

SUPPLEMENTARY INFORMATION

SMARCA4/2 loss inhibits chemotherapy-induced apoptosis by restricting IP3R3-mediated Ca²⁺ flux to mitochondria

Xue Y^{1,2,3,4*}, Morris JL^{5*}, Yang K^{1,2*}, ..., Prudent J^{5§}, Huang S^{1,2§}.

¹Department of Biochemistry, McGill University, Montreal, Quebec H3G 1Y6, Canada.

²Goodman Cancer Research Centre, McGill University, Montreal, Quebec H3A 1A3, Canada.

³Department of Human Genetics, McGill University, Montreal, Quebec H3A 0C7, Canada.

⁴Department of Medical Genetics and Cancer Research Program, McGill University Health Centre, Montreal, Quebec H4A 3J1, Canada.

⁵Medical Research Council Mitochondrial Biology Unit, University of Cambridge, Cambridge Biomedical Campus, Cambridge CB2 0XY, UK.

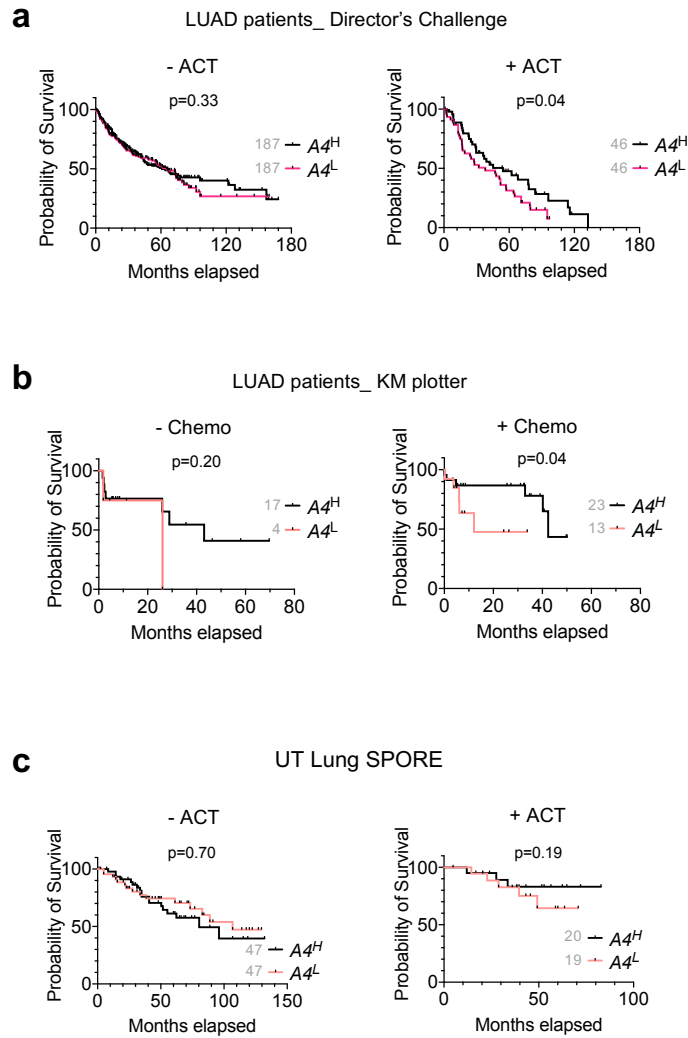
* These authors contributed equally

§ These authors jointly supervised this work

Supplementary Figures 1-18

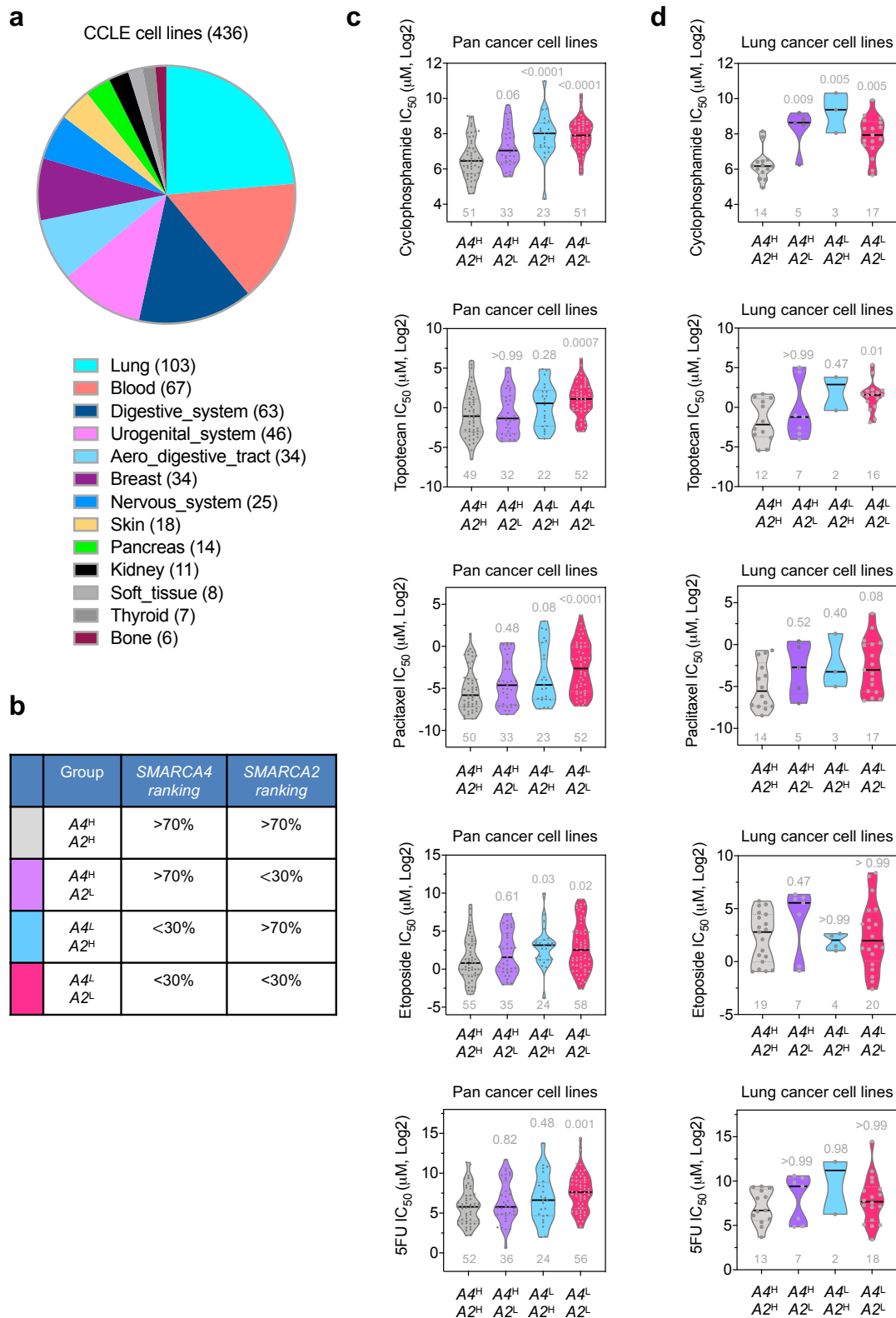
Supplementary References

Supplementary Tables 1-3



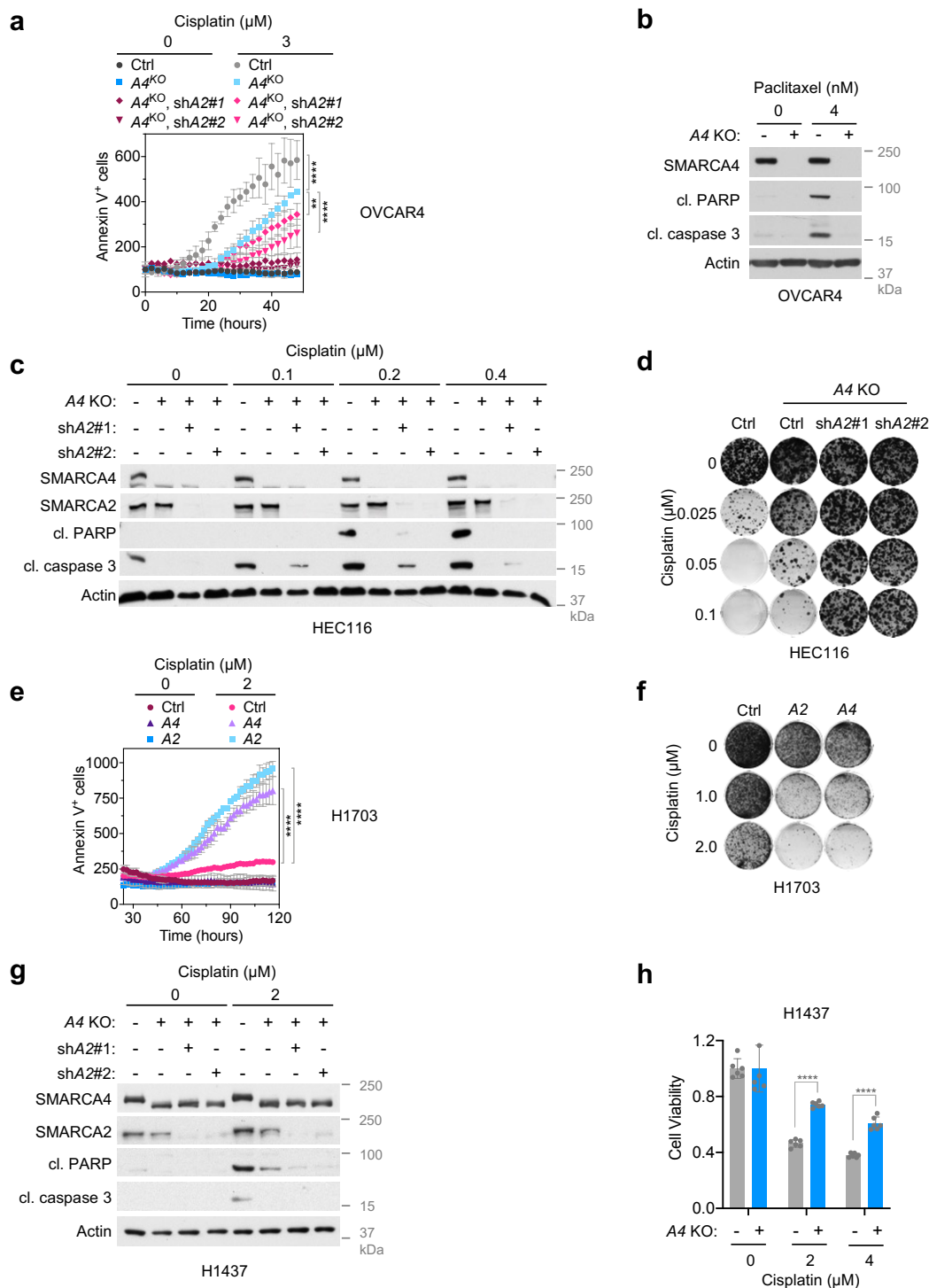
Supplementary Fig. 1 Reduced *SMARCA4* expression is associated with chemoresistance in non-small cell lung cancer, related to Fig. 1.

a Kaplan–Meier (KM) curves of overall survival in lung adenocarcinoma (LUAD) patients $\pm$ adjuvant chemotherapy (ACT). Director's Challenge Consortium for the Molecular Classification of Lung Adenocarcinoma ¹ was analyzed and patients were stratified based on median of *SMARCA4* mRNA expression (jetset probe, Affy ID 213720_s_at). **b** KM curves of overall survival in lung adenocarcinoma patients $\pm$ chemotherapy. Kaplan–Meier Plotter ² was used and patients were stratified based on auto select best cut-off of *SMARCA4* mRNA expression (jetset probe, Affy ID 213720_s_at). **c** KM curves of overall survival in lung cancer patients $\pm$ adjuvant chemotherapy. The UT Lung SPÖRE dataset ³ was analyzed and patients were stratified based on median of *SMARCA4* mRNA expression (jetset probe, Affy ID 213720_s_at). One-tailed Mantel-Cox test, p : p -value.



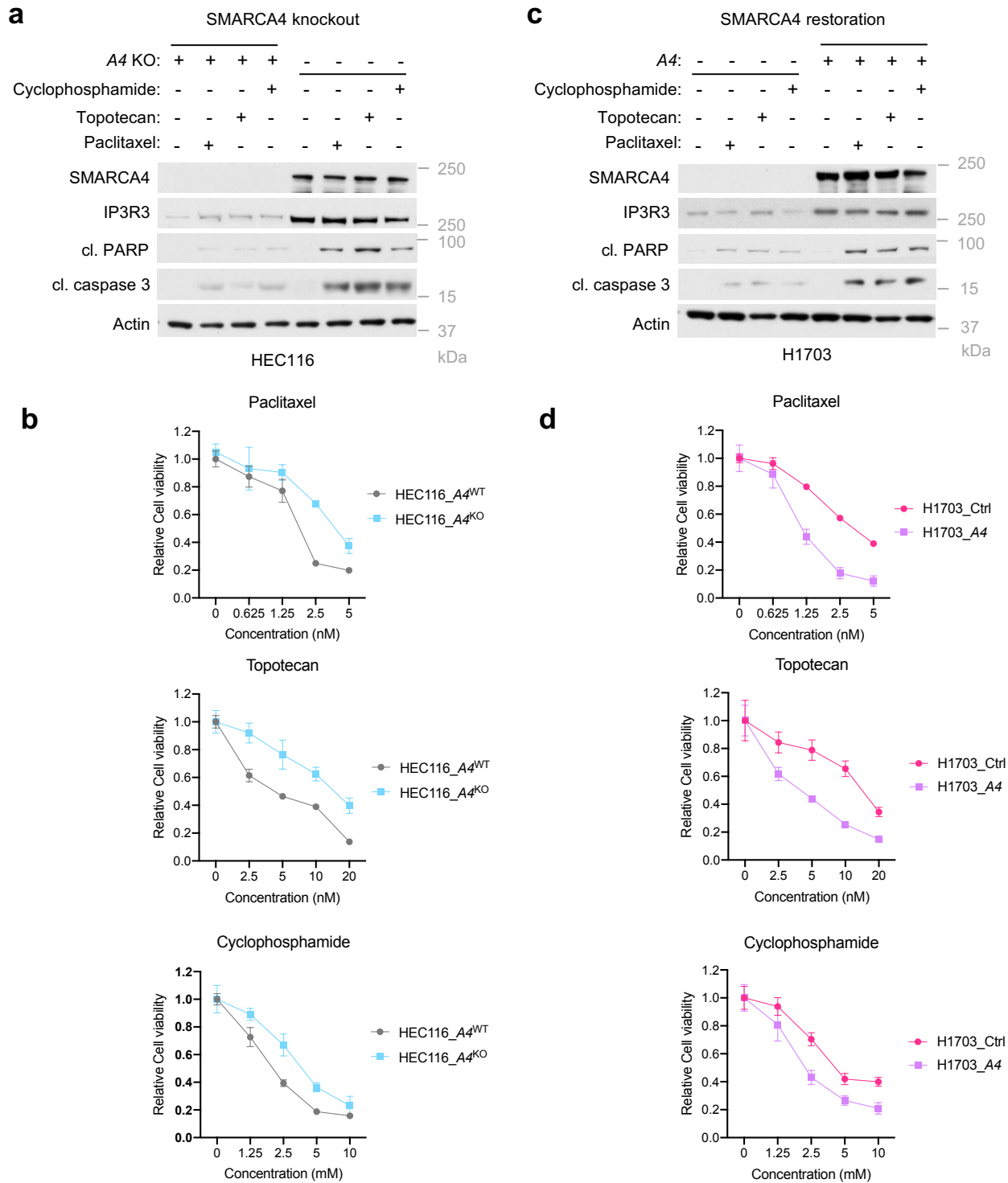
Supplementary Fig. 2 Reduced SMARCA4/2 expression is associated with resistance to chemotherapeutics in cancer cell lines, related to Fig. 1.

a Pie chart depicting the tissue of origins of cell lines with both mRNA expression and IC₅₀ data available. Numbers of cell lines are indicated in parentheses for each tissue type. **b** Stratification of cell lines according to the mRNA expression of *SMARCA4/2*. A4^H: *SMARCA4*^{High}, A4^L: *SMARCA4*^{Low}, A2^H: *SMARCA2*^{High}, A2^L: *SMARCA2*^{Low}. **c, d** IC₅₀ of indicated chemotherapy drugs in pan cancer cell lines (**c**) and lung cancer cell lines (**d**) with different mRNA expression levels for *SMARCA4* and *SMARCA2*. Cell line numbers are indicated in grey below each group. One-way ANOVA Kruskal–Wallis test followed by Dunn’s test for multiple comparisons to A4^HA2^H group. *p*-values are indicated in grey above each group.



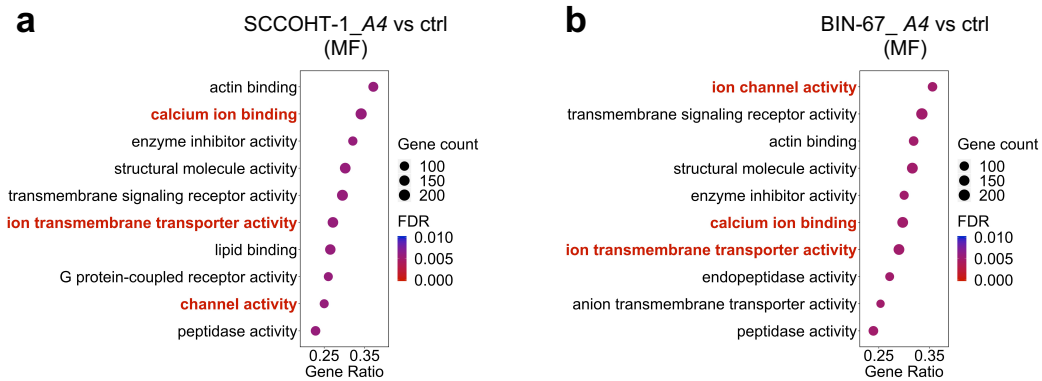
Supplementary Fig. 3 SMARCA4/2 loss causes resistance to chemotherapy drug in ovarian and lung cancers, related to Fig. 1.

a Annexin V staining of OVCAR4 cells with the indicated *SMARCA4* (*A4*) perturbation and cisplatin treatments. **b** Immunoblot analysis of OVCAR4 cells with the indicated *A4* perturbation and paclitaxel treatments (48 hours). **c**, **d** Immunoblot analysis (**c**, 48 hours) and colony formation (**d**, 12 days) of HEC116 cells with indicated *SMARCA4/2* (*A4/2*) perturbations and cisplatin treatments. **e** Annexin V staining of H1703 cells with the indicated *A4* perturbation and cisplatin treatments. **f** Colony formation of H1703 cells with the indicated *A4/2* perturbations and cisplatin treatments (12 days). **g**, **h** Immunoblot analysis (**g**, 48 hours) and cell viability assay (**h**, 4 days) of H1437 cells with indicated *A4/2* perturbations and cisplatin treatments. Ctrl: Control; *A4*^{KO}: *SMARCA4* knockout; shA2: shRNA targeting *SMARCA2*; cl.: cleaved. **a**, **e**, mean $\pm$ SD, $n = 3$ independent experiments, two-way ANOVA; **h**, mean $\pm$ SD, $n = 6$ independent experiments, two-tailed t -test; p -values (p), cisplatin treated: (**a**) Ctrl vs *A4*^{KO} < 0.0001, *A4*^{KO}_shA2#1 vs *A4*^{KO} = 0.0010, *A4*^{KO}_shA2#2 vs *A4*^{KO} < 0.0001; (**e**, **h**) all < 0.0001. ** p < 0.01, **** p < 0.0001.



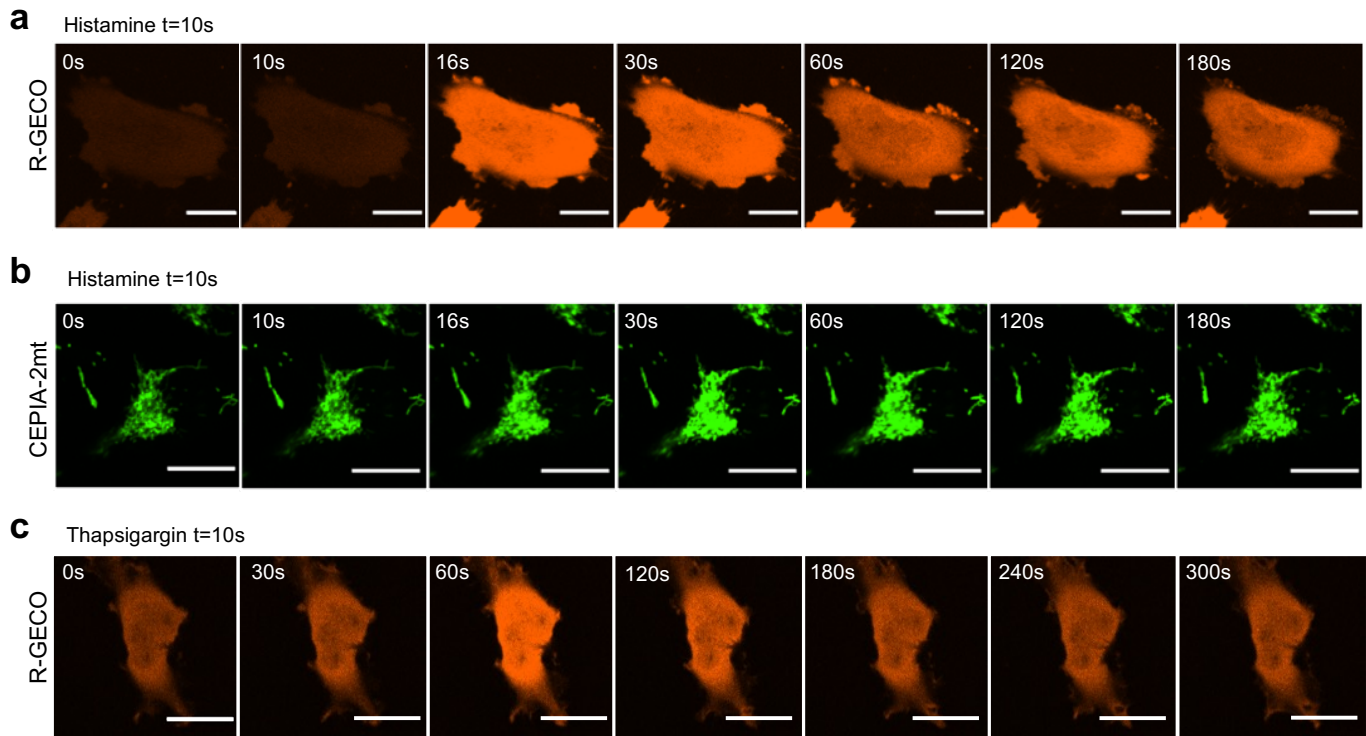
Supplementary Fig. 4 SMARCA4/2 loss causes resistance to cyclophosphamide, topotecan and paclitaxel in ovarian and lung cancer cells, related to Fig. 1.

a-d Immunoblot analysis (**a, c**) and cell viability assay (**b, d**) of HEC116 (**a, b**) and H1703 (**c, d**) cells with indicated *SMARCA4/2* perturbations and treatments of cyclophosphamide, topotecan and paclitaxel. **a, c**, cells were collected 48 hours after the treatment of 2 mM cyclophosphamide, 4 nM topotecan and 2 nM paclitaxel. *A4^{KO}*: *SMARCA4* knockout; *A4*: *SMARCA4*. **b, d**, mean $\pm$ SD, n = 6 independent experiments for all groups.



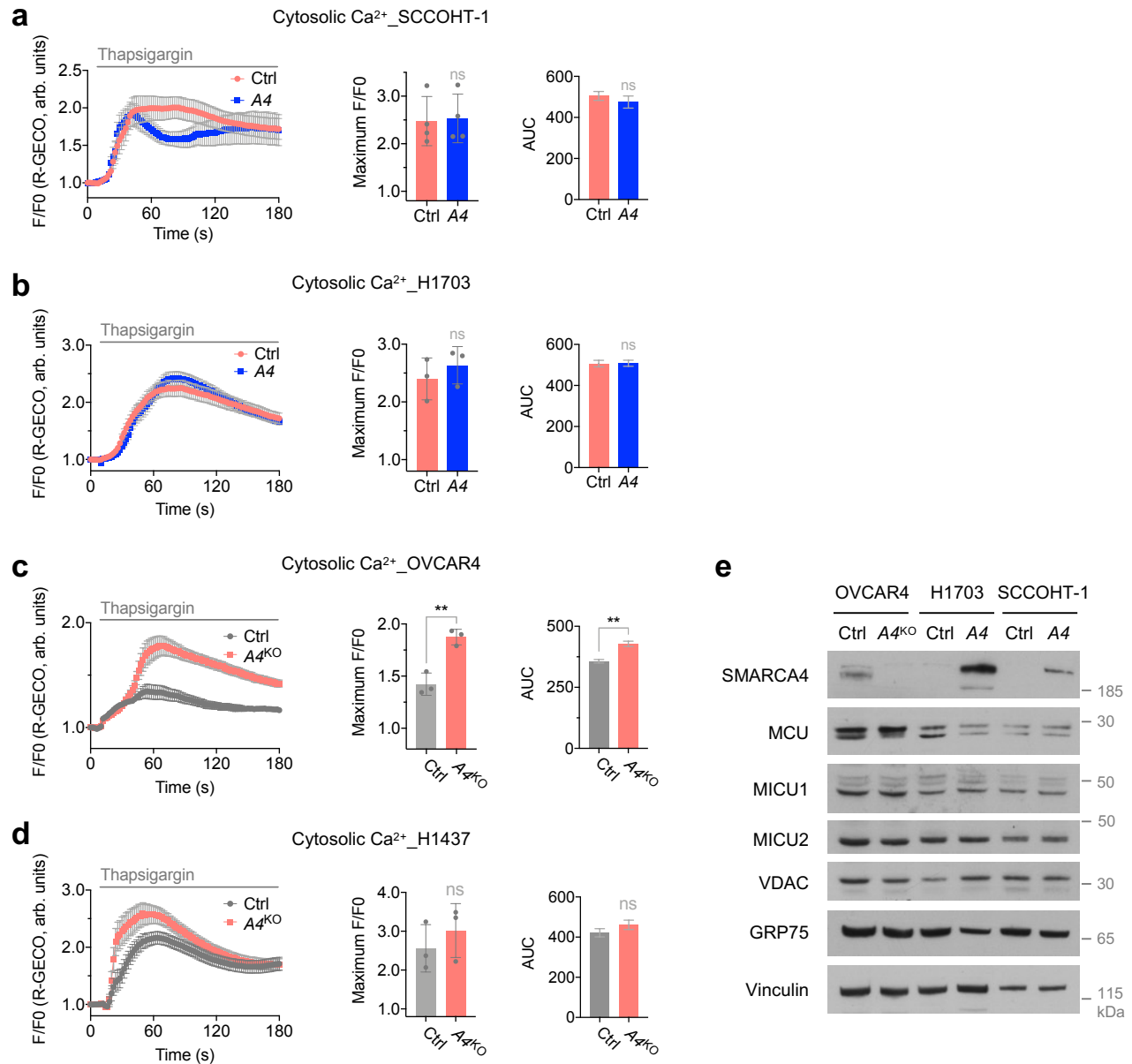
Supplementary Fig. 5 Gene Set Enrichment Analysis of published gene expression datasets in SCCOHT with SMARCA4 restoration, related to Fig. 2.

a, b Top 10 enriched gene ontology terms in SCCOHT-1 (**a**) and BIN-67 (**b**) cells with SMARCA4 restoration⁴. MF: gene sets derived from the GO Molecular Function Ontology. FDR: False Discovery Rate. Calcium/ion transportation terms are highlighted with red.



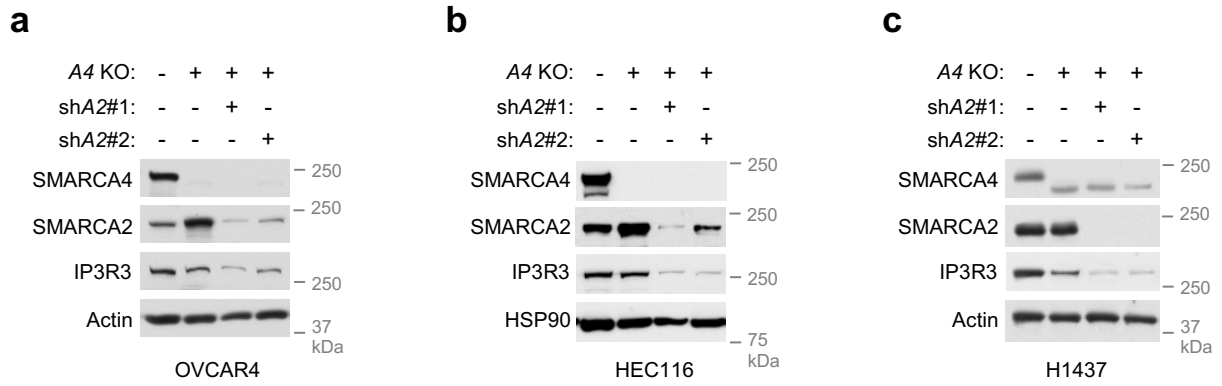
Supplementary Fig. 6 SMARCA4 modulates Ca^{2+} flux from ER to mitochondria, related to Fig. 2.

a Representative confocal time-lapse images of SMARCA4 expressing H1703 cells transfected with the cytosolic Ca^{2+} probe R-GECO. 100 μM histamine final was added at $t = 10\text{s}$. Scale bar, 25 μm . Corresponding to Fig. 2g. **b** Representative confocal time-lapse images of SMARCA4 expressing H1703 cells transfected with the mitochondrial Ca^{2+} probe CEPIA-2mt. 100 μM histamine final was added at $t = 10\text{s}$. Scale bar, 25 μm . Corresponding to Fig. 2h. **c** Representative confocal time-lapse images of SMARCA4 expressing H1703 cells transfected with the cytosolic Ca^{2+} probe R-GECO. 10 μM thapsigargin final was added at $t = 10\text{s}$. Scale bar, 25 μm . Corresponding to Supplementary Fig. 7b.



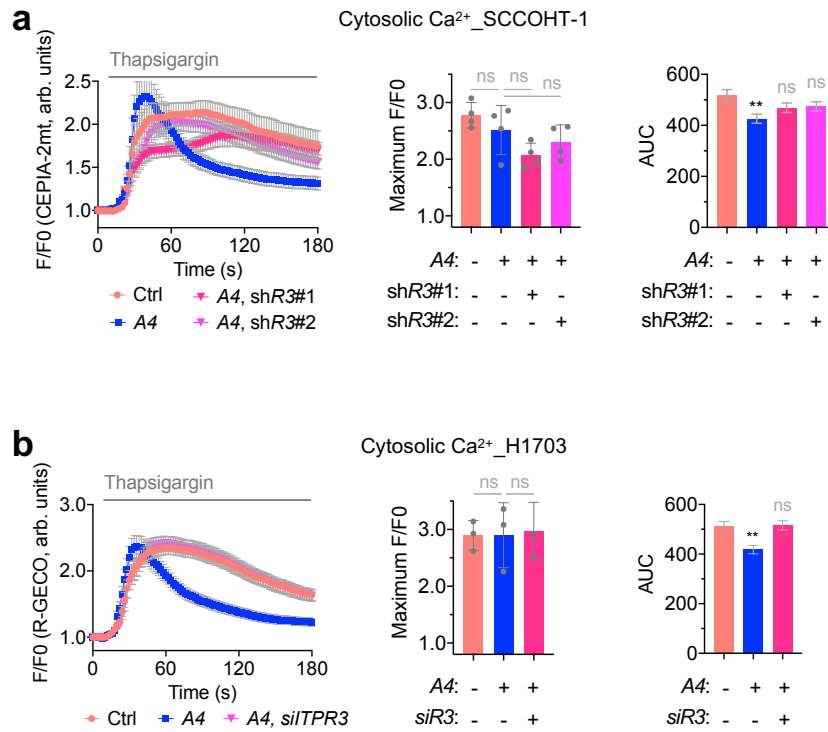
Supplementary Fig. 7 SMARCA4 loss does not reduce Ca^{2+} storage in the ER, related to Fig 2.

a Changes of cytosolic Ca^{2+} content in SCCOHT-1 cells $\pm$ SMARCA4 restoration upon thapsigargin stimulation. For all panels, 21 control (Ctrl) cells and 29 *SMARCA4* (*A4*)-expressing cells from $n=4$ independent experiments were analyzed. **b** Changes of cytosolic Ca^{2+} content in H1703 cells $\pm$ SMARCA4 restoration upon thapsigargin stimulation. For all panels, 31 Ctrl cells and 39 *A4* restored cells from $n=3$ independent experiments were analyzed. **c** Changes of cytosolic Ca^{2+} content in OVCAR4 cells $\pm$ *SMARCA4* knockout ($A4^{\text{KO}}$) upon thapsigargin stimulation. For all panels, 57 Ctrl cells and 59 $A4^{\text{KO}}$ cells from $n=3$ independent experiments were analyzed. **d** Changes of cytosolic Ca^{2+} content in H1437 cells $\pm$ *SMARCA4* knockout ($A4^{\text{KO}}$) upon thapsigargin stimulation. For all panels, 46 Ctrl cells and 48 $A4^{\text{KO}}$ cells from $n=3$ independent experiments were analyzed. **e** Immunoblots of the indicated proteins in OVCAR4, H1703 and SCCOHT-1 cells with the indicated *SMARCA4* perturbations. **a-d**, Left: traces of cytosolic Ca^{2+} content in indicated cell lines upon 10 μM thapsigargin stimulation (mean $\pm$ SEM). Middle: quantification of the maximal Ca^{2+} signal peaks induced by thapsigargin stimulation (mean $\pm$ SD). Right: quantification of the area under the curve (AUC) from (a) (mean $\pm$ SEM). The Ca^{2+} probe R-GECO (R-GECO F/F0) was used to monitor cytosolic Ca^{2+} . Arb. units: arbitrary units. Two-tailed unpaired t-test, p -values (p): (a) F/F0 – 0.8833, AUC – 0.1529; (b) F/F0 – 0.4453, AUC – 0.9043; (c) F/F0 – 0.0039, AUC – 0.0007; (d) F/F0 – 0.4386, AUC – 0.0925. ** $p < 0.01$; ns, not significant.



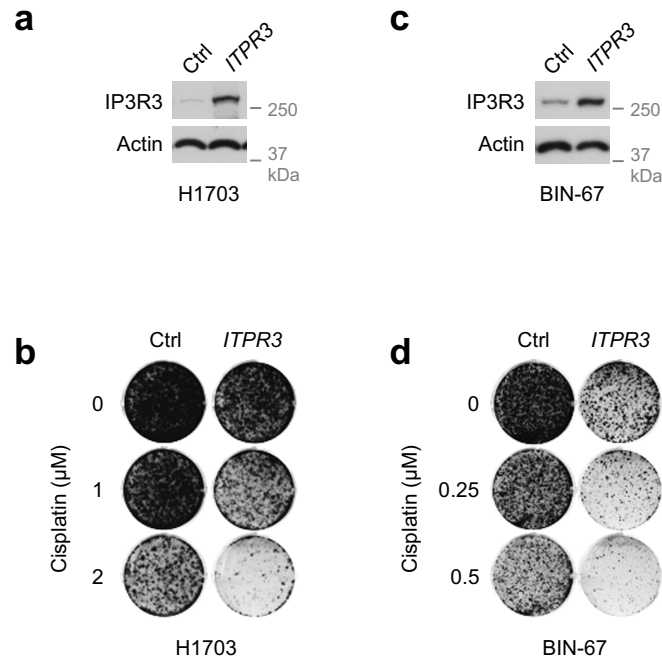
Supplementary Fig. 8 SMARCA4/2 regulate IP3R3 expression in ovarian and lung cancer cells, related to Fig. 3.

Immunoblots of indicated proteins in OVCAR4 (**a**), HEC116 (**b**) and H1437 (**c**) cancer cell lines with indicated *SMARCA4/2* perturbations. *A4^{KO}*: *SMARCA4* knockout; shA2: shRNA targeting *SMARCA2*.



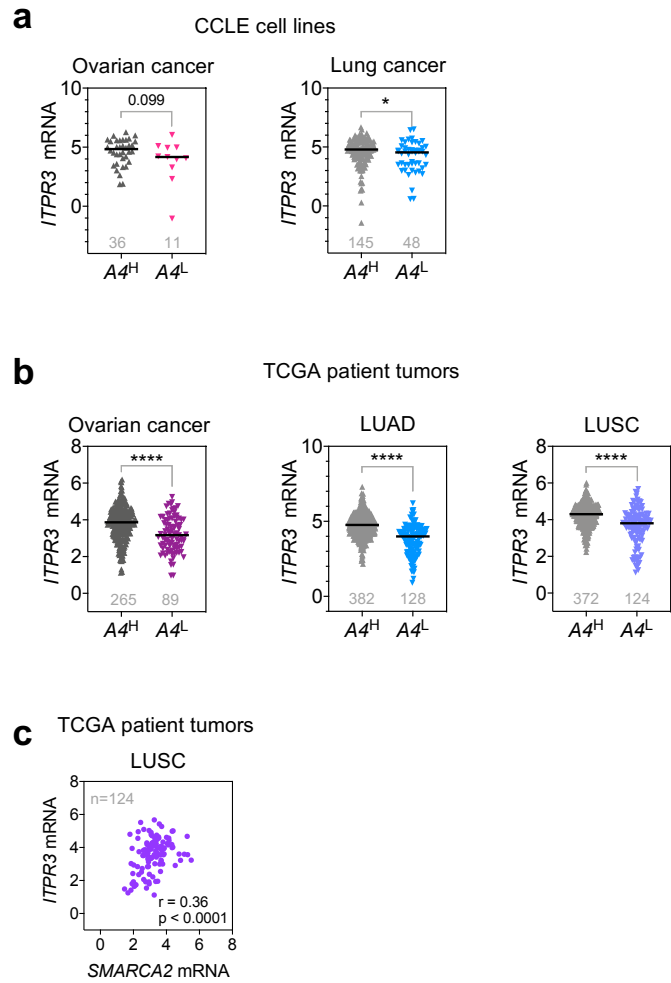
Supplementary Fig. 9 Perturbations of *ITPR3* do not affect Ca^{2+} storage in the ER, related to Fig. 4.

a Changes of cytosolic Ca^{2+} content in SCCOHT-1 cells with indicated *SMARCA4* and *ITPR3* perturbations upon thapsigargin stimulation. 25 Ctrl, 29 *A4*, 52 *A4* ShR3#1, and 58 *A4* ShR3#2 cells from n=4 independent experiments were analyzed. Ctrl: control; *A4*: *SMARCA4*; shR3: shRNA targeting *ITPR3*. Corresponding to Fig. 4a-c. **b** Changes of cytosolic Ca^{2+} content in H1703 cells with indicated *SMARCA4* and *ITPR3* perturbations upon thapsigargin stimulation. 50 Ctrl, 50 *A4*, and 50 *A4* siR3#1 cells from n=3 independent experiments were analyzed. Ctrl: control; *A4*: *SMARCA4*; siR3: siRNA targeting *ITPR3*. Corresponding to Fig. 4d-f. **a, b**, Left: traces of cytosolic Ca^{2+} content in the indicated cell lines upon 10 μM thapsigargin stimulation (mean $\pm$ SEM). Middle: quantification of the maximal Ca^{2+} signal peaks induced by thapsigargin stimulation (mean $\pm$ SD). Right: quantification of the area under the curve (AUC) from **(a)** (mean $\pm$ SEM). The Ca^{2+} probe R-GECO (R-GECO F/F0) was used to monitor cytosolic Ca^{2+} . Arb. units: arbitrary units. One-way ANOVA followed by Dunnett's tests for multiple comparisons to *A4*^H*A2*^H group; *p*-values (*p*): **(a)** AUC, *A4* – 0.0018; **(b)** AUC, *A4* – 0.0012. ***p* < 0.01; ns, not significant.



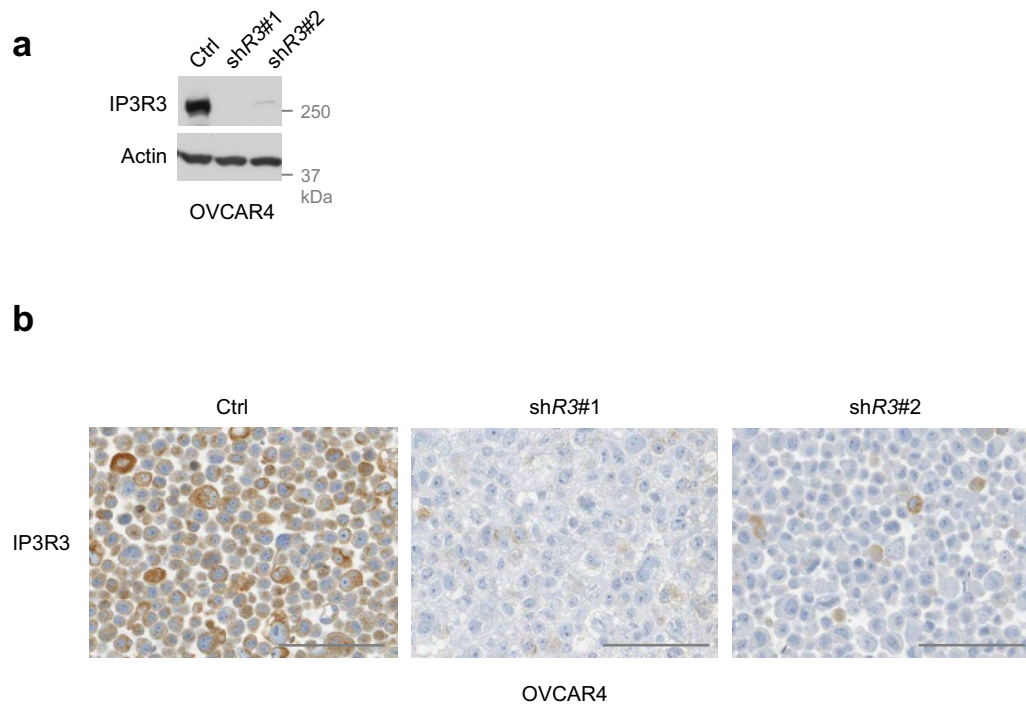
Supplementary Fig. 10 Ectopic expression of *ITPR3* sensitizes SMARCA4/2 deficient cancer cells to cisplatin, related to Fig. 4.

a Immunoblots of H1703 cells with ectopic *ITPR3* expression. **b** Colony formation of H1703 cells with ectopic *ITPR3* expression cultured with indicated cisplatin treatments. Cells were fixed and stained 18 days after plating. Drugs were refreshed every 3 days. **c** Immunoblots of BIN-67 cells with ectopic *ITPR3* restoration. **d** Colony formation of BIN-67 cells with ectopic *ITPR3* expression cultured with indicated cisplatin treatments. Cells were fixed and stained 12 days after plating. Drugs were refreshed every 3 days.



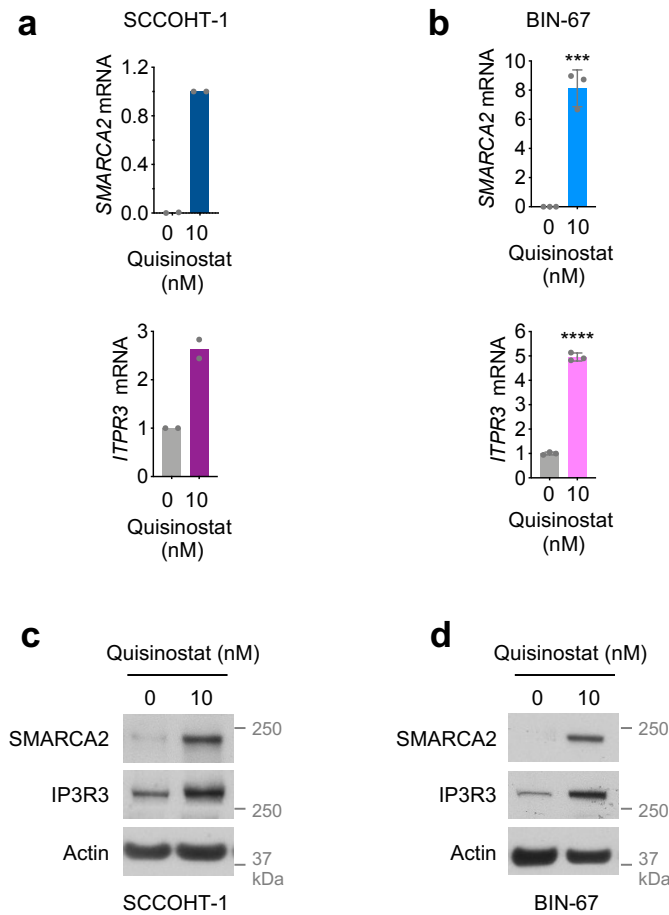
Supplementary Fig. 11 *ITPR3* mRNA expression is reduced in ovarian and lung cancers expressing lower levels of *SMARCA4/2*, related to Fig. 5.

a *ITPR3* mRNA expression in ovarian (left, n=47) and lung (right, n=193) cancer cell lines with differential *SMARCA4* expression. Gene expression data were obtained from Cancer Cell Line Encyclopedia (CCLE) and in Reads Per Kilobase Million (RPKM) ⁵. A4^L: *SMARCA4*^{Low}, cell lines with the bottom quartile of *SMARCA4* expression; A4^H: *SMARCA4*^{High}, the other cell lines. Number of cell lines is indicated in grey. Two-tailed *t*-test, *p*-values (p): left – 0.099, right – 0.0391. **p* < 0.05. Corresponding to Fig. 5a. **b** *ITPR3* mRNA expression in ovarian cancer (Left, n=454), lung adenocarcinoma (LUAD, middle, n=510) and Lung Squamous Cell Carcinoma (LUSC, right, n =496) patient tumors with different expression of *SMARCA4*. Gene expression data were obtained from UCSC Xena and in Fragments Per Kilobase Million (FPKM). A4^L: *SMARCA4*^{Low}, tumors with the bottom quartile of *SMARCA4* expression; A4^H: *SMARCA4*^{High}, the other cell lines. Number of tumor samples is indicated in grey. Two-tailed *t*-test, *p*-values (p): all < 0.0001. *****p* < 0.0001. Corresponding to Fig. 5c. **c** Correlation of *ITPR3* and *SMARCA2* mRNA in LUSC (n=124) patient tumors with low expression of *SMARCA4*. Gene expression data were obtained from UCSC Xena and in FPKM. A4^{Low}: *SMARCA4*^{Low}, patient tumors with the bottom quartile of *SMARCA4* expression. Number of tumor samples is indicated in grey. r, Pearson correlation; p, *p*-value.



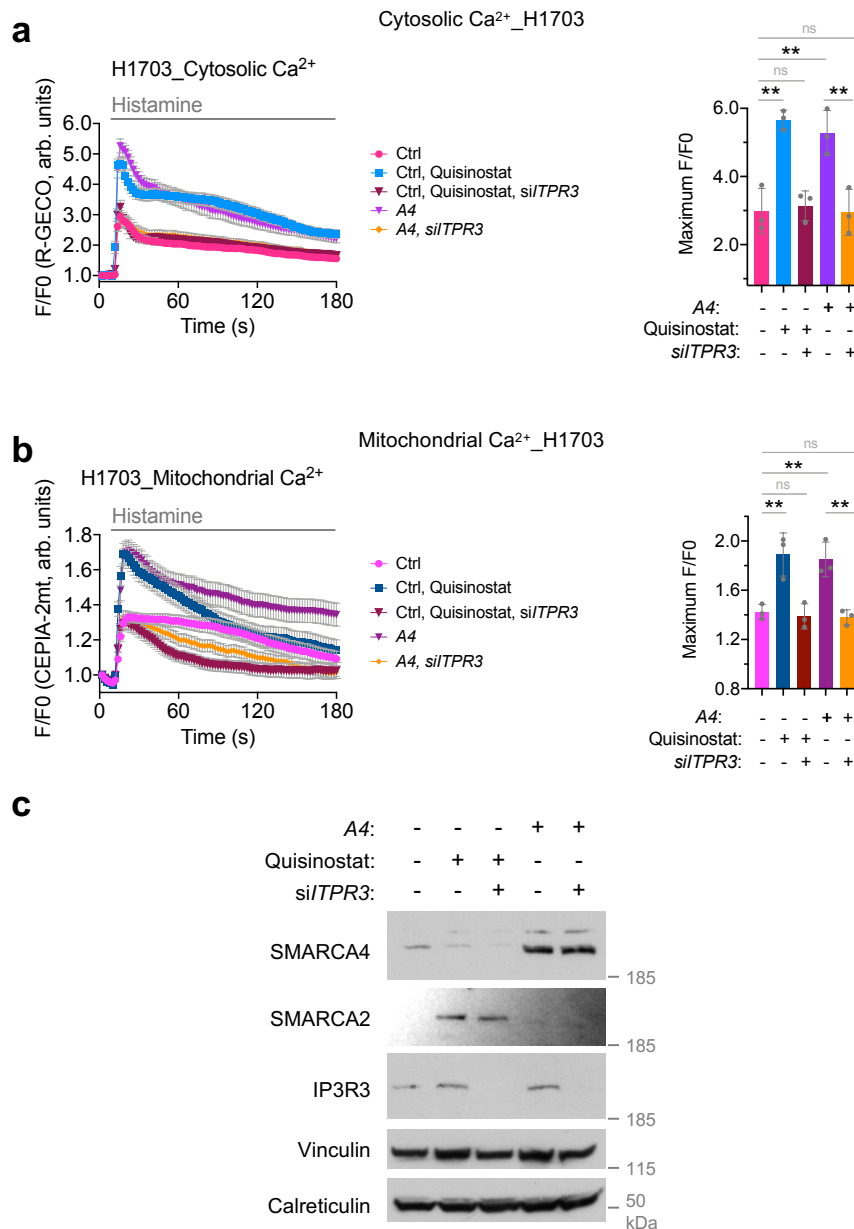
Supplementary Fig. 12 Specificity validation of IP3R3 antibody by shRNA knockdown, related to Fig. 5.

a Immunoblot analysis of IP3R3 protein expression in OVCAR4 cells expressing control vector or shRNAs targeting *ITPR3* (*R3*). **b** Representative images of immunohistochemistry analysis for IP3R3 in OVCAR4 cells described in (**a**). Scale bar, 100 μ m.



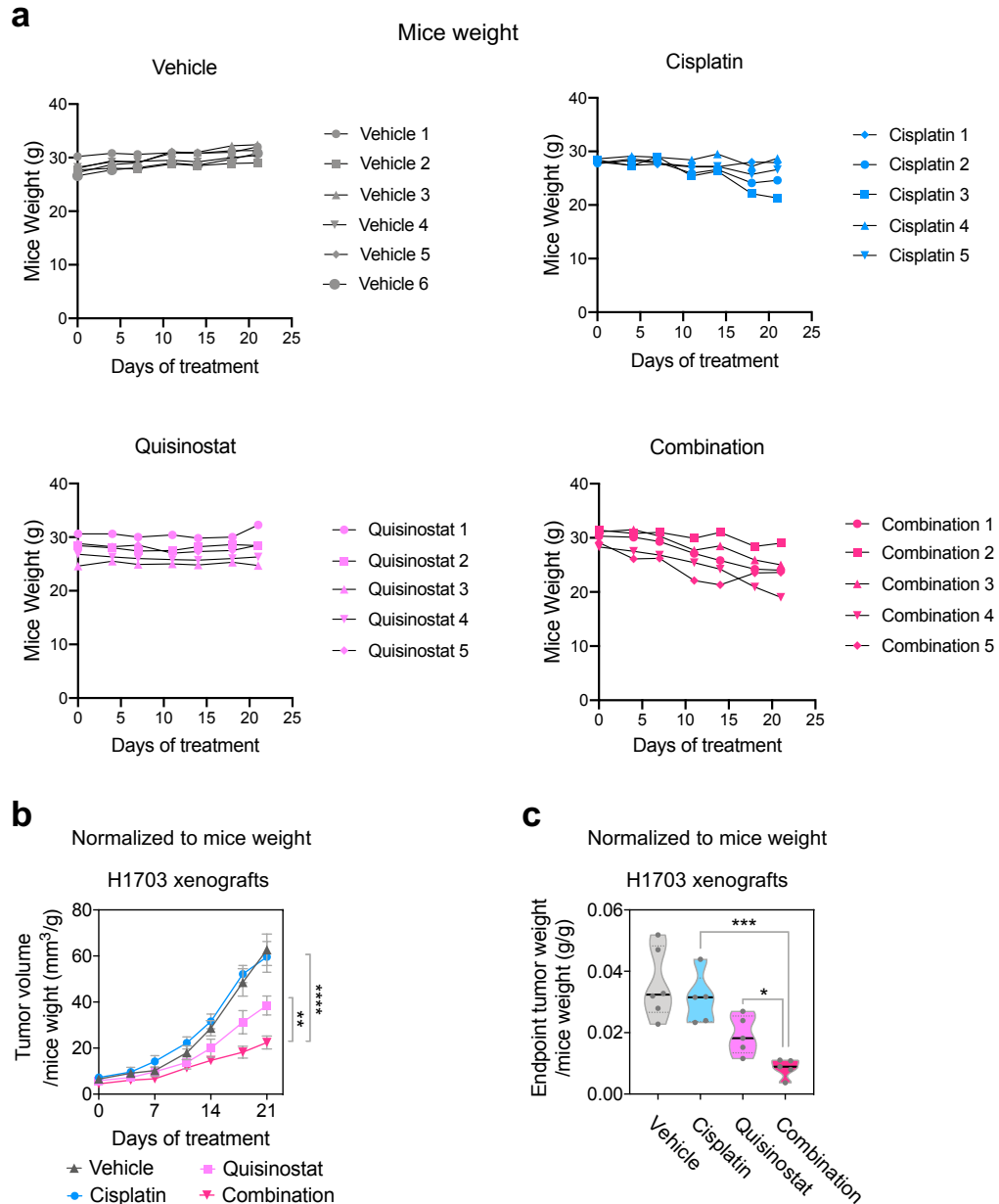
Supplementary Fig. 13 HDAC inhibitor activates *SMARCA2* and *ITPR3* expression in SCCOHT cells, related to Fig. 6.

a, b RT-qPCR measurements of *SMARCA2* (upper) and *ITPR3* (lower) mRNA expression in SCCOHT-1 (**a**) and BIN-67 (**b**) cells treated with quisinostat. Cells were collected 48 hours after the treatment. $n = 2$ (**a**) or 3 (**b**) independent experiments. Mean $\pm$ SD, two-tailed t -test (**b**), p -values (p): Top - 0.0004, bottom <0.0001 . *** $p < 0.001$, **** $p < 0.0001$. **c, d** Immunoblot analysis of *SMARCA2* and *IP3R3* protein expression in BIN-67 (**c**) and SCCOHT-1 (**d**) cells treated with quisinostat for 48 hours.



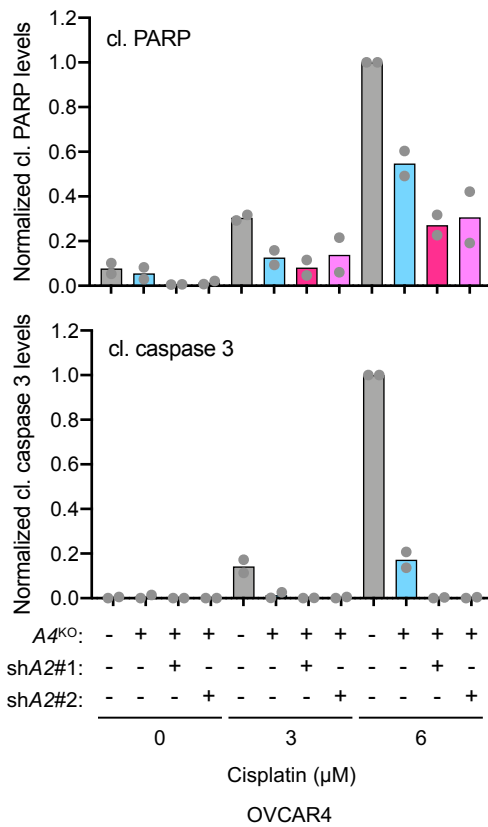
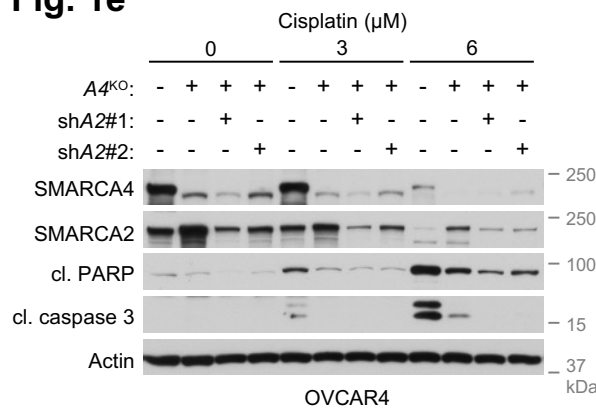
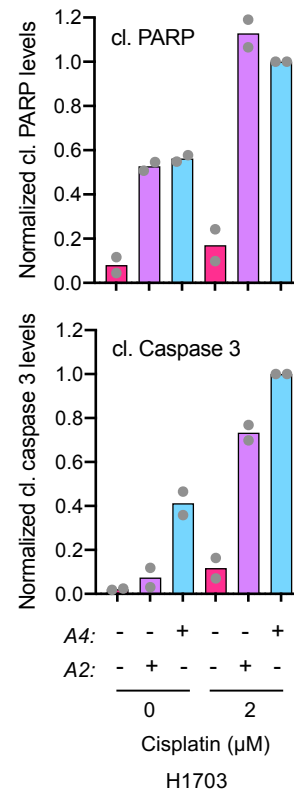
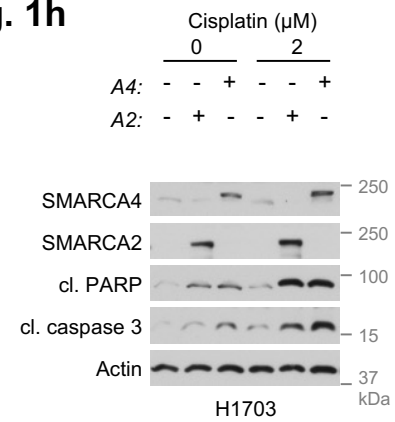
Supplementary Fig. 14 HDAC inhibitor restores Ca^{2+} flux in H1703 cells, related to Fig. 6.

a, b Changes of cytosolic (**a**) and mitochondrial (**b**) Ca^{2+} contents in H1703 cells with indicated *SMARCA4*, *ITPR3* perturbations and quisinostat treatment, upon histamine stimulation. For cytosolic Ca^{2+} , 63 control (Ctrl), 61 Ctrl, quisinostat, 51 Ctrl, quisinostat, siITPR3, 50 *A4* restored, and 53 *A4* restored, siITPR3 cells, from n=3 independent experiments were analyzed. For mitochondrial Ca^{2+} , 50 Ctrl, 51 Ctrl, quisinostat, 58 Ctrl, quisinostat, siITPR3, 52 *A4* restored, and 50 *A4* restored, siITPR3 cells from n=3 independent experiments were analyzed. Quisinostat: 40 nM for 72 hours. Left: traces of cytosolic and mitochondrial Ca^{2+} contents in indicated cell lines upon 100 μM histamine stimulation (mean $\pm$ SEM). Right: quantification of the maximal Ca^{2+} signal peaks induced by histamine stimulation (mean $\pm$ SD). The Ca^{2+} probes R-GECO (R-GECO F/F0) and CEPIA-2mt (CEPIA-2mt F/F0) were used to monitor cytosolic and mitochondrial Ca^{2+} , respectively. Arb. units: arbitrary units. One-way ANOVA followed by Tukey's multiple comparison test, *p*-values (*p*): (**a**) Ctrl vs Ctrl_Quisinostat (Qui) – 0.0013, Ctrl vs Qui_siITPR3 (siR3) – 0.9965, Ctrl vs *A4* – 0.0041, Ctrl vs *A4*_siR3 >0.9999, *A4* vs *A4*_siR3 – 0.0037; (**b**) Ctrl vs Ctrl_ Qui – 0.0045, Ctrl vs Qui_ siR3 – 0.9955, Ctrl vs *A4* – 0.0082, Ctrl vs *A4*_siR3 – 0.9901, *A4* vs *A4*_siR3 – 0.0042. ***p* < 0.01. **c** Immunoblot analysis of the indicated proteins in H1703 cells with indicated *SMARCA4* and *ITPR3* perturbations and quisinostat treatment. Quisinostat: 40 nM for 72 hours.

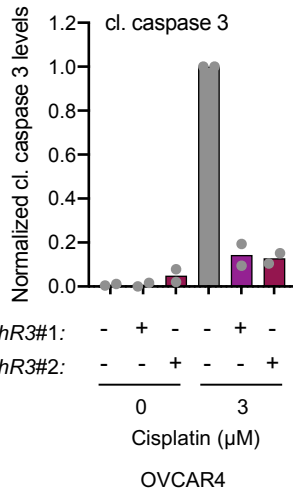
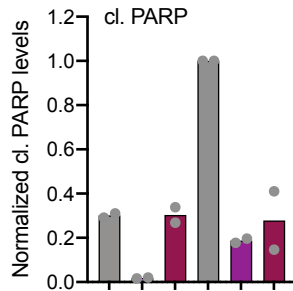
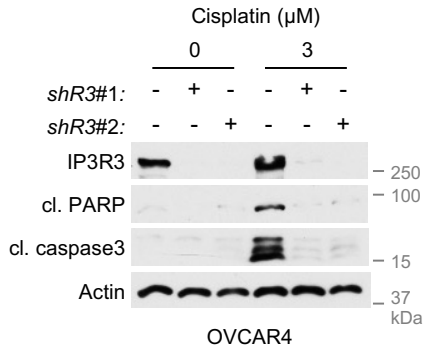
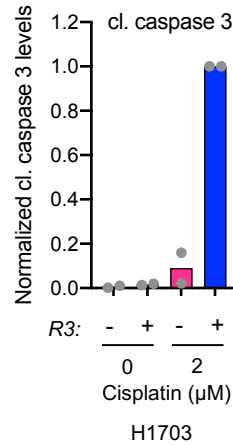
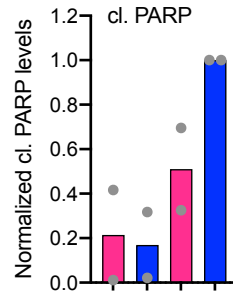
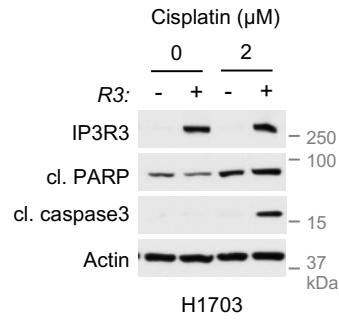
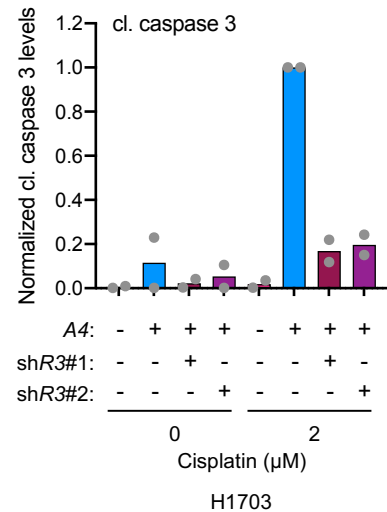
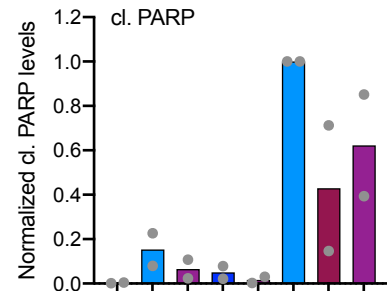
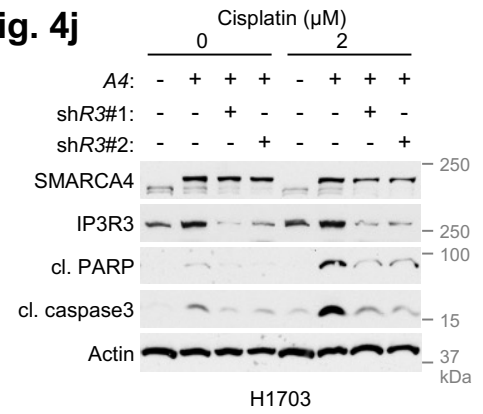


Supplementary Fig. 15 Effects of cisplatin, quisinostat or their combination on tumor growth normalized to body weight of mice, related to Fig. 6.

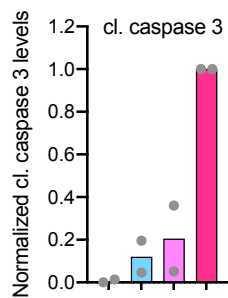
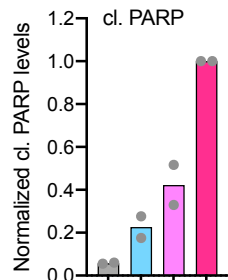
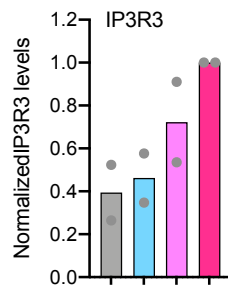
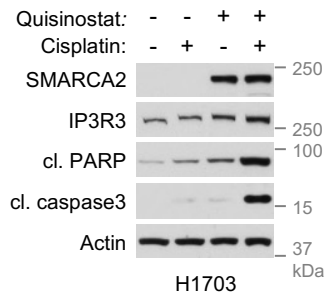
a Body weight of mice in xenograft models of H1703 cells treated with cisplatin, quisinostat or their combination. **b** Tumor growth normalized to body weight in xenograft models of H1703 cells treated with cisplatin, quisinostat or their combination. Mean $\pm$ SEM, vehicle group (n=6 animals), all other groups (n=5 animals), two-way ANOVA, p -values (p): cisplatin <0.0001, quisinostat – 0.0058. ** p < 0.01, **** p < 0.0001. **c** Final tumor weight normalized to body weight at the end point of the experiment. Vehicle group (n=6 animals), all other groups (n=5 animals). One-way ANOVA followed by Dunnett's tests for multiple comparisons to the combination group, p -values (p): lower, cisplatin - 0.0002, quisinostat – 0.0349. * p < 0.05, *** p < 0.001. Corresponding to Fig. 6i.

Fig. 1e**Fig. 1h****Supplementary Fig. 16a Quantification of key immunoblots in Fig. 1.**

The histograms show the quantification of cleaved PARP, cleaved caspase 3 or IP3R3 corresponding to indicated figures. The quantification was performed by ImageJ from n=2 independent representative experiments and normalized to the loading control Actin.

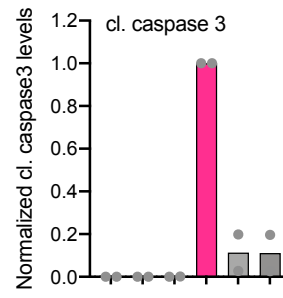
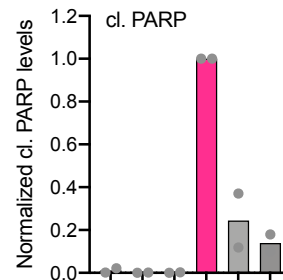
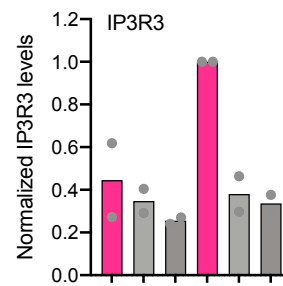
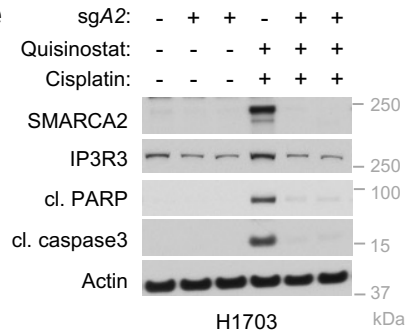
Fig. 4g**Fig. 4i****Fig. 4j****Supplementary Fig. 16b Quantification of key immunoblots in Fig. 4.**

The histograms show the quantification of cleaved PARP, cleaved caspase 3 or IP3R3 corresponding to indicated figures. The quantification was performed by ImageJ from n=2 independent representative experiments and normalized to the loading control Actin.

Fig. 6b

Quisinostat:	-	-	+	+
Cisplatin:	-	+	-	+

H1703

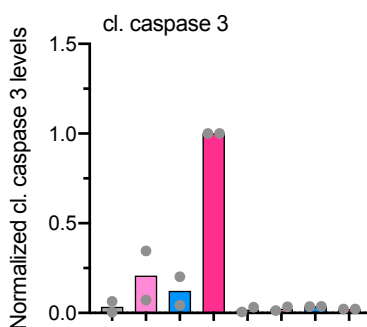
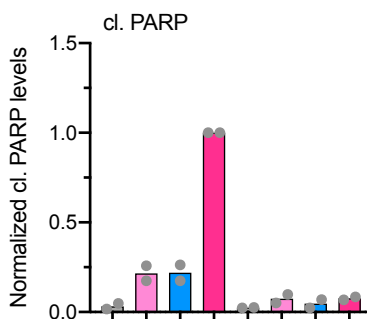
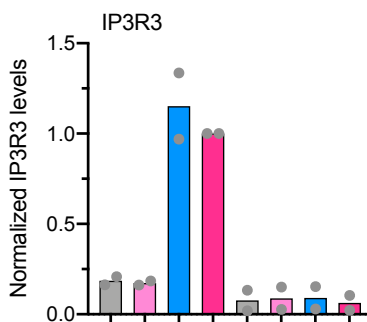
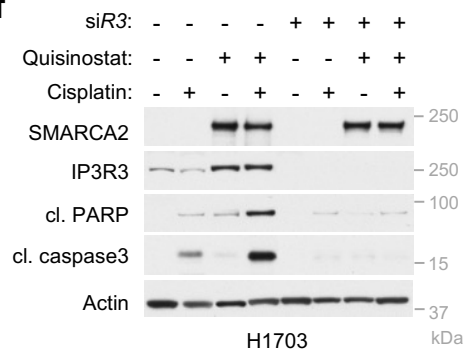
Fig. 6e

sgA2:	-	+	+	-	+	+
Quisinostat:	-	-	-	+	+	+
Cisplatin:	-	-	-	+	+	+

H1703

Supplementary Fig. 16c Quantification of key immunoblots in Fig. 6b, e.

The histograms show the quantification of cleaved PARP, cleaved caspase 3 or IP3R3 corresponding to indicated figures. The quantification was performed by ImageJ from n=2 independent representative experiments and normalized to the loading control Actin.

Fig. 6f

	siR3:	-	-	-	-	+	+	+	+
Quisinostat:	-	-	+	+	-	-	+	+	
Cisplatin:	-	+	-	+	-	+	-	+	

Supplementary Fig. 16d Quantification of key immunoblots in Fig. 6f.

The histograms show the quantification of cleaved PARP, cleaved caspase 3 or IP3R3 corresponding to indicated figures. The quantification was performed by ImageJ from n=2 independent representative experiments and normalized to the loading control Actin.

Fig. 1e

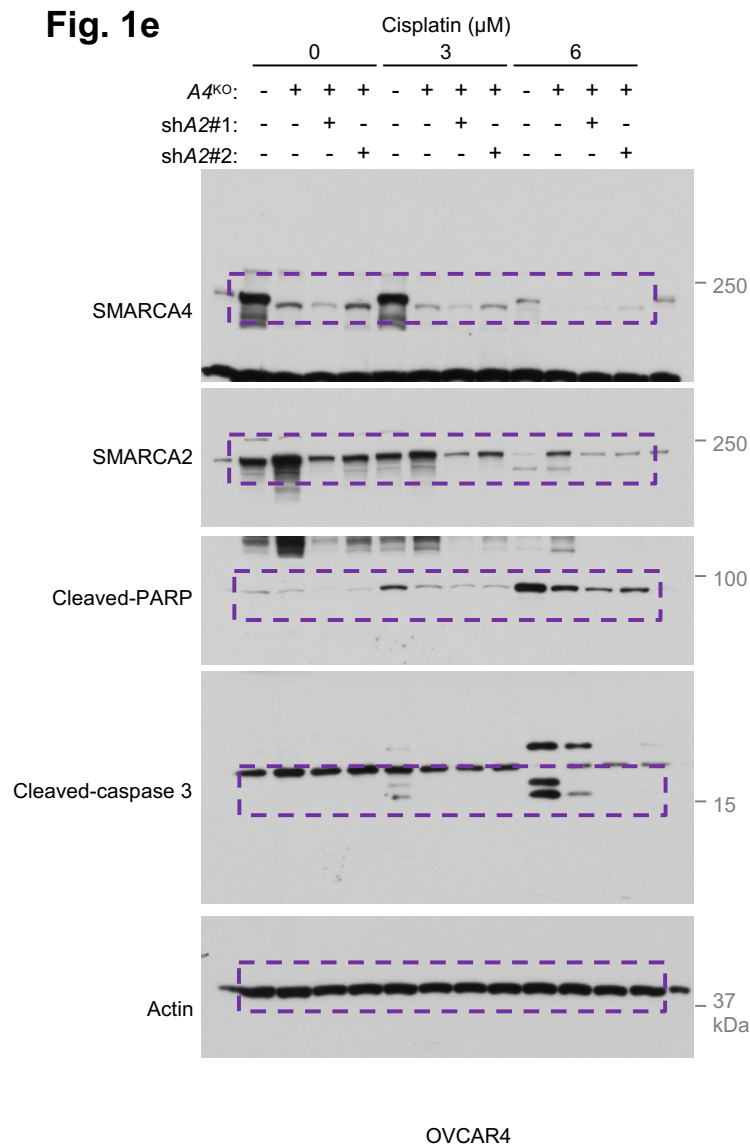
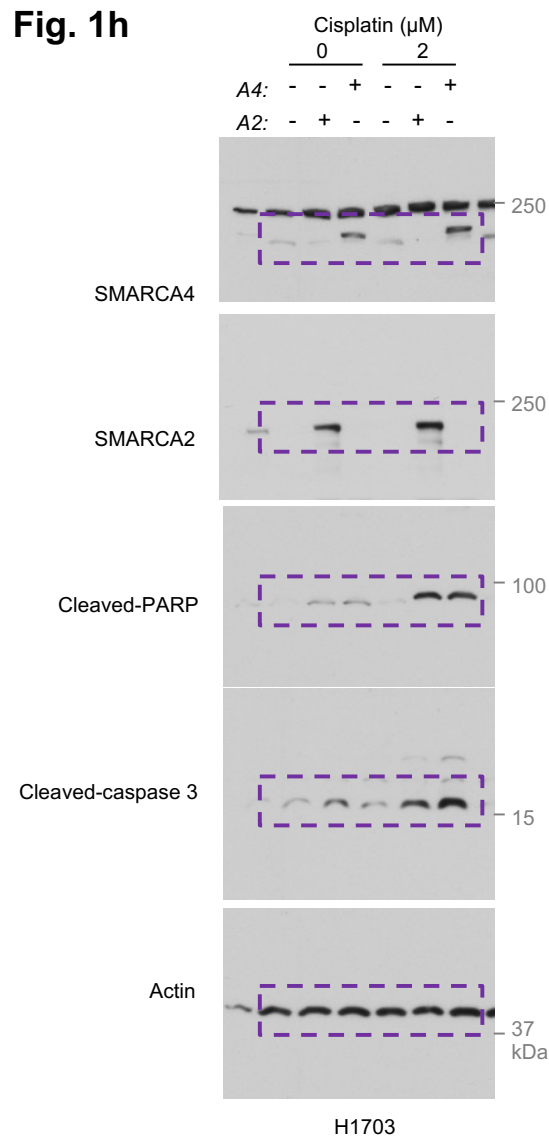


Fig. 1h



Supplementary Fig. 17a Uncropped scans for the immunoblots presented in Fig. 1.

Fig. 2c, f, i

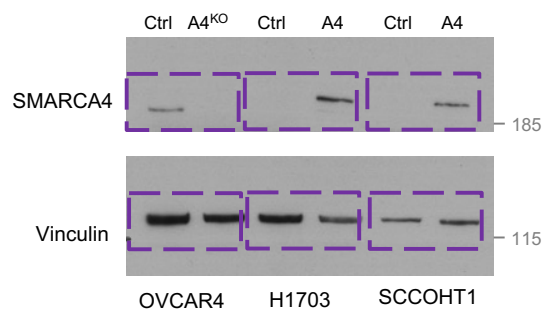
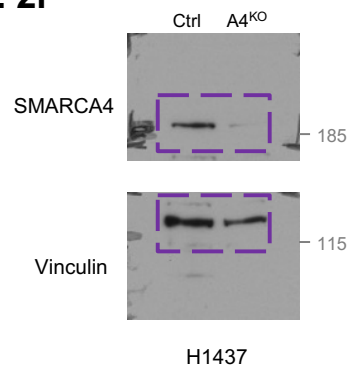
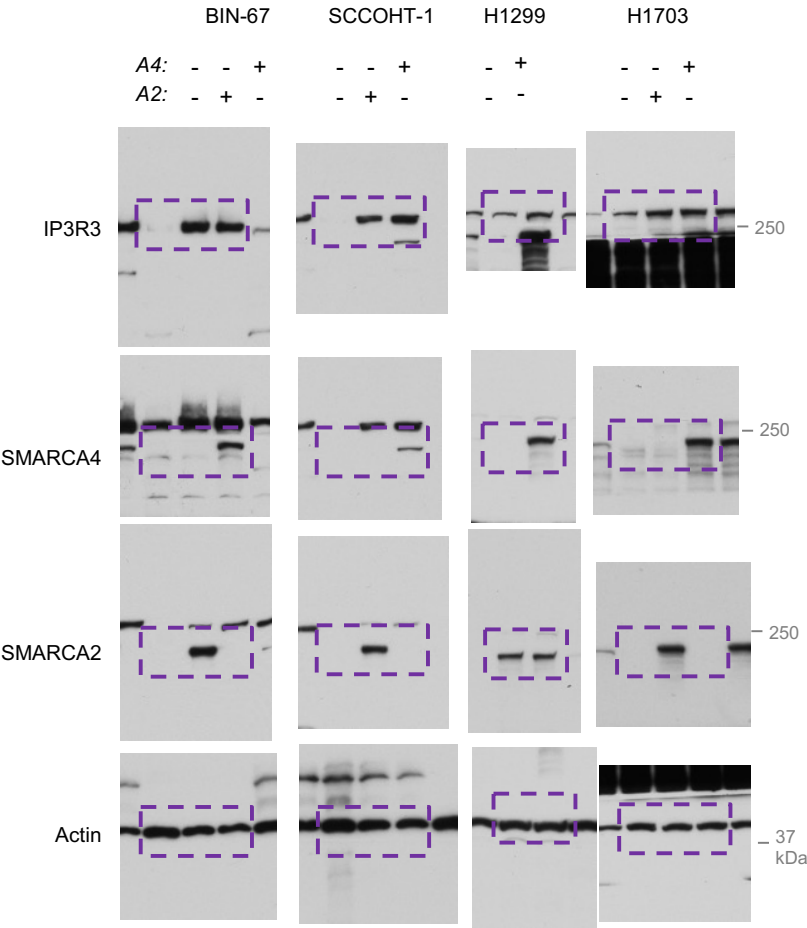


Fig. 2l



Supplementary Fig. 17b Uncropped scans for the immunoblots presented in Fig. 2.

Fig. 3d



Supplementary Fig. 17c Uncropped scans for the immunoblots presented in Fig. 3.

Fig. 4a

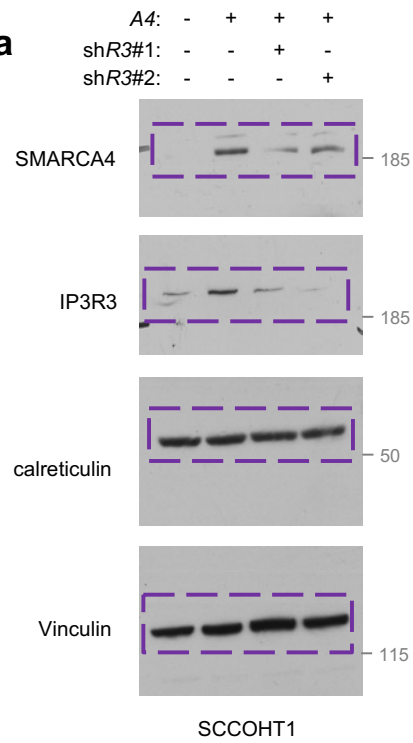


Fig. 4d

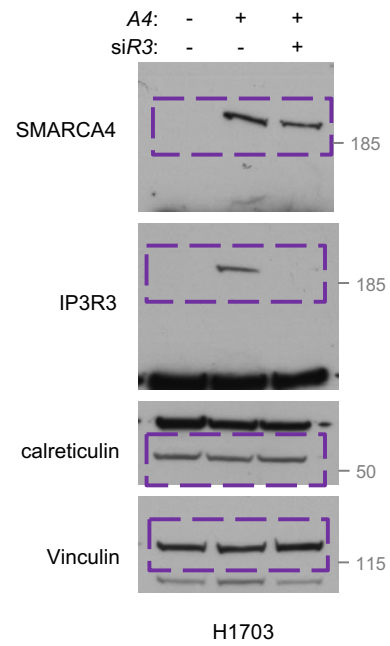


Fig. 4g

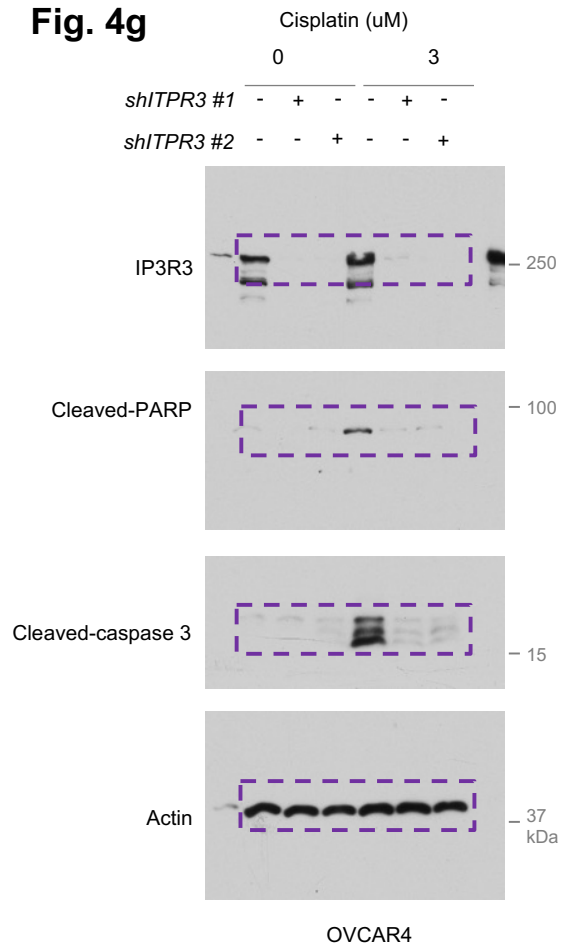
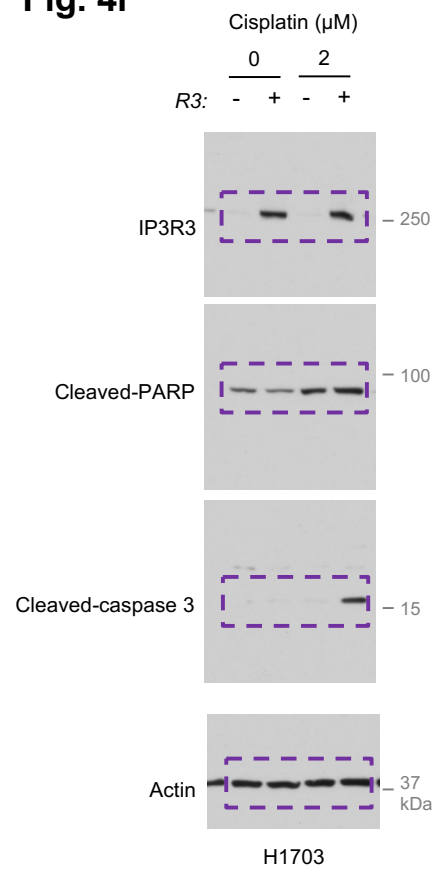
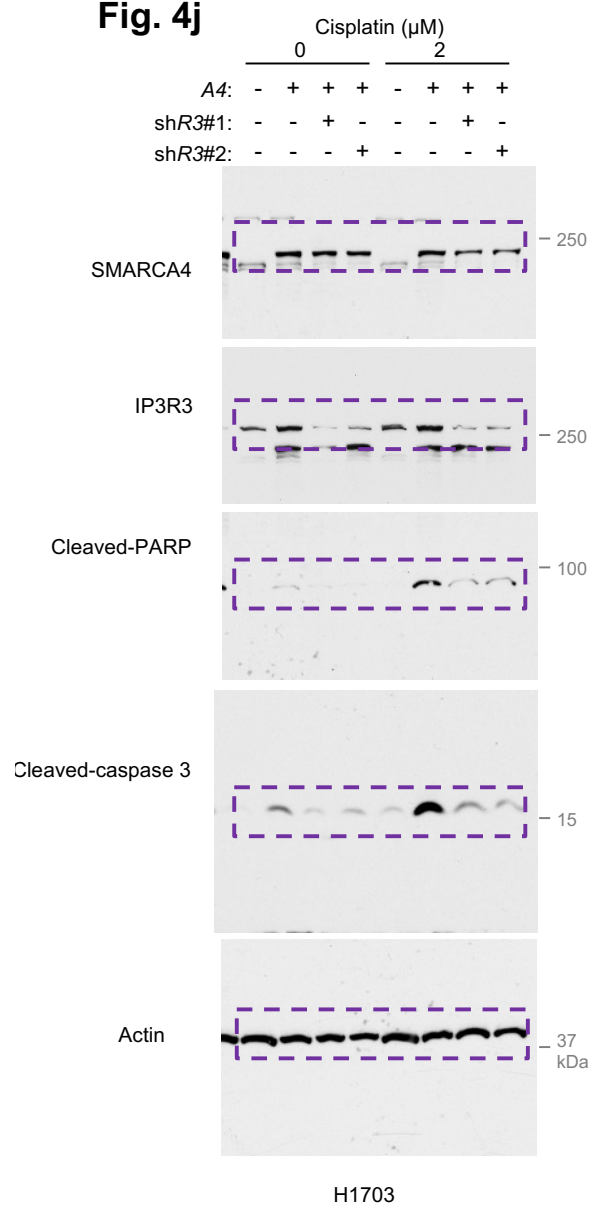


Fig. 4i



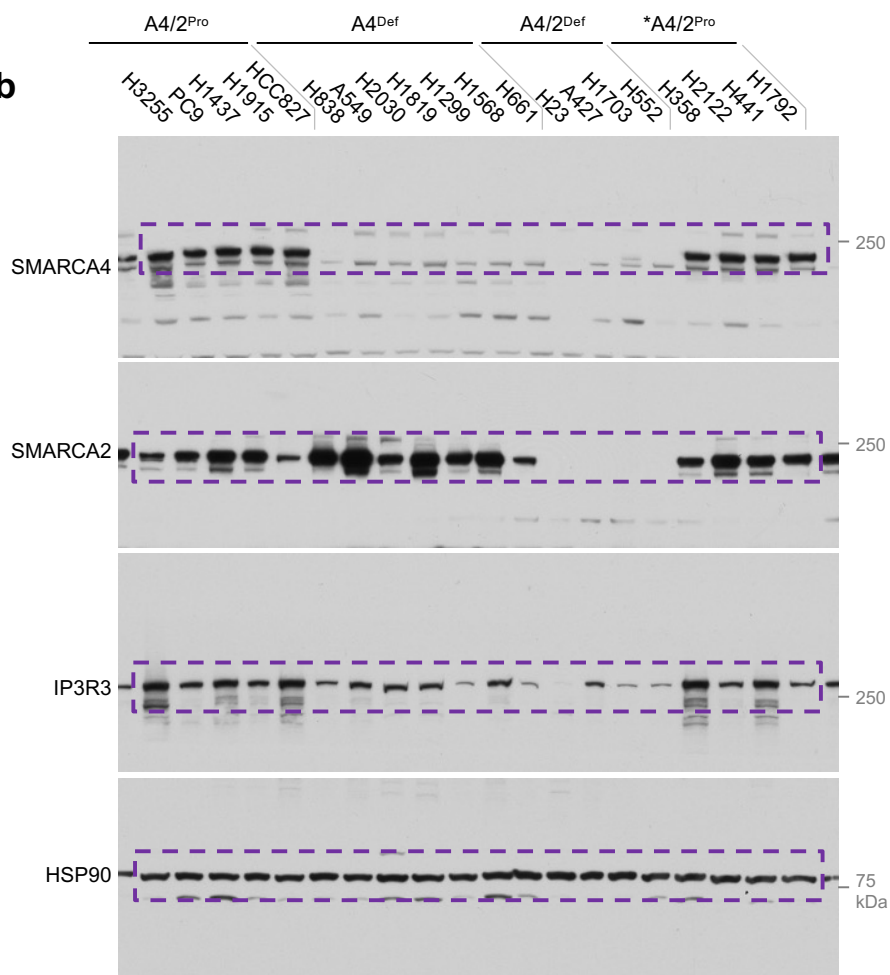
Supplementary Fig. 17d Uncropped scans for the immunoblots presented in Fig. 4.

Fig. 4j



Supplementary Fig. 17e Uncropped scans for the immunoblots presented in Fig. 4.

Fig. 5b



Supplementary Fig. 17f Uncropped scans for the immunoblots presented in Fig. 5.

Fig. 6b

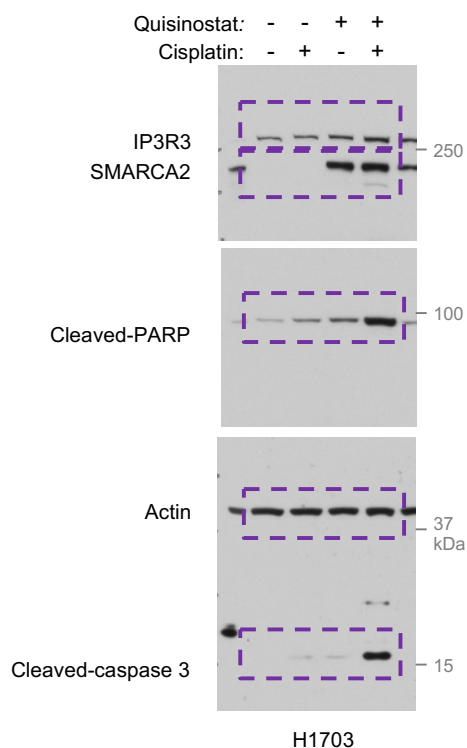


Fig. 6e

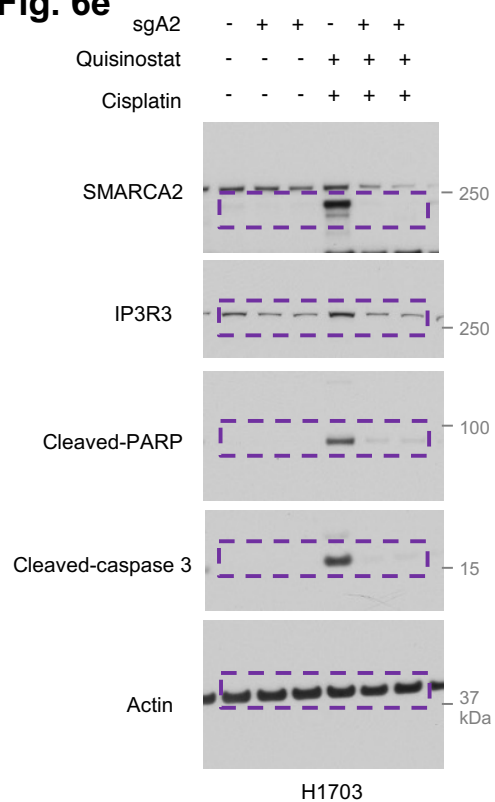
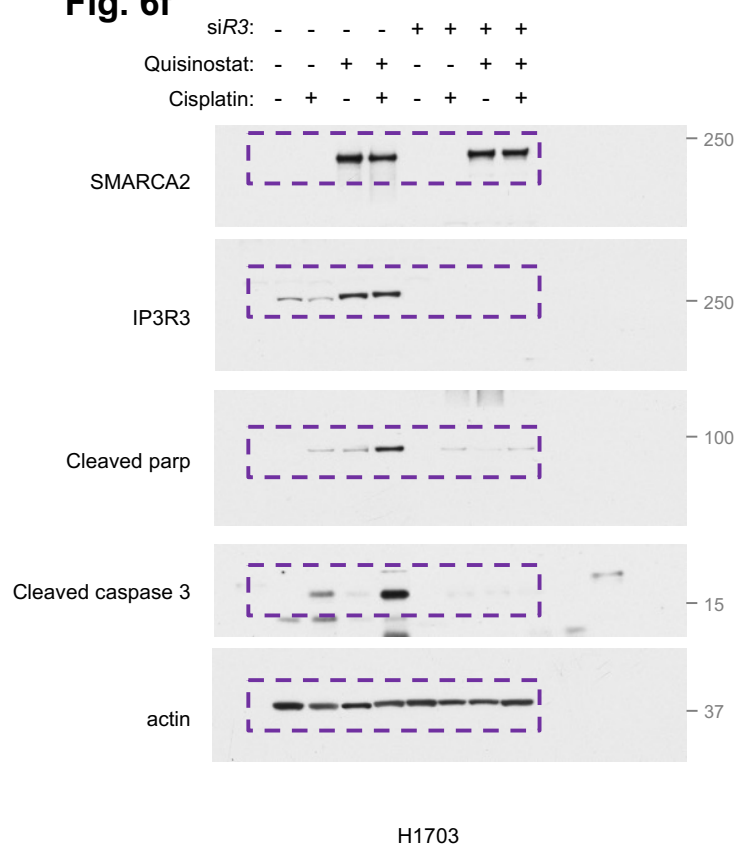
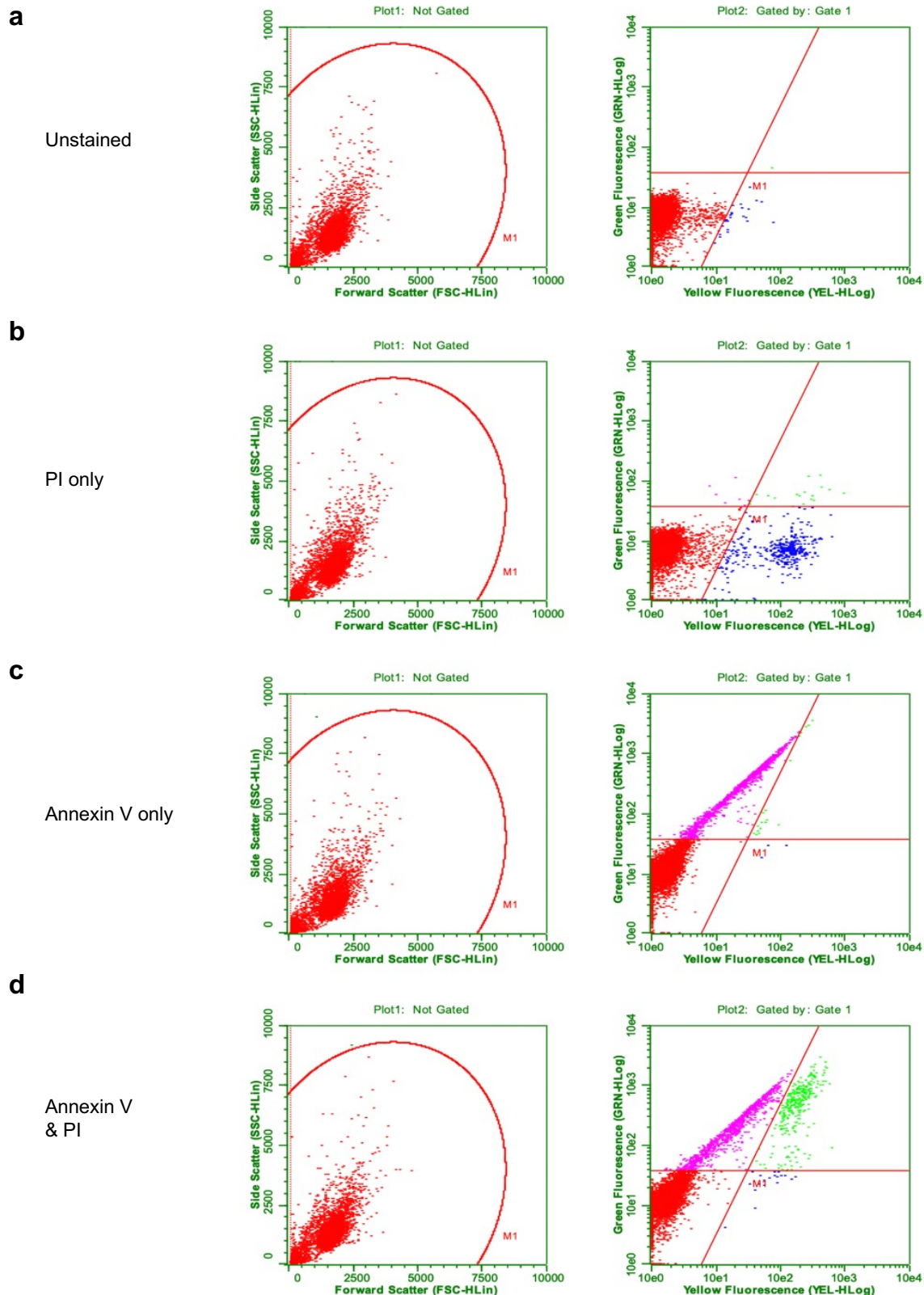


Fig. 6f



Supplementary Fig. 17g Uncropped scans for the immunoblots presented in Fig. 6.



Supplementary Fig. 18 Gating strategy using Guava flow cytometer.

a-d The forward and side scatter gating (left column with the circle) and the fluorescence gating (right column with the 4 quadrants) of H1703 cells from the following conditions: without the addition of annexin V and propidium iodide (PI) fluorescent probes (**a**); with the addition of PI fluorescent probe only (**b**); with the addition of annexin V fluorescent probe only (**c**); with the addition of both annexin V and PI fluorescent probes (**d**). Gating strategy applied to Fig. 1f, i, Fig. 4h, k, Fig. 6c.

Supplementary References

1. Director's Challenge Consortium for the Molecular Classification of Lung A, *et al.* Gene expression-based survival prediction in lung adenocarcinoma: a multi-site, blinded validation study. *Nat Med* **14**, 822-827 (2008).
2. Gyorffy B, Surowiak P, Budczies J, Lanczky A. Online survival analysis software to assess the prognostic value of biomarkers using transcriptomic data in non-small-cell lung cancer. *PLoS ONE* **8**, e82241 (2013).
3. Tang H, *et al.* A 12-gene set predicts survival benefits from adjuvant chemotherapy in non-small cell lung cancer patients. *Clin Cancer Res* **19**, 1577-1586 (2013).
4. Xue Y, *et al.* CDK4/6 inhibitors target SMARCA4-determined cyclin D1 deficiency in hypercalcemic small cell carcinoma of the ovary. *Nat Commun* **10**, 558 (2019).
5. Ghandi M, *et al.* Next-generation characterization of the Cancer Cell Line Encyclopedia. *Nature* **569**, 503-508 (2019).

Supplementary Table 1

Genes (1)	RRA score	Genes (2)	RRA score	Genes (3)	RRA score	Genes (4)	RRA score	Genes (5)	RRA score	Genes (6)	RRA score	Genes (7)	RRA score	Genes (8)	RRA score
EP300	2.67E-09	HDAC1	0.023624	UHRF2	0.090401	AFF1	0.17331	KDM3A	0.28901	BAZ1B	0.42906	NCOA2	0.59619	TADA2A	0.82441
KMT2B	0.0000243	PHF7	0.023885	DPF3	0.092226	ING5	0.17349	SPHK2	0.29206	TDRD10	0.42957	SIRT2	0.59802	LEO1	0.82956
YWHAZ	0.0000436	ARID4B	0.024947	SETDB2	0.093123	ZNHT3	0.17629	SIRT3	0.29661	TAF9	0.43006	BRD9	0.60399	ATAD1	0.83085
KMT2A	0.000064	CDK9	0.025104	SAP18	0.096263	PHF2	0.1777	CHD6	0.29807	TDFP1	0.43157	ELL2	0.60975	KANSL1	0.83338
CARM1	0.0001188	TDRD3	0.025269	TFPT	0.09646	SUZ12	0.18151	PBRM1	0.29963	PRMT6	0.43281	PRMT2	0.61043	LCOR	0.83559
YWHAE	0.0001207	CRB2	0.025654	PCGF5	0.09863	BM11	0.18652	TDRD5	0.30113	NAT10	0.43743	LCORL	0.61411	SIRT1	0.84088
TRIM24	0.00019443	PHF20L1	0.029262	ACTR5	0.099062	CBX1	0.18669	BRWD1	0.3061	SIRT4	0.43833	PRMT5	0.61808	KDM4C	0.85247
BRPF1	0.00019715	TDRD6	0.029703	ATXN7L3	0.099444	HINFP	0.19163	C14orf169	0.30663	L3MBTL2	0.44465	MTA2	0.61816	NCOA6	0.85272
NAA60	0.00066005	TBL1Y	0.030374	ACTL6A	0.10104	SRCAP	0.19185	GLYR1	0.30732	KMT2D	0.45425	PHC3	0.61943	BRD1	0.85493
ATAD5	0.00081299	BAZ2B	0.031043	RCOR3	0.10115	TAF1A	0.19325	NAT8L	0.31001	NAT8	0.45501	PRAME	0.62422	SETD1A	0.86493
SMARCA4	0.0010377	BRDT	0.03147	EAF1	0.10245	RNF40	0.19356	YWHAB	0.31029	JMJD4	0.46917	UBE2B	0.6275	HCFC2	0.8658
SUPT20H	0.0014358	KMT2C	0.033125	BPTF	0.10386	MGA	0.19406	SUPT4H1	0.31051	NAA40	0.47086	CHD1	0.62805	JMJD6	0.86789
TADA1	0.0015269	EZH1	0.0333	SUPT5H	0.10517	NSL1	0.19739	FBXL19	0.31148	CENPA	0.47172	HMG20B	0.62907	CLOCK	0.87307
KDM1A	0.0016866	MBD2	0.033926	BRD2	0.1057	RUVBL1	0.19868	PHF19	0.31988	NCOR2	0.47375	JELLS	0.6335	SMARCD2	0.87314
SMARCA5	0.0018939	E2F6	0.03396	GATAD2A	0.10716	HSPBAP1	0.2004	BCORL1	0.32191	MLLT6	0.47534	HADA3	0.63757	ING4	0.87364
CHORDC1	0.001899	UBE2E1	0.035234	TAF12	0.10754	MSL3	0.20239	RSF1	0.32427	HDAC11	0.47539	ATAD2	0.64007	DNMT3B	0.8803
MEN1	0.0020397	CHD7	0.037429	SETD1B	0.10782	HDAC2	0.20435	HDAC7	0.32919	KDM6A	0.47783	MBD1	0.64046	CDYL	0.88319
TAF5L	0.0021228	KAT6A	0.037756	NRBF2	0.11092	SMYD5	0.20546	USP21	0.33353	RBBP4	0.47999	FBXO11	0.64373	FANCL	0.88406
PHB2	0.002161	KAT5	0.038894	CTR9	0.11115	BCOR	0.20561	SAP130	0.33469	C11orf30	0.48189	NCOR1	0.65683	SCMH1	0.88875
RCOR1	0.0023035	UTY	0.03916	WIZ	0.11252	AFF4	0.20981	UHRF1BP1L	0.33559	MBD3L4	0.48435	PHF21B	0.65906	SUPT16H	0.88903
SMARCA1	0.0023462	BRPF3	0.03976	ELL3	0.11383	DPF1	0.21303	STK31	0.33588	KDM4D	0.48467	SETD2	0.66198	DMAP1	0.9
EED	0.0027557	ARID5A	0.040991	SIRT7	0.11444	MORF4L1	0.21386	MLLT3	0.3373	TTF2	0.48612	JADE1	0.66546	NOC2L	0.9067
PRMT7	0.0027997	SMARCAL1	0.041069	CBX2	0.11504	PRMT8	0.21589	ATRX	0.33898	POLD3	0.48647	MBD3L5	0.66948	MSL1	0.91042
PAD12	0.0028217	SUPT7L	0.041336	EHMT1	0.11532	SUV420H2	0.21619	WAC	0.34064	MBIP	0.48761	CBX3	0.67313	UHRF1BP1	0.91173
ASH1L	0.0037223	KDM4B	0.04158	PHF5A	0.11583	NAT14	0.21918	RNF20	0.34321	PWWP2B	0.48781	KDM5C	0.67765	PADI3	0.91752
RAD54B	0.0049241	PHF12	0.04176	AEBP2	0.11598	NCOA7	0.22146	RBBP5	0.34638	EAF2	0.48894	MYSM1	0.6784	SMYD4	0.91796
PHC1	0.0050188	SMARCE1	0.043411	EP400	0.11953	DDX59	0.22352	NFRKB	0.35025	YWHAG	0.48968	CDK2AP1	0.67915	BRD7	0.91883
SAP30	0.0051789	WDR5	0.044249	INO80	0.12	ANP32A	0.22745	KDM5D	0.35053	ATAD3A	0.49552	CHD8	0.68063	PHF11	0.91951
VPS72	0.0065217	ARID4A	0.054749	USP16	0.12062	PHF10	0.23104	GTF3C4	0.35411	NAA50	0.49709	PAD14	0.68122	NAA15	0.92076
SFMBT2	0.0070212	KDM2A	0.048604	SKP1	0.12325	TET2	0.23124	ATXN7	0.35762	FBXO10	0.50221	ELL	0.68434	CHD5	0.93168
ZBTB4	0.007139	PHF3	0.048687	RNF17	0.12343	FXR1	0.23464	INO80E	0.36067	PCGF2	0.50517	RAD54L	0.68507	CXXC1	0.94424
UHRF1	0.0072372	TAF1	0.050208	ARID3A	0.12467	NUP98	0.23674	L3MBTL4	0.3618	BRD3	0.50933	KMT2E	0.70481	SMARCD1	0.94812
KAT7	0.0096453	ACTR6	0.05149	SUV39H2	0.12695	MBTD1	0.23729	HDAC6	0.36189	ZBTB38	0.50991	PHF8	0.70666	CECR2	0.95108
DOT1L	0.010117	KDM1B	0.0527	USP22	0.13128	CCNT1	0.2398	PHF13	0.36439	CDYL2	0.51365	CRB1	0.70674	SMARCC2	0.95668
CXXC4	0.010334	HAT1	0.052729	ING2	0.13294	ZCWPW1	0.24183	SUV39H1	0.36551	L3MBTL3	0.51446	MBD3	0.70722	NCOA5	0.95931
SDN1	0.010334	PCGF6	0.053682	NAT9	0.13685	CTBP1	0.24306	TRDMT1	0.36732	AIRE	0.51966	FXR2	0.71255	HDAC5	0.96278
TET3	0.010514	INO80B	0.054319	PHF20	0.13711	CDY2B	0.24664	CHD2	0.37352	MORF4L2	0.52287	PAGR1	0.71792	CBX7	0.96405
CREBBP	0.0115	HCFC1	0.054626	SMARCA2	0.1373	MTA3	0.24667	WDR61	0.37485	DPF2	0.53133	DCAF4	0.72078	BAZ2A	0.96598
EPC1	0.012459	DNMT3A	0.054695	MBD4	0.13935	RAD54L2	0.24775	WDR82	0.37831	TDRD12	0.53187	YEATS2	0.72328	MCRS1	0.97371
MTA1	0.012602	KDM5B	0.055097	ENY2	0.14003	ATAD3B	0.24778	JARID2	0.37959	ZZZ3	0.54046	NCOA1	0.72417	CSNK2A2	0.97445
MBD5	0.013244	ZNF217	0.0564	MLLT1	0.14141	INO80D	0.24878	SUPT3H	0.38559	DNMT1	0.5407	ACTL6B	0.74157	UBE2A	0.97874
DNMT3L	0.013415	WDR48	0.056479	KAT6B	0.14306	RYBP	0.24937	TDRKH	0.38628	SFMBT1	0.54378	TDRD7	0.74334	PHF1	0.98182
MEAF6	0.014396	PHC2	0.058132	CHD3	0.14487	DPY30	0.25265	BRD8	0.38766	LRWD1	0.54739	PRMT3	0.74591	ATAD3C	0.98261
PRDM2	0.014788	KDM3B	0.062656	NAT6	0.14515	SMYD1	0.25308	JMJD1C	0.3901	ARID5B	0.5474	PHF23	0.74984	HDAC3	0.98294
ARID3B	0.015059	MTF2	0.064419	NRIP1	0.14586	TBL1X	0.25627	ACTR8	0.39164	YEATS4	0.54799	CXXC5	0.74986	JADE2	0.98339
SMARCB1	0.015464	PAXIP1	0.065585	ARID1B	0.1496	NCOA4	0.25755	ZNHT2	0.39209	SMARCC1	0.54888	GMPS	0.75073	GPS2	0.98466
TDRD9	0.015905	CDY1B	0.065684	TDRD1	0.14973	SIRT6	0.25775	CSNK2A1	0.39216	SMARCD3	0.55983	PHF14	0.75108	UHL5	0.98725
SIN3A	0.016107	TAD43	0.066542	USP11	0.14976	WHSC1L1	0.25935	ARID2	0.39297	CDC73	0.57457	CBX4	0.75432	HDAC10	0.98725
CHD4	0.016158	CRB3	0.067422	SETD7	0.15103	KDM8	0.25996	PADI1	0.39429	MAX	0.57475	POLE3	0.7548	SCML2	0.98879
JMJD8	0.016368	PRMT9	0.067675	PRMT1	0.15123	MECP2	0.26181	KDM7A	0.39693	RUVBL2	0.57553	PRR15L	0.75942	SET	0.99027
L3MBTL1	0.01751	EZH2	0.068998	ARID1A	0.15263	BTAF1	0.26576	SIN3B	0.40119	MLLT10	0.57562	SMARCAD1	0.77594	UBE3A	0.9908
HDGFL1	0.018293	ING3	0.071441	ARID3C	0.15274	EHMT2	0.2689	NAT8B	0.40175	PHF6	0.57682	KAT8	0.77965	HLTF	0.99258
MBD3L1	0.018758	SUV420H1	0.072673	ZNHT1	0.15447	RNF2	0.26968	NAA16	0.40371	DZIP3	0.57736	RING1	0.78038	TRRAP	0.99356
KDM6B	0.018768	YWHAB	0.073256	KDM5A	0.15466	BAZ1A	0.27001	ING1	0.40529	MBD3L2	0.57829	SUDS3	0.7831	NSD1	0.99472
TAF6L	0.019043	SSRP1	0.074081	MRGBP	0.16477	CBX6	0.27026	SMYD3	0.40686	TP53BP1	0.58025	REST	0.78397	USP3	0.99496
CHRAC1	0.019436	PHF21A	0.07466	RBBP7	0.16777	KDM2B	0.27358	PWWP2A	0.40765	SIRT5	0.58057	WHSC1	0.78516	MSL2	0.99544
YAF2	0.020094	SMYD2	0.074694	DR1	0.16832	ZCWPW2	0.27654	HDAC4	0.40797	TET1	0.58361	CHD9	0.78694	CBX5	0.99641
ZNHT6	0.020252	MDC1	0.074928	BRD4	0.16929	RCOR2	0.28156	JMJD7	0.40844	KDM4A	0.5844	SETD8	0.79082	NAA30	0.99792
MBD3L3	0.020783	PAF1	0.078495	CCDC101	0.171	KANSR2	0.28401	PCGF3	0.41498	CTBP2	0.58684	RTF1	0.79904	PCGF1	0.99928
HDAC9	0.021183	CBX8	0.085586	KAT2A	0.17101	NCOA3	0.2856	NAA20	0.41868	KAT2B	0.58785	ZBTB33	0.80413	TBL1XR1	0.99988
PADI6	0.02159	MBD6	0.086573	HDAC8	0.17104	GATAD2B	0.28757	USP7	0.42121	KANSL3	0.59169	ASH2L	0.80426		
YWHAQ	0.023306	TAF10	0.088651	CSRP2BP	0.17183	SETDB1	0.28802	INO80C	0.42333	ERCC6	0.59355	SFN	0.8084		

Supplementary Table 1

Ranking of genes by robust rank aggregation (RRA) scores in a CRISPR screen with OVCAR4 cells treated ± cisplatin (100 nM). Cisplatin was refreshed every 3 days for 11 days before harvesting. Data was analysed by the MAGeCK statistical software package. See also Source Data.

Supplementary Table 2

SCCOHT-1_A4_Ca²⁺-related_genes

CASQ1	MYL4	FSTL1	SLIT1	LRP1	RYR3	TRPA1	SLC6A4
SPOCK1	HMCN2	MAN1A1	GNPTAB	KCNK3	GRID1	SLC6A7	SLC6A6
S100A14	ANXA10	TRPM2	PLCH2	SLCO2A1	ANO2	ABCA1	SLC9A7
S100A9	EGF	ANXA2P2	PLS3	ATP1A2	ATP8A1	SLC45A3	CACNA1S
THBD	FAT2	CLGN	DGKA	ABCC3	ATP2B3	GRIN3A	TRPC6
GJB2	SVEP1	ANXA2	ACTN1	SLCO2B1	CLDN4	CFTR	SLC6A20
S100A3	HEG1	RASEF	CIB4	CNGA3	LRRC38	SLC22A13	SLC22A3
PRSS3	RASGRP1	EFHD2	LPCAT2	KCNK12	SLC6A15	SLC51A	SLC8A3
CDHR4	DUOX2	MYO5A	EGFL6	ATP1A4	SLC20A1	SLC12A3	SCN4A
CACNA1E	PCDHGC5	SLIT3	ARSA	GABRE	SLC3A1	SLC28A3	SLC16A2
PADI3	VCAN	CDHR2	SGCA	GRIN2A	SLC1A7	CACNA1D	
DYSF	CDH16	PLS1	MYL9	SCN5A	SLC26A8	TRPC3	
MGP	PITPNM3	RHBDL3	CAPN14	AQP1	SLC4A1	KCNN4	
CLSTN2	DLK1	CAPN8	CBLB	PDE2A	KCNK9	KCNG1	
LTBP1	DNER	NELL1	CUBN	HTR3C	KCND3	KCNQ5	
ADGRE2	ENPP2	GSN	EPDR1	SLC18A3	SLC37A2	SLC1A3	
S100A16	DUOX1	PKD1L2	CAPN3	KCNK1	NIPAL1	SLC2A1	
FBLN5	RET	ANXA9	CDH24	CHRNA9	KCNF1	JPH2	
CALB2	NECAB1	FBLN2	S100A10	CLCA2	ATP2B4	HPN	
FBN1	MEGF6	CIB3	RASGRP3	ADAMTS8	SLC9A1	GABRR2	
CRB2	LTBP2	SNCB	LRP1B	ATP8B1	CACNA1C	FXYP4	
MYL10	OIT3	ASPH	CALML3	SLC7A8	ANO9	SLC22A5	
PAMR1	MAN1C1	SELL	TTN	NIPAL4	KCNC4	SLC16A1	
JAG1	CRTAC1	PPP3CA	NOTCH2	SLC22A4	KCNE5	SLC34A2	
THBS2	RAB44	PKDREJ	PLCZ1	ANO4	LRRC8C	SLC37A1	
PADI4	EHD4	SPOCK2	SYT1	CALHM1	CLCN1	ATP1B1	
ANXA8	LPL	NID2	CLEC3B	KCNMA1	SLC11A1	SLC19A2	
FAT3	ANXA13	NOX5	PADI6	APOL1	GABRA2	SLC16A12	
CAPN11	LTBP3	GCH1	RCN3	CEACAM1	CACNA1I	PKD1L1	
LOXL2	MYL2	CIB1	NCS1	SLC51B	ITPR2	SLC6A17	
THBS1	HSPG2	DLL1	PCDH11X	SLC7A4	SCNN1B	TRPV2	
RPTN	S100A13	CABP1	DST	SHROOM2	SLC44A1	SLC36A2	
S100A4	S100A1	DGKB	PCDH20	SCNN1A	SLC5A3	SLC6A3	
MATN2	PRRG4	NKD1	MMP12	GABRQ	GRIA1	KCNK5	
PCDH12	CAPN2	REPS2	PLA2G4A	ANO1	SLC13A4	KCNAB1	
MYL7	HPCAL1	EHD2	EDEM1	CACNA1G	FXYP3	SLC38A4	
FSTL4	CDHR1	FBN2	EYS	SLC9A9	SLC22A16	ABCC2	
DNASE1L3	KCNIP2	RASGRP4	PLSCR4	P2RX6	P2RX1	CACNG6	
S100A2	S100A6	HPCAL4	AGRN	KCNK13	ANKH	SLC28A1	
ANXA3	PLCB4	CRACR2B	SULF2	KCNH1	SLC30A3	ATP2B1	
DGKG	VSNL1	CALN1	PLCD4	LRRC8E	KCNE1	KCNA10	
SPARC	BMP1	MATN4	ENPP1	SLC38A3	OTOP2	SLC8B1	
SCUBE3	NOTCH4	CDH2	PCDHA2	SLC13A2	CACNB4	CLIC4	
TGM3	HMCN1	C1R	CPNE6	SLC2A9	SLC34A3	SLC5A1	
EDIL3	NPNT	EPS15	CALM2	SCN2A	ITPR3	SLC4A4	
MCTP1	CCBE1	RGN	TPM4	ASIC2	SLC4A9	SFXN3	
EGFLAM	ADGRE5	PAM	CABP4	CATSPER1	RHBG	SLC45A2	
EHD1	EFHC2	ACTN4	PCDHA10	KCNQ3	BEST1	SFXN5	
SMOC1	ADGRV1	UMODL1	ALOX15B	TMEM37	SLC1A2	SLC6A9	
S100A5	VWA2	CLSTN3	OCM	SLC26A9	AZIN2	SLC30A1	

BIN-67_A4_Ca²⁺-related_genes

FAT2	EGFL6	SLIT3	PCDHA12	SLC2A1	CACNA1S	KCNK1
F7	MMP12	ALOX15B	ACTN1	NIPAL4	KCNMA1	SLC22A16
S100A3	OTOF	CRTAC1	DHH	LRRC38	CACNA1I	LRRC26
CLEC3B	ANXA3	PCDHGC4	MEGF6	HTR3A	CACNG6	CNNM4
RPTN	SUSD1	PCDHB15	S100A13	ATP8B1	SLCO3A1	CLCN1
CAPN8	PRF1	ENPP2	CALN1	SLC6A20	GABRR2	KCNJ8
S100A14	FSTL4	MATN3	DLK2	CNGA3	TMEM37	KCNB1
S100A16	DYSF	PKD2L2	SCUBE2	ITPR3	KCNJ12	SLC22A1
SPARC	PAMR1	RYSR1	REPS2	CHRNA9	SLC6A19	CLCA1
CDHR4	ANXA1	TTYH1	ANXA2	SCNN1B	SLC6A6	GRIN3B
S100A9	THBD	CASQ2	SMOC1	SLC9A3	KCNA4	CHRNE
SPOCK1	NECAB2	S100A10	KCNIP2	SLC13A4	SLC13A3	ADAMTS8
CRB2	PKDREJ	EGFLAM	S100A11	CLIC5	SLC5A5	SLC4A11
MYL2	HEG1	DNASE1L3	PCDHGA10	SLC2A9	SLC38A3	GRIN2B
RASGRP4	PCDHAC1	EHD4	PITPNM2	SLC18A3	SLC23A1	P2RX6
FLG	LTBP2	TPO	PCDHA13	ATP6V1B1	ANO4	SLC13A1
ANXA8	ACTN4	DAG1	SVEP1	ANO2	CLIC4	CHRNA1
MYL3	NAALADL1	TTN	CRELD1	CLCA2	P2RX3	PDE2A
NID2	HMCN2	ANXA13	PCDHGC5	LRRC8E	SCNN1G	TTYH3
AOAH	CRNN	EGF	VIL1	CLIC3	ABCA1	KCNAB2
S100A4	TNNC1	S100A1	CDH23	SLC51A	KCNJ5	KCNK10
FBLN2	TRPM2	PCDH1	CAPN3	SLC6A12	KCNK6	ASIC2
CAPN9	MATN2	SMOC2	HRC	SLC22A7	SLC31A2	CLCNKA
PADI1	MYLRF	PCDHA11	DLK1	SLC37A2	ITGAV	RYSR3
S100A2	FSTL1	PKD1L2	AIF1	SLC7A4	SLC6A2	SLC44A2
CASQ1	DLL4	CAPS	SLC26A9	SLC28A1	GRIN2C	LRRC8D
CACNA1E	FBN1	CABP4	GABRE	CNGB1	P2RX7	SLC52A1
ANXA9	S100P	THBS4	CEACAM1	KCNA10	MFSD2A	GAS6
PITPNM3	ADGRE1	MAN1C1	SLC12A3	SLC10A6	SLC26A4	KCNQ3
MYL10	ACTN3	ADGRL4	SLC5A1	CATSPER1	ATP1B2	KCNE5
MYL4	CIB3	NID1	KCNK3	TMEM30B	AZIN2	SLC17A2
SELP	SPOCK2	EHD1	KCNE1	SCN4A	CACNG7	SLC39A4
CLSTN2	VWA2	CDH24	JPH2	BEST2	KCND3	ATP1A1
OC90	SGCA	PCDHA10	SLCO2B1	HPN	GRID1	ANO6
CDH16	VWCE	ANXA4	KCNN4	KCNH1	BEST1	SLC25A29
DGKG	BMP1	FBN3	FXYP4	ANO9	SLC1A2	ATP1B1
CAPN11	EHD2	PCDHGA12	AQP1	ATP1A2	LRRC55	KCNAB1
S100A5	CAPN2	PADI4	P2RX1	GRIA1	ATP2B4	KCNQ4
FBLN5	LPCAT2	AGRN	SLCO2A1	HTR3C	SLC30A1	TRPV4
PLCD4	PADI3	CAPN14	SLC51B	SLC13A5	SLC2A10	SLC25A42
TGM3	NOX5	CAPN12	CLDN4	SLC6A4	CACNA2D4	GABRR1
HSPG2	CPNE6	LTBP3	ANO1	SLC16A12	NIPAL3	GJD3
ITLN1	SCUBE1	SLIT1	SLC7A8	CALHM1	ZACN	KCNJ16
MAASP1	EEF2K	NOTCH1	APOL1	SLC26A8	ATP2B2	KCNC4
GSN	OCM	PCDHAC2	SCNN1A	SLC1A7	SLC22A14	
MYL7	PADI2	EFCAB12	GABRP	ATP2B3	BSND	
RASGRP3	NOTCH3	PLSCR4	PKD1L1	SLC5A9	GLRA4	
DUOX1	MGP	PCDHGB7	FXYP3	CACNA1G	SLC22A4	
F10	DGKA	SULF2	SLC16A8	SLC16A3	SLC6A3	
PLCB2	PCDHB4	MYL9	ABCC3	SLC12A2	SLC28A3	

BIN-67_SMARCA4_ChIP_Peaks

OR4F29	PINK1	KIAA0319L	JUN	SLC44A3	NOTCH2NLA	DEDD	NEK7	LINC00467	LOC339529	ITGB1	ADAMTS14	KIF11	GRK5	RASSF10	AMBRA1
LINC01128	SH2D5	TRAPP3	LINC01135	CNN3	ANKRD35	FCGR2A	ATP6V1G3	SLC30A1	ZBTB18	NRP1	PCBD1	EXOC6	MIR4681	ARNTL	LRP4
AGRN	HP1BP3	STK40	HSD52	ALG14	RNF115	FCRLB	NR5A2	NEK2	C1orf100	PARD3	UNC5B	MYOF	TIAL1	SPOX1	C11orf49
RNF223	E1F4G3	GRIK3	IGGY	TMEM56-RWDD3	GPR89A	OLFM12B	CAMSA2	LPKAT1	DES12	CUL2	UNC5B-AS1	PRA10AC1	BAG3	RRAS2	DDI2
MXRA8	ECE1	LINC01137	MIR4711	PTBP2	PRKAB2	MIR4654	TMEM9	PP2R5A	EFCAB2	CREM	VSIR	PLCE1	INPP5F	CYP2R1	SLC39A13
GNB1	NBPB3	INPP5B	NFIA	DPYD-AS1	CHD1L	MIR556	PKP1	NENF	KIF26B	CCNY	ANAPC16	TBC1D12	MCMBP	CALCA	NUP160
CALML6	ALPL	MIR3659	KANK4	MIR137HG	BCL9	DDR2	TNN1	ATF3	SMYD3	GJD4	CHST3	PDLIM1	TACC2	INSC	PTPRJ
GABRD	RAP1GAP	MACF1	DOCK7	LINC01176	GJA5	RG5A	PHLDA3	TATDN3	SCCPDH	FZD8	ASCC1	SORBS1	BTBD16	SOX6	TRIM49B
KCNAB2	USP48	KIAA0754	UBE2U	SNX7	GPR89B	RG55	CSR1P	RP56K1	ZNF496	ANKRD30A	DDIT4	CCNJ	PLEKHA1	PLEKHA7	OR4C46
CHD5	HSPG2	PABPC4	CACHD1	MFSO14A	LINC01138	TMCO1	MIR5191	PTPN14	SH3BP5L	MTRNR2L7	NUDT13	TLL2	HMX3	PIK3C2A	TRIM48
RNF207	CDG42	BMP8B	RAVER2	CDC14A	NBPB8	MIR3658	IP09	KCNK2	PGBD2	ZNF33BP1	PPP9CB	TM9SF3	CHST15	KCNK1	OR5AK4P
HES3	EPHB2	TMCO2	JAK1	COL11A1	NBPB14	FAM78B	ELF3	SPATA17	DIP2C	LINC00999	USP54	LCOR	EEF1AKMT2	SERGEF	TNKS1BP1
PLEKHG5	MIR4253	ZMPSTE24	DNAJC6	RNPC3	NBPB15	POGK	GPR37L1	TGFB2-AS1	PFKP	ACTR3BP5	ZSWIM8	ANKRD2	CTBP2	LDHAL6A	CTNND1
KLHL21	KDM1A	NFYC	LEPROT	VAV3	PP1A4E	POU2F1	ARM18A	RAB3GAP2	PTRM1	LOC41666	CAMK2G	AVP1	TEX36-AS1	PTPN5	STX3
CAMTA1	MIR3115	CTPS1	PDE4B	NBPB6	LSP15	MPZL1	LCR6	MARK1	KLIF6	BMS1	KAT6B	MARVELD1	LOC28308	MRGPRX2	TCN1
SLC45A1	HTRID	SCMH1	SGIP1	CLC1	LINC02591	MP2	UBE2T	HLX	UCN3	CSGALNACT2	DUPD1	GOLGA7B	EDRF1-DT	NAV2	MSA10
REBE	ZNF436	EDN2	MIER1	TAF13	FCGR1CP	GPR161	PPP1R12B	DUSP10	IL15RA	LINC00840	ZNF503-AS2	LOXL4	FANK1	LOC100126784	TMEM109
ENO1	ID3	HIVEP3	SLC35D1	KIAA1324	LINC00869	TBX19	SYT2	HHIP1.2	PFKFB3	C1orf142	KCNMA1	HPS1	INSYV2A	FIBIN	TMEM132A
ENO1-AS1	MDS2	GUA2A	GADD45A	EP5L3	LINC00623	LOC100505918	CYB5R1	TLR5	PRKQCQ-AS1	TMEM72	DLG5	CNNM1	PTPRE	BBOX1	VWCE
SLC2A7	LOC284632	SLC2A1-AS1	GNIG2	CSF1	HIST2H2AA4	ATP1B1	MYBPH	CCDC185	SFTA1P	RASSF4	DLG5-AS1	GOT1	GLRX3	CCDC34	DBD1
MIR34A	GRHL3	SLC2A1	RP65	AHCYL1	MTMR11	NME7	CHIT1	CAPN2	LINC00710	SYT15	LINC00856	ABC2	LINC01164	LGR4	BEST1
SPSB1	STPG1	EBNA1BP2	SRSF11	KCNK4	OTUD7B	GORAB	LINC01136	TP53BP2	USP6NL	GPRIN2	LINC00959	DNMBP	PWWP2B	BDNF	FTTH1
CLSTN1	SRRM1	ELOVL1	AK5	CYMP	PLEKH01	PRRC2C	BTG2	FBX028	PROSER2	NPY4R	ZMIZ1-AS1	ERLIN1	INP5A	ELP4	INCENP
UBE4B	STMN1	HY1	ZZZ3	KCNK3	ADAMTSL4	VAMP4	FMOD	MIR320H2	PROSER2-AS1	LINC00842	ZMIZ1	SCD	CYP2E1	PAX6	SCGB1D2
KIF1B	CRYBG2	STGAL3	GIPC2	RAP1A	HORMAD1	DNM3	OTPC	LBR	SEPHS1	ANXA8	PPF	OLMALINC	SCGB1C1	RCN1	SCGB1D4
PEX14	LIN28A	ARTN	ADGR12	LINC01160	CERS2	DNM3OS	ATP2B4	ENAH	BEND7	ZNF488	ANXA11	PAX2	IFTM1	EIF3M	SCGB1A1
CASZ1	RP56KA1	IP013	PRKACB	CTTNBP2NL	MLL1T1	PIGC	LAX1	SRP9	FMD4A4	FAM25C	PRXL2A	KAZALD1	IFTM3	QSER1	AHNAK
CLorf127	ARD1A	ERB3	SAMD13	WNT2B	PIPSK1A	TNFSF18	SNRPE	EPHX1	NMT2	BRMPD2	SH2D4B	BTBC	TALDO1	DEPDC7	EEF1G
SRRM	SN	MIR5584	GN5	MOV10	PI4KB	TNFSF4	SOX13	H3F3A4P	FAM171A1	DRGX	NRG3	NTSC2	CD151	TCPI1L1	TUT1
MTOR	TRNP1	KIF2C	SSX21P	RHOC	CGN	LOC100506023	PLEKHA6	LIN9	PTER	CHAT	CCSER2	RPEL1	MUC5B	HPK3	INTS5
DISP5	TENT5B	ZSWIM5	LPAR3	AKR7A2P1	C2CD4D	PRDX6	PPP1R15B	ITPKB	RSU1	AGAP7P	GRDI1-AS1	NEURL1	BRSK2	KIAA1549L	WDR74
DRAXIN	GPR3	LINC01144	SYDE2	SLC16A1	THEM4	RC3H1	LRRN2	COQ8A	CUBN	SGMS1	MIR346	SH3PXD2A-AS1	LSP1	C11orf91	PLAAT2
MTIHR	SCARNA1	PRDX1	C1orf52	LRIIG2	S100A10	KIAA0040	RBBP5	VIM	ZWINT	GRID1	SH3PXD2A	CARS	CD59	SPINDOC	
NBPB	EYA3	PIK3R3	BCL10	MAGI3	RPTN	RASAL2-AS1	DSTYK	WNT9A	STRSLA6	IPMK	WAPL	STN1	OSBPL5	LMO2	CCDC88B
SNORA59B	PTAFR	CYP4A22	DDAH1	PHTF1	CRNN	RASAL2	TMCC2	DUSP5P1	HACD1	TFAM	BMPRIA	COL17A1	APBB1	NAT10	NRXN2
DHRS3	TMEM200B	FOXO2	CCN1	HIPK1	S100A7A	C1orf720	NUAK2	RHOU	STAM	SLC16A9	AGAP11	SFR1	HPX	ABTB2	SF1
KAZN	PTPRU	TRABD2B	SH3GLB1	TSPAN2	S100A7	TOR1AIP1	LEMD1-AS1	RAB4A	NSUN6	CCDC6	GLUD1	ITPRIP	OLFM1L1	ELF5	EHD1
TMEM51	MATN1-AS1	SLCSA9	PKN2	VANGL1	S100A6	CEP350	MIR135B	ABC810	NEBL-AS1	LINC01553	NUTM2A	SORCS3	PPHBP2	EHF	MAJIN
DDI2	SDC3	AGBL4	RBMXL1	MAB21L3	S100A2	QSOX1	CDK18	GALNT2	MIR1915	ANK3	NUTM2A-AS1	ADD3	CYB5R2	MIR1343	ARL2-SNX15
UQCRLH	SNORD103C	DMRTA2	LRRCB8	ATP1A1	AQP10	ACBD6	ELK4	PGBD5	MIR1915HG	RHOHTB1	PAPSS2	SMNDC1	TUB	CD44	POLA2
EPHA2	PUM1	FAF1	LRRRC8-DT	CD58	IL6R	XPR1	SLC26A9	C1orf198	MLLT10	TMEM26	KLLN	DUSP5	LMO1	SLC1A2	TIGD3
FBX042	NKAIN1	CDKN2C	LRRRC8	MIR320B1	SHE	IER5	FAM72A	FAM89A	DNAJC1	CABCOC01	PTEN	RBM20	TRIM66	PAMR1	SLC25A45
CROCCP3	SERINC2	OSBP1.9	LRRRC8D	TRIM45	ZBTB7B	LINC01699	SRGAP2	TRIM67	LOC100130992	ARID5B	RNLS	PDCD4-AS1	ST5	FIX1	NEAT1
MIR3675	LINC01226	ZFYVE9	GEMIN8P4	GDAPE2	EPNA1	ZNF648	SRGAP2C	EGLN1	SPAG6	MIR548AV	FAS-AS1	SHOC2	IP07	MIR3973	MALAT1
NBPB1	TINAGL1	TUT4	ZNF326	WARS2	GBA	BGSL1	MAPKAPK2	DISC2	PIPK2A	ZNF365	MIR4679-1	GPAM	ZNF143	LDLRAD3	KAT5
CROCCP2	COL16A1	COA7	BARHL2	HAO2	CLK2	SHCBPVL	C1orf116	LINC01354	ARMC3	ADO	LIPA	ACSL5	WEE1	PRR5L	AP5B1
CROCC	ADGRB2	ECHDC2	HFM1	ZNF697	GON4L	LAMC1	YOD1	IRF2BP2	ARHGAP21	JMJD1C	IFT2	MIR4295	SWAP70	TRAF6	FOSL1
MST1L	KPNA6	PODN	TGFB3	NOTCH2	LMNA	NMNAT2	CD55	LINC00184	PRTFDC1	JMJD1C-AS1	IFT1B	TCF7L2	LOC40028	API5	C11orf68
PAD12	MTMR9LP	SLC1A7	EPHX4	FAM72B	SMG5	SMG7-AS1	CD34	LINC01132	ENKUR	REEP3	SLC16A12	CASP7	SBF2	ALKBH3	DRAP1
PAD11	ZBTB8A	LRRRC42	GFI1	SRGAP2D	NES	NC2	PLXNA2	SNORA14B	GPR158	ANXA2P3	LINC00865	VWA2	ADM	ALKBH3-AS1	YIF1A
ARHGFE10L	ZBTB8B	CDP2	DIPK1A	EMBP1	PEAR1	COLGALT2	CAMK1G	TBCE	ABH1	HERC4	HTR7	AFAP1L2	AMPD3	C11orf96	RIN1
ACTL8	KIAA1522	MIRP137	MTF2	ANKRD20A12P	KIRREL1	RNF2	TRAF3P3	LYST	LYZL1	MYPN	ANKRD1	ABLIM1	MTRNR2L8	ACCS	NPAS4
PAX7	YARS	SSBP3	CCDC18-AS1	NA	CADM3	HMCN1	C1orf74	LGALS8	PTCHD3P1	KIF1BP	LINC00502	SHTN1	MRV11	CD82	PC
MIR4695	HPCA	ACOT11	FNBP1L	FAM72D	TAGLN2	RG51	IRF6	RP57P5	MIR938	HKDC1	PCGF5	VAX1	ZBED5-AS1	TSPAN18	C11orf86
IFPO2	RNF19B	DHCR24	BCAR3	NBPB20	LINC01133	RG52	UTP25	RG57	SVIL	HK1	HECTD2	SLC18A2	CSNK2A3	LINC02685	POLD4
PLA2G2E	ZSCAN20	LOC100507634	MIR760	NBPB9	ATP1A2	GLRX2	SYT14	IH	LYZL2	TSPAN15	PPP1R3C	PDDZ8	GALNT18	PRDM11	CLCF1
UBXN10	C1orf94	MIR4422	GCLM	PDE4DIP	PEA15	CD373	SERTAD4	OPN3	ARHGAP12	COL13A1	TNKS2	EMX20S	USP47	SYT13	GSTP1
VWA5B1	GJB4	PRKAA2	ABCA4	LOC655513	DCAF8	B3GALT2	HHAT	PLD5	KIF5B	H2AFY2	FGFBP3	PRLHR	DKK3	LOC100507384	UNC93B1
LINC01141	SMIM12	OMA1	ARHGAP29	SEC22B	F11R	DENND1B	KCNH1	LINC01347	EPC1	TYSND1	BTAF1	NANOS1	MICAL2	CREB3L1	ALDH3B1
CAMK2N1	DLGAP3	MYSM1	F3	NBPB10	USF1	LHX9	RCOR3	AKT3	CCDC7	NPPFR1	IDE	PRDX3	TEAD1	CHRM4	NDUF88

CHKA	MIR4693	ARHGAP32	KRAS	C12orf80	RASSF9	MIR620	STARD13	DOCK9	FSCB	PLEKHH1	DYNCH1H	E1F3-DT	PIAS1	ASB9P1	HS3ST2
MIRGPBF	MSANTD4	TMEM45B	LMNTD1	KRT7	MGAT4C	MED13L	RF3C	UBAC2	C14orf28	PIGH	RCOR1	TRIM69	CORO2B	CHD2	USP31
TPC2	AASDHPP7	APLP2	RASSF8-AS1	KRT86	C12orf29	MIR4472-2	MIR548F5	PCCA	RPS29	RAD51B	TRAF3	SHF	DRAIC	NR2P2	GGA2
MYEOV	GUCY1A2	C11orf44	RASSF8	KRT81	KITLG	LINC00173	CCNA1	PCCA-AS1	DNAAF2	ZFP36L1	KLC1	SLC28A2	LINC00593	MIR4714	CACNG3
CCND1	CWF19L2	OPCML	BHLHE41	KRT75	LINC02458	HRK	CSNK1A1L	GGACT	KLHDC1	ACTN1-AS1	AHNAK2	SLC30A4	TLF3	IGFIR	RBBP6
ANO1	ELMOD1	LOC283177	SSPN	KRT6A	DUSP6	NOS1	POSTN	TMT4C	NEMF	DCAF5	GPR132	BLOC1S6	UACA	SYNM	TNRC6A
FADD	SLN	WASH8P	ITPR2	KRT71	ATP2B1-AS1	KSR2	LINC00366	NALCN-AS1	ARF6	SUSD6	CRIP2	SQOR	LRRC49	LRRC28	ARHGAP17
CTTN	SLC35F2	IQSEC3	MED21	KRT1	LINC00615	WSR2	NHLRC3	NALCN	LINC01588	MAP3K9	LINC00226	MYEF2	THSD4	ME2A	KDM8
SHANK2-AS3	RAB39A	NINJ2	STK38L	KRT76	DCN	TAOK3	LHPL6	ITGBL1	DMAC2L	PCNX1	LINC00221	CTXN2	ADPGK	ASB7	IL4R
SHANK2	EXP45	ERC1	PPH1B1	KRT8	EEA1	HSP98	LINC00332	FGF14	MAP4K5	SIPA1L1	CHEK2P2	DUT	HCN4	ALDH1A3	E1F3CL
FOLR1	DDX10	LINC00942	PTH1H	CSAD	LOC643339	CIT	LINC00598	METT121C	ATL1	RG56	HERC2P3	FBN1	INSY1	CHSY1	E1F3C
RELT	ZC3H12C	ADIPOR2	ERGIC2	RARG	NUDT4	BICDL1	SLC25A15	LINC00551	SAV1	DPF3	NBEAP1	COP2	PML	TARSL2	SULT1A1
FAM168A	RDX	DCP1B	TMTC1	AAAS	SOC2	PXN	WBP4	FAM155A	PYGL	DNAL1	LINC01193	DTWD1	ISLR2	WASH3P	RRN3P2
RAB6A	FDX1	CACNA1C-IT3	DDX11	LOC100652999	CRADD	SIRT4	KBTBD6	MYO16-AS1	TRIM9	ELMSAN1	LOC646214	TNFAIP8L3	ISLR	HBO1	SNX29P2
DNAJB13	C11orf53	CACNA1C	DENND5B	CALCOCO1	MIR5700	ORA1	MTRF1	COL4A1	TMX1	ENTPD5	CXADR2	CYP19A1	STRA6	LINC00235	SMG1P2
C2CD3	LAYN	ITFG2-AS1	DENND5B-AS1	HOXC13	KRT19P2	RHOE	MIR5006	COL4A2	FRMD6-AS2	SYNDIG1L	REREP3	DMXL2	CYP11A1	RAB40C	SLC7A5P1
PH4I3	SIK2	PRMT8	AMN1	HOXC9	NDUFA12	CLIP1	DGKH1	RAB20	FRMD6-AS1	NP2C	NIPA1	SCG3	SEMA7A	METR	ASPHD1
LIF2	PPP2R1B	DYRK4	RESF1	MIR3198-2	VEZT	CLIP1-AS1	ENOX1	LINC00346	NID2	LTBP2	GOLGA8S	TMOD3	ARID3B	UBE2I	TME62
XRRAL1	CRYAB	NTF3	BICD1	ITGA5	USP44	VPSB7B	SMIM2-IT1	ANKRD10	PTGER2	AREL1	HERC2	MAPK6	PKDC	SNORD60	NPIP813
TPBGL	IL18	VWF	FGD4	BLOC1S1	PGAMIP5	ABC9	TSC22D1	TUBGC3	GNPNA1	DLST	GOLGA8C	MYO5A	SIN3A	TBC1D24	CD2BP2
ARRB1	PLET1	CD9	DNM1L	CD63	NTN4	PTPNM2	LINC00330	ATP11A	DDHD1	E1F2B2	WHAMMP2	FAM214A	PTPN9	ZG16B	SPHS2
RPS3	TTIC2	PLEKHG6	PKP2	ERBB3	SNRPF	TME2D	NUFIP1	MCF2L	MIR5580	TMED10	APBA2	ONECUT1	SNX33	FLYWCH1	TNPF68
GDPD5	DRD2	TNFRSF1A	ALG10	CTDSP2	LTAAH	ZNF664	GT2F2	PCID2	BMF4	POS	FAM189A1	RS124D1	SCAPER	TNFRSF12A	ITGAD
UVRRG	TMPS55	CD27	CNPE8	ATP23	ELK3	SCARB1	KCTD4	CUL4A	CDKN3	LINC01220	TJPI	CCP1	ACSBG1	THOC6	ZNF267
WNT11	USP28	MLF2	KIF21A	USP15	SLC9A7P1	UBC	SNORA31	TMC03	CGRFP1	ERG28	CHRFAM7A	PRTG	MORF4L1	TFAP4	LOC90705
EMSY	NNMT	FOXJ2	GXYLT1	MIRLET71	IKBP	MIR5188	SLAH3	RASA3	SAMD4A	TTL5	MTMR10	NEDD4	RASGRF1	HMOX2	TP53TG3B
AQF11	C11orf71	MFAP5	PRICKLE1	PPM1H	SPIC	LINC02372	SLC4A2	UPF3A	SOC54	ESRRB	OTUD7A	TCF12	ANKRD34C-AS1	UBN1	SLC6A10P
RSP1	LINC00900	RIMKL1B	TMEM117	DRAM1	EPA00	LUPA6	ORH1H12	MAPK11P1L	VASH1	CHRNA7	MYZAP	TMED3	PPL	LINC00273	
THRSF	BUID13	TMEM52B	NELL2	SRGAP1	IGF1	GALNT9	FNDCA3	BMS1P17	LGAL53	LRRC74A	ULK4P3	POLR2M	MINAR1	ABAT	UBE2MP1
NDUPC2	SIK3	GABARAPL1	ANO6	C12orf66	STAB2	ANKRD20A9P	CDADC1	BMS1P18	TBPL2	IRF2BP1	LINC02256	ALDH1A2	ZFAND6	C16orf72	TP53L3GHP
GAB2	RNF214	YBX3	PLEKHA8P1	TBKI1	NT5DC3	MPHOS918	RCBTB1	METTL17	KTN1	TMEM63C	FMN1	LIPC	CEMP1	ATF7IP2	RNAS5P41
RAB30	BACE1-AS	ETV6	LINC00938	RASSF3	TTC41P	PSPC1	SPRYD7	ARHGEF40	LINC00520	POMT2	RYR3	ADAM10	IL16	NUBP1	LINC02167
ANKRD42	CD3E	BCL2L14	ARID2	MSRB3	TXNRD1	ZMYM5	DLF2	ZNF219	PEL12	SPTLC2	AVEN	SLTM	STARD5	CLEC16A	ANKRD26P1
CREBZF	LOC100131626	BORCS5	SCAF11	HMG2	MIR3922	CRYL1	SL13P4	DAD1	NAA30	NRXN3	PGBD4	LDHAL6B	MEX3B	RM12	C16orf87
SYTL2	PHLDB1	DUSP16	SLC38A1	LLPH	WASHC4	EEF1AKMT1	WDFY2	OXAIL	SLC35F4	STON2	KATNB1L1	CEPB1	LITAF	NEF50	
EED	DDX6	GPR19	SLC38A2	TMBIM4	C12orf75	LATS2	DHRS12	AJUBA	ARMH4	KCNK10	SLC12A6	GCNT3	AP3B2	MIR4718	PHKB
CCDC81	MIR4492	APOLD1	SLC38A4	IRAK3	NUAK1	MIRP57	TME272	C14orf93	PSMA3	PTPN21	LPCA74	ANXA2	WHAMM	MIR365A	ABCC12
ME3	BCL9L	DDX47	PCED1B	CAND1	TCPI1L2	MICU2	NEK3	ACTN1	DACT1	EML5	ACTC1	RORA	BNC1	MIR3179-3	SLAH1
PRSS23	CCDC84	RPL13AP20	PCED1B-AS1	IFNG	POLR3B	SACS	VPS36	DHRS4	DAAMI	FOXN3-AS2	DPH6	C2CD4A	SH3GL3	MIR3180-3	CBLN1
FZD4	H2AFX	GPRC5A	HDAC7	MDM1	RFK4	ANKRD20A19P	MIR759	CARMIL3	GPR135	TTCTB	C15orf41	C2CD4B	ADAMTSL3	PDXDC1	ZNF423
FZD4-DT	USP2	GPRC5D-AS1	ADCY6	RAP1B	MTERF2	SPATA13	OR7E156P	TM9SF1	L3HYPDH	RIN3	FAM98B	TLN2	SLC28A1	MARF1	TENT4B
GRM5-AS1	NECTIN1	HEBP1	CACNB3	MDM2	CRY1	PARP4	PCDH9-AS2	PRKD1	JKAMP	LGMM	RASGRP1	MIR190A	PDE8A	POPPL	TOX3
SLC6A4	TRIM29	HTR7P1	RND1	CPM	BTBD11	TPTE2P1	PCDH9-AS3	AP4S1	PCNX4	CHGA	C15orf54	TPM1	AKAP13	ABCC1	FTO
VSTM5	OAF	GSG1	PRKAG1	CPSP6	CMKLR1	MTMR6	PCDH9	HECTD1	PRKCH	ITPK1-AS1	THBS1	RPS27L	KLHL25	MIR3179-2	IRX3
HEPH1	TMEM136	EMPI	KMT2D	YEATS4	CORO1C	CDK8	DACH1	HEATR5A	FLJ22447	ASB2	SRP14-AS1	RAB8B	AGBL1-AS1	NOMO2	IRX5
PANX1	ARHGEF12	LINC01559	TUBA1A	RAB31P	SSH1	USP12	KLF5	DTD2	RHOJ	SERPINA6	PAK6	APH1B	LINC00052	ABCC6P1	LPCAT2
IZUMO1R	GRIK4	GRIN2B	TUBA1C	CNOT2	SVOP	RASL11A	LMO7	ARHGA5P5	WDR89	SERPINA9	CCDC9B	USP3	NTRK3	ARL1P1	NUP93
AMOTL1	TBCEL	ATF7IP	KCNH3	PTPRB	TRPV4	LNX2	SCEL	AKAP6	SYNE2	SERPINA5	DISP2	DAIP2	MIR1179	TMC7	NLR5
ENDOD1	SCSD	ART4	FMNL3	PTPRR	TCHP	POLR1D	RNF219	EAPP	ZBTB25	SERPINA3	KNSTRN	SNX1	AEN	ITPR1P2	CPNE2
SES3	UBASH3B	PTPRO	BCDIN3D	TMEM19	C12orf76	GSK1	NDP1P2-AS1	CFL2	PPP1R36	CLMN	C15orf62	CSNK1G1	ISG20	GDE1	RSPRY1
FAM76B	BSX	EP8	ASIC1	TPB2	PPP1C	MTUS2	NDP1P2	FAM177A1	PLEKHG3	SYNE3	ZFYVE19	ZNF609	HAPLN3	CRYM	ARL2B8P
MIR1260B	HSPA8	DERA	LIMA1	KBR1	CCDC63	SLC7A1	LINC00353	NFKBIA	RAB15	YRK1	DL4	MTMT	MPGE8	CRYM-AS1	KIFC3
MAML2	SCN3B	SKP1P2	MIR1293	PHLDA1	MYL2	LINC00544	MIR622	LINC00609	MIR4708	C14orf177	MGA	PARP16	ABHD2	NPIP83	GINS3
ARHGAP42	ROB03	MIR3974	DIP2B	NAP1L1	LINC01405	KATNAL1	LINC00410	SFTA3	FUT8-AS1	BCL11B	MAPKBPI	INTS14	RLBP1	SMG1P3	NDRG4
CEP126	ROB04	REIRGL	ATP1	ZDHHC17	OAS3	LINC00426	ABCC4	MIR4503	FUT8	CCDC85C	SPTBN5	MIR4311	MIR9-3	SLC7A5P2	CDH5
YAP1	PKNOX2	PLEKHA5	SLC11A2	MIR1252	TPCN1	USP1	CLDN10-AS1	SLC25A21-AS1	CCDC196	EML1	EHD4	SNAPC5	RHCG	RRN3P1	BEAN1
BIRC2	PAT2	AEBP2	BIN2	PAWR	PLBD2	ALOX5AP	DNAJC3	LINC00639	GPHN	EVL	TP53BP1	SMAD6	AF3S2	MOSMO	TK2
TMEM123	CDON	PDE3A	GALNT6	PPP1R12A	LHX5	TEX26	UGGT2	SEC23A	FAM71D	DEGS2	PDIA3	SMAD3	IQGAP1	EEF2K	CMTM3
MMF7	ST3GAL4	PYROXD1	NR4A1	OTOGL	RBM19	HSPH1	IP05	MIAT	MPP5	SLC25A29	FRMD5	C15orf61	ST8SIA2	NPIP85	CA7
MMF20	ETSI	ST8SIA1	KRT180	PTPRQ	TBX3	FRY	STK24	FBXO33	E1F2S1	WDR25	CASC4	SKOR1	FAM174B	OTOAP1	CBFB

PLEKHG4	PAFAH1B1	NUFIP2	GJC1	AXIN2	DLGAP1	ONECUT2	02-Mar	C19orf33	SNAR-A3	YPEL5	RTN4	RMND5A	CCDC93	BBS5	CFLAR
KCTD19	MIR1253	MIR4523	NMT1	CEP112	DLGAP1-AS4	ATP8B1	MUC16	ACTN4	MYH14	LBH	MTIF2	RNF103-CHMP3	INSIG2	CCDC173	CFLAR-AS1
CTCF	RAP1GAP2	ANKRD13B	PLCD3	PRKCA	PTPRM	NEDD4L	OR1M1	ACP7	VSG10L	LCLAT1	CCDC88A	LOC285074	EN1	KLHL23	STRADB
CENPF	OR1D5	COR606	ACBD4	CACNG5	MTCL1	ALPK2	ZNFI21	PLEKHG2	NLRP12	CAPN13	PPP4R3B	CYTOR	MARCO	METTL5	CDK15
SLC12A4	SPNS2	SSH2	HEXIM1	CACNG4	TXNDC2	MALT1	C3P1	RP516	MYADM	EHD3	EFEMP1	MIR4435-1	STEA3	SP5	SNORD11
NFATC3	GLTPD2	BLMH	MAP3K14	HELZ	GNAL	ZNFS32	PDE4A	EID2	MBOAT7	SLC30A6	VRK2	THNSL2	SCTR	METTL8	BMPR2
SMPD3	MINK1	TBC1D29P	ARHGAP27	PTPNC1	MPPE1	SEC11C	LDLR	PSM4	SYT5	LINC00486	REL	FOXJ3	TMEM177	CYBBD1	ICA1L
CDH1	RNF167	CRLF3	PLEKHM1	C17orf58	IMPA2	CCBE1	SPC24	SERTAD1	PTPRH	LTBP1	USP4	TEX37	PTPN4	PTPN4	ABH2
TANGO6	LOC728392	TEFM	MAPK8IP1P2	KPNA2	ANKRD62	PMAP1P1	TMEM205	SPTBN4	PPN6R1	RASGRP3	XPO1	EIF2AK3	INHBB	METAP1D	RAPH1
MIR1538	PTPNC3	MIR4733	LINC02210	LINC00674	TUBB6	RNF152	ECST	LTBP4	KMT5C	CRIM1	FAM161A	MIR4436A	GLI2	DLX2	PARD3B
OXDC2P-NPBP814	FBXO39	SUZ12	STH	ARHGAP27P2	AFG3L2	ZCCHC2	ZNFA40	NUMBL	SMM17	FEZ2	MIR5192	LSP14	TFP2L1	ITGA6	NRP2
CLEC18C	TEKT1	C17orf75	KANSL1	SOX9	SPIRE1	PHLP1	ZNFA33	COQ8B	TPO	VIT	TMEM17	GGT8P	CLASP1	RAPGEF4	INO80D
VAC14	GPS2	CCL2	KANSL1-AS1	LINC00673	FAM210A	SERPINB5	ZNFA42	CCDC97	RNF144A	EIF2AK2	TSN	ACTR3BP2	TSN	MAP3K20	GPR1
IST1	TMEM256-PLSCR3	RFL	LRR37A	CDCA2EP4	ANKRD20A5P	SERPINB7	IER2	TGFB1	LINC00298	CDCA2EP3	UGP2	KNIP3	BN1	CDCA7	KLFT
PMFBP1	POLR2A	SLFN5	LRR37A2	BTBD17	ROCK1	DSEL	CACNA1A	ARHGEF1	LINC00299	RMDN2	PEL1	FAHD2A	PROC	WIPF1	CREB1
ZFH3	RPL29P2	MMP28	NSF	RAB37	GATA6-AS1	DOK6	CCDC130	LIPE	ID2	LINC00309	TRIM43	IWS1	CHN1	METTL21A	
HCCAT5	KDM6B	CCL4	RPRML	SLC9A3R1	CTAGE1	CD226	LOC284454	PSG3	MBOAT2	GALM	LGALS3	FAHD2CP	AMMECRIL	ATP5MC3	CCNYL1
LOC283922	PER1	TBC1D3B	EFCAB13	CDRL2	RBBP8	SOC6	MIR181C	PSG8	ASAP2	SRSF7	AFTPH	DUSP2	SAP130	HNRNP43	FZD5
CLEC18B	NDEL1	TBC1D3C	MIR4592	SLC16A5	CABLES1	LINC01541	NANOS3	PSG8-AS1	YWHAQ	GEMIN6	LINC02579	ARID5A	HIS6T1	MIR3128	PLEKHM3
GLG1	STX8	TADA2A	MIR1203	NTSC	TMEM241	ZNFA07	IL27RA	PSG10P	GRHL1	DHX57	SERTA2	KANSL3	RAB6C	NFE2L2	PKFYVE
GAZH	USP43	DUSP14	CALCOCO2	MIR3678	LAMA3	ZADH2	LOC100507373	PSG1	RRM2	SOS1	LINC02245	CNNM4	MED1599	AGPS	MAP2
ZNRF1	GAS7	HNF1B	UBE2Z	CASKIN2	TTC39C	LOC339298	DNAJB1	PSG11	ATP6V1C2	MAP4K3	SLCIA4	ANKRD23	AMER3	PDE1A	UNC80
LDHD	ZNFI8	LOC440434	GIP	ITGB4	OSBPLA	ATP9B	APFM1	PSG2	KCNF1	MAP4K3-DT	SPRED2	TMEM131	POTEE	RBM45	ACADL
BCAR1	MAP2K4	MIRP45	JGB2BP1	UNC13D	LINC01915	TXNL4A	KLIF2	PSG5	PQLC3	TMEM178A	ETAA1	KIAA1211L	MZT2A	OSBPL6	CPS1
TMEM170A	MYOCD	ARHGAP23	GNGT2	WB2	SS18	WASH5P	MYO9B	PSG6	ROCK2	THUMPD2	C1D	REV1	MIR663B	SESTD1	CPS1-IT1
CHST5	ELAC2	ARL5C	NGFR	TRIM47	KCTD1	PTBP1	OCEL1	PSG9	E2F6	EML4	APLF	LONRF2	ANKRD30BL	CWC22	MIR548F2
SYCE1L	TEKT3	STAC2	ITGA3	TRIM65	GAREM1	GPX4	UNC13A	PRG1	LPN1	COX7A2L	GKN2	NMS	GPR39	UBE2E3	ERBB4
ADAMTS18	CDRT4	NEUROD2	SPATA20	MIRP138	MAPRE2	MDIN	ARDC2	SMG6	MIR4262	KCNG3	GKN1	PDC13	LYPD1	MIR437	MIR4776-1
CLEC3A	TRIM16	ERBB2	ABCC3	SPHK1	ZNFA36	CTRP8	PDE4C	KCNNA	NBA5	MTA3	ANTXR1	NPA52	MIR3679	ITPR1D2	VW C2C
CENPN	ADORA2B	RARA	ANKRD40	SNHG16	INOR8C	ADAMTS15	MIR3188	ZNFA227	DDX1	HAAO	GPFT1	TBC1D8	R3HDM1	NUP35	ATL
MIR4720	TTC19	JGB2B4	TOB1	SNORD1A	GALNT1	UQCRI1	GDF15	ZNFA235	MYCN	ZFP6L2	SNORA36C	RNF149	MIR128-1	ZC3H15	04-Mar
PLCG2	MIR1288	TNS4	SPAG9	ST6GALNAC2	C18orf21	BTBD2	LRR2C25	JGSF23	FAM49A	LINC01126	AAK1	CREG2	UBXN4	ITGAV	IGFBP5
HSPB1	ZNFA287	SMARCE1	UTP18	SNHG20	SLC39A6	MKNK2	REX1BD	BCL3	LINC00954	THADA	ANXA4	MAPK4	CXCR4	FAM171B	DIRC3
NECAB2	MIRP19	KRT10	HLF	SEC14L1	FHOD3	DOT1L	TMEM59L	CBLC	SDC1	DYNC2L11	GMCL1	SLC9A4	GTDC1	MIR129	TMBIM1
SLC38A8	TOM1L2	KRT20	MMD	SEPTIN9	TPGS2	SPPL2B	CRTIC1	PPP1R13L	PUM2	SLC3A1	LINC01816	PHL2	ZEB2	COL5A2	TUBA4B
COTL1	DRC3	KRT23	TMEM100	TNRC6C	CELFA	LMNB2	COMP	ERC1	HS1BP3	SLX3	SNRPG	NCK2	RND3	WDR75	DNAJB2
USP10	SLCSA10	KRT34	PCPT	LINC01993	SLC14A2	GADD45B	HOMER3	POSB	APOB	SIX2	FAM136A	UXS1	RBM43	SLC40A1	DNPEP
ZDHHC7	GRAP	LOC100505782	ANKFN1	SOC3	SLC14A1	GNG7	GATAD2A	RTN2	KLHL29	LINC01121	TGFA	LIMS1	ARL5A	ANKAR	SPEG
C16orf74	GRAPL	KRT32	NOG	CYTH1	SIGLEC15	SLC39A3	ZNFA737	VASP	ATAD2B	PRKCE	ADD2	MIR4265	STAM2	INPP1	TMEM198
IRF8	EPN2	KRT13	TRIM25	TIMP2	PSTPIP2	ZNFA77	ZNFA75	EML2	MPSD2B	EPAS1	VAX2	MIR4268	FMNL2	MFSD6	MIR4268
LINC02135	SLC47A2	KRT15	CUEDC1	LGALS3BP	C18orf25	SLP84	HAVCR1P1	FBXO46	EPF3B	RHOQ	DYSE	SEPTIN10	NBA42	NEMP2	ACSL3
FOX1	AKAP10	KRT19	RNF43	ENGASE	LOXHD1	SMIM24	LINC00662	NOVA2	POMC	CRIP1	CYP26B1	LIMS3-LOC440895	GRD2	NAB1	SCG2
KLHDC4	SPECC1	KRT16	TRIM37	RBF3X3	PIAS2	ATCAY	UQCFS1	IGFL4	DNMT3A	SOC35	EXOC6B	MIR4436B1	ACVR1	GLS	APIS3
SLC7A5	MAP2K3	KRT42P	CLTC	RNF213	SKOR2	DAPK3	PLEKHFI	LOC93429	DTNB	LINC01118	SPR	MALL	UPP2	NABP1	WDFY1
BANP	KCNJ12	GAST	VMP1	BAIAP2	SMAD2	MAP2K2	CCNE1	IGFL1	KIF3C	LINC01119	SEFN5	MTLN	PKP4	CAVIN2	MRPL44
ZNFA69	FLJ36000	JUP	MIR21	BAHCC1	ZBTB7C	CREB3L3	UR1	HIF3A	GAREM2	MCFD2	RAB11FIP5	LINC01106	DAPL1	SLC39A10	FAM124B
SNA13	MTRNR2L1	STAT5B	BC1D3P1-DHX40L	NPLOC4	CTIF	SIRT6	ZNFA507	AP2S1	KCNK3	TTCA7	STAMPB	BCL2L11	BAZ2B	STK17B	DOCK10
PIEZO1	MIR4522	STAT5A	BCAS3	SECTM1	MIR4743	SH3GL1	RHPN2	ARHGAP35	MAPRE3	STPG4	MTHFD2	MIR4435-2HG	LY75	HECW2	MIR548AR
SPATA2L	WSB1	STAT3	C17orf82	HEXD	SMAD7	DP9P	GPATCH1	NPAS1	PREB	CALM2	SEMA4F	ANAPC1	PLA2R1	GTIF3C	LOC46736
SPIRE2	TBC1D3P5	CAVIN1	MED13	OGFOD3	MIR4744	MIR7-3HG	LRP5	NOP53	TRIM54	KCNK12	TACR1	ZC3H8	ITGB6	PGAP1	NGEF
TUBB3	KSR1	ATP6V0A1	MRC2	ROCK1P1	LIPG	ZNFA4	CEBPB	SNAR-A1	MPV17	MSH6	EVA1A	TTL	MIR4785	COQ10B	TRPM8
NXN	LYRM9	PLEKH3	10-Mar	THOC1	ACAA2	REFX2	KIAA0355	PLA2G4C	EIF2B4	FBXO11	GCFC2	FLJ42351	RBM51	MOB4	SPP2
ABR	TMEM97	LINC00910	TANC2	TYMS	MYO5B	TNFSF9	WTIP	EMP3	SUP17L	FOXN2	TMSB10	IL1A	TANK	SATB2	SH3BP4
MYO1C	SARM1	ETV4	SMARCD2	ADCFAP1	ME2	FLJ25758	ZNFA30	KDELRI	MRPL33	PPP1R21	KCMF1	IL1B	PSMD14	TYW5	TWIST2
SLC43A2	FAM222B	MEOX1	TEX2	NDC80	SMAD4	INSR	CD22	CYTH2	LOC100505716	STON1-GTF2A1L	TCF7L1	PAX8-AS1	GRB14	SPATS2L	LINC01881
MIR132	DHRS13	SOST	SMURF2	LIPN2	DCC	ARHGEF18	CAPNS1	SULT2B1	FOSL2	PSME4	SH2D6	PAX8	COBLL1	KCTD18	SRXN1
MIR212	SEZ6	CFAP97D1	PLEKH1P1	MYL12A	SNORA37	STXB2	ZNFA529	FTL	PLB1	ACYP2	PARTICL	WASH2P	TTCT1B	AOX1	FKBP1A
SMG6	PIPOX	C17orf53	LRR37A3	MYL12B	TXNL1	CTXN1	SIPA1L3	PPPIA3	TOGARAM2	C2orf73	ATOH8	DDX11L2	CERS6	AOXP2P	NSFL1C
MNT	TIAP1	RUNDC3A	AMZ2P1	TGFI1	LINC-ROR	CD320	PPP1R4A	RRAS	CLIP4	SPTBN1	ST3GAL5	SLC35F5	ABCB11	BZW1	LOC100289473
METTL16	CRYBA1	FAM171A2	RGS9	DLGAP1-AS1	STSLA3	ANGPTL4	SPINT2	SIGLEC16	ALK	EML6	KDM3A	ACTR3	DHRS9	ORC2	SIRPA

PDYN	SALL4	DOP1B	TTC28-AS1	TBC1D22A	TRIM71	FAM107A	MYLK	GP887	RTP4	SLC2A9	THEGL	APIAR	RAPEF2	C	TNPO1
ZNF343	ZSHZ2	CLDN14	TTC28	LINC00898	CRTPA	PTPRG	KALRN	MBNL1	LPP	WDR1	HOPX	TIFA	ANP32C	LINC02120	FCHO2
CDCC25B	ZNF217	HLCS	CCDC117	ZBED4	FBXL2	C3orf14	ITGB5	MBNL1-AS1	TPRG1	RAB28	REST	NEUROG2	01-Mar	TARS	TMEM174
AP5S1	SUMO1P1	RIPPLY3	ZNRF3-AS1	MAPK11	UBP1	MAG11	HEG1	RAF2B	CLDN1	LINC01085	IGFBP7-AS1	LARP7	SMIM31	RXP3	ARHGEF28
SMOX	BCAS1	PIGP	RHBD3	PLXNB2	PDCD6IP	SLC25A26	MIR5481	C3orf79	ILIRAP	CPEB2-DT	EPHA5-AS1	MIR302B	KLHL2	AMACR	HEXB
LINC01433	MIR4756	DYRK1A	NF2	MAPK8IP2	TRANK1	LRIG1	TXNRD3	ARHGEF26	OSTN	CPEB2	CENPC	ANK2	CPE	CIQTNF3	NSA2
ADRA1D	CY2P4A1	ERG	CABP7	RPL23AP82	EPH2A1P1	MIR4272	PLXNA1	PLCH1	CCDC50	CIQTNF7	YTHDC1	CAMK2D	PALLD	RAI14	FAM169A
PRNP	FAM209B	LINC00114	ASCC2	SUMF1	MLH1	SLC1G2	PODXL2	SSR3	MBD1D2	FGFBP1	UTP9	AR5J	SH3RF1	TTCC3L	GCNT4
SLC23A2	TFA2P2C	PSMG1	MTMR3	EGOT	LRRFP12	EOGT	AIBT81	TIPARP	DPPA2P3	TAPT1-AS1	RUFY3	METTL14	CLCN3	DNAJ21	HMGCR
GICPD1	BMP7	C2CD2	LIF	ITPR1	GOLGA4	ARL6IP5	MGLL	LINC00880	HES1	CLRN2	CXCL8	MYO22	HPF1	UGT3A1	POLK
CHGB	RAE1	UMODL1-AS1	MTFP1	BHLHE40-AS1	ITGA9	LINC00870	CNBP	CCNL1	LINC00884	SLIT2	MTHFD2L	USP53	LINC02275	NADK2	F2R
PLCB4	RBMS8	LINC00313	OSBP2	BHLHE40	MIR26A1	RYBP	COG61	RSRC1	TMEM44-AS1	ADGRA3	AREG	PDE5A	AADAT	NIPBL	F2RL1
ANKF1	PMEP1A	HSE2BP	SMTN	EDEM1	SLC22A13	SHQ1	SNORA7B	MLF1	FAM43A	DHX15	BTC	ANXA5	GALNT7	CPLANE1	AGGF1
SNAP25-AS1	RAB22A	PDXK	LIMK2	LMCD1-AS1	XYLB	GXYLT2	MBD4	IQCI-SCHIP1	LINC01968	PI4K2B	SCARB2	IL21	WDR17	EGFLAM	ZBED3-AS1
SLX4IP	STX16	TRAPP1C10	PISD	SSU42	TTC21A	EBLN2	IFT122	SCHIP1	XXYLT1	SLC34A2	STBD1	FGF2	ASB5	PTGER4	TBCA
JAG1	PRELID3B	PTTG1IP	DEPDC5	OXRTR	CSRNPI	GBE1	PLXND1	IL12A	PPPIR2	SLC34A2	SHROOM3	NUDT6	SPC35	PTXO4	SCAMP1
LOC319593	HRH3	PCSAR	YWHAH1	RAD18	MOBP	LINC00971	TMCC1	KPN-A4	SDHAP2	SMIM20	MIR4450	SPRY1	DCDT	GHR	JHLY
BTBD3	LAMA5	POFUT2	APIB1P1	THUMP03	ZNF620	POU1F1	ATP2C1	ARL4	SDHAP2	RBPJ	SEPTIN11	LINC01091	WWC2-AS2	LOC648987	JMY2
BFSPI	CABLES2	COL18A1	SLCSA4	SETD5	CTNNB1	EPHA3	NEK11	PPM1L	TRFC	CKAR	CNOT6L	ANKRD50	WWC2	LOC100132356	SERINC5
OVL02	COL9A3	COL18A1-AS1	SYN3	CAMK1	ULK4	PROS1	CPNE4	SERPIN11	PCYT1A	TBC1D19	MRPL1	SLC25A31	CLDN24	CCL28	ZFYVE16
ZNF133	DID01	SPATC1L	TIMP3	CIDEA	TRAK1	DHFR2	ACPP	GOLM4	PAK2	STM2	ANXA3	LARP1B	CDKN2AIP	PAIP1	MTRNR2L2
DZANK1	EEF1A2	YBEY	HMOX1	JAGN1	ACKR2	LINC00879	NPHF3-AS1	EGEEM1P	SENP5	ARAP2	HNRNPD	PGRMC2	LOC89247	NNT-AS1	RASGRF2
TDN1	LKAAEARI	DIPA2	MB	EMC3	POMGNT2	EPHA6	BSP2	MIR551B	MELTF	RELL1	IRF5	JADE1	HCN1	SSBP2	
FOX2A	NBPWR2	PRMT2	APOL6	JRAK2	ABHD5	ARL6	CDV3	MECOM	DLG1	TBC1D1	SEC31A	SLC71	CASP3	EMB	ATP6AP1L
CT53	LINC00266-1	CCTRL2	RBOF2	LINC00906	TOPAZ1	CRYBG3	TOPBP1	ACTRT3	BDH1	KLF3	COQ2	PABPC4L	SLC25A4	PABP8	MIR3977
SYNDIG1	MIR3648-1	HSEY1P1	MYH9	TIMP4	TGM4	CLDN1D1	SLC02A1	SLC7A14	ANKRD18DP	KLF3-AS1	HPSE	PCDH18	CFAP97	ISL1	SCARNA18
APMAP	TPTE	TMEM121B	TXN2	TSEN2	TMEM158	CPOX	AMOTL2	RPL22L1	ZNF395	TLR6	GPA73	SLC7A11	SNX25	PELO	EDIL3
LOC284798	BAGE3	CECR2	CACNG2	MKRN2	LARS-AS1	DCBLD2	PMPT3A	EIF5A2	PCGF3	FAM114A1	WDFY3	LINC00499	SORBS2	ARL15	MEF2C
ENTPD8	ANKRD30BP2	MIR648	CIQTNF6	NUP210	LIMD1	COL1A1	MSL2	MIR569	CPLX1	MIR574	MIR4451	NOCT	FAT1	HSBP3	ARRDC3-AS1
PYGB	ANKRD20A1P	MICAL3	CARD10	FBLN2	FYCO1	FLIP1L	STAG1	PLD1	FGRL1	TMEM156	MAPK10	ELF2	TRIML1	SNX18	NRF21-AS1
NANP	SAMSN1	LINC01634	TRIOBP	LINC00620	XCR1	MIR548G	SLC35G2	FNDCC3B	LOC100130872	KLHL5	SLC10A6	SETD7	FRG1	ESM1	NR2F1
MIR663A	NR1P1	USP18	MICAL1	WNT7A	ALS2CL	TBC1D23	IL20RB	NCEH1	NSD2	UGDH	C4orf36	MGS72	DUX4L8	MIR5687	FAM172A
MIR663A1HG	USP25	GGT3P	MAFF	TMEM43	CCDC12	ADGRG7	CLDN18	ECT2	NELFA	UBE2K	AFB1	MAML3	PLEKHG4B	RNF138P1	KIAA0825
FRG1BP	MIR99A1HG	DGCR6	GTBPB1	XPC	SETD2	NFKBIZ	ARMC8	LINC00578	HGACF	PDSSA	KLHL8	TBC1D9	SDHA	PLP1	SLF1
DEFB115	MIR99A	TXNRD2	SLN2	LSM3	KIP9-AS1	MIR548A3	MIRAS	PIK3CA	ADRA2C	N4BP2	NUDT9	RNF150	PPT080	ANKRD55	ARSK
HML3-AS1	MIRLET7C	ARVCF	APOBEC3A	B	SLC6A6	SCAP	ALCAM	PIK3CB	ZNF639	FAM86EP	LOC344967	HERC6	INPP4B	LPCAT1	MAP3K1
ID1	MIR125B2	MED15	APOBEC3B	SH3BP5	MAM4	CBLB	FOXL2	GNB4	TMEM128	CHRNA9	HERC3	GAB1	SDHAP3	ACTBL2	RHOBTB3
MIR3193	CXADR	SERPIND1	CBX7	METTL6	PLXNB1	BBX	MIRP22	USP13	NSG1	APBB2	FAM13A	FREM3	TENT4A	PLK2	LINC01554
BCL2L1	BTG3	TUBA3FP	PDGFB	BTB	P4HTM	LINC00636	RBP1	PEX5L	STX18-AS1	LIMCH1	TIGD2	HHIP-AS1	ROPN1L	PDE4D	ELL2
FOXSI	D21S2088E	POM121L8P	SNORD43	ANKRD28	CCDC36	CD47	PXYLP1	CCDC39	CYTL1	ATP10D	SNCA	SMAD1	ANKRD33B	NDUFAF2	PSK1
XKR7	APP	RIMBP3C	RPS19BP1	GALNT15	DAG1	IFT57	ZBTB38	SOX2-OT	STK32B	TXK	ATOH1	MMAA	DAP	ZSWIM6	CASP1
KIF3B	CYYR1	PPM1F	MRTFA	MIR3714	BSN	PHLD2	RASA2	SOX2	LINC01587	TEC	FDLIM5	C4orf51	DNAH5	KIF2A	ERAP1
DNMT3B	N6AMT1	TOP3B	MCHR1	TBC1D5	MST1R	C3orf52	ATP1B3	LINC01994	EVC2	SLAIN2	BMPRIIB	ZNF827	TRIO	IP011	ERAP2
SNTA1	BACH1	ZNF280B	RANGAP1	SATB1	SEMA3F	CCDC80	ATR	ATP11B	EVC	FRYL	RAP1GDS1	LSM6	OTULIN	SREK1IP1	LNPEP
ZNF341	TIAM1	BCR	ZC3H7B	EHFB	GNAI2	BOC	PLS1	B3GNT5	CRMP1	OCDAD2	E1F4E	POU4F2	ANKH	ADAMTS6	LOC100289230
CHM4B	SOD1	IGLL1	T0B2	KAT2B	SEMA3B	NAA50	SLC9A9-AS1	LINC00888	JAKMIP1	CWH43	DAPP1	ARHGAP10	11-Mar	NLN	PAM
ITCH	LINC00159	VPREB3	CSDC2	VENTXP7	TUSC2	GRAMD1C	PLSCR2	KLHL6	PPP2R2C	LRRCC6	H2AFZ	LRBA	MYO10	ERBIN	PPP5K2
DYNLRB1	MIS18A	GSTT2	SNU13	UBE2E2	MAPKAPK3	ZBTB20	GYG1	PARL	KIAA0232	USP46	FLJ20021	PRSS48	BASP1	SREK1	EFNA5
TP53NP2	EVA1C	ADORA2A	TNFRSF13C	MIR548AC	MIR4787	GAP43	CP	VWASB2	TBC1D14	SNORA26	NFKB1	FAM160A1	LINC02111	MAST4	PER
UQCCL1	TCPI0L	UPB1	RNU12	UBE2E1	MANF	TUSC7	TM4SF1	CAMK2N2	SORCS2	RASL11B	MANBA	GATB	CDH18	CD180	PIA2
VSTM2L	PAXBPI-AS1	TOP1P2	ATP5MGL	RPL15	TLR9	UPK1B	TM4SF4	CHRD	MIR4798	HP1L1	UBE2D3	FBXW7	GUSBP1	PIK3R1	MAN2A1
SLC32A1	C21orf62	TMEM211	PACCSIN2	NKIRAS1	SEMA3G	B4GALT4	WWTR1	IGF2BP2	AFAP1-AS1	RPL21P4	SLC9B2	TRIM2	CDH9	OCLN	LINC01848
GTSF1L	IL10RB	KIAA1671	BK1	THRB	TKT	ARHGAP31	WWTR1-AS1	ETV5	AFAP1	CHIC2	TET2	TMEM131L	PURPL	GUSBP3	STARD4
OSER1	IFNGR2	CRYBB2P1	SULT4A1	TOP2B	DCPIA	STXBPL	COMM2D	DGKG	ABLIM2	PDGFRA	PPA2	GRIA2	LSP1P3	SERF1A	EPH414A
LINC01260	TMEM50B	MYO18B	PNPLA3	NEK10	ACTR8	FAM162A	ANKUB1	TBCD1	SH3TC1	KDR	GIMD1	GASK1B	PDZD2	GT2H2B	APC
LINC00494	ITSN1	ASPHD2	PARVB	SLC4A7	SELENOK	KPNA1	RNF13	E1F4A2	ACOX3	SRD5A3	PAPSS1	TMEM144	MIR4279	SMA5	REEP5
PREX1	LINC00649	HP54	PHF21B	CMC1	ARHGEF3	DTX3L	LOC646903	ADIPOQ-AS1	GP878	PDCL2	SGMS2	C4orf46	GOLPH3	GUSBP9	DCP2
PTGS1	KCNE1	MIR548J	MIR4762	CMTM8	SPATA12	PARP15	TSC22D2	ST6GAL1	CPZ	NMU	SEC24B	FNIP2	MTMR12	MAP1B	MCC
SLC9A8	RUNX1	MIAT	LOC730668	CMTM7	SLMAP	SEC22A	SELENOT	RTP1	USP17L10	CEP135	EGF	C4orf45	ZFR	MIR4803	CCDC112
TMEM189-UBE2V	CBR3-AS1	MN1	PRR34	CMTM6	FLNB	HACD2	SLAH2	MASP1	MIR548I2	AASDH	FAM241A	MIR3688-1	SUB1	MIRP27	FEM1C

TMED7	ARHGEF37	GMD5	HIST1H2BD	C6orf723	GABRR2	MYB	FND1	OSBP3	MLX1PL	SYPL1	ZYX	DOCK5	VXN	YWHAZ	CD37L1
AP51	TIGD6	LINC01600	HIST1H3E	TMEM151B	UBE2J1	AH1	SOD2	HOXA1	STX1A	NAMPT	ZNF786	EBF2	SGK3	ZNF706	RCL1
HSD17B4	PDGFRB	SERPINB9P1	HIST1H2B	MIR4642	RRAGD	LINC00271	IGF2R	HOXA5	ABHD11	CCDC71L	ZNF282	PPP2R2A	PPP1R42	GRHL2	ACK2
SRRFBP1	ARSI	SERPINB6	HCG11	SUPT3H	BACH2	MAP7	MAP3K4	HIBADH	CLDN4	PIK3CG	ZNF777	BNIP3L	CPA6	NCALD	PDCC1LG2
SNX24	RPS14	RIPK1	LINC00240	RUNX2	MIR4464	MAP3K5	AGPAT4	JAZF1	TMEM270	PRKAR2B	ZNF746	PNMA2	PREX2	RRM2B	ERNMP1
PPIC	NDS1	BP4L	ZNF391	CLIC5	FBXL4	IFNGR1	PACRG	CHN2	ELN	HBPI	ATP6V0E2-AS1	DPYSL2	C8orf34	ODF1	IL33
CEP120	SYNPO	TUBB2A	HIST1H2BL	PLA2G7	FAXC	TNFAIP3	PACRG-AS1	PRR15	LIMK1	COG5	LRRC61	STMN4	LINC01592	KLF10	UHRF2
CSNK1G3	SMIM3	PXDC1	ZKSCAN8	ADGRF1	USP45	PERP	CAHM	MIR550A3	CLIP2	BCAP29	REPIN1	CLU	SULF1	AZIN1	GLDC
ZNF608	TNIP1	FAM50B	ZSCAN9	CD2AP	PRDM13	ARFGF3	OKI	SCRN1	GT22R2D2	LAMB1	GIMAP5	ELP3	NCOA2	BAALC	KDM4C
MEGF10	CCDC69	PRPF4B	LINC01623	OPN5	SIM1	PBOV1	RNASET2	MTURN	GT22P1	NRCAM	NOS3	ZNF395	TRAM1	BAALC-AS1	PTPRD
CTXN3	ATOX1	ECT2	HLA-L	MMUT	HACE1	HEBP2	TCR10L2	AQP1	CCL26	IFRD1	ASIC3	FZD3	SBSPO1	RIMS2	LURAP1L
LINC01184	NMUR2	CDYL	IER3	C6orf141	LINC28B-AS1	MIR3145	LINC01558	LOC100130673	MDH2	MDFIC	PRKAG2	EXTL3	STAU2-AS1	ABRA	MPDZ
HINT1	MFAP3	PPP1R3G	DDR1	PAQR8	PREP	FLJ46906	AFDN	DPY19L1P1	SRRM3	TTEC	KMT2C	KIF13B	STAU2	NUDCD1	LINC01235
RAPGEF6	GALNT10	MIR3691	HCG22	EFHC1	PRDM1	ECT2L	SMOC2	BMPEP	ZP3	TES	FABP5P9	LINC00589	UBE2W	SVBU	LINC00583
CSF2	LARP1	LYRM4	PSORSIC1	TRAM2	ATG5	REPS1	THBS2	NPSR1-AS1	RSBN1L	CAV2	ACTR3B	MIR3148	GDAP1	MED30	NFB
SLC22A5	HAVCR1	FARS2	CD5N	GSTA3	CRYBG1	ABRACL	DLL1	HERPUD2	CD36	CAV1	DPW6	SARAF	PKA1	EXT1	TTTC39B
IRF1	ADAM19	LY86	MICA	GSTA4	BEND3	HECA	FAM20C	EEPD1	GNAT3	MET	HTR5A	RBPMS	HEY1	COL14A1	BNC2
IL4	RNF145	CAGE1	C6orf47	ICK	OSTM1	CTED2	W12-237311.2	KIAA0895	SEMA3C	CAPZA2	INSIG1	GT2E2	MIRP28	MTBP	ADAMTS1
SHROOM1	UBLCP1	DSP	NEU1	MIR5685	LINC00222	LINC01625	SUN1	AOAH-IT1	PLO	ST7	SHH	PPP2CB	TPD52	MRPL13	HAUS5
FSTL4	LOC285626	PIPSK1P1	TNXB	GCLC	SESN1	FILCN1	GET4	ELMO1	SEMA3E	ST7-AS1	ESYT2	NRG1-IT3	ZBTB10	ZHX2	MLT3
UBE2B	LINC01845	SCARNA27	NOTCH4	KLHL31	CD164	MIR3668	ADAP1	POU6F2-AS1	SEMA3A	ST7-AS2	OR4F21	FUT10	PAG1	DERL1	IFNA1
CDKN2AIPNL	ADRA1B	EEF1E1	TAP2	LRRIC1	PP16	MIR465	MICALL2	LOC646999	KIAA1324L	TPAN12	ANGPT2	RNF122	SNX16	TBC1D31	MTAP
PCBD2	CCNG1	TFAP2A-AS1	TAP1	COL21A1	GRP6	NMBR	MAFK	LINC00265	DBF4	FAM3	DEFB1	BRF2	CA13	KLHL38	CDKN2B-AS1
C5orf66-AS2	TENN2	MIR5689	PSMB9	DST	WASF1	ADGRG6	TFAMP1	SGCT	SRI	WASL	DEFA6	RAB11F1P1	REXO11P	ANXA13	CDKN2B
TGFB1	WWC1	GCNT2	COL11A2	ZNF451	SLC22A16	LOC153910	MIR4655	MRPL32	STEA2P	SND1	DEFA5	E1F4BP1	PSKH2	FER1L6-AS1	TEB
SMAD5	PANK3	ELOVL2	DAXX	BAG2	SLC16A10	HIVEP2	CHST12	STK17A	FZD1	SND1-IT1	FAM90A7P	PLP5	ATP6V0D2	TMEM65	EQTN
TRP7	SLIT3	SMIM13	LINC00336	PRIM2	TRAF3P2	ADAT2	MIR4648	COA1	LRRD1	MIR129-1	MIR54813	LETM2	WWP1	NSMCE2	MOB3B
SPOCK1	MIR585	ERVFRD-1	ITPR3	GUSBP4	CCN6	PHACTR2	SDK1	BLVRA	PEX1	METT12B	FAM86B3P	C8orf86	RIPK2	TRIB1	ACO1
NPY6R	SPDL1	NEDD9	LEMD2	KHDRBS2	LAMA4	STX11	FOXK1	URGCP	FAM133B	FLNC	PRAG1	TACC1	OSGIN2	LRATD2	BGAL1
FAM13B	DOCK2	TMEM170B	MLN	PTPA1	RPL4B	UTRN	APZ1	SPDY1	CDK6	SMO	CLDN23	ADAM9	NBN	PCAT1	SPINK4
CTNNA1	FOX11	ADTRP	HMGAI	ADGRB2	MARCKS	EPN2A	TNRC18	GCK	BET1	STRIP2	MFHAS1	SFRP1	DECR1	POU5F1B	NFX1
SLL1	KCNIP1	HIVEP1	ANKS1A	FAM135A	HDAC2	GRM1	FSCN1	OGDH	CASD1	UBE2H	MIR4660	ANK1	CALB1	MYC	AQP7
SPAT24	GABRP	EDN1	TCP11	OGFRL1	NTSDC1	RAB32	RNF216	SNHG15	PEG10	ZC3HC1	TNKS	KAT6A	LINC00534	MIR1204	SUGT1P1
TMEM173	FGF18	TBC1D7	ZNF76	MIR30A	DSE	STXBPS-AS1	E1F2AK1	IGFBP3	PPP1R9A	CPA2	MSRA	AP3M2	TMEM64	PVT1	ANKRD18B
PSD2	FBXW11	GFOI1	PPARD	LINC00472	RWD1	SASH1	CYTH3	TNS3	PON2	CPA4	C8orf74	SLC20A2	SLC26A7	GSDMC	UBE2R2
PURA	SH3PXD2B	RANBP9	FKBP5	RIMS1	ROSI	TAB2	RAC1	C7orf69	MIR591	CPA1	MIR1322	CHRN3	MIR378D2	FAM49B	UBAP1
CYSTM1	DUSP1	JARID2	LHP15	KCNQ5	CEP85L	LATS1	DAGLB	C7orf57	DLX6-AS1	MIR29A	MIR598	HGSNAT	PDP1	ASAP1	ENHJ
PDN1	ERGIC1	GMPR	MAKP14	MIR4282	ASF1A	RAET1E-AS1	CCZ1B	UPPI	BA1AP2L1	MKLN1	XKR6	POTE4	GEM	ADCY8	DNAJB5
HBEGF	CREBRF	ATXN1	PXT1	KCNQ5-AS1	GJA1	RAET1L	C1GALT1	ZPBP	NPTX2	PODXL	BLK	LINC00293	FSBP	EFR3A	LINC13B
UNKHD1-E1F4EBP	NKX2-5	RBM24	SRSF3	DDX43	HSP2	IYD	MIOS	DDC-AS1	KPNA4	PLXNA4	CTSB	EFCAB1	VIRMA	CCN4	RUSC2
VTNRN1-1	LOC285593	CAP2	MTCH1	EEF1A1	SMPDL3A	PLEKHG1	GLCC1	COBL	ZNF655	AKR1B10	FAM86B1	RBC1C1	DPY19L4	NDRG1	CREB3
PCDHAC2	CPEB4	FAM8A1	FGD2	SLC17A5	RNF217	MTFHD1L	NXPPI	VSTM2A	CASTOR3	AKR1B15	FAM86B2	RG520	INTS8	MIR30D	HRC1
PCDH1B	NSG2	KIF13A	PMI	COX7A2	RNF217-AS1	AKAP12	PHF14	EGFR	AGFG2	BPGM	LOC729732	TCEA1	NDUFAF6	COL22A1	SPAAR
PCDH5	MSX2	RNF144B	TMEM217	SEN6	TPD52L1	RMND1	THSD7A	PSPH	MUC12	CALD1	MIR3926-2	SOX17	MIR3150A	KCNK9	OK2S2
TAI7	DRD1	MIR548A1	MDGA1	MYO6	HDDC2	ARMT1	ARL4A	LOC650226	TRIM56	AGBL3	FGF20	XKR4	LOC100500773	AGO2	RECK
DIAPH1	CPLX2	ID4	ZFAND3	IRAK1BP1	LINC02523	ESR1	ETV1	ZNF716	SERPINE1	STRA8	MTUS1	SBFPI	GD6	PTK2	GLPFR2
GNPDA1	SIMC1	MBOAT1	BTBD9	LCA5	HEY2	JPCEFI	CRPPA-AS1	ZNF733P	COL26A1	STMP1	ATP6V1B2	TMEM68	MTDH	MROH5	GNE
NDHPI	UNC5A	CDKAL1	KIF6	BCKDHB	NCOA7	TIAM2	CRPPA	LINC01005	CLUX1	LUZP6	GPRA2	LINC01606	MATN2	PSCA	MELK
SPRY4	UIMC1	CASC15	UNC5CL	IBTK	HINT3	TBIM1	ANKMY2	ZNF92	PRKRIP1	AKR1D1	HR	LINC00588	RPL30	GML	PAX5
PGF1	PRK7-AS1	HDGFL1	NCR2	UBE3D	MIR5695	ARID1B	TSPAN13	GUSB	ORA12	KIAA1549	BMP1	CYP7A1	POP1	PLEC	ZBTB5
ARHGAP26	FAM193B	NRSN1	USP49	PGM3	ECHDC1	TMEM242	PRPS1L1	TPST1	RASA4B	ZC3HAV1	PHYHIP	NSMAF	NIPAL2	DGAT1	EXOSC3
ARHGAP26-AS1	HNRNP1	MRS2	GUCA1B	TRX18	ARHGAP18	SNX9	HDAC9	TMEM248	POLR2J3	KLKG2	PPP3CC	TOX	KCN52	VPS28	FAM201A
NR3C1	C5orf60	ALDH5A1	TRERF1	NTSE	AKAP7	SYN2	ITGB8	MIR4650-2	RASA4	HIPK2	SORBS3	RAB2A	STK3	ZNF251	CNTNAP3
MIR5197	SQSTM1	RIPOR2	UBR2	SNX14	LINC01013	GT2H5	LOC100506178	STAG3L4	LRRIC1	TBXAS1	C8orf58	CHD7	MIR599	DDX11L5	FAM74A1
HIM1B1	TBC1D9B	CMAPB	TBCC	SLC35A1	STX7	TULP4	IL6	AUTS2	FBXL13	PARP12	EGR3	ASPH	COX6C	KANK1	SPATA31A3
ADR2	GFPT2	CARMIL1	BICRAL	AKIRIN2	EYA4	TMEM181	FAM126A	GALNT17	RPL19P12	KDM7A	RHOBTB2	YTHDF3	SPAG1	PUM3	ZNF658
SH3TC2	DUSP22	SCGN	SRF	CNR1	SLC2A12	DYNLT1	KLHL7-DT	MIR3914-1	LHFP13-AS2	DENND2A	CHMP7	MTFR1	RNF19A	RFX3	GLD1R
ABLIM3	FOXQ1	TRIM38	DNPH1	RNGTT	SGK1	EZR	MALSU1	MIR4650-1	KMT2C-AS1	TMEM178B	R3HCC1	DNAJC5B	ANKRD46	GLIS3-AS1	FGF7P3
AFAP1L1	FOXF2	HIST1H2AC	ABCC10	PNCB1	LINC01010	OSTCP1	IGF2BP3	SBDSP1	PUS7	KIAA1147	NKX2-6	TRIM55	SNX31	GLIS3	ANKRD20A3
CSNK1A1	FOXCI	HIST1H1E	MRPS18A	SRSF12	ALDH8A1	RSPH3	STK31	PMS2P2	ATXNL7L1	WEE2-AS1	STC1	CRH	PABPC1	SLC1A1	AQP7P5

LOC642929	SLC35D2	NIBAN2	APOO	ELF4
LINC01189	ZNF367	STXBP1	ZFX	ZNF280C
FAM27C	PRXL2C	ST6GALNAC4	PCYT1B	GPC4
FGF7P6	ZNF782	FAM102A	PPP4R3C	GPC3
SPATA31A5	CTSV	CIZ1	NR0B1	PLAC1
PTGER4P2-CDK2AP2P2	TDRD7	WDR34	SYTL5	MOSPD1
LOC286297	TMOD1	PKN3	BCOR	FHL1
AQP7P1	XPA	PHYHD1	ATP6AP2	ZIC3
FAM27B	TBC1D2	IER5L	LOC100132831	MIR2114
FRG1JP	ANKS6	LINC00963	USP9X	MAMLD1
FRG1HP	COL15A1	PTGES	EFHC2	MTM1
PGM5P2	TGFBRI	FNBP1	FUNDC1	MAGEA4
ANKRD20A4	ALG2	ABL1	DIPK2B	GABRE
LOC100133920	NR4A3	FIBCD1	LOC392452	MAGEA5
FOXDL4L5	MSANTD3	FAM78A	MIR222	MAGEA2
FAM122A	CAVIN4	RAPGEF1	KRBOX4	ZNF185
FXN	OR13C2	MED27	ZNF674	ZNF275
BANCR	ABCA1	BARHL1	CHST7	CCNQ
C9orf135	SLC44A1	RALGDS	SLC9A7	BCAP31
MAMDC2	ZNF462	DBH	ZNF630	LICAM
SMC5	RAD23B	RXRA	SSX3	FLNA
KLF9	KLF4	FCN2	FTSJ1	IKBKKG
ZFAND5	ACTL7B	OLFM1	TFE3	GAB3
TMC1	ELP1	QSOX2	SYP	TMLHE
ALDH1A1	MIR32	SEC16A	FAM156A	GYG2P1
ANXA1	TMEM245	MIR4674	PHF8	TTY3
TRPM6	EPB41L4B	AGPAT2	FOXR2	SPRY3
OSTF1	PALM2	SNHG7	UBQLN2	
PCSK5	AKAP2	TRAF2	SPIN3	
RFK	ECPAS	CACNA1B	ZXDA	
PRUNE2	SHOC1	TUBBP5	SPIN4	
PCA3	MIR4668	ZBED1	MSN	
GNA14	PTBP3	MXRA5	MIR223	
GNAQ	HSDL2	LOC389906	OPHN1	
CEP78	KIAA1958	STS	YIPF6	
TLE1	RGS3	VCX3B	EFNB1	
SPATA31D5P	COL27A1	TBL1X	FAM155B	
SPATA31D1	MIR455	MID1	DLG3	
FRMD3	ATP6V1G1	HCCS	OGT	
GKAP1	TMEM268	MSL3	RPS26P11	
KIF27	TEX48	PRPS2	HDAC8	
RMI1	TNFSF15	FAM9C	CHIC1	
NTRK2	01-Dec	GSI-600G8.3	NEXMIF	
AGTPBP1	ASTN2-AS1	LINC01203	RPS6KA6	
LOC389765	TRIM32	EGFL6	SRPX2	
TUT7	MEGF9	RAB9A	SYTL4	
CTSLP8	GSN	OFD1	NXF3	
SPIN1	GGTA1P	GEMIN8	TCEAL1	
NXNL2	DAB2IP	BMX	ESX1	
MIR4289	TTL11	PIR	TSC22D3	
UNQ6494	OR5C1	APIS2	VSIG1	
LOC100129316	RABGAP1	S100G	SNORD96B	
MIR3910-1	LHX2	REPS2	ALG13	
ECM2	NEK6	MIR4768	PLS3	
FBP1	NR6A1	NHS	CUL4B	
MIR2278	OLFML2A	PHKA2-AS1	XIAP	
AOPEP	MAPKAP1	SH3KBP1	STAG2	
ERCC6L2	PBX3	SMPX	OCRL	
LOC158435	ANGPTL2	SMS	APLN	
HSD17B3	GARNL3	SAT1	UTP14A	

Supplementary Table 2

Lists of SMARCA4 regulated genes related to Ca^{2+} and SMARCA4-bound genes in SCCOHT cells. SMARCA4 regulated genes were from ontology terms of ion transmembrane transporter and calcium ion binding in Fig. 2a, b. SMARCA4-bound genes whose loci showed SMARCA4 occupancy within 3 kbp from their transcription start sites were identified from ChIP-seq data in BIN-67 (GSE117734). See also Source Data.

Supplementary Table 3

Primer Name	Sequence (5' to 3')
PTRC_index	ACACTCTTTCCCTACACGACGCTCTTCCGATCTNNNNNNGGCTTTATATATCTTGTGGAAAGGACG
IllSeqR_CR_r	GTGACTGGAGTTCAGACGTGTGCTCTTCCGATCTACTGACGGGCACCGGAGCCAATTCC
P5_Illuseq	AATGATACGGCGACCACCGAGATCTACACTCTTCCCTACACGACGCTCTTCCGATCT
P7_index_IR_r	CAAGCAGAAGACGGCATACGAGATNNNNNNGTGACTGGAGTTCAGACGTGTGCTCTTCCGATCT
	(NNNNNN = index sequences)
GAPDH_qPCR_For	AAGGTGAAGGTCGGAGTCAA
GAPDH_qPCR_Rev	AATGAAGGGGTCATTGATGG
ITPR3_qPCR_For	TATGCAGTTTCGGGACCACC
ITPR3_qPCR_Rev	TGCCCTTGTA CTGTCACAC
SMARCA2_qPCR_For	AGGGGATTGTAGAAGACATCCA
SMARCA2_qPCR_Rev	TTGGCTGTGTTGATCCATTGG

Supplementary Table 3

Lists of primers used in this study. See also Source Data.