrine System Disorders,Organismal Injury and Abnormalities,Reproductive System	Benign prostatic carcinoma	0.0000701		ABCBD1,APCA1,APCA,	64
339	Cancer,Hematological Disease,Organismal Injury and Abnormalities	Bone marrow cancer	0.0000701	0.864	A1CF,ABCBD1,ABCC3,	259
340	Hematological Disease,Organismal Injury and Abnormalities,Psychological Dis	Quantity of granules	0.0000711	-0.958	ADCVY1,AGEF,CASR,	165
341	urological Disease,Lymphoid Tissue Structure and Development,Organ Morphology,C	Abnormal morphology of lymphoid organ	0.0000711		ARHGDB,ARHGFE,A,	72
342	Organismal Injury and Abnormalities	Morphology of lymphoid	0.0000749		ACE2,ACTG2,AGEF,	147
343	etabolism,Molecular Transport,Small Molecule Biochemistry,Vitamin and Mineral Me	Quantity of retinoid	0.0000749	-0.618	ADH1C,ALDH1A1,APC,	12
344	Cancer,Organismal Injury and Abnormalities	Liquid tumor	0.0000759	0.376	A1CF,ABCBD1,ABCC3,	260
345	Metabolic Disease,Organismal Injury and Abnormalities	Assembly of fibrous protein	0.0000793		AGR2,AP1M2,CFTR,C,	13
346	gnaling and Interaction,Cellular Assembly and Organization,Cellular Function and N	Function of gastrointestinal tract	0.0000808	0.444	ADCVY1,AGEF,CASR,	165
347	ndocrine System Disorders,Organismal Injury and Abnormalities,Reproductive System	Atopic disease	0.0000808	-0.152	AKR1B,BCCL2,CAC1,	51
348	Cancer,Organismal Injury and Abnormalities	Upper aerodigestive carcinoma	0.0000841		ABCBD1,APCA1,APCA,	64
349	Gastrointestinal Disease,Hepatic System Disease	Cholelithiasis	0.0000841		ABCBD1,APCA1,APCA,	64
350	Cancer,Neurological Disease,Organismal Injury and Abnormalities	Nervous system neoplasm	0.0000887	0.538	AGER,AMP,APCA1,A,	100
351	Neurological Disease,Organismal Injury and Abnormalities,Psychological Disorders	Degenerative dementia	0.0000887		ADCVY1,AGEF,CASR,	165
352	Cancer,Organismal Injury and Abnormalities,Reproductive System Disease	Breast carcinoma	0.0000927	0.423	ABLIM1,ABDO,ADM28,	241
353	ndocrine System Disorders,Organismal Injury and Abnormalities,Reproductive System	Ductal in situ carcinoma	0.0000942	0.813	AGER,AGR2,AMP,BF,	73
354	Cancer,Organismal Injury and Abnormalities	Neoplasia of tumor cell lines	0.0000942	0.522	ABLIM1,ALDH1A3,ARE,	74
355	Gastrointestinal Disease,Organismal Injury and Abnormalities	Abnormality of small intestine	0.0000984		AGR2,AP1M2,AREG,C,	29
356	atological Diseases and Conditions,Organ Morphology,Organismal Injury and Abnorm	Recess of skin	0.000108		CTSE,CDX1,CBR1,	30
357	Cancer,Hematological Disease,Organismal Injury and Abnormalities	Myeloid neoplasm	0.0001092	0.128	A1CF,ABCBD1,ABCC3,	260
358	atological Diseases and Conditions,Organ Morphology,Organismal Injury and Abnorm	Abnormal morphology of epidermis	0.0001092		AREG,CASR,C,AGEF,	87
359	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Gastroesophageal adenocarcinoma	0.000105		ADAM28,ADANK1,ADC,	233
360	Cancer,Organismal Injury and Abnormalities	Growth of tumor	0.000107	0.084	ADAM28,AFP,FL,	12
361	ic Disease,Neurological Disease,Organismal Injury and Abnormalities,Psychological D	Transport of ion	0.000107	1.654	AGER,AMP,APCA1,A,	89
362	Cancer	Alzheimer disease	0.00011		AGER,AMP,APCA1,A,	89
363	Cancer	Hyperplasia of tissue	0.00011	-1.739	AGR2,C3,CAP,CAV1,	39
364	Respiratory System Development and Function	Morphology of respiratory system	0.000112		ABCBD1,APCA1,APCA,	64
365	Organismal Injury and Abnormalities,Renal and Urological Disease	Renal lesion	0.000112	0.116	ADCVY1,AGEF,CASR,	165
366	Neurological Disease,Organismal Injury and Abnormalities,Psychological Disorders	Alzheimer disease or frontotemporal dementia	0.000118	-0.115	ABCBD1,APCA1,APCA,	64
367	ndocrine System Disorders,Gastrointestinal Disease,Organismal Injury and Abnorm	Paraneoplastic cerebellar degeneration	0.000119		ADAM28,ADANK1,AH,	304
368	Cancer,Organismal Injury and Abnormalities	Malignant neoplasm of aerodigestive tract	0.000121	0.961	ABCBD1,APCA1,APCA,	64
369	Cancer	Synthesis of carbohydrate	0.000124		BMP4,CDX1,CDX2,CR,	25
370	ctive Tissue Disorders,Organismal Injury and Abnormalities,Skeletal and Muscular Dis	Abnormality of rib cage	0.000124	0.39	ADCVY1,AGEF,AGEF,	51
371	Embryonic Development,Organismal Development	Corneal and soft tissue tumor	0.000135	1.682	ADCVY1,AGEF,AGEF,	51
372	ndocrine System Disorders,Organismal Injury and Abnormalities,Reproductive System	Development of head	0.000136		ADCVY1,AGEF,AGEF,	51
373	nd Function,Gastrointestinal Disease,Organ Morphology,Organismal Development,Org	Abnormal morphology of duodenum	0.000136		AP1M2,CFTR,FGA,H,	8
374	Neurological Disease,Organismal Injury and Abnormalities,Psychological Dis	Uptake of lipid	0.000142	0.528	ABCBD1,APCA1,APCA,	64
375	Cancer,Organismal Injury and Abnormalities	Chronic pharyngitis	0.000144	-0.841	AGER,AMP,APCC3,	40
376	Cell-Cell Signaling and Interaction	Activation of connective tissue cells	0.000145	1.454	AGER,AMP,BCL2,IT,	32
377	Developmental Disorder,Organismal Injury and Abnormalities	Congenital malformation of genitourinary system	0.000153	-0.069	ACSL1,AGTR2,ALDH1,	73
378	Embryonic Development,Organismal Development	Development of gonad	0.000157	-0.983	ADCVY1,AGEF,CASR,	165
379	etabolism,Molecular Transport,Small Molecule Biochemistry,Vitamin and Mineral Me	Concentration of retinol	0.000161	0.374	AGER,AMP,APCC3,	40
380	Cancer,Hematological Disease,Organismal Injury and Abnormalities	Bone marrow neoplasm	0.000161	0.397	A1CF,ABCBD1,ABCC3,	262
381	ncer,Hematological Disease,Organismal Injury and Abnormalities,Psychological Dis	Acute leukemia	0.000164	-0.44	ABCBD1,APCA1,APCA,	64
382	Hair and Skin Development and Function,Organ Morphology	Morphology of hair	0.000164		AGR2,AREG,CASR,C,	45
383	Organismal Injury and Abnormalities	Quantity of vitreous humor	0.000168	-0.582	AGER,AMP,CBSCL2,	25
384	ndocrine System Disorders,Gastrointestinal Disease,Organismal Injury and Abnorm	Pancreatic adenocarcinoma	0.000167	0.849	ABCBD1,APCA1,APCA,	64
385	Cancer,Organismal Injury and Abnormalities,Reproductive System Disease	Endometrial hyperplasia	0.000173	0.087	ABCBD1,APCA1,APCA,	64
386	Cancer,Organismal Injury and Abnormalities,Reproductive System Disease	Invasion of tumor	0.000174		AGER,AMP,APCC3,	40
387	Cancer,Organismal Injury and Abnormalities,Reproductive System Disease	Endometrial adenocarcinoma	0.000174		ABCBD1,APCA1,APCA,	64
388	Cellular Development,Cellular Growth and Proliferation	Endometrial adenocarcinoma	0.000188	0.816	ABCBD1,APCA1,APCA,	64
389	rganismal Development,Organismal Injury and Abnormalities,Skeletal and Muscu	Abnormal morphology of rib	0.000188		BMP4,CDX1,CDX2,CR,	19
390	Cellular Development,Connective Tissue Development and Function,Connective Tis	Differentiation of myofibrils	0.000189	-0.984	BMP4,EPF1,FBX7,	12
391	Cardiovascular Disease,Organismal Injury and Abnormalities	Sliding of myofibrils	0.000189		ACTA1,ACTG2,ADP,A,	12
392	Neurological Disease,Organismal Injury and Abnormalities,Psychological Disorders	Pedicular scoliosis	0.000199	0.216	AGER,AMP,APCA1,A,	100
393	Neurological Disease,Organismal Injury and Abnormalities,Psychological Disorders	Taopathy	0.000199		AGER,AMP,APCA1,A,	100
394	Cancer,Organismal Injury and Abnormalities	Abnormal morphology of spleen	0.000206	-0.721	AFP11,AGR2,ALDH,	281
395	Cancer,Organismal Injury and Abnormalities	Lymphatic system tumor	0.000206		ABCBD1,APCA1,APCA,	64
396	Gastrointestinal Disease,Organismal Injury and Abnormalities	Obstruction of small intestine	0.000214		ADCVY1,AGEF,CASR,	165
397	Development and Function,Organ Development,Tissue Development	Development of cornea	0.000214	0.039	ALDH1A1,ALDH3A1,A,	14
398	gnaling and Interaction,Cellular Assembly and Organization,Cellular Function and N	Adhesion of small intestine	0.000214	0.42	CAV1,CDH1,CDH3,AG,	18
399	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Colorectal adenocarcinoma	0.000218		ABCBD1,APCA1,APCA,	64
400	Conditions,Hair and Skin Development and Function,Organ Morphology,Organism	Abnormal morphology of hair	0.000218		AREG,CBSCL2,CEL,	23
401	Development and Function,Lymphoid Tissue Structure and Development,Organ Morpho	Organization of extracellular matrix	0.000219	0	ADAM28,ADANK1,ADC,	233
402	Cellular Development,Cellular Growth and Proliferation	Transport of chorite	0.000235	0.223	AN010,AN04,AN07,A,	17
403	ment,Organismal Injury and Abnormalities,Skeletal and Muscular Disorders,Skeletal	Proliferation of pancreatic cancer cell lines	0.000239	1.895	CDH17,CYAP1,AGEF,	51
404	Cancer,Organismal Injury and Abnormalities	Abnormal morphology of rib cage	0.000242		BMP4,CDX1,CDX2,CR,	21
405	Cell-Cell Signaling and Interaction,Cellular Growth and Proliferation	Stem cells	0.000255	-1.008	ADCVY1,AGEF,AGEF,	51
406	Cellular Development,Cellular Growth and Proliferation	Transport of molecule	0.000255	1.687	A1CF,ABCBD1,ABCC3,	246
407	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Metastatic malignant neoplasm of digestive system	0.000254	-0.659	AGTR2,APCC3,C3,CA,	48
408	Organismal Injury and Abnormalities	Renal impairment	0.000254	-0.659	AGTR2,APCC3,C3,CA,	48
409	Cellular Development,Cellular Growth and Proliferation	Organization of fibrous protein	0.000264	-1.176	ABCBD1,APCA1,APCA,	64
410	Lipid Metabolism,Molecular Transport,Small Molecule Biochemistry,Vitamin and Mineral	Neoplasia of fatty acid	0.000268	0.771	ACTN3,ADCVY,ADCVY,	114
411	Cancer,Organismal Injury and Abnormalities	Upper aero-digestive squamous cell carcinoma	0.000284		ADAM28,ADANK1,AH,	235
412	Digestive System Development and Function,Organismal Development	Morphology of mouth	0.000289		AGER,AMP,CIFTR,CR,	30
413	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Gastric carcinoma	0.000289		CDX2,ADANK1,ADC,	233
414	ases and Conditions,Immunological Disease,Inflammatory Disease,Organismal Injury	Lichen planus	0.000289		CALM3,BCL2,DDFEB,	21
415	Gastrointestinal Disease,Organismal Injury and Abnormalities	Intrahepatic cholelithiasis	0.000286		ABCBD1,APCA1,APCA,	64
416	Cancer,Neurological Disease,Organismal Injury and Abnormalities	Central nervous system tumor	0.000286	0.339	ABCBD1,APCA1,APCA,	64
417	Development,Skeletal and Muscular Development,Organismal Development	Abnormal morphology of body wall	0.000289	0.004	BMP4,CDX1,CDX2,CR,	23
418	Development,Skeletal and Muscular Development,Organismal Development	Abnormal morphology of body wall	0.000289		ACTL1,IRBP2,BMPR,C,	14
419	ndocrine System Disorders,Organismal Injury and Abnormalities,Reproductive System	Stage I serous ovarian adenocarcinoma	0.000296		CELSR3,MSLN,MUC1,	7
420	Cancer,Organismal Injury and Abnormalities,Renal and Urological Disease	Organismal Injury and Abnormalities	0.000303		BCAN,BHRB,CAV1,	44
421	Cancer,Organismal Injury and Abnormalities	Bladder carcinoma	0.000303	0.331	ADCVY1,AGEF,CASR,	165
422	Cancer,Organ Morphology	Morphology of epidermis	0.000317		AFP11,ALDH1A1,AL,	36
423	Cancer,Organismal Injury and Abnormalities	Invasion of tissue	0.000322	-0.586	ANKK3,CAV1,CD36,CD,	53
424	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Advanced colorectal cancer	0.000324	0.169	BCN1,ACAF1,FRZB,	15
425	Cellular Assembly and Organization,Cellular Growth and Proliferation	Survival of organism	0.000324	-0.686	ABCBD1,APCA1,APCA,	64
426	Lipid Metabolism,Small Molecule Biochemistry	Recruitment of lipid	0.000324	1.854	ABCBD1,APCA1,APCA,	64
427	Cellular Assembly and Organization,Cellular Assembly and Organization,Cellular Ass	Conversion of embryonic cells	0.000324	-2.431	BMP4,DMBT1,FDX,NM,	4
428	Dermatological Disease,Organismal Injury and Abnormalities	Lesion of hair	0.000329		ABCBD1,APCA1,APCA,	64
429	Cancer,Neurological Disease,Organismal Injury and Abnormalities	Central nervous system solid tumor	0.000329	0.339	ABCBD1,APCA1,APCA,	64
430	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Metastatic colorectal cancer	0.000331		ABCBD1,APCA1,APCA,	64
431	Cancer,Organismal Injury and Abnormalities	Atherosclerotic lesion	0.000353	-1.537	APCA1,APCA,APCA4,	34
432	Cancer,Organismal Injury and Abnormalities	Remodeling of bone	0.000358	-0.354	BCL2L1,CAV1,CD49,	39
433	Cancer,Organismal Injury and Abnormalities	Fibrosis	0.000362	1.412	ADH2,ACSL1,ACTA1,A,	101
434	Lipid Metabol					

**Table S3 (Related to Figure4). Gene enrichment sets for control vs *BRCA1<sup>mut</sup>* -FTE organoids at 1 year culture**

NAME	SIZE	ES	NES	NOM p-val	FDR q-val	FWER p-val	RANK AT MAX	LEADING EDGE
GNF2_EIF3S6	120	0.6727409	2.8466096	0	0	0	5273	tags=82%, list=27%, signal=111%
MORF_ACTG1	138	0.6190265	2.7050114	0	0	0	6618	tags=83%, list=34%, signal=125%
MORF_TPT1	102	0.6477453	2.6736124	0	0	0	5716	tags=81%, list=29%, signal=115%
MORF_NPM1	162	0.6042291	2.647897	0	0	0	6649	tags=83%, list=34%, signal=125%
GCM_TPT1	69	0.6866267	2.6212063	0	0	0	4785	tags=86%, list=25%, signal=113%
GCM_NPM1	115	0.61789876	2.5851052	0	0	0	6596	tags=86%, list=34%, signal=129%
GNF2_ST13	64	0.6888458	2.5632267	0	0	0	5273	tags=84%, list=27%, signal=115%
GNF2_TPT1	38	0.73548156	2.5450826	0	0	0	4761	tags=95%, list=24%, signal=125%
MORF_NME2	154	0.5721919	2.5130274	0	0	0	6659	tags=77%, list=34%, signal=115%
GNF2_MMP1	32	0.7303712	2.4124823	0	0	0	1928	tags=59%, list=10%, signal=66%
MODULE_312	45	0.68017954	2.389409	0	0	0	2563	tags=40%, list=13%, signal=46%
MODULE_83	316	0.49353978	2.3648179	0	0	0	6709	tags=68%, list=34%, signal=102%
GCM_PSME1	84	0.5871864	2.352315	0	0	0	6830	tags=75%, list=35%, signal=115%
MODULE_254	54	0.629287	2.3378637	0	0	0	2563	tags=39%, list=13%, signal=45%
MORF_RAN	266	0.49931005	2.332909	0	0	0	8072	tags=77%, list=41%, signal=129%
MORF_FBL	138	0.5317876	2.3047824	0	0	0	8072	tags=82%, list=41%, signal=139%
GCM_CSNK2B	98	0.56095266	2.303643	0	0	0	7609	tags=81%, list=39%, signal=132%
MODULE_357	76	0.5848927	2.2981043	0	0	0	1789	tags=37%, list=9%, signal=40%
GNF2_FBL	145	0.52505355	2.2934113	0	0	0	5833	tags=61%, list=30%, signal=87%
MODULE_29	27	0.7299376	2.2928236	0	0	0	4785	tags=93%, list=25%, signal=123%
MORF_UBE2I	238	0.49950063	2.2902822	0	0	0	7819	tags=71%, list=40%, signal=117%
MODULE_154	71	0.5919356	2.2594893	0	8.69E-05	0.001	1789	tags=37%, list=9%, signal=40%
GNF2_DAP3	118	0.5474657	2.259309	0	8.32E-05	0.001	6928	tags=72%, list=36%, signal=111%
MODULE_297	76	0.58601916	2.2580717	0	7.97E-05	0.001	1789	tags=37%, list=9%, signal=40%
MORF_ANP32B	197	0.49914193	2.2527962	0	7.65E-05	0.001	7939	tags=75%, list=41%, signal=125%
GCM_APEX1	113	0.5416784	2.2478492	0	7.36E-05	0.001	6935	tags=73%, list=36%, signal=113%
GNF2_GLTSCR2	31	0.6947166	2.234576	0	1.40E-04	0.002	4785	tags=94%, list=25%, signal=124%
GNF2_SPRR1B	21	0.75724036	2.2250254	0	1.35E-04	0.002	1541	tags=57%, list=8%, signal=62%
GCM_ACTG1	123	0.5223154	2.2139533	0	1.87E-04	0.003	7113	tags=72%, list=37%, signal=112%
MORF_ERH	114	0.52058136	2.2041113	0	1.81E-04	0.003	7947	tags=81%, list=41%, signal=135%
MORF_EIF3S6	122	0.5279552	2.200043	0	1.75E-04	0.003	7947	tags=80%, list=41%, signal=135%
MODULE_298	19	0.7568386	2.1905832	0	1.69E-04	0.003	596	tags=42%, list=3%, signal=43%
MORF_JUND	64	0.5846139	2.18988	0	1.64E-04	0.003	5647	tags=72%, list=29%, signal=101%
MODULE_68	19	0.75790423	2.1639967	0	1.60E-04	0.003	596	tags=42%, list=3%, signal=43%
MORF_G22P1	171	0.48629752	2.160848	0	1.55E-04	0.003	7947	tags=72%, list=41%, signal=120%
MODULE_73	19	0.7453506	2.1528246	0	1.51E-04	0.003	560	tags=53%, list=3%, signal=54%
GNF2_CKS2	50	0.59455144	2.1213331	0	1.47E-04	0.003	4890	tags=58%, list=25%, signal=77%
MORF_EIF4A2	138	0.49196252	2.100293	0	2.38E-04	0.005	6830	tags=64%, list=35%, signal=99%
MODULE_114	332	0.4412614	2.099389	0	2.32E-04	0.005	6614	tags=64%, list=34%, signal=96%
GNF2_CDC20	56	0.569282	2.09359	0	2.26E-04	0.005	5387	tags=63%, list=28%, signal=86%
MODULE_151	311	0.43870503	2.0863914	0	3.06E-04	0.007	6614	tags=65%, list=34%, signal=96%
MODULE_32	237	0.45042282	2.0774214	0	5.56E-04	0.013	7049	tags=65%, list=36%, signal=100%
MODULE_153	32	0.6424479	2.0701852	0	5.84E-04	0.014	727	tags=34%, list=4%, signal=36%
MORF_EIF3S2	243	0.44350612	2.0691514	0	5.71E-04	0.014	7819	tags=64%, list=40%, signal=105%
GNF2_CCNA2	68	0.5379757	2.0674078	0	5.58E-04	0.014	5387	tags=57%, list=28%, signal=79%
GNF2_RAN	85	0.51783055	2.0476763	0	6.27E-04	0.016	7423	tags=71%, list=38%, signal=114%
MODULE_552	16	0.7388666	2.041278	0	6.91E-04	0.017	2623	tags=69%, list=13%, signal=79%
GCM_PFN1	51	0.5614346	2.027505	0	7.47E-04	0.019	6657	tags=69%, list=34%, signal=104%
MODULE_537	17	0.72189254	2.0227401	0.002304148	7.32E-04	0.019	1687	tags=41%, list=9%, signal=45%
MORF_CSNK2B	285	0.4247475	1.9933726	0	0.001108753	0.03	8124	tags=65%, list=42%, signal=110%
GNF2_PTX3	36	0.60176075	1.990988	0.002604167	0.001154729	0.032	3290	tags=50%, list=17%, signal=60%
GNF2_HMMR	47	0.5508787	1.9842057	0	0.001268832	0.036	5387	tags=62%, list=28%, signal=85%
GCM_PPP1CC	56	0.5361963	1.9795676	0	0.001517148	0.044	7609	tags=70%, list=39%, signal=114%
GNF2_CNBR2	57	0.5345916	1.9762547	0	0.001523605	0.045	5387	tags=58%, list=28%, signal=80%

**Table S4 (Related to Figure4). Functional annotation for control vs BRCA1<sup>mut</sup>-FTE organoids at 1 year by IPA software**

Rank	Category	Diseases or Functions Annotation	p-value	Z-score	Gene List	# Molecules
1	Cancer,Organismal Injury and Abnormalities	Non-melanoma solid tumor	4.47E-44	1.922	AAAS,AATK,ABCBA,ABC	1023
2	Cancer,Organismal Injury and Abnormalities	Nonhematologic malignant neoplasm	9.97E-44	1.865	AAAS,AATK,ABCBA,ABC	1020
3	Cancer,Organismal Injury and Abnormalities	Tumorigenesis of tissue	1.2E-43	2.413	AAAS,AATK,ABCBA,ABC	1014
4	Cancer,Organismal Injury and Abnormalities	Non-melanoma solid tumor	1.1E-42	2.787	AAAS,AATK,ABCBA,ABC	1015
5	Cancer,Organismal Injury and Abnormalities	Cancer of secretory structure	1.25E-42	0.223	AAAS,AATK,ABCBA,ABC	898
6	Cancer,Organismal Injury and Abnormalities	Epithelial neoplasm	3.1E-42	2.892	AAAS,AATK,ABCBA,ABC	1009
7	Cancer,Endocrine System Disorders,Organismal Injury and Abnormalities	Thyroid carcinoma	3.4E-42		AAAS,AATK,ABCBA,ABC	832
8	Cancer,Endocrine System Disorders,Organismal Injury and Abnormalities	Thyroid carcinoma	3.8E-42	1.914	AAAS,AATK,ABCBA,ABC	1007
9	Cancer,Endocrine System Disorders,Organismal Injury and Abnormalities	Endocrine carcinoma	9.28E-42		AAAS,AATK,ABCBA,ABC	836
10	Cancer,Endocrine System Disorders,Organismal Injury and Abnormalities	Endocrine carcinoma	9.87E-42		AAAS,AATK,ABCBA,ABC	834
11	Cancer,Endocrine System Disorders,Organismal Injury and Abnormalities	Endocrine carcinoma	9.23E-41		AAAS,AATK,ABCBA,ABC	836
12	Cancer,Endocrine System Disorders,Organismal Injury and Abnormalities	Neoplasia of endocrine tumor	1.59E-40		AAAS,AATK,ABCBA,ABC	834
13	Cancer,Endocrine System Disorders,Organismal Injury and Abnormalities	Neck neoplasm	2.44E-40	1.897	AAAS,AATK,ABCBA,ABC	838
14	Cancer,Endocrine System Disorders,Organismal Injury and Abnormalities	Head and neck carcinoma	4.49E-40		AAAS,AATK,ABCBA,ABC	858
15	Cancer,Organismal Injury and Abnormalities	Head and neck cancer	1.73E-39	2.784	AAAS,AATK,ABCBA,ABC	860
16	Cancer,Organismal Injury and Abnormalities	Extragenital solid tumor	6.39E-39	2.026	AAAS,AATK,ABCBA,ABC	1026
17	Cancer,Organismal Injury and Abnormalities	Malignant solid tumor	1.17E-38	1.182	AAAS,AATK,ABCBA,ABC	1026
18	Cancer,Organismal Injury and Abnormalities	Cancer	4.64E-38	0.85	AAAS,AATK,ABCBA,ABC	1029
19	Cancer,Organismal Injury and Abnormalities	Solid tumor	6.83E-38	1.868	AAAS,AATK,ABCBA,ABC	1029
20	Cancer,Organismal Injury and Abnormalities	Head and neck tumor	1.35E-37	3.063	AAAS,AATK,ABCBA,ABC	862
21	Cancer,Organismal Injury and Abnormalities	Abdominal carcinoma	3.07E-36	2.209	AAAS,AATK,ABCBA,ABC	933
22	Cancer,Organismal Injury and Abnormalities	Abdominal adenocarcinoma	2.32E-33		AAAS,AATK,ABCBA,ABC	885
23	Cancer,Organismal Injury and Abnormalities	Adenocarcinoma	2.44E-33	0.622	AAAS,AATK,ABCBA,ABC	897
24	Cancer,Organismal Injury and Abnormalities	Abdominal cancer	4.6E-32	0.253	AAAS,AATK,ABCBA,ABC	946
25	Cancer,Organismal Injury and Abnormalities	Abdominal neoplasm	7.24E-32	1.959	AAAS,AATK,ABCBA,ABC	955
26	Cancer,Organismal Injury and Abnormalities	Large intestine adenocarcinoma	4.37E-29		AAAS,AATK,ABCBA,ABC	778
27	Cancer,Organismal Injury and Abnormalities	Digestive system cancer	7.54E-29	1.006	AAAS,AATK,ABCBA,ABC	894
28	Cancer,Organismal Injury and Abnormalities	Digestive organ tumor	2.68E-27	1.084	AAAS,AATK,ABCBA,ABC	736
29	Cancer,Organismal Injury and Abnormalities	Gastrointestinal adenocarcinoma	5.95E-27		AAAS,AATK,ABCBA,ABC	786
30	Cancer,Organismal Injury and Abnormalities	Gastrointestinal adenocarcinoma	3.34E-25	1.119	AAAS,AATK,ABCBA,ABC	801
31	Cancer,Organismal Injury and Abnormalities	Large intestine neoplasm	0.49E-23		AAAS,AATK,ABCBA,ABC	891
32	Cancer,Organismal Injury and Abnormalities	Malignant neoplasm of large intestine	1.2E-22	-0.478	AAAS,AATK,ABCBA,ABC	791
33	Cancer,Organismal Injury and Abnormalities	Gastrointestinal tumor	3.32E-21	0.806	AAAS,AATK,ABCBA,ABC	817
34	Cancer,Organismal Injury and Abnormalities	Gastrointestinal tract cancer	7.5E-21	-0.161	AAAS,AATK,ABCBA,ABC	871
35	Cancer,Organismal Injury and Abnormalities	Frequency of tumor	7.44E-21	3.807	AAAS,AATK,ABCBA,ABC	694
36	Cancer,Organismal Injury and Abnormalities	Tumorigenesis of epithelial neoplasm	1.9E-20	3.880	AAAS,AATK,ABCBA,ABC	905
37	Cancer,Organismal Injury and Abnormalities	Development of carcinoma	5.07E-20	2.706	AAAS,AATK,ABCBA,ABC	675
38	Cancer,Organismal Injury and Abnormalities	Development of malignant tumor	8.04E-20	3.033	AAAS,AATK,ABCBA,ABC	681
39	Cancer,Organismal Injury and Abnormalities	Incidence of tumor	3.03E-19	3.033	AAAS,AATK,ABCBA,ABC	681
40	Cancer,Organismal Injury and Abnormalities	Genitourinary tumor	1.12E-15	1.258	AAAS,AATK,ABCBA,ABC	675
41	Cancer,Organismal Injury and Abnormalities	Endometrioid carcinoma	3.3E-15		AAAS,ABCBA,ABC81,AB	318
42	Cancer,Organismal Injury and Abnormalities	Pelvic adenocarcinoma	3.61E-15		AAAS,ABCBA,ABC81,AB	409
43	Cancer,Organismal Injury and Abnormalities	Colorectal adenocarcinoma	3.73E-15		AAAS,AATK,ABCBA,ABC	425
44	Cancer,Organismal Injury and Abnormalities	Genitourinary adenocarcinoma	5.15E-15		AAAS,ABCBA,ABC81,AB	543
45	Cancer,Organismal Injury and Abnormalities	Malignant genitourinary solid tumor	7.5E-14	-0.107	AAAS,AATK,ABCBA,ABC	570
46	Cancer,Organismal Injury and Abnormalities	Genital tumor	1.1E-14	1.501	AAAS,AATK,ABCBA,ABC	540
47	Cancer,Organismal Injury and Abnormalities	Pelvic tumor	1.63E-14		AAAS,AATK,ABCBA,ABC	604
48	Cancer,Organismal Injury and Abnormalities	Genitourinary carcinoma	2.01E-14	0.896	AAAS,ABCBA,ABC81,AB	590
49	Cancer,Organismal Injury and Abnormalities	Colon adenocarcinoma	3.18E-14		AAAS,AATK,ABCBA,ABC	408
50	Cancer,Organismal Injury and Abnormalities	Pelvic carcinoma	3.19E-14		AAAS,AATK,ABCBA,ABC	408
51	Cancer,Organismal Injury and Abnormalities	Colorectal carcinoma	5.28E-14		AAAS,AATK,ABCBA,ABC	429
52	Cancer,Organismal Injury and Abnormalities	Genital tract cancer	5.9E-14		AAAS,AATK,ABCBA,ABC	561
53	Cancer,Organismal Injury and Abnormalities	Colorectal carcinoma	6.1E-14		AAAS,AATK,ABCBA,ABC	451
54	Cancer,Organismal Injury and Abnormalities	Uterine endometrioid carcinoma	3.58E-13	0.948	AAAS,ABCBA,ABC81,AB	453
55	Cancer,Organismal Injury and Abnormalities	Uterine endometrioid carcinoma	3.58E-13		AAAS,ABCBA,ABC81,AB	260
56	Cancer,Organismal Injury and Abnormalities	Colorectal tumor	3.58E-13	0.366	AAAS,AATK,ABCBA,ABC	464
57	Cancer,Organismal Injury and Abnormalities	Angiogenic cancer	4.76E-13	0.199	AAAS,AATK,ABCBA,ABC	612
58	Cancer,Organismal Injury and Abnormalities	Female genital tract cancer	7.2E-13		AAAS,ABCBA,ABC81,AB	232
59	Cancer,Organismal Injury and Abnormalities	Endometrioid endometrial adenocarcinoma	8.85E-13		AAAS,ABCBA,ABC81,AB	255
60	Cancer,Organismal Injury and Abnormalities	Colorectal carcinoma	1.02E-12	-1.067	AAAS,AATK,ABCBA,ABC	422
61	Cancer,Organismal Injury and Abnormalities	Endometrial adenocarcinoma	1.28E-12		AAAS,ABCBA,ABC81,AB	477
62	Cancer,Organismal Injury and Abnormalities	Development of digestive organ tumor	1.77E-12	3.047	AAAS,AATK,ABCBA,ABC	420
63	Cancer,Organismal Injury and Abnormalities	Endometrial carcinoma	2.86E-12		AAAS,ABCBA,ABC81,AB	291
64	Cancer,Organismal Injury and Abnormalities	Abnormality of endocrine system	7.38E-12		AAAS,ABCBA,ABC81,AB	427
65	Cancer,Organismal Injury and Abnormalities	Hepatobiliary carcinoma	8.71E-12	2.138	AAAS,AATK,ABCBA,ABC	426
66	Cancer,Organismal Injury and Abnormalities	Female genital neoplasm	9.74E-12	1.96	AAAS,ABCBA,ABC81,AB	414
67	Cancer,Organismal Injury and Abnormalities	Abnormal growth in endometrium	9.75E-12		AAAS,ABCBA,ABC81,AB	413
68	Cancer,Organismal Injury and Abnormalities	Tumorigenesis of reproductive tract	1.13E-11	1.96	AAAS,ABCBA,ABC81,AB	414
69	Cancer,Organismal Injury and Abnormalities	Development of genital tumor	1.82E-11	1.446	AAAS,ABCBA,ABC81,AB	400
70	Cancer,Organismal Injury and Abnormalities	Female genital tract cancer	4.62E-11		AAAS,ABCBA,ABC81,AB	400
71	Cancer,Organismal Injury and Abnormalities	Cancer of head	4.87E-11	2.613	ABC81,ACV1R1,AMER1,A	159
72	Cancer,Organismal Injury and Abnormalities	Endometrium tumor	5.13E-11		AAAS,ABCBA,ABC81,AB	291
73	Cancer,Organismal Injury and Abnormalities	Liver carcinoma	7.35E-11	2.138	AAAS,AATK,ABCBA,ABC	401
74	Cancer,Organismal Injury and Abnormalities	Endometrial cancer	1.05E-10		AAAS,ABCBA,ABC81,AB	299
75	Cancer,Organismal Injury and Abnormalities	Breast or gynecological cancer	1.31E-10	0.555	AAAS,ABCBA,ABC81,AB	440
76	Cancer,Organismal Injury and Abnormalities	Colorectal disorder	1.53E-10	2.047	AAAS,AATK,ABCBA,ABC	481
77	Cancer,Organismal Injury and Abnormalities	Colorectal tumor	1.67E-10	0.343	AAAS,AATK,ABCBA,ABC	469
78	Cancer,Organismal Injury and Abnormalities	Hepatobiliary system cancer	1.92E-10	2.261	AAAS,AATK,ABCBA,ABC	468
79	Cancer,Organismal Injury and Abnormalities	Uterine carcinoma	2.41E-10		AAAS,ABCBA,ABC81,AB	297
80	Cancer,Organismal Injury and Abnormalities	Breast or colorectal cancer	2.72E-10	-0.588	AAAS,AATK,ABCBA,ABC	530
81	Cancer,Organismal Injury and Abnormalities	Organization of cytoskeleton	1.05E-09	-4.002	AATK,ABCBA,ABC81,AB	248
82	Cancer,Organismal Injury and Abnormalities	Colorectal cancer	1.27E-09	-0.896	AAAS,AATK,ABCBA,ABC	457
83	Cancer,Organismal Injury and Abnormalities	Metabolism of glycosphingolipid	1.48E-09		ABCBA,ABC81,ARSA,AS	69
84	Lipid Metabolism,Small Molecule Biochemistry	Metabolism of membrane lipid derivative	1.55E-09	-3.397	ABCBA,ABC81,ABHD6,A	69
85	Cancer,Organismal Injury and Abnormalities	Liver cancer	1.65E-09	2.261	AAAS,AATK,ABCBA,ABC	406
86	Cancer,Organismal Injury and Abnormalities	Liver tumor	2.35E-09	2.797	AAAS,AATK,ABCBA,ABC	406
87	Cancer,Organismal Injury and Abnormalities	Autosomal recessive neurological disorder	3.44E-09		AAAS,ALDH18A1,ALG14	87
88	Cancer,Organismal Injury and Abnormalities	Metabolism of glycolipid	4.08E-09	-2.581	ABCBA,ABC81,ALG14,A	25
89	Cancer,Organismal Injury and Abnormalities	Uterine tumor	4.1E-09		AAAS,ABCBA,ABC81,AB	280
90	Cancer,Organismal Injury and Abnormalities	Autism spectrum disorder or intellectual disability	6.76E-09		ABC81,ALDH18A1,AFSH	78
91	Cancer,Organismal Injury and Abnormalities	Uterine cancer	6.89E-09		AAAS,ABCBA,ABC81,AB	308
92	Cancer,Organismal Injury and Abnormalities	Ora cancer	6.97E-09		ABC81,AMER1,ANKRD1	338
93	Cancer,Organismal Injury and Abnormalities	Oral cancer	7.66E-09		ABC81,AMER1,ANKRD1	338
94	Cancer,Organismal Injury and Abnormalities	Oral squamous cell carcinoma	8.05E-09		ABC81,AMER1,ANKRD1	338
95	Cancer,Organismal Injury and Abnormalities	Autophagy of cells	9.75E-09	-2.784	ABSA,ATG3,BAQ8,BCL2L	62
96	Cell Morphology,Cellular Function and Maintenance	Autophagy	1.38E-08	-2.544	ABSD,ARSA,ATG3,BAQ8	68
97	Cellular Assembly and Organization,Cellular Function and Maintenance	Organization of cytoskeleton	1.74E-08		AATK,ABC81,ACTR2,ADAF	248
98	Cancer,Organismal Injury and Abnormalities	Liver lesion	2.34E-08	3.448	AAAS,AATK,ABCBA,ABC	428
99	Cancer,Organismal Injury and Abnormalities	Oral cavity carcinoma	2.42E-08		ABC81,AMER1,ANKRD1	170
100	Cancer,Organismal Injury and Abnormalities	Mental retardation	6.02E-08		ALDH18A1,ARHGGEF6,AF	48
101	Cancer,Organismal Injury and Abnormalities	Upper gastrointestinal carcinoma	5.03E-08		AATK,ABCBA,ABC81,AB	269
102	Cancer,Organismal Injury and Abnormalities	Metabolism of sphingolipid	6.02E-08	-2.647	ABCBA,ABC81,ARSA,AS	29
103	Cancer,Organismal Injury and Abnormalities	Upper gastrointestinal tract tumor	6.86E-08	1.124	AATK,ABCBA,ABC81,AB	251
104	Cancer,Organismal Injury and Abnormalities	Upper or intellectual disability	0.00000077		ABC81,ALDH18A1,AFSH	65
105	Cancer,Organismal Injury and Abnormalities	Upper gastrointestinal tract cancer	8.57E-08		AATK,ABCBA,ABC81,AB	279
106	Cancer,Organismal Injury and Abnormalities	Microtubule dynamics	9.77E-08	-3.883	AATK,ABC81,ACTR2,ADAF	142
107	Cancer,Organismal Injury and Abnormalities	Transcription of RNA	0.00000233	-3.334	ACTR2,ACV1R1,AKIRIN2,	196
108	Cancer,Organismal Injury and Abnormalities	Malignant neoplasm of male genital organ	3.90E-08		AATK,ABCBA,ABC81,AB	334
109	Cancer,Organismal Injury and Abnormalities	Male genital neoplasm	0.00000288		AATK,ABCBA,ABC81,AB	334
110	Cancer,Organismal Injury and Abnormalities	Prostatic carcinoma	0.00000273		ABC81,ABC89,ABC83,AF	292
111	Cancer,Organismal Injury and Abnormalities	Prostate cancer	0.00000275		AATK,ABCBA,ABC81,AB	330
112	Cancer,Organismal Injury and Abnormalities	Transport of vesicles	0.00000339	-1.276	AATK,ABC81,APFC,BDC2,C	24
113	Cancer,Organismal Injury and Abnormalities	Prostatic tumor	0.00000342		AATK,ABCBA,ABC81,AB	331
114	Cancer,Organismal Injury and Abnormalities	Neoplasia of cells	0.00000507	0.711	ABC81,ABC81,ABHD15,	463
115	Cancer,Organismal Injury and Abnormalities	Ubiquitination of protein	0.00000529	-2.692	AMER1,ATG3,BAQ8,BRA	58
116	Organismal Survival	Organisms' death	0.00000591	14.072	ABC81,ABC81,ACV1R1,A	246
117	Cancer,Organismal Injury and Abnormalities	Morbidity or mortality	0.00000124	14.065	ABC81,ABC81,ACV1R1,A	248
118	Cancer,Organismal Injury and Abnormalities	Prostatic adenocarcinoma	0.00000125		ABC81,ABC89,ABC83,AF	277
119	Cancer,Organismal Injury and Abnormalities	Hydrolysis of glycosphingolipid	0.00000145		ARSA,GBA2,HEXA,HEXE	5
120	Cancer,Organismal Injury and Abnormalities	Abnormal morphology of liver	0.0000162	-2.2	ABC83,ADOA,APC,ARID	35
121	Cancer,Organismal Injury and Abnormalities	Breast or prostatic cancer	0.00000171	-0.2	AATK,ABCBA,ABC81,AB	412
122	Cancer,Organismal Injury and Abnormalities	Morphology of liver	0.00000225		ABC83,ADOA,APC,ARID	48
123	Hepatic System Development and Function,Hepatic System Disease,Organ Morphology	Familial mental retardation	0.00000235		ALDH18A1,ARHGGEF6,AF	48
124	Cellular Assembly and Organization,Cellular Function and Maintenance	Expression of RNA	0.00000326	-2.657	ABC81,ACTR2,ACV1R1,	231
125	Cellular Assembly and Organization,Cellular Function and Maintenance	Cell death of tumor cell lines	0.00000402	3.227	AAAS,AATK,ABCBA,ABC	170
126	Cellular Assembly and Organization,Cellular Function and Maintenance	Accumulation of glycosphingolipid	0.00000479	1.468	ARSA,GAALC,GBA2,GNL1	163
127	Lipid Metabolism,Molecular Transport,Small Molecule Biochemistry	Upper aero-digestive squamous cell carcinoma	0.00000483		ABC81,AMER1,ANKRD1	8
128	Cancer,Organismal Injury and Abnormalities	Accumulation of glycosphingolipid	0.00000527		ARSA,GAALC,ADAF,UGT8	17
129	Lipid Metabolism,Molecular Transport,Small Molecule Biochemistry	Cognitive impairment	0.00000529	0.965	ALDH18A1,ARHGGEF6,AF	80
130	Cancer,Organismal Injury and Abnormalities	Transcription	0.00000568		ACTR2,ACV1R1,AKIRIN2,	361
131	Cancer,Organismal Injury and Abnormalities	Infection by HIV-1	0.0000058	-7.644	ALG14,ATMIN,ATXN2,BIC	70
132	Cancer,Organismal Injury and Abnormalities	Formation of cellular protrusions	0.00000662	-3.12	ABC81,ACTR2,ADAF,APC	107
133	Cancer,Organismal Injury and Abnormalities	Apoptosis of colorectal cancer cell lines	1.61E-07		APC,ATMIN,BAQ8,BCL2,L	128
134	Cancer,Organismal Injury and Abnormalities	Familial encephalopathy	0.00000738	-0.358	ALDH18A1,ASAHI1,ANCI	10
135	Hereditary Disorder,Neurological Disease,Organismal Injury and Abnormalities	Capillary hemangioma	0.00000744		ABC81,AMER1,BCL2L1,L	13
136	Cancer,Organismal Injury and Abnormalities	Accumulation of sphingolipid	0.00000757	1.54	ARSA,GAALC,GBA2,GNL1	17
137	Lipid Metabolism,Molecular Transport,Small Molecule Biochemistry	Hereditary neuropathy	0.00000857		ALDH18A1,ASAHI1,ATL1	37
138	Hereditary Disorder,Neurological Disease,Organismal Injury and Abnormalities	Apoptosis of tumor cell lines	0.00000915	2.707	AAAS,AATK,ABCBA,ABC	138
139	Hereditary Disorder,Neurological Disease,Organismal Injury and Abnormalities	Synthesis of sphingolipid	0.0000105	-2.231	ABCBA,ABC81,ABHD15,	463
140	Lipid Metabolism,Molecular Transport,Small Molecule Biochemistry	Repair of DNA	0.0000107	-3.897	ACS3,ATF2,ATMIN,BCL	146
141	Cancer,Organismal Injury and Abnormalities	Melanoma	0.0000123	-0.393	AATK,ABCBA,ABC81,AB	589
142	Cancer,Organismal Injury and Abnormalities	Infection of cells	0.0000132	-7.855	ABC81,ALG14,ATXN2,BI	70
143	Cancer,Organismal Injury and Abnormalities	Cell viability of tumor cell lines	0.0000135	-6.073	ABC81,APG5,AKS,ASA	85
144	Cancer,Organismal Injury and Abnormalities	Transcription	0.0000231		ACTR2,ACV1R1,AKIRIN2,	361
145	Cancer,Organismal Injury and Abnormalities	Breast or ovarian carcinoma	0.0000232		ABCBA,ABC89,ABHD10,	253
146	Cancer,Organismal Injury and Abnormalities	Morphogenesis of neurons	0.0000255	-1.997	ABHI,ADAF1,APC,ARHG	74
147	Cellular Growth and Proliferation,Neurological System Development and Function,Organ Morphology	Breast or ovarian cancer	0.0000261		ABCBA,ABC81,ACTO1,AC	202
148	Cancer,Organismal Injury and Abnormalities	Malignant neoplasm of aerodigestive tract				

151	Carbohydrate Metabolism,Lipid Metabolism,Small Molecule Biochemistry	Synthesis of phosphatidylinositol	0.0000308	-0.728	CD51,HSPAS5,INPP4A,IN	20
152	Cell Morphology,Cellular Assembly and Organization	Synthesis of phospholipid	0.0000347		BAK,CLN3,CTSA,DNM2	10
153	Lipid Metabolism,Small Molecule Biochemistry	Synthesis of phospholipid	0.0000362	-1.293	ABCAB,AGPS,ATF6,CDS	32
154	Digestive System Development and Function,Gastrointestinal Disease	Abnormal morphology of digestive system	0.0000384		ABCBI,ABCD3,ACOH,AF	67
155	Lipid Metabolism,Small Molecule Biochemistry	Metabolism of phospholipid	0.0000405	-2.279	ABCBA,ABHD6,AGPS,AT	36
156	Cell Death and Survival	Cell death of neuroepithelial precursor cells	0.0000419	0.046	DICER1,ERBB3,HTT,P33	6
157	Intellectual Disability,Hereditary Disorder,Neurological Disease,Organismal Injury and Abnormalities	Autosomal dominant mental retardation	0.0000445		ARID2,ATP6V1B2,CDK1	18
158	Cell Death and Survival	Cell viability	0.0000483	-6.186	ABCBI,AGPS,AK3,AMIG	147
159	Endocrine System Disorders,Organismal Injury and Abnormalities,Reproductive System Development and Function	Ovarian tumor	0.0000514		ABCBA,ABCBI,ABCBA,A	168
160	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Cell death of connective tissue cells	0.0000519	-0.894	ABCBI,ASAH1,ATF2,ATF	69
161	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Neurogenesis	0.0000524	-1.997	ABH1,ADAP1,APC,ARHG	7
162	Cancer,Organismal Injury and Abnormalities	Upper aerodigestive tract carcinoma	0.0000527		ABCBA,ABCBI,ACOI,AC	196
163	Carbohydrate Metabolism,Lipid Metabolism,Small Molecule Biochemistry	Synthesis of lipids	0.0000542	-1.673	ATF6,CD51,CTBP2,DKG	28
164	Intellectual Disability,Hereditary Disorder,Neurological Disease,Organismal Injury and Abnormalities	Dominant mental retardation	0.0000555		ARID2,ATP6V1B2,CDK1	19
165	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Morphology of cellular protrusions	0.0000582		AATK,AP1M2,APC,ARSA	39
166	Endocrine System Disorders,Organismal Injury and Abnormalities,Reproductive System Development and Function	Ovarian cancer	0.0000609		ABCBA,ABCBI,ABCBA,A	164
167	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Abnormal morphology of Purkinje cell layer of cerebellum	0.0000645		ARSA,ATXN2,BICD2,CLN	14
168	Endocrine System Disorders,Organismal Injury and Abnormalities,Reproductive System Development and Function	Gonadal tumor	0.0000664	1.387	ABCBA,ABCBI,ABCBA,A	173
169	Cellular Assembly and Organization,Cellular Compromise	Formation of cellular inclusion bodies	0.0000684	-1.721	ATF6,BAFG,BCL2L1,CRY	15
170	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Apoptosis	0.0000683	2.677	AAAS,AATK,ABCBI,ABR	254
171	Carbohydrate Metabolism,Lipid Metabolism,Small Molecule Biochemistry	Metabolism of phosphatidic acid	0.0000687	-2.496	ATF6,CD51,CTBP2,DKG	30
172	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Apoptosis of fibroblast cell lines	0.0000676	-1.495	ABCBI,ASAH1,ATF2,ATF	40
173	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Cell cycle progression	0.0000695	-2.989	ABRAXAS2,AMER1,ANK	111
174	Lipid Metabolism,Small Molecule Biochemistry	Accumulation of cerebroside	0.0000914	1.165	ARSA,GAL,GBA2,PSAP	5
175	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Autophagy of tumor cell lines	0.0000922	-2.973	ATG3,BAX,BCL2L1,CRY	25
176	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Morphology of microvilli	0.0000944		AP1M2,PLS1,PLS3,RAE	6
177	Intellectual Disability,Hereditary Disorder,Neurological Disease,Organismal Injury and Abnormalities,Skeletal and Muscular System Development and Function	Autosomal dominant hereditary spastic paraplegia	0.0000944		ALDH18A1,ATL1,OPTIC1	28
178	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Cell death of colorectal cancer cell lines	0.0001047	1.335	APC,ATMIN,BAX,BCL2L1	39
179	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Opening of cellular membrane	0.00011		BAX,BCL2L1,IBD	3
180	Cellular Growth and Proliferation,Organismal Development	Growth of yeast	0.000116	0.522	ABCBI,ALG14,ATXN2,B	15
181	DNA Replication,Recombination, and Repair	Metabolism of DNA	0.00012	0.016	ABCBI,ANKRD17,APC,A	46
182	Cancer,Organismal Injury and Abnormalities	Mixed neoplasia	0.00012		ABCBA,ACADS,ACTR2,A	136
183	Cellular Function and Maintenance	Clastrin mediated endocytosis	0.00012	-2.791	ATP6AP1,ATP6V1B2,CD	13
184	Intellectual Disability,Hereditary Disorder,Neurological Disease,Organismal Injury and Abnormalities	Development of neurons	0.0001232	-3.665	ABH1,ADAP1,AMIGQ2,AP	89
185	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Cellular death	0.000133	2.181	ARSA,ATF2,ATP6V1B2	14
186	Lipid Metabolism,Small Molecule Biochemistry	Synthesis of glycolipid	0.000135	-2.156	ABCBA,ABCBI,ALG14,AI	14
187	Endocrine System Disorders,Organismal Injury and Abnormalities,Reproductive System Development and Function	Development of gonadal tumor	0.000148		ABCBA,ABCBA,ABHD6,A	141
188	Lipid Metabolism,Small Molecule Biochemistry	Synthesis of lipids	0.000151	-3.705	ABCBA,ABCBI,ABCBA,A	168
189	Endocrine System Disorders,Organismal Injury and Abnormalities,Reproductive System Development and Function	Ovarian carcinoma	0.000159		ABCBA,ABCBA,ABHD6,A	147
190	Infectious Diseases	HIV infection	0.000164	-7.705	ABCBI,ALG14,ATMIN,AT	75
191	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Apoptosis of endoderm	0.000164	2	CUL1,HNFA4,HTT,VPSA	4
192	Carbohydrate Metabolism	Synthesis of carbohydrate	0.000191	-1.404	AKR1A1,ALG14,SH3BP2	97
193	Cancer,Hematological Disease,Organismal Injury and Abnormalities	Neoplasia of blood cells	0.00019	2.617	ABCBI,ABRAXAS2,A	278
194	Development and Function,Neurological Disease,Organ Morphology,Organismal Development and Function	Loss of Purkinje cells	0.00019		ATXN2,EI24,HTT,OSTM1	6
195	Infectious Diseases	Cell death of fibroblast cell lines	0.000197	-1.685	ABCBI,ASAH1,ATF2,ATF	49
196	Infectious Diseases	Viral infection	0.0002	-7.507	AAAS,ABCBI,ABH1,ACTR	153
197	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Cell survival	0.000201	-6.138	ABCBI,AGPS,AK3,AMIG	150
198	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Morphology of mitochondria	0.000214		ACOT13,ATF2,CTCF,CUL	22
199	Hereditary Disorder,Neurological Disease,Organismal Injury and Abnormalities	Acute myeloid leukemia	0.000217	0.272	ABCBI,ABCBI,ABCBI,A	152
200	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Formation of microvilli	0.000219		ATP8B1,DAO1,HNFA4,PL	7
201	Cancer,Organismal Injury and Abnormalities	Extradural retroperitoneal tumor	0.000221	1.444	AATK,ABCBI,ABCD3,AB	294
202	Hereditary Disorder,Neurological Disease,Organismal Injury and Abnormalities	Autosomal dominant neuropathy	0.000223	-6.15	ALDH18A1,ATL1,CHMP2	13
203	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Gastric carcinoma	0.000224		ABCBI,ABCBI,ACO1,ACV	130
204	Digestive System Development and Function	Morphology of digestive system	0.000226		ABCBI,ABCD3,ACOH,AF	77
205	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Macroautophagy	0.000226	-1.982	ATG3,CHMP2A,CHMP2B	18
206	Hereditary Disorder,Neurological Disease,Organismal Injury and Abnormalities	Myeloid leukemia	0.000231	-0.073	ABCBI,ABCBI,ABCBI,A	156
207	Endocrine System Disorders,Organismal Injury and Abnormalities,Reproductive System Development and Function	Ovarian adenocarcinoma	0.000238		ABCBA,ABCBA,ABHD6,A	139
208	Endocrine System Disorders,Organismal Injury and Abnormalities,Reproductive System Development and Function	Morphology of cerebellar cortex cells	0.000254		ARSA,ATXN2,BICD2,EI2	12
209	Intellectual Disability,Hereditary Disorder,Neurological Disease,Organismal Injury and Abnormalities	Recessive mental retardation	0.00027		ALDH18A1,ARHGFE,AS	25
210	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Dysregulation of neurons	0.000282	2.136	ABCBI,ATF2,ATF2,ATF	69
211	Cancer,Hematological Disease,Organismal Injury and Abnormalities	Hematopoietic neoplasm	0.000288	2.726	ABCBI,ABH1,ABRAXAS2	279
212	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Apoptosis of embryonic cell lines	0.000288	-1.618	ATF2,ATG3,BAX,BCL2L1	34
213	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Apoptosis of embryonic tissue	0.000294	-1.449	AMER1,CUL1,HNFA4,A	15
214	Lipid Metabolism,Small Molecule Biochemistry	Catabolism of lipid	0.000294	-3.093	ABHD6,ACB5,ADAL,AP	91
215	Cancer,Cardiovascular Disease,Organismal Injury and Abnormalities	Hemangioblastoma	0.000295		ABCBI,AMER1,DDX6,DI	10
216	Organismal Development	Arrest in growth of organism	0.000296		ACVR1,ATF2,CTCF,CUL	22
217	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Rectal adenocarcinoma	0.000301		ABCBI,AMER1,AMIGQ2	5
218	Development and Function,Neurological Disease,Organ Morphology,Organismal Development and Function	Morphology of cerebral cortex	0.000309		ARHGAP5,ARL6,BACE1	30
219	Development and Function,Neurological Disease,Organ Morphology,Organismal Development and Function	Abnormal morphology of cerebellar cortex	0.00033		ARSA,ATXN2,BICD2,CLN	15
220	Cancer,Organismal Injury and Abnormalities	Cancer	0.00037	1.953	ABCBI,ABCBI,ABHD15	374
221	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	G2/M phase	0.00035	-0.378	ABCBI,ATF2,BCL2L1,IB	34
222	Cancer,Hematological Disease,Organismal Injury and Abnormalities	Bone marrow neoplasm	0.000354	0.439	ABCBI,ABH1,ACBD5,AD	168
223	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Cecum adenocarcinoma	0.000369		AMER1,APC,ARHGAP5,A	74
224	Development and Function,Neurological Disease,Organ Morphology,Organismal Development and Function	Morphology of hippocampus	0.00037		ARL6,BACE1,CEP350,M	54
225	Carbohydrate Metabolism	Metabolism of carbohydrate	0.00039	-1.517	ABCBI,AKR1A1,ALG14,I	74
226	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Extension of cellular protrusions	0.000401	-2.693	AATK,ARHGAP20,ARHG	57
227	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Infection of tumor cell lines	0.000401	-6.15	ACTR2,ADAL,ALG14,BI	23
228	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Cycling of centrosome	0.000422	-1.646	CCT110,CEP70,CEP88	16
229	Cancer,Hematological Disease,Organismal Injury and Abnormalities	Hematologic cancer	0.000425	2.49	ABCBI,ABRAXAS2,ACBI	274
230	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Size of microvilli	0.000425		PLS1,RAE8A,USH1C	3
231	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Right colon cancer	0.000428		APC,KRAS,MSH2	3
232	Cancer,Organismal Injury and Abnormalities,Reproductive System Development and Function	Breast carcinoma	0.000428		ABCBA,ABHD10,ACOT9,	153
233	Gene Expression	Activation of DNA endogenous promoter	0.000429	-3.654	ACTR2,ACVR1,AKIRIN2,	122
234	Behavior	Habituation	0.000463	-1.342	BACE1,CERS6,KAP5,F	8
235	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Lymphoreticular neoplasm	0.000473	2.559	ABCBI,ABH1,ABRAXAS2	245
236	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Double-stranded DNA break repair of tumor cell lines	0.000473	-0.958	BM1,DEK,PBR1,RS1,R	9
237	Cancer,Organismal Injury and Abnormalities	Clear-cell adenocarcinoma	0.000501		ABCBI,ACADS,ADAL,AP	91
238	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Site of origin of cancer	0.000512		BAK,CLN3,CTSA,DNM2	10
239	Cancer,Hematological Disease,Organismal Injury and Abnormalities	Malignant myeloid neoplasm	0.000512	1.034	ABCBI,ACB5,ADAL,AP	162
240	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Macroautophagy of cells	0.000512	-1.715	ATG3,CHMP2A,CHMP2B	17
241	Intellectual Disability,Hereditary Disorder,Neurological Disease,Organismal Injury and Abnormalities,Psychological Development and Function	Familial atrophic lateral sclerosis	0.000534		BCL2L1,CHMP2B,GRN,A	8
242	Hereditary Disorder,Neurological Disease,Organismal Injury and Abnormalities	Acute leukemia	0.000536	-0.161	ABCBI,ABCBI,ABCBI,A	161
243	Development and Function,Neurological Disease,Organ Morphology,Organismal Development and Function	Abnormal morphology of Purkinje cells	0.000537		ARSA,ATXN2,EI24,FMR1	11
244	Cancer,Hematological Disease,Organismal Injury and Abnormalities	Bone marrow cancer	0.00057	0.428	ABCBI,ACB5,ADAL,AP	163
245	Embryonic Development,Organismal Development	Arrest in growth of embryo	0.000577		ACVR1,ATF2,CTCF,CUL	21
246	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Neuronal cell death	0.00058	1.418	AATK,AMIGQ2,APC,ASA	705
247	Intellectual Disability,Hereditary Disorder,Neurological Disease,Organismal Injury and Abnormalities	Head and neck squamous cell carcinoma	0.000585		ABCBI,ABCBI,AMER1,A	25
248	Intellectual Disability,Hereditary Disorder,Neurological Disease,Organismal Injury and Abnormalities	Autosomal recessive mental retardation	0.0006		ALDH18A1,ACCC3,CASP	20
249	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Gastric adenocarcinoma	0.000628		ABCBI,ABCBI,ABCBI,A	122
250	Lipid Metabolism,Small Molecule Biochemistry	Synthesis of glycosphingolipid	0.000643	-1.922	ABCBA,ABCBI,ARSA,B4	9
251	Protein Synthesis	Homo-oligomerization of protein	0.000655		AKC3,APC,ATL1,ATL2,BA	22
252	Lipid Metabolism,Small Molecule Biochemistry	Concentration of lipid	0.000667	-0.808	ABCBI,ABHD6,ACOT13	65
253	Lipid Metabolism,Small Molecule Biochemistry	Metabolism of protein	0.000669	-1.871	ABCBI,ACO1,ACR,AKIP1	117
254	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Rectum cancer	0.000672		ACB5,AMER1,AMIGQ2,	57
255	Cancer,Hematological Disease,Organismal Injury and Abnormalities	Myeloid neoplasm	0.000672	0.729	ABCBI,ABH1,ACB5,AD	167
256	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Interphase	0.000688	-1.837	ABCBI,ACVR1,APC,ATF	79
257	Infectious Diseases,Organismal Injury and Abnormalities	Infection of embryonic cell lines	0.000699	-5.559	ATMIN,ATXN2,CD164,C	31
258	Auditory Disease,Neurological Disease	Hearing loss	0.000704	3.07	ABCBI,ARSA,ATP6V1B2	29
259	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Polarization of neurons	0.000706		APC,GSK3B,HTT,KIF3A,F	5
260	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Cell death of lung cancer cell lines	0.000717	-0.296	AMER1,BAK,BCL2L1,IB	35
261	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Maintenance of stem cells	0.000725		APC,BMPR1A,DDX6,DIC	12
262	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Catabolism of protein	0.000742	-2.074	ACR,ANAPC10,APC,ATF	67
263	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Fragmentation of cells	0.000744	-0.642	ABCBI,ABCBI,BAK,BCL	1
264	Cancer,Organismal Injury and Abnormalities,Reproductive System Development and Function	Breast cancer	0.000746	0.152	ABCBA,ABCBI,ABHD10,	203
265	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Degeneration of cells	0.000757	3.312	ARSA,ATF2,ATP6V1B2	40
266	Intellectual Disability,Hereditary Disorder,Neurological Disease,Organismal Injury and Abnormalities	Familial acute myeloid leukemia	0.000769		APC,CHIC2,KRAS,MSH2	6
267	Infectious Diseases	Infection of epithelial cell lines	0.000771	-5.468	ATMIN,ATXN2,CD164,C	30
268	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Loss of brain cells	0.000775		ABCBI,ADAL,APC,CEP	30
269	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Expansion of endoplasmic reticulum	0.000782	0.254	ATXN2,CHMP2B,DICER1	10
270	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Senescence of fibroblast cell lines	0.000827	-0.682	ARHGAP5,BMI1,BRD7,D	19
271	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Apoptosis of connective tissue cells	0.000836	-0.38	ATF2,ATF6,BAX,BCL2L1	34
272	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Transport of protein	0.000852	-1.965	ABCBA,AP1M2,APPBP2,	35
273	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Gastroesophageal adenocarcinoma	0.000871		ABCBA,ABCBI,ABCBI,A	146
274	Drug Metabolism,Small Molecule Biochemistry	Transport of drug	0.000872		ABCBI,HSP,RALBP1,RI	4
275	Embryonic Development,Organismal Development,Tissue Development	Development of epiblast	0.000877		APC,EED,IHH,SBS	5
276	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Expansion of endoplasmic reticulum	0.000877	0.254	ATF6,ALG3,HSPA5,SUC	4
277	Intellectual Disability,Hereditary Disorder,Neurological Disease,Organismal Injury and Abnormalities	Primary sclerosing cholangitis	0.000887		BAX,BCL2L1,CASP2,CAI	8
278	Infectious Diseases	Infection of cervical cancer cell lines	0.000933	-5.771	ADAL,ALG14,BICD2,BMF	44
279	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Pancreaticobiliary tumor	0.000943	1.664	AATK,ABCD3,ABCD4,AB	258
280	Hydrate Metabolism,Lipid Metabolism,Small Molecule Biochemistry	Concentration of phosphatidic acid	0.000959	-1.27	BAK,IBD,CD51,CERS6,C	20
281	Development and Function,Neurological Disease,Organ Morphology,Organismal Development and Function	Morphology of Purkinje cells	0.000961	0.943	ARSA,ATXN2,BICD2,IBD	20
282	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Colony formation of bone cancer cell lines	0.000961	0.943	BM1,CNOT7,DICER1,MT	5
283	Intellectual Disability,Hereditary Disorder,Neurological Disease,Organismal Injury and Abnormalities,Skeletal and Muscular System Development and Function	Hereditary spastic paraplegia	0.000966		ALDH18A1,ATL1,BCID2,	11
284	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Mitosis	0.000978	-1.254	ABRAXAS2,ANKS1A,BRU	53
285	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Permeabilization of mitochondria	0.00098	-0.908	BAX,BCL2L1,CASP2	2
286	Development and Function,Neurological Disease,Organismal Development,Tissue Development and Function	Morphology of intestinal epithelium	0.000989		ABCBI,AP1M2,DICER1,I	7
287	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Morphology of neurons	0.00102		AATK,ARSA,ATXN2,BA	65
288	Cancer,Neurological Disease,Organismal Injury and Abnormalities	Meloid leukemia	0.00102	2.425	APC,BAK,BCL2L1,BMI1	3
289	Cellular Function and Maintenance,Cellular Growth and Proliferation,Nervous System Development and Function	Movement of centrosome	0.00102		APC,GSK3B,PAR6A	3
290	Cancer,Hereditary Disorder,Organismal Injury and Abnormalities	Turcot syndrome	0.00102		APC,MSH2,P	



301		Neurodegeneration	0.0012	2.584	ARBA,ATF2,ATF81,BAC	37
302	Cellular Development,Cellular Growth and Proliferation	Colony formation of sarcoma cell lines	0.00121	1.226	BMI1,CHOT1,DICER1,MT	37
303	Cellular Compromise,DNA Replication, Recombination, and Repair	Chromosomal instability	0.00121	2.488	ABRAXAS2,APC,CDK12,C	37
304	Cancer,Organismal Injury and Abnormalities,Reproductive System Disease	Mammary tumor	0.00121	0.365	ABCBA,ABCB1,ABHD10	212
305	Neurological Disease	Degeneration of nervous system	0.00123	2.375	ARSA,ATF2,ATF81,BAC	34
306	Cellular Development	Morphology of embryo	0.00127	1.339	AATK,ARHGAP1,ARHGAP5	101
307	Cell Death and Survival	Cell viability of gastrointestinal stromal tumor cell lines	0.00128	-2.224	IGF2R,ZNF254,ZNF429,Z	5
308	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Apoptosis of fetal neuron	0.00128	-1.446	BAK,BCL2L1,CEBP2,PAI	16
309	Cellular Development and Maintenance	Stomach tumor	0.00128	2.886	AATK,ABCB1,ABCB1,AC1	139
310	Cellular Death and Survival	Glioma tumor cell lines	0.0013	-2.966	ACR13,ACR2B,ACR3,ACT	199
311	Cell Death and Survival	Apoptosis of lung cancer cell lines	0.0013	-0.369	AMER1,BAK,BCL2L1,BID	30
312	Cell Death and Survival	Apoptosis of neuronal progenitor cells	0.00133	1.067	DICER1,ERBB3,HTT,RGB	4
313	Cell Death and Survival/Neurological Development	Ankonia of embryonic cell lines	0.00134	1.568	AATK,ARHGAP1,ARHGAP5	4
314	Cell Morphology	Permeabilization of liposome	0.00133	-1.067	BAK,BID,FGFR1,TRC1	4
315	Organismal Development	Growth of organoid	0.00133	1.339	ARCB1,ACR13,ARHGAP5	4
316	DNA Replication, Recombination, and Repair, Gene Expression	Methylation of DNA	0.00134	0.52	ARF1,ARID4A,ATF7IP,CTC	11
317	Cell Morphology,Cell Function and Maintenance	Repair of tumor cell lines	0.00136	-5.468	ATF2,BAK,EP300,OSK3B	30
318	Infectious Diseases	Infection of kidney cell lines	0.00136	-5.468	ATF2,BAK,EP300,OSK3B	30
319	Cell Death and Survival	Cell death of osteoclasts	0.00136	-0.522	ARSA,ASAH1,GBA2,HEX	6
320	Cell Death and Survival	Necrosis	0.00136	2.684	AAAS,AATK,ABCB1,AKP	244
321	Cancer,Organismal Injury and Abnormalities	Liquid tumor	0.00137	1.942	ARCB1,ABCB1,ABCB2,AB	198
322	Cellular Assembly and Organization,DNA Replication, Recombination, and F	Segregation of chromosomes	0.00137	-1.371	ABRAXAS2,APC,CHMP2	17
323	Cellular Assembly and Organization,Cellular Function and Maintenance	Bone deformity	0.00138	1.962	AMER1,CHPF,CSK,CTSR	21
324	Cellular Assembly and Organization,Cellular Function and Maintenance	Leukemia	0.00138	-0.104	ARCB1,ACR13,ARHGAP5	188
325	Cellular Assembly and Organization,Cellular Function and Maintenance	Organization of nucleus	0.0014	1.226	ARF1,ARHGAP5,CHMP2L1	18
326	Cellular Assembly and Organization,Cellular Function and Maintenance	Organization of nucleus	0.0014	3.205	ARF1,ARHGAP5,CHMP2L1	18
327	Cellular Assembly and Organization,Cellular Function and Maintenance	Quiescence	0.00141	1.226	BID,DEK,DICER1,DYRK1	22
328	Cellular Assembly and Organization,Cellular Function and Maintenance	Size of brain	0.00142	1.226	AATK,ARHGAP5,ARHGAP5	22
329	Cellular Assembly and Organization,Cellular Function and Maintenance	Malignant neoplasm of retroperitoneum	0.00144	-0.447	AATK,ARHGAP5,ARHGAP5	22
330	Cellular Assembly and Organization,Cellular Function and Maintenance	Quantity of carboxywater	0.00146	-2.178	ARCB1,ARHGAP5,ARHGAP5	22
331	Cellular Assembly and Organization,Cellular Function and Maintenance	Infection by RNA virus	0.00148	-7.878	ARCB1,ACTR2,ADAL,AL	87
332	Neurological Disease,Small Molecule Biochemistry	Paralysis	0.00148	2.608	ALDH1F1,ATL1,BICD2	25
333	Cellular Assembly and Organization,Cellular Function and Maintenance	Apoptosis of rhombencephalon	0.0015	-1.067	ATF2,BAK,EP300,OSK3B	6
334	Lipid Metabolism,Small Molecule Biochemistry	Catabolism of sphingolipid	0.0015	-2.2	ARSA,ASAH1,GBA2,HEX	6
335	Cancer,Gastrointestinal Disease,Organismal Injury and Abnormalities	Gastric cancer	0.00151	1.226	AATK,ABCB1,ABCB1,AC1	139
336	Cellular Assembly and Organization	Organization of organite	0.00152	-1.664	ARCB1,ATF2,BAK,BCL2L	37
337	Cellular Assembly and Organization	Organization of organite	0.00152	-1.664	AATK,ABCB1,ABCB1,AC1	139
338	Developmental Disorder,Neurological Disease	Global developmental delay with intellectual disability	0.00161	0.001	CYFIP1,LOC102747891	10
339	Hepatic System Development and Function,Hepatic System Development,Organ Morph	Abnormal morphology of hepatocytes	0.00162	0.001	CLN3,CTSL,ENTTF2	9
340	Cell Morphology,Cellular Function and Maintenance	Autophagy of cervical cancer cell lines	0.00162	-0.059	BAK,BCL2L1,CRYAB,MA	8
341	Cellular Assembly and Organization,Cellular Function and Maintenance	Autophagy of cervical cancer cell lines	0.00164	0.001	AATK,ARHGAP5,ARHGAP5	22
342	Embryonic Development,Organismal Development	Patterning of body axis	0.00164	0.001	APC,BMPR1A,GRSF1,HR	5
343	RNA Post-Transcriptional Modification	Defecatabilization of mRNA	0.00167	-1.964	FTO,GRSF2,MET13,LJL	16
344	Lipid Metabolism,Small Molecule Biochemistry	Catabolism of glycosphingolipid	0.00171	-1.964	ARSA,GBA2,HEXA,HEXE	6
345	Cancer,Organismal Injury and Abnormalities	Familial motor neuron disease	0.00171	-1.964	ARSA,GBA2,HEXA,HEXE	6
346	Hereditary Disorder,Neurological Disease,Organismal Injury and Abnormalities	Familial motor neuron disease	0.00171	-1.964	ARSA,GBA2,HEXA,HEXE	6
347	Cellular Movement and Maintenance	Cell motility of fibroblast cell lines	0.00173	-1.567	ARHGAP5,ARHGAP5,ARHGAP5	22
348	Lipid Metabolism,Small Molecule Biochemistry	Concentration of phospholipid	0.00173	-0.563	ABHD6,BAK,BID,CD51,C	24
349	Cellular Assembly and Organization	Formation of synapse	0.00173	0.001	CYFIP1,DICER1,KAT5	16
350	Cellular Assembly and Organization	Formation of synapse	0.00173	0.001	CYFIP1,DICER1,KAT5	16
351	Cellular Assembly and Organization	Formation of synapse	0.00173	0.001	CYFIP1,DICER1,KAT5	16
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439	Cellular Assembly and Organization	Formation of synapse	0.00173	0.001	CYFIP1,DICER1,KAT5	16
440	Cellular Assembly and Organization	Formation of synapse	0.00173	0.001		

**Table S5 (Related to STAR Method) Primer sequences**

Primer Name	Gene Targeted	Application	Sequence (5'-3')
hBRACHYURY-F	<i>BRACHYURY</i>	qRT-PCR	5'-GCTGTGACAGGTACCCAACC-3'
hBRACHYURY-R	<i>BRACHYURY</i>	qRT-PCR	5'-CATGCAGGTGAGTTGTCAGAA-3'
hBRCA1-Full-F	<i>BRCA1</i>	qRT-PCR	5'-TAGCAAGGAGCCAACATAACAGAT-3'
hBRCA1-Full-R	<i>BRCA1</i>	qRT-PCR	5'-CTGTGTGAGAGAAAAGAATGGAATAAG-3'
hBRCA1-DeltaEXON1-F	<i>BRCA1</i>	qRT-PCR	5'-GATTCTGCAAAAAGGCTGCT-3'
hBRCA1-DeltaEXON1-R	<i>BRCA1</i>	qRT-PCR	5'-CAGATGCTGCTTCACCCTGA-3'
hGAPDH-F	<i>GAPDH</i>	qRT-PCR	5'-GTGGACCTGACCTGCCGTCT-3'
hGAPDH-R	<i>GAPDH</i>	qRT-PCR	5'-GGAGGAGTGGGTGTCGCTGT-3'
hGATA3-F	<i>GATA3</i>	qRT-PCR	5'-CTCATTAAGCCCAAGCGAAG-3'
hGATA3-R	<i>GATA3</i>	qRT-PCR	5'-GTCTGACAGTTCGCACAGGA-3'
hMIXL1-F	<i>MIXL1</i>	qRT-PCR	5'-GGTACCCCGACATCCACTT-3'
hMIXL1-R	<i>MIXL1</i>	qRT-PCR	5'-GCCTGTTCTGGAACCATACCT-3'
hOCT4-F	<i>POU5F1</i>	qRT-PCR	5'-ACCCACACTGCAGCAGATCA-3'
hOCT4-R	<i>POU5F1</i>	qRT-PCR	5'-CCACACTCGGACCACATCC-3'
hOSR1-F	<i>OSR1</i>	qRT-PCR	5'-GGACCTCTGCGGAACAAG-3'
hOSR1-R	<i>OSR1</i>	qRT-PCR	5'-TGCAGGGAAGGGTGGATA-3'
hOVGP1-F	<i>OVGP1</i>	qRT-PCR	5'-AATTCTCTACCCAGAGTTCAACAAA-3'
hOVGP1-R	<i>OVGP1</i>	qRT-PCR	5'-CCGATGGACAGTAGTGTTTTCA-3'
hPAX2-F	<i>PAX2</i>	qRT-PCR	5'-GAAGTGCCCCCTTGTGTG-3'

hPAX2-R	<i>PAX2</i>	qRT-PCR	5'-TCGTTGTAGGCCGTGTACTG-3'
hSALL1-F	<i>SALL1</i>	qRT-PCR	5'-ATTGCAGCCTAGCCAAAAAG-3'
hSALL1-R	<i>SALL1</i>	qRT-PCR	5'-ACCAGCTGAGCAGAAAGGTC-3'
hSOX17-F	<i>SOX17</i>	qRT-PCR	5'-ACGCCGAGTTGAGCAAGA-3'
hSOX17-R	<i>SOX17</i>	qRT-PCR	5'-TCTGCCTCCTCCACGAAG-3'
hSOX2-F	<i>SOX2</i>	qRT-PCR	5'-GGGGGAATGGACCTTGTATAG-3'
hSOX2-R	<i>SOX2</i>	qRT-PCR	5'-GCAAAGCTCCTACCGTACCA-3'
hWT1-F	<i>WT1</i>	qRT-PCR	5'-GAATGCATGACCTGGAATCA-3'
hWT1-R	<i>WT1</i>	qRT-PCR	5'-TCTGCCCTTCTGTCCATTTC-3'