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DETAILED MATERIALS AND METHODS

Induction of KIN and drug administration

To induce karyomegalic interstitial nephritis in *Fan1* KO mice 8-12 weeks old male and female mice were injected intraperitoneally with pharmaceutical grade cisplatin (2 mg/kg) (Fresenius Kabi), weekly for 5 weeks, as previously ¹. Control mice received PBS. For RNAseq studies the mice were treated as outlined above and euthanized one week after the last cisplatin injection. The mice were divided into 4 experimental cohorts, 1) ctrl (PBS), 2) *Fan1*KO (PBS), 3) ctrl (cisplatin), 4) *Fan1* KO (cisplatin); each cohort consisting of 2 male and 1 female mice. For short-term cisplatin injury studies, the mice were treated as outlined above and euthanized one week after the last cisplatin injection. The mice were divided into 4 experimental cohorts, 1) ctrl (PBS), 2) *Fan1* KO (PBS), 3) ctrl (cisplatin), 4) *Fan1* KO (cisplatin); each cohort consisting of 5 male mice. For long-term recovery studies, the mice were treated as outlined above, and euthanized 28 days after the last cisplatin administration. The mice were divided into 4 experimental cohorts, 1) ctrl (PBS), 2) *Fan1* KO (PBS), 3) ctrl (cisplatin), 4) *Fan1* KO (cisplatin); each cohort consisting of 3 male mice. For roscovitine studies the mice were divided into 6 experimental cohorts, 1) ctrl (PBS), 2) *Fan1* KO (PBS), 3) ctrl (cisplatin), 4) *Fan1* KO (cisplatin), 5) ctrl (Roscovitine + cisplatin) and 6) *Fan1* KO (Roscovitine + cisplatin); each cohort consisting of 4 male mice. Roscovitine was administered at 150 mg/kg (LC Laboratories) 1 hour before cisplatin injection, as outlined in the Results section. Roscovitine was dissolved in DMSO (400 mg/ml), aliquoted and stored at -20C. On a day of administration roscovitine aliquots were dissolved in 10%Tween80/20%PEG400/70%(30%-(2-Hydroxypropyl)- β -cyclodextrin)) solution. Control mice received PBS injections of equivalent volumes. Mouse body weight at the time of injection ranged from 25 to 40 g. Mouse survival was 100% in all of the experiments.

Unilateral ureteral obstruction.

3 male and 2 female *Fan1* KO mice and control mice weighing 22–25 g were used for UUO. The mice were anesthetized with methoxyflurane following protocols approved by the IACUC at the University of Pittsburgh. After induction of anesthesia, the left flank was opened through a small incision, and the left ureter was completely ligated with 2-0 suture at two points ². Mice were monitored postoperatively, and both kidneys were harvested for analysis 4 days after initial surgery. Mouse survival was 100% in the UUO experiment.

Tubular injury score

Whole kidneys were stained with periodic acid–Schiff (PAS) and were imaged using a Leica DM2500 microscope. Tubular injury scores were assigned to PAS-stained kidney sections (5 µm) by an experienced kidney pathologist who was blinded to the identity of the samples. Tubular injury/degeneration was defined as including luminal cell casts, and acellular/atrophic changes, and scoring was as follows: 0 = none detected; 1 = 1%–10% tubules involved; 2 = 10%–25% tubules involved; 3 = 25%–50% tubules involved; 4 = greater than 50% tubules involved. Karyomegaly was defined as the presence of enlarged nuclei in the tubules, and scoring was as follows: 0 = no enlarged cells; 1 = presence of enlarged cells.

Histological and immunofluorescence analysis of kidneys

Kidneys were fixed with 4% paraformaldehyde overnight at 4°C, embedded in paraffin and sectioned at 5µm thickness. Staining with hematoxylin and eosin, periodic acid–Schiff (PAS), or Masson’s trichrome reagents were performed according to manufacturer’s protocols. For immunostaining sections were blocked in 10% donkey serum/1% BSA and permeabilized in 0.5% Triton X-100.

Cell lines

Primary human kidney proximal tubular cells (hPTECs) were isolated as reported³ and cultured in DMEM/F12 containing 5% FBS (Atlas Biologicals), 100 U/ml penicillin, 100ug/ml streptomycin, Insulin-Transferrin-Selenium and Glutamax-I (Gibco). Cell culture plates were coated with 5µg/cm² rat tail collagen-1 (Corning 354236) and incubated for 1h. The cells were cultured in 5% CO₂ at 37°C. Passage 2 hPTECs were transduced with lentiviral particle expressing E6E7 plasmid (Addgene #52394).

Immunofluorescence

Cells plated on coverslips were washed once with PBS and fixed with 4% paraformaldehyde for 10 min. 0.5% Triton X-100 was added to cells for 10 min for permeabilization. Coverslips were then blocked with blocking buffer (10% donkey serum/ 0.25% Tween/ 1% BSA) for 1hr and incubated with primary antibody overnight at 4°C. Following overnight incubation, coverslips were washed three times with PBS, then

incubated with secondary antibody (Alexa Fluor, Life Technologies) for 1.5 h. Coverslips were mounted with DAPI medium and visualized under the fluorescence microscope.

CRISPR/Cas9 genome editing

Human kidney proximal tubule *FAN1* knockout cells were generated using CRISPR/Cas9 technology. Briefly, hPTEC cells were transfected with a pSpCas9(BB)-2A-GFP (PX458) plasmid (Addgene, #48138) containing a *FAN1* sgRNA. Forty-eight hours post-transfection, GFP-positive cells were sorted by fluorescence activated cell sorting (FACS) and single cells were grown into 96-well plates until colonies formed. Loss of *FAN1* expression was monitored by Western blotting using anti-FAN1 antibody and confirmed by Sanger sequencing.

Generation and Imaging of Fucci cell lines

To generate parental (control) and *FAN1* KO hPTEC tFucci(SA)5 expressing stable cell lines, we employed the PiggyBac transposon system⁴. The pPBbsr-based tFucci(SA)5 (Addgene plasmid #153520) was a gift from Atsushi Miyawaki. Super piggyBac Transposase expression vector was purchased from System Biosciences LLC (#PB210PA-1). tFucci(SA)5 and transposase encoding vectors were cotransfected into hPTECs using Lipofectamine 3000. Transfected cells were selected with blasticidin S at 20 µg/ml (Apexbio Technology LLC) for 3 days followed by blasticidin S at 10 µg/ml for 7 days. Cell cycle profiling using the FUCCI assay was performed in parental and *FAN1* KO cells +/- treated for 1 hour with 5 µM cisplatin, fixed with 4% paraformaldehyde for 10 min and imaged with Leica TCS SP8 confocal microscope (Leica Microsystems, Germany). Cells expressing tFucci(SA)5 appear red (expressing AzaleaB5-hCdt1(30/120)Cy(-)) when in G1, green (expressing h2-3-hGem(1/110)) when in late-S/G2/M-phases, and cells expressing both reporter genes and thus appearing orange were designated as being in late G1/early S, as reported⁴.

Flow cytometry analysis

Low-confluence cultures of asynchronously growing *FAN1* KO hPTECs were treated with 5 µM cisplatin (Fresenius Kabi) for 1 h and then cultured for 24, 48 and 72 hours. Following trypsinization, cells were collected by centrifugation, washed in PBS, and fixed in 4% PFA, followed by permeabilization in 0.25% Tween for 10 minutes and staining in DAPI for 30 minutes. Cells were centrifuged, washed in PBS. Cells were analyzed by FACS using LSR

Fortessa™ (BD Biosciences, San Jose, CA). Cell cycle profiles were created using FlowJo analysis software (TreeStar Inc., Ashland, OR). Single cells were identified by measuring forward and side scatter, and cell doublets excluded by pulse area vs pulse width. For each condition 20,000 cells were analyzed by flow cytometry.

Antibodies

Primary antibodies and lectins used in this study are shown in **Supplemental Table 4**. Secondary antibodies were donkey anti-rabbit Alexa Fluor 594, donkey anti-rabbit Alexa Fluor 488, donkey anti-mouse Alexa Fluor 594 or donkey anti-mouse Alexa Fluor 488 (all from Molecular Probes), and goat anti-rabbit IgG-HRP (sc-2004, Santa Cruz). Samples were mounted in ProlongGold (Molecular Probes) and images captured on a Leica TSC 5SP X confocal microscope (Leica Microsystems).

RNA Extraction and qRT-PCR

qRT-PCR primers used in this study are shown in **Table 5**. RNA was isolated from mouse kidneys using Quick-RNA Miniprep kit (Zymo Research). 0.5 µg RNA was reverse transcribed using iScript (Bio-Rad). Quantitative real-time PCR was carried out using SYBRGreen Master Mix and run on a CFX96 Real-Time PCR System (Bio-Rad). The data were normalized to *Gapdh*.

RNA sequencing and data analysis

RNA sequencing was performed on 4 experimental cohorts of mice, 1) ctrl (PBS), 2) Fan1KO (PBS), 3) ctrl (cisplatin), 4) *Fan1* KO (cisplatin); each cohort consisting of 2 male and 1 female mice. Cisplatin injury was induced as described above. Total RNA was isolated from one whole kidney from each mouse and sent for library preparation and sequencing to Genewiz (NJ, USA). Analysis of the RNA-seq data was performed at the University of Pittsburgh Center for Research Computing HTC cluster. Using the R programming language, RNA-seq FASTQ reads were first aligned to the *mm10* genome using Rsubread⁵, followed by featureCounts⁶ read summarization and gene annotation. Statistical analysis of the RNA-seq data was performed using the limma-voom package⁷ (Bioconductor). We used Benjamini-Hochberg multiple testing correction with an adjusted p-value < 0.05 to identify genes with statistically significant expression difference. Hierarchical distance clustering of the RNA-seq data was performed using Morpheus software (Broad Institute, Cambridge, MA). The Venn diagram in **Supplementary Figure**

9B was generated using the online tool VENNY (<http://bioinfogp.cnb.csic.es/tools/venny/index.html>). To generate the Venn diagram, we compared the cisplatin treated *Fan1* KO-cisplatin and ctrl-cisplatin differentially expressed genes with the previously published G1/S, G2/M and M cell cycle enriched gene sets ⁸.

Western Blotting

Kidney tissues or human kidney proximal tubule cells (hPTECs) were lysed in RIPA lysis buffer (Pierce) supplemented with Benzonase[®] Nuclease (Millipore Sigma) and homogenized with a sonicator. Cleared tissue lysates were produced by centrifugation of the resulting samples at 16,000 g for 30 minutes at 4°C. Gel electrophoresis of tissue lysates was performed using the NuPAGE system (Invitrogen). Samples were resolved on 4%–12% Bis-Tris gels and transferred onto PVDF membrane. Membranes were blocked with 5% milk in TBST and probed with primary and secondary antibodies respectively.

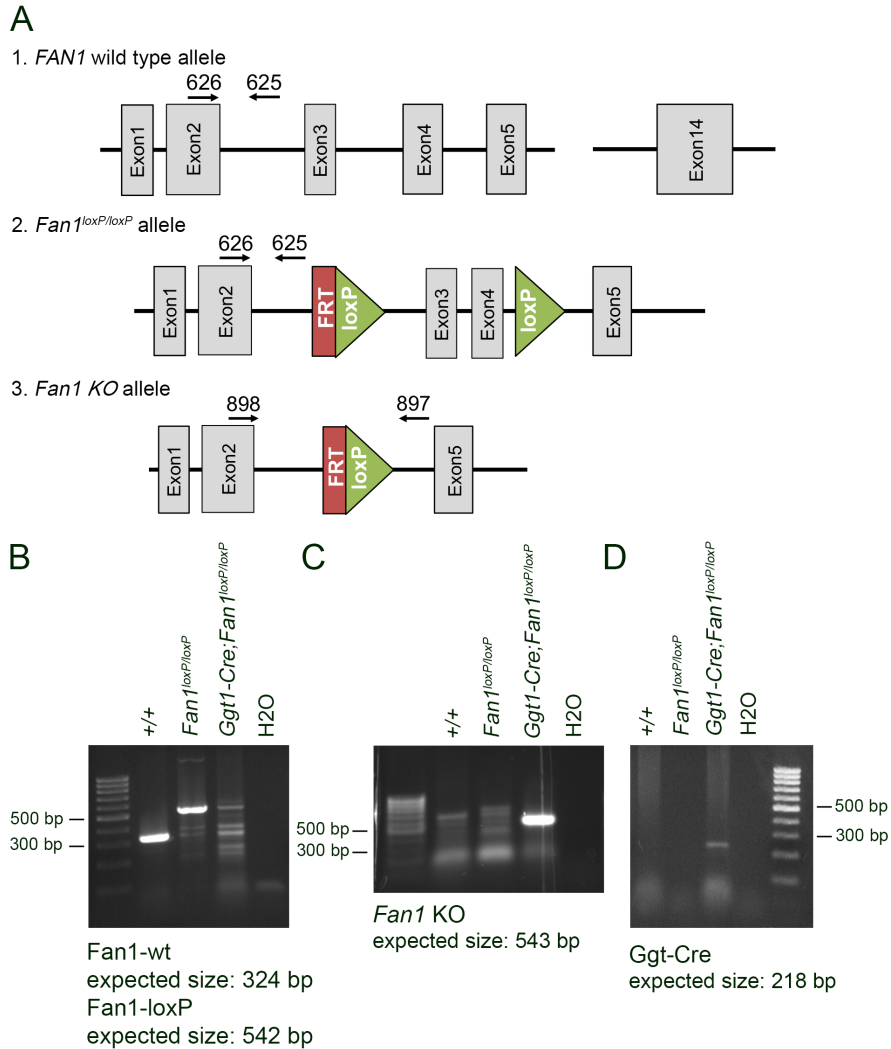
Subcellular Fractionation

Subcellular fractionations were isolated using a subcellular fractionation kit (ThermoFisher Scientific, #78840) according to the manufacturer's instruction. The fractionated protein lysates were analyzed with western blotting using indicated antibodies (**Supplemental Table 4**).

Chromosomal spread analysis

Chromosomal spread analysis was performed on parental and human FAN1KO kidney proximal tubular cells. In brief, cells were treated with 0.05 mg/ml Colcemid (Invitrogen, catalog no. 15210-016) for 1.5 hours prior to harvesting by trypsinization. The cell pellet was resuspended in 5 ml of 0.075 mM hypotonic KCl solution at 37°C for 20 minutes at 37°C. Cells were then fixed with freshly made 3:1 methanol/glacial acetic acid for 15 minutes and dropped onto microscope slides to obtain metaphase spreads. The slides were then stained with Giemsa (Gibco, #10092-013) for 5 minutes, washed briefly in tap water and air-dried.

SUPPLEMENTARY FIGURES



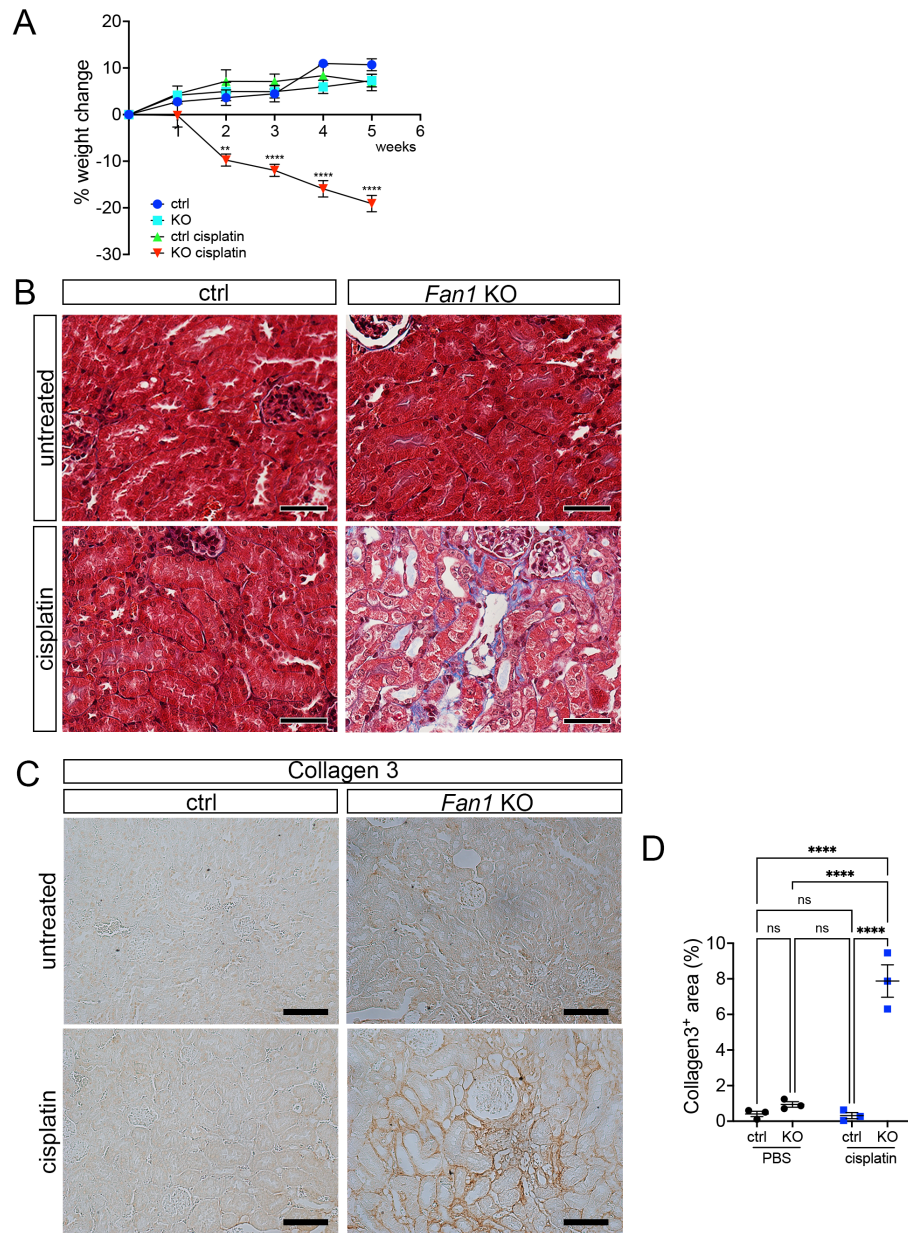
Supplementary Figure 1. Overview of *Fan1*-alleles and genotyping results.

(A) Schematic demonstrating the various *Fan1*-alleles used in this study. Binding positions of the genotyping primers are indicated with arrows and numbers. FRT, flippase recognition target; loxP, loxP sequence.

(B) Genotyping details for detecting the *Fan1* wild type (wt) allele and *Fan1^{loxP}*-allele from whole kidney lysates using primers 626 and 625 (see SFig. 1A). The *Fan1^{loxP}*-allele (542 bp) is barely detectable in *Ggt1-Cre; Fan1^{loxP/loxP}* kidney lysates due to recombination in proximal tubules.

(C) Genotyping details for detecting the *Fan1* KO-allele from whole kidney lysates using primers 898 and 897 (see SFig. 1A). The *Fan1* KO-allele is present only in *Ggt1-Cre; Fan1^{loxP/loxP}* kidneys due to recombination.

(D) Genotyping details for detecting the *Ggt1-Cre*-allele from whole kidney lysates. The *Ggt1-Cre*-allele is present only in *Ggt1-Cre; Fan1^{loxP/loxP}* kidneys.



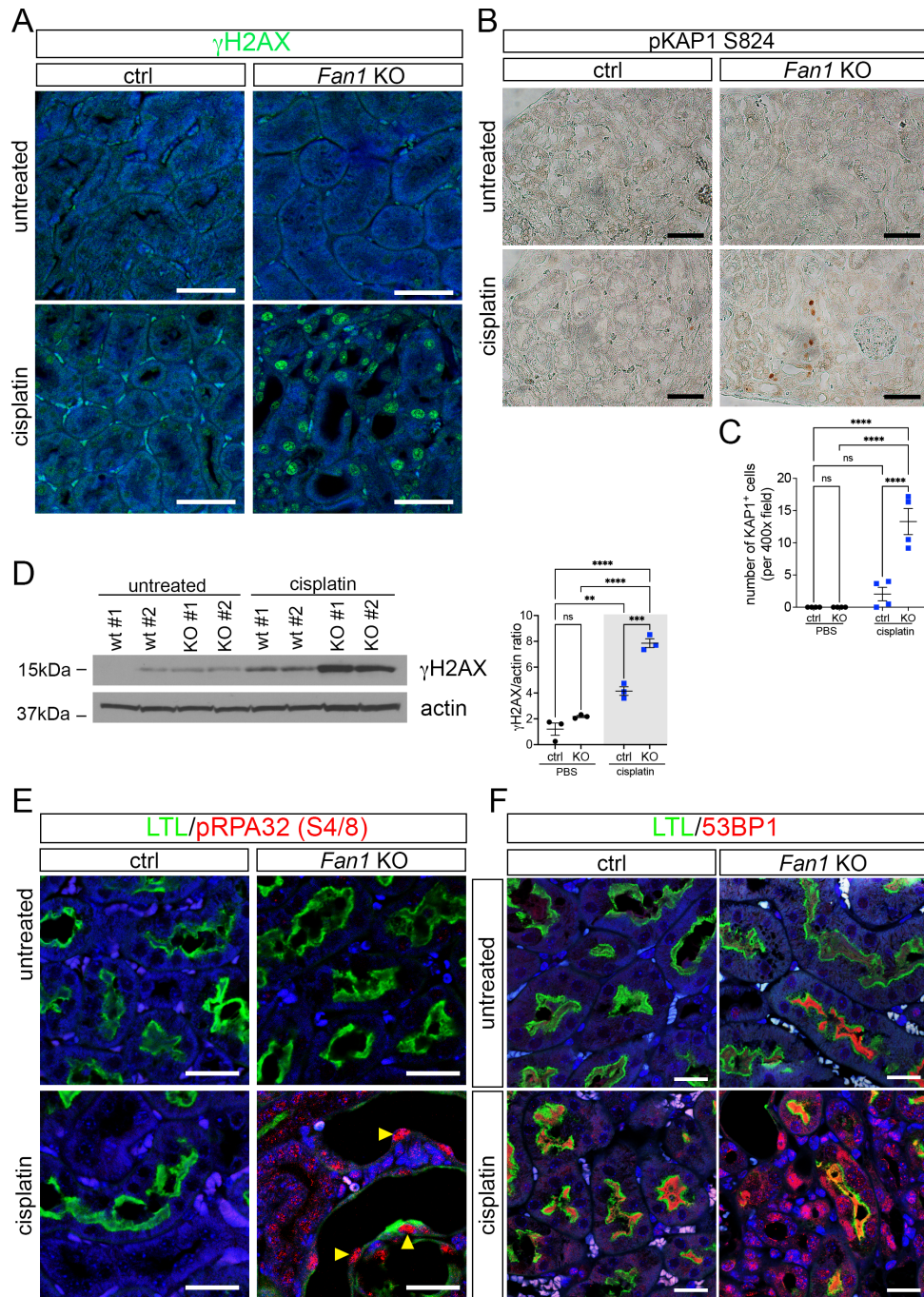
Supplementary Figure 2. Repeated low dose cisplatin administration induces fibrogenesis in *Fan1* KO kidneys but not in control kidneys.

(A) Change in weekly body weight in untreated and cisplatin treated ctrl and *Fan1* KO mice compared to the initial body weight at the onset of experiment. Significant loss in body weight was observed between PBS treated ctrl and cisplatin treated *Fan1* KO mice. Data are expressed as mean \pm SEM; n is the number of mice. n=5 for all groups, **p<0.01, ****p<0.0001. 2-way ANOVA with Tukey's post hoc test.

(B) Masson's trichrome staining in control and *Fan1* KO kidneys after repeated low dose cisplatin (2 mg/kg) administration. Untreated control, cisplatin-treated control and *Fan1* KO kidneys appear histologically normal, whereas cisplatin *Fan1* KO kidneys stain with blue, a characteristic sign of tubular interstitial fibrosis. Scale bars 50 μ m.

(C) Representative images of immunohistochemical staining of collagen III in untreated and cisplatin treated kidneys. n = 3 for untreated controls and cisplatin treated animals. Scale bar 100 μ m.

(D) Quantification of collagen 3 expression in 6 random cortical areas in untreated and cisplatin treated control and *Fan1* KO kidneys. Data are expressed as mean \pm SEM; n is the number of mice. n=3 for all groups, ****p<0.0001. 2-way ANOVA with Tukey's post hoc test.



Supplemental Figure 3. Increased expression of DNA damage markers in *Fan1* KO kidneys after cisplatin injury.

(A) Mice were subjected to repeated low dose cisplatin administration weekly for 5 weeks and kidneys examined 1 week after the last dose. Phosphorylated H2AX at S135 (γ H2AX) was detected using immunofluorescence staining. γ H2AX expression is greatly increased in the PTECs of *Fan1* KO kidneys after cisplatin compared to control kidneys. Scale bar 50 μ m.

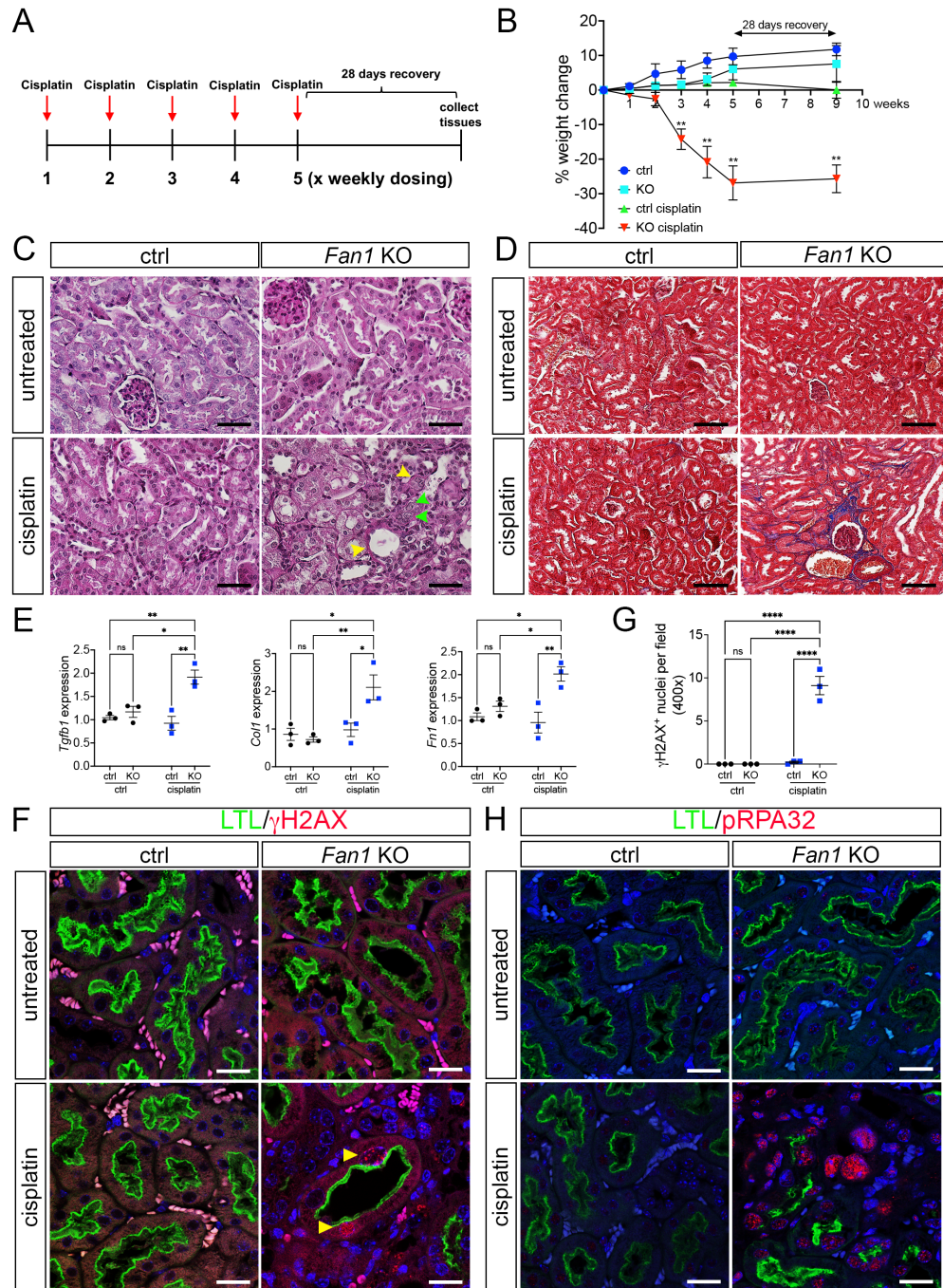
(B) Increased levels of the ATM target phosphorylated KAP1 (S824) in *Fan1* KO kidneys 1 week after the last cisplatin injection compared to the kidneys in other experimental groups. Scale bar 50 μm .

(C) Quantification of the number of pKAP1(S824)-positive cells in 6 random cortical areas in untreated and cisplatin treated control and *Fan1* KO kidneys shows significant upregulation in *Fan1* KO kidneys after cisplatin compared to kidneys in other experimental cohorts. Data are expressed as mean \pm SEM; n is the number of mice. n=4 for all groups, ****p<0.0001. 2-way ANOVA with Tukey's post hoc test.

(D) Representative image of western blot analysis of γH2AX expression in cisplatin treated *Fan1* KO kidneys. Actin is a loading control. Densitometric analysis of γH2AX western blot band intensities demonstrates significant increase in the level of DNA damage in cisplatin treated *Fan1* KO kidneys compared to other experimental cohorts. Data are expressed as mean \pm SEM; n is the number of mice. n=3 for all groups, **p<0.01, ****p<0.0001. 2-way ANOVA with Tukey's post hoc test.

(E) Immunofluorescence staining of pRPA32 (S4/8) (yellow arrowheads), which marks single strand DNA, an indicator of replication stress, is increased in cisplatin treated *Fan1* KO kidneys, but not in control kidneys. Lotus lectin (LTL) labels proximal tubules. Scale bar 25 μm .

(F) Immunofluorescence staining of 53BP1, which marks DNA double-strand breaks is increased in cisplatin treated *Fan1* KO kidneys, but not in control kidneys. Lotus lectin (LTL) labels proximal tubules. Scale bar 25 μm .



Supplemental Figure 4. *Fan1* KO kidneys fail to repair long-term tubular cell DNA damage.

(A) Schematic diagram of the long-term recovery protocol after repeat low dose cisplatin administration.

(B) Post cisplatin recovery is associated with sustained weight loss in *Fan1* KO mice but not in ctrl mice. Animal weights were recorded weekly and compared with their body weights before cisplatin injection to calculate weight loss percentages. Data are expressed as mean \pm SEM; n is the number of mice. n=3 for all groups, **p<0.01. 2way ANOVA with Tukey's post hoc test.

(C) PAS staining reveals persistent presence of karyomegalic nuclei (green arrowheads) and basement membrane defects (yellow arrowheads) in cisplatin treated *Fan1* KO kidneys after 28 days of recovery. Scale bar 50 μm .

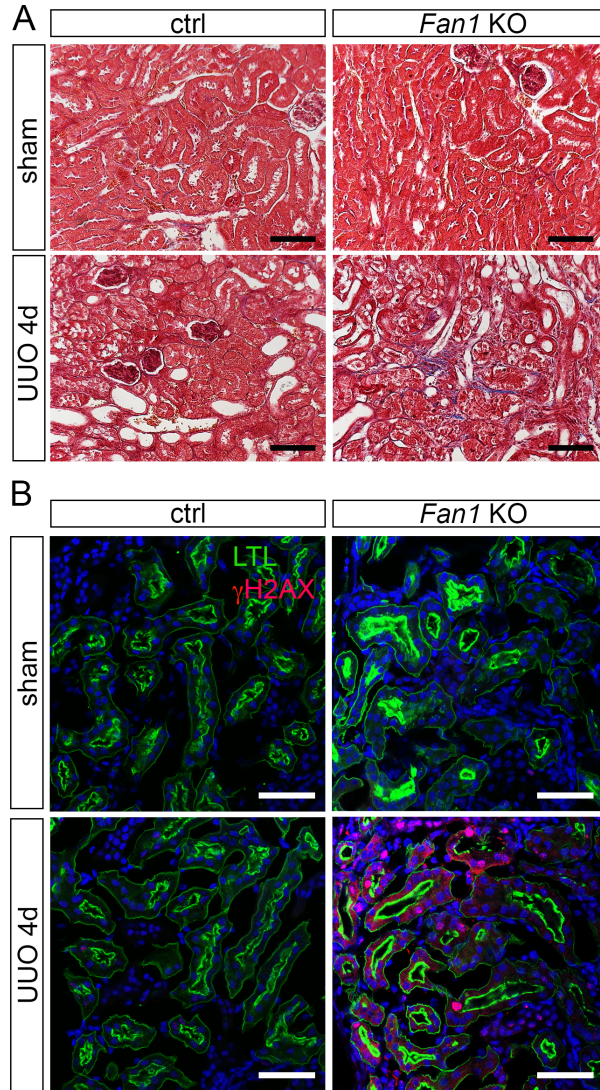
(D) Masson's trichrome staining shows interstitial fibrosis in *Fan1* KO kidneys 28 days after cisplatin administration. No fibrosis is detectable in cisplatin treated control kidneys. Scale bar 100 μm .

(E) qPCR analysis of fibrosis markers *Tgfb1*, *Col1* and *Fn1* in control and cisplatin treated kidneys. Data are expressed as mean \pm SEM; n is the number of mice. n=3 for all groups, *p<0.05, **p<0.01, 2-way ANOVA with Tukey's post hoc test.

(F) Immunofluorescence staining against γH2AX (yellow arrowheads) reveals failed DNA repair in *Fan1* KO kidneys 28 days after cisplatin administration. Scale bar 20 μm .

(G) Quantification of γH2AX -positive cells in *Fan1* KO kidney cortical areas in a random field of 400x magnification shows 9.1 ± 1.1 cells in *Fan1* KO vs. 0.2 ± 0.1 cells in control kidneys. Data are expressed as mean \pm SEM; n is the number of mice. n=3 for all groups, ****p<0.0001. 2way ANOVA with Tukey's post hoc test.

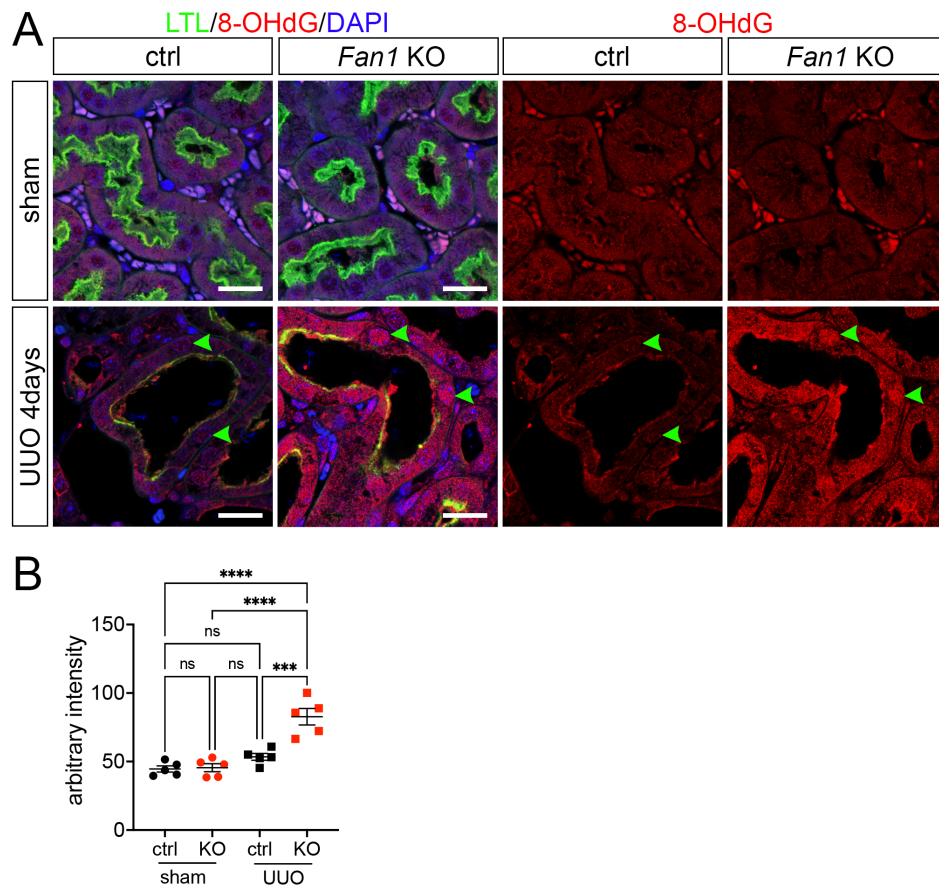
(H) Immunofluorescence staining against pRPA32 (S4/8) (red) marks the nuclei with persistent replication stress in *Fan1* KO kidneys 28 days after cisplatin administration. Scale bar 20 μm .



Supplementary Figure 5. Increased fibrosis and DNA damage in *Fan1* KO kidneys after 4 days of UUO.

(A) Masson's trichrome staining reveals the development of interstitial fibrosis in *Fan1* KO kidneys after 4 days of UUO. No fibrosis is detectable at this early stage in UUO control kidneys. Scale bar 100 μ m.

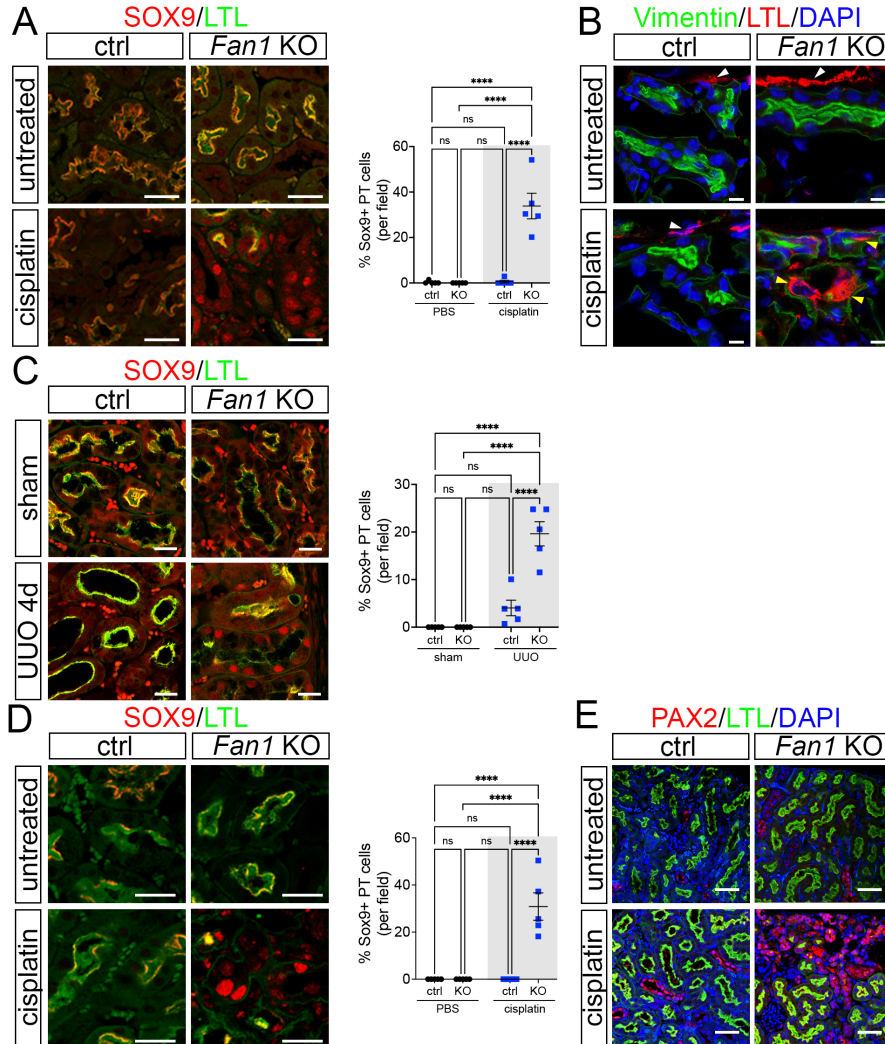
(B) Immunofluorescence staining with antibodies against γ H2AX and the proximal tubular marker Lotus lectin (LTL) demonstrate numerous γ H2AX-positive nuclei in the proximal tubules of *Fan1* KO kidneys after 4 days of UUO, whereas none can be detected in control UUO kidneys at this stage. Scale bar 50 μ m.



Supplementary Figure 6. Increased levels of oxidative DNA damage in *Fan1* KO kidneys after 4 days of UUO.

(A) Immunofluorescence staining with antibodies against 8-OHdG and the proximal tubular marker Lotus lectin (LTL) show increased levels of oxidative DNA damage in the nuclei (green arrowheads) of the proximal tubule cells in *Fan1* KO kidneys after 4 days of UUO, compared to control kidneys. Scale bar 20 μ m.

(B) Quantification of 8-OHdG staining intensity in the PTEC nuclei of sham and UUO control and *Fan1* KO kidneys imaged from 6 random cortical areas. Data are expressed as mean \pm SEM; n is the number of mice. n=5 for all groups, ***p<0.001, ****p<0.0001. 2-way ANOVA with Tukey's post hoc test.



Supplementary Figure 7. Sox9 expression is upregulated in *Fan1* KO kidneys after injury.

(A) Repeat low dose cisplatin administration leads to increased SOX9 (red) expression in *Fan1* KO compared to control kidneys. 33.8% ± 5.6% of *Fan1* KO proximal tubule cells are positive for SOX9 compared to 0.6% in control kidneys. Scale bar 25 μm.

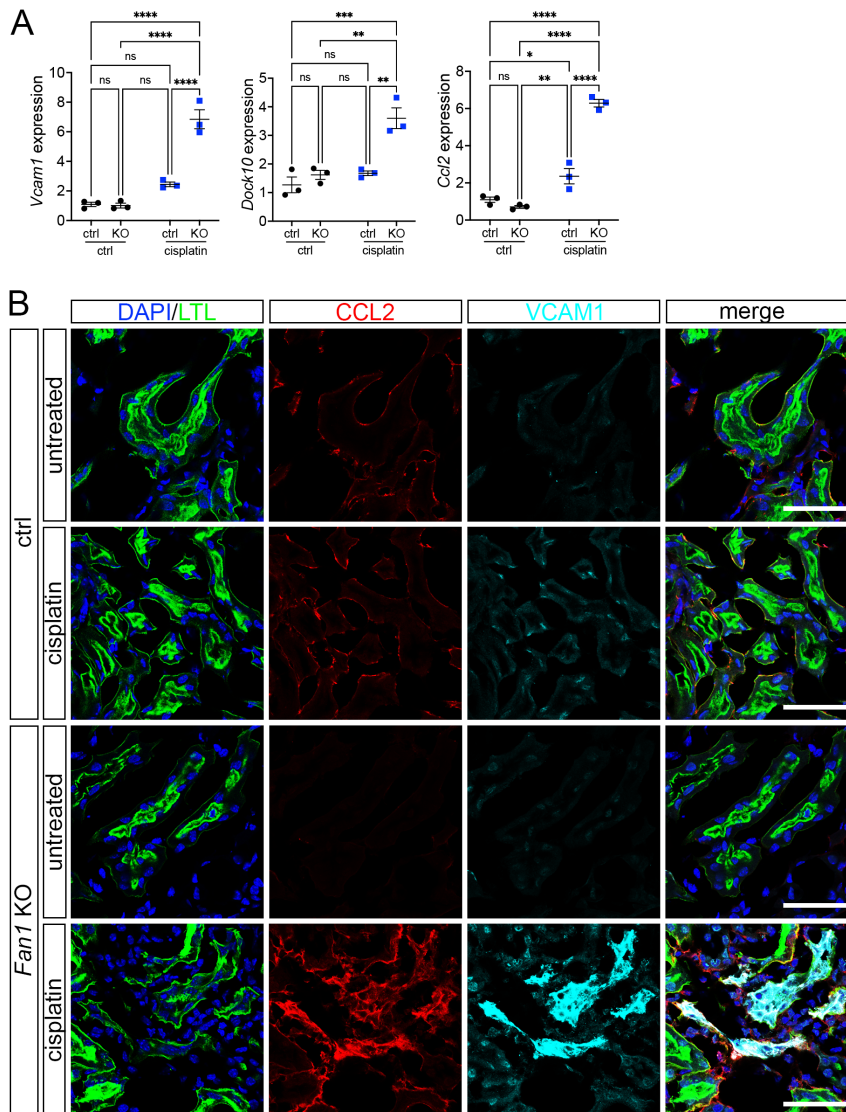
(B) Repeat low dose cisplatin administration induces aberrant vimentin (red) expression in *Fan1* KO proximal tubule cells (yellow arrowhead) and not in control kidneys. White arrowhead indicates normal vimentin staining in the renal capsule cells. Scale bar 7.5 μm.

(C) UUO leads to increased SOX9 (red) expression in *Fan1* KO compared to control kidneys 4 days after ureter ligation. 18.8% ± 2.2% of *Fan1* KO proximal tubule cells are positive for SOX9 compared to 3.5% ± 1.4% cells in control kidneys. Scale bar 10 μm.

(D) SOX9 (red) high expression is maintained in the proximal tubule cells in *Fan1* KO kidneys after long term recovery from repeat low dose cisplatin administration. 30.9% ± 5.8% of *Fan1* KO proximal tubule cells are positive for SOX9 compared to 0% in control kidneys. Scale bar 50 μm.

(E) PAX2 (red) is expressed in the proximal tubule cells in *Fan1* KO kidneys after long term recovery from repeat low dose cisplatin administration. Scale bar 50 μm .

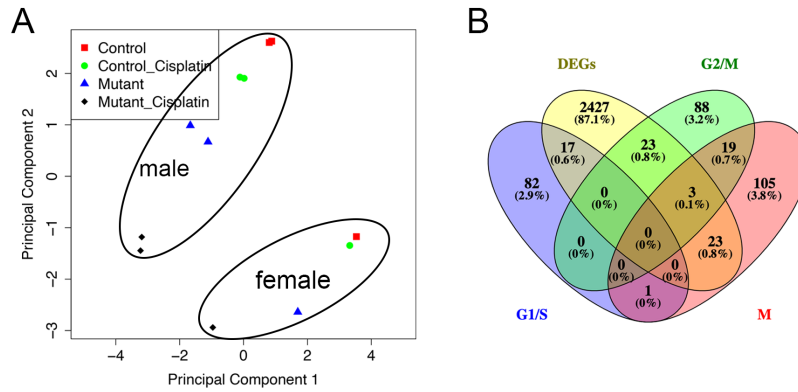
(A,C,D) Data are expressed as mean \pm SEM; n is the number of mice. n=5 for all groups, ***p<0.001, ****p<0.0001. 2-way ANOVA with Tukey's post hoc test.



Supplementary Figure 8. Markers of failed tubular repair, VCAM1 and CCL2 are upregulated in *Fan1* KO kidneys 28 days after cisplatin injury.

(A) qPCR analysis shows that *Vcam1*, *Dock10* and *Ccl2* expression is upregulated in *Fan1* KO kidneys after cisplatin injury, *Vcam1* (ctrl 1.0 ± 0.1 vs *Fan1* KO 2.1 ± 0.2 , **** $p < 0.001$), *Dock10* (ctrl 9.7 ± 1.3 vs *Fan1* KO 29.4 ± 4.4 , **** $p < 0.01$) and *Ccl2* (ctrl 9.7 ± 1.3 vs *Fan1* KO 29.4 ± 4.4 , **** $p < 0.01$), $n = 3$ each. Data are expressed as mean \pm SEM, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, **** $p < 0.0001$. 2-way ANOVA with Tukey's post hoc test.

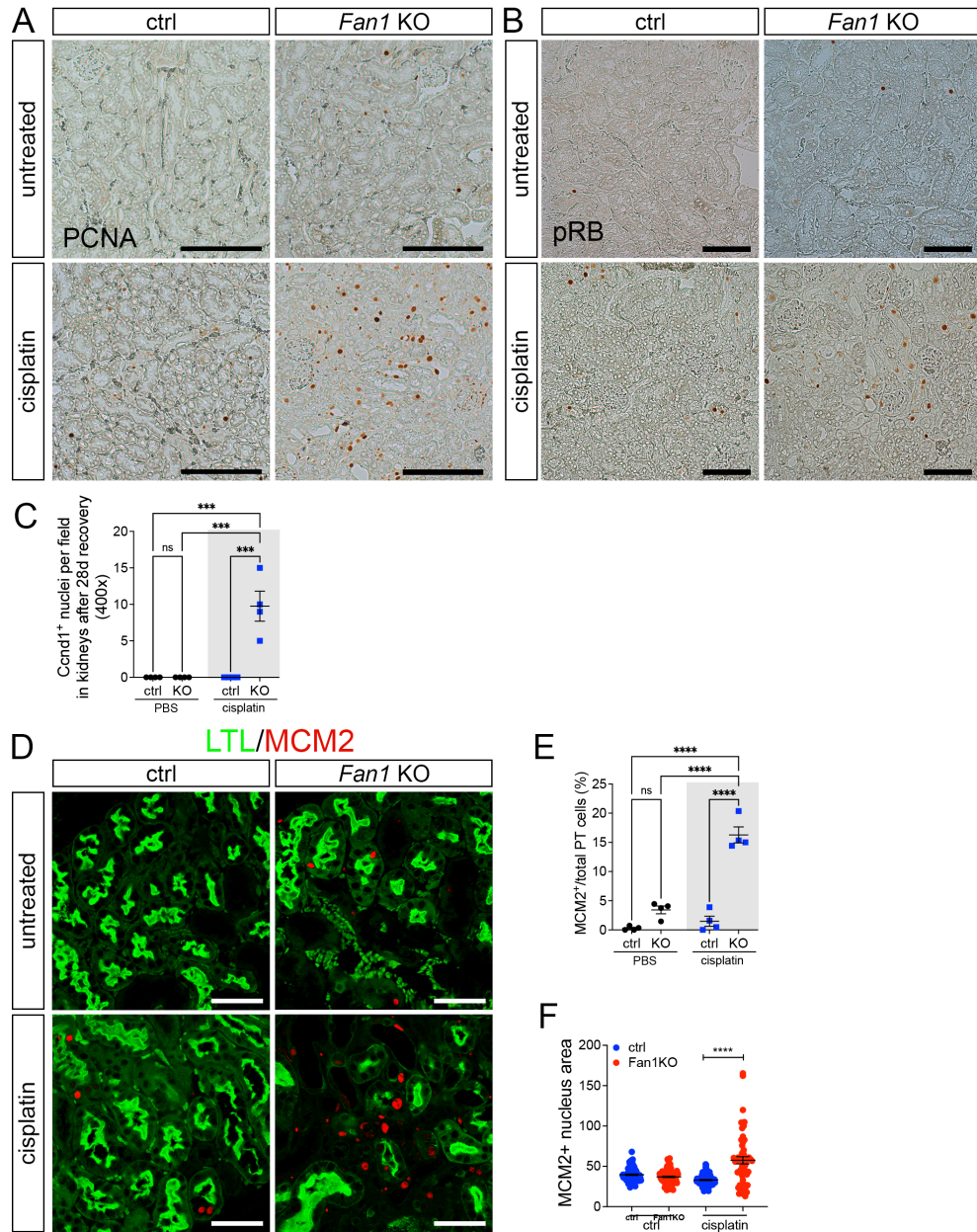
(B) Immunofluorescence staining with antibodies against CCL2 (red), VCAM1 (magenta) and the proximal tubular marker Lotus lectin (LTL) (green) show overlapping expression of VCAM1 and CCL2 in the injured proximal tubule cells in *Fan1* KO kidneys, consistent with failed tubular repair, compared to control kidneys. Scale bars 20 μm .



Supplementary Figure 9. Principal component analysis reveals *Fan1*- and gender-dependent differences in mouse kidneys after cisplatin injury.

(A) Principal component analysis showed that the kidney transcriptome was more similar in control mice even after cisplatin injury and was more distantly related to the transcriptome of *Fan1* KO kidneys. Regardless of +/- cisplatin treatment or genotype, the kidney transcriptomes were relatively dissimilar between male and female mice.

(B) Venn diagram indicating the number of significant differentially expressed genes across cell cycle phases (G1/S, G2/M and M) and the overlap between each set of genes in cisplatin treated *Fan1* KO kidneys. Notice, the overrepresentation of G2/M specific genes in injured *Fan1* KO kidneys compared to other cell cycle phases.



Supplementary Figure 10. Cell cycle proliferation markers are upregulated in cisplatin treated *Fan1* KO kidneys.

(A) Immunohistochemical staining for PCNA in untreated and cisplatin treated kidneys. Scale bar 200 μ m.

(B) Immunohistochemical staining for phosphorylated pRB (S807/811) in untreated and cisplatin treated kidneys. Scale bar 100 μ m.

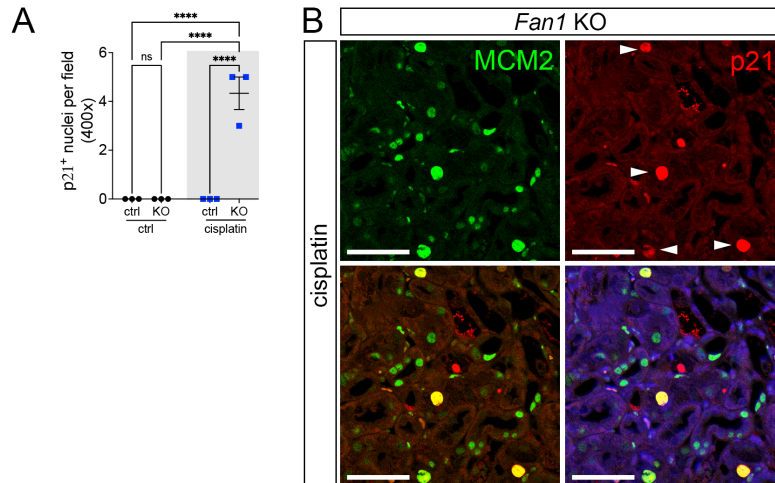
(C) Quantification of CCND1+ nuclei in *Fan1* KO kidneys 28 days after cisplatin injury. There are 9.8 ± 2.0 CCND1+ nuclei per field (400x) in *Fan1* KO kidneys compared to none in other groups, *** $p < 0.001$, $n = 4$.

(D) Immunostaining for MCM2 and LTL in untreated and cisplatin treated kidneys. Scale bar 50 μ m.

(E) Quantification of MCM2+ nuclei 16.3% \pm 1.4% of *Fan1* KO proximal tubule cells are positive for MCM2 compared to 1.5 \pm 0.9% in control kidneys. **** $p < 0.0001$, $n = 4$.

(F) Quantification of the area of MCM2+ nuclei in untreated and cisplatin treated kidneys. Nuclear area in cisplatin treated ctrl kidneys 33.0 ± 0.7 vs 57.5 ± 4.4 in cisplatin treated *Fan1* KO kidneys, **** $p < 0.0001$, n=100 MCM2+ nuclei in ctrl kidneys and n=55 MCM2+ nuclei in *Fan1* KO kidneys.

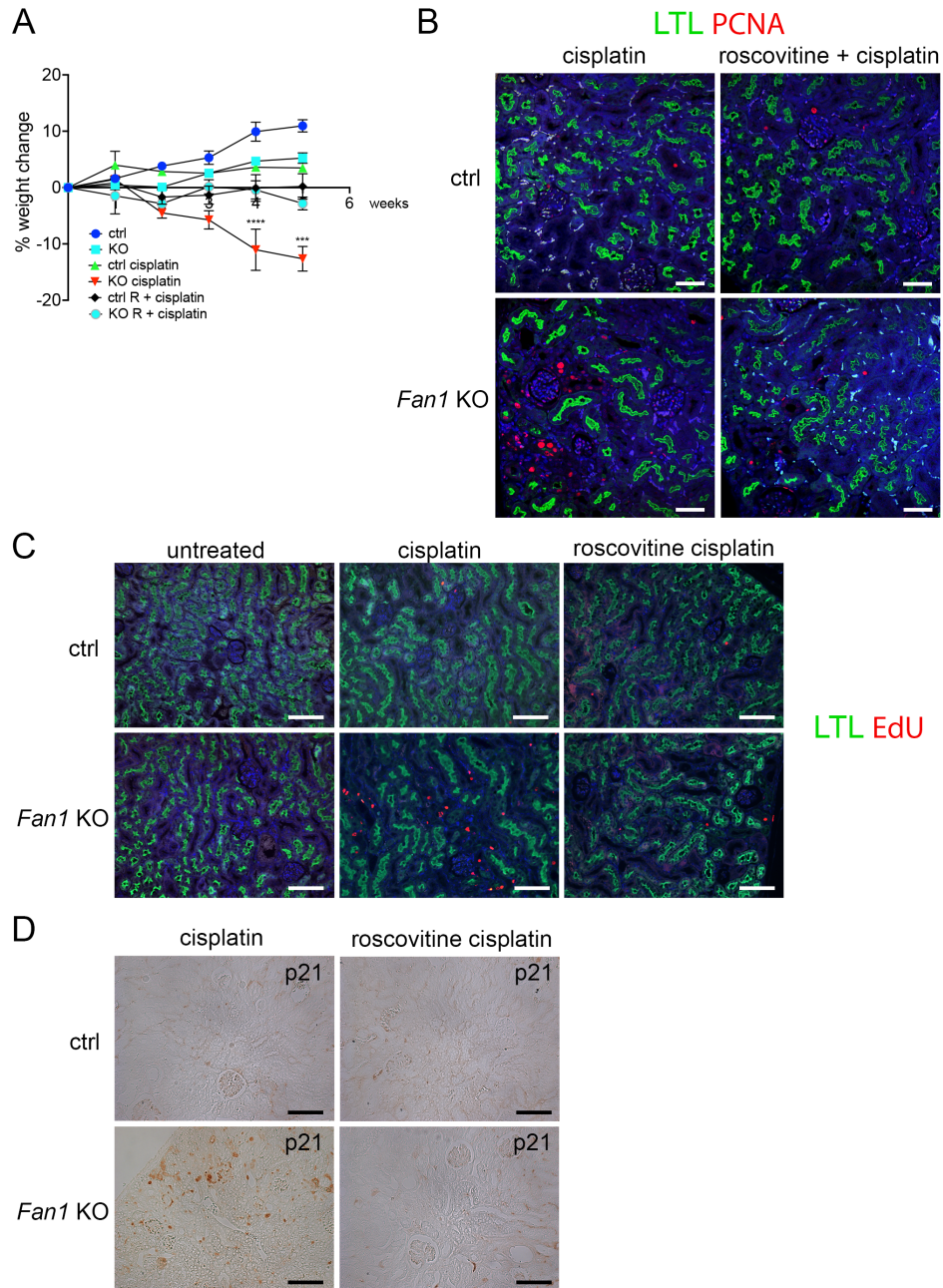
(A,C,D) Data are expressed as mean \pm SEM; n is the number of mice. n=5 for all groups, *** $p < 0.001$, **** $p < 0.0001$. 2-way ANOVA with Tukey's post hoc test.



Supplementary Figure 11. Persistent DNA damage leads to abnormal co-expression of p21 and MCM2 in *Fan1* KO kidneys.

(A) Quantification of p21+ nuclei per 400X field in untreated and cisplatin treated kidneys. 4.3 ± 0.7 p21+ nuclei per field in *Fan1* KO kidneys, **** $p < 0.0001$, $n = 3$. Data are presented as the mean \pm SEM. A 2-way ANOVA with Tukeys' post hoc analysis.

(B) Immunostaining for MCM2 and LTL in cisplatin treated *Fan1* KO kidneys. White arrows indicate nuclei in which MCM2 and p21 overlap. Scale bar 50 μ m.



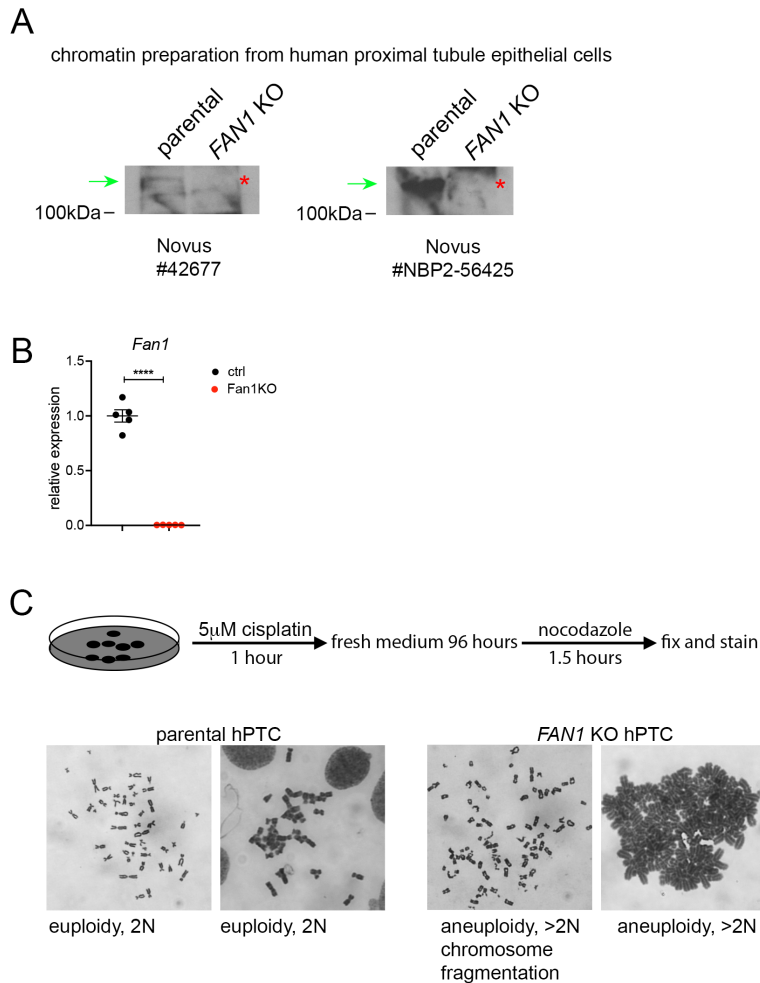
Supplementary Figure 12. Roscovitine treatment blocks S phase activity in *Fan1* KO kidneys.

(A) Roscovitine treatment before cisplatin administration protects *Fan1* KO mice from weight loss. Animal weights were recorded weekly and compared with their body weights before cisplatin injection to calculate weight loss percentages. Data are expressed as mean \pm SEM; n is the number of mice. n=4 for all groups, ***p<0.001, ****p<0.0001. 2way ANOVA with Tukey's post hoc test.

(B) Representative images of PCNA immunofluorescence staining in cisplatin and roscovitine + cisplatin treated kidneys. LTL (green) staining marks proximal tubules. Scale bar 50 μ m.

(C) Representative images of EdU (red) detection with click chemistry in cisplatin and roscovitine + cisplatin treated kidneys. LTL (green) staining marks proximal tubules. Scale bar 100 μm .

(D) Representative images of p21 immunohistochemistry staining in cisplatin and roscovitine + cisplatin treated kidneys. In contrast to mice treated only with cisplatin, the kidneys of roscovitine + cisplatin treated mice did not contain any p21-positive nuclei. Scale bar 100 μm .

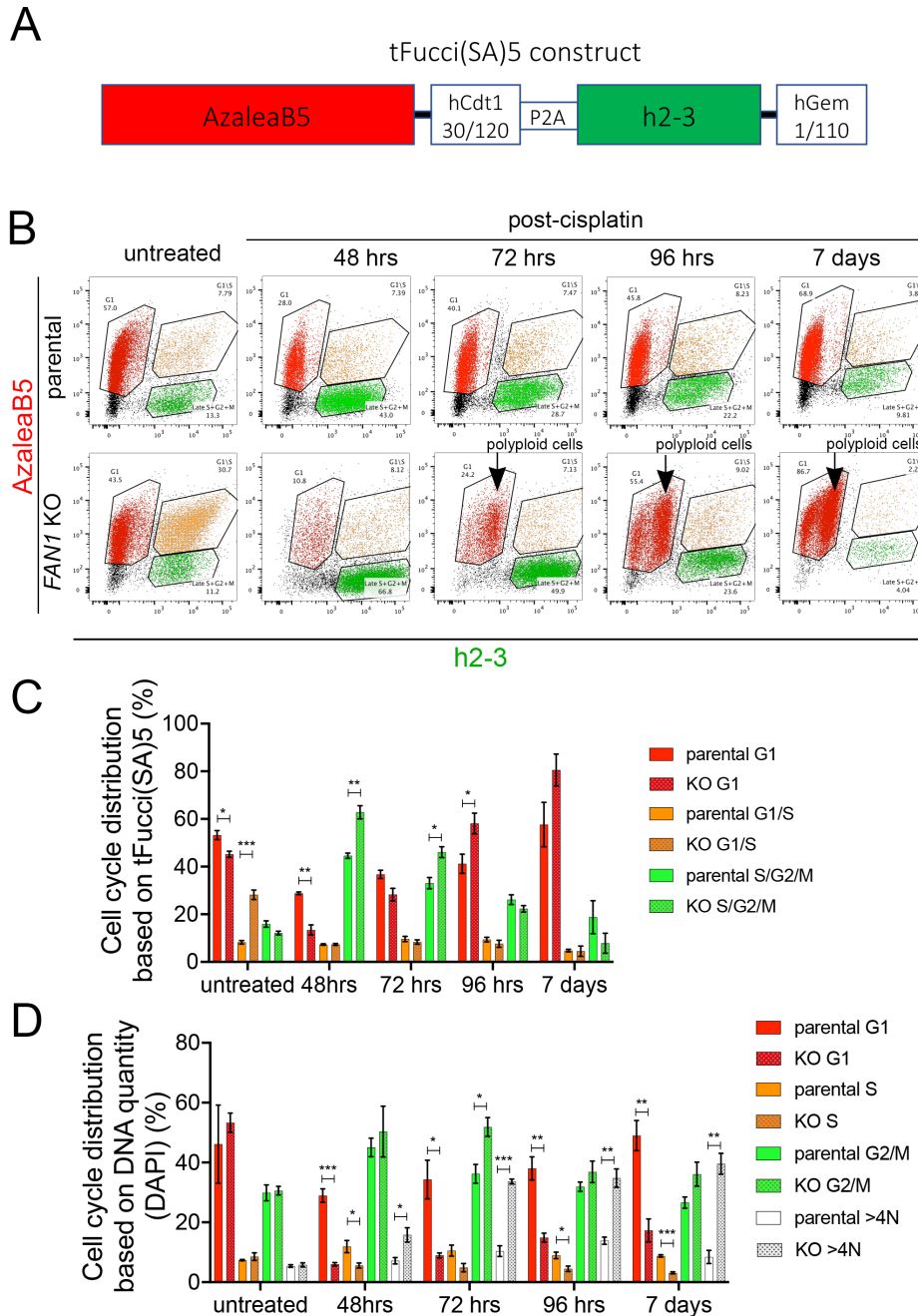


Supplementary Figure 13. Confirmation of loss of FAN1 expression in human FAN1 KO CRISPR/Cas9 kidney proximal tubule cells.

(A) Absence of FAN1 expression in human PTECs was confirmed by immunoblotting of the chromatin fraction from the parental and *FAN1* KO cells with antibodies against FAN1. #42677 (Novus) anti-FAN1 antibodies detect the residues 1-50 in FAN1 N-terminus, #NBP2-56425 (Novus) detects the FAN1 C-terminus. Green arrow indicates the FAN1 protein band in the parental chromatin extractions; red star indicates absence of FAN1 band in FAN1KO extracts.

(B) qPCR analysis of human PTECs with primers against *FAN1* confirm the absence of *FAN1* mRNA transcript in KO CRISPR/Cas9 kidney proximal tubule cells. **** $p < 0.0001$, $n = 5$ biological replicates. Data are presented as the mean \pm SEM. Two-tailed, unpaired Student's t test.

(C) Examples of metaphase spreads of parental and *FAN1* KO human proximal tubule cell lines 96 hours after 1 hour exposure to 5 μ M cisplatin. *FAN1* KO hPTCs demonstrate aneuploidy and chromosomal fragmentation.



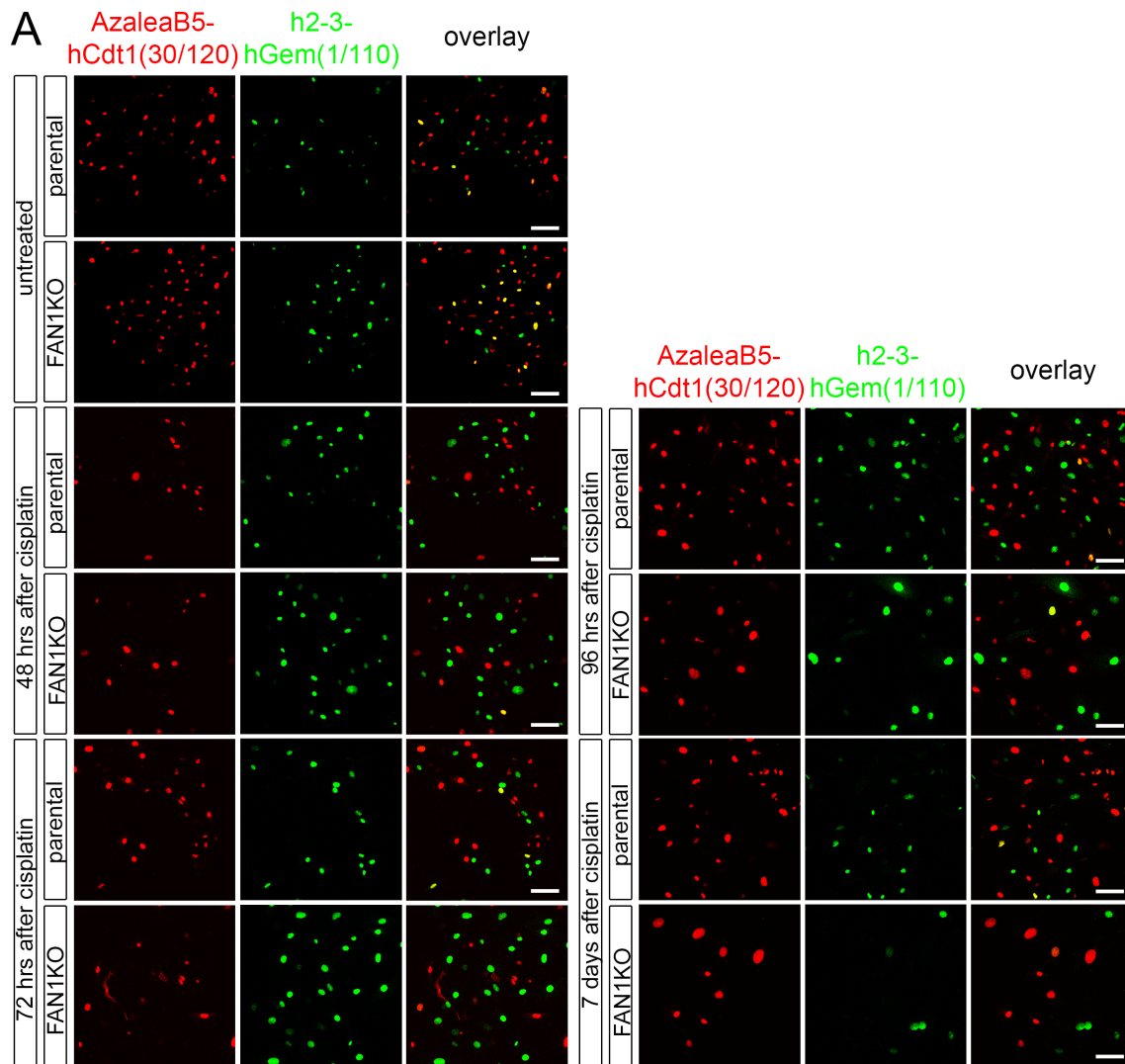
Supplementary Figure 14. Fucci assay combined with FACS reveals a distinct polyploid cell population in *FAN1* KO hPTECs.

(A) Schematics of the tandem Fucci variant, tFucci(SA)5. hGem(1/110), APC^{Cdh1}-mediated ubiquitination domain (1–110) of human Geminin; hCdt1, residues 30–120 of human Cdt1; P2A, self-cleaving peptide.

(B) Gating strategy of parental and *FAN1* KO hPTECs to identify different cell cycle phases based on their expression of red (AzaleaB5(+)/h2-3(-)), yellow (AzaleaB5(+)/h2-3(+)), or green (AzaleaB5(-)/h2-3(+)) fluorescence. A panel with representative data from parental and *FAN1* KO hPTECs is shown.

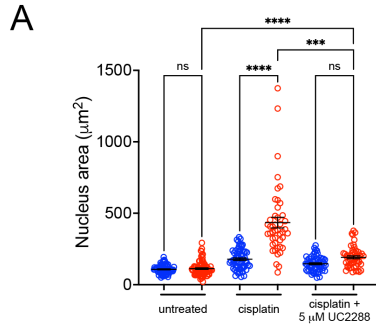
(C) Cell cycle distribution of parental and *FAN1* KO hPTECs based on tFucci(SA) expression. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, $n = 3$ replicates each. Data are presented as mean \pm SEM. Two-tailed, unpaired Student's t test.

(D) Cell cycle distribution of parental and *FAN1* KO hPTECs based on DNA content (cellular ploidy) was determined by flow cytometry based on DAPI staining. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, $n = 3$ replicates each. Data are presented as mean \pm SEM. Two-tailed, unpaired Student's t test.



Supplementary Figure 15. Fucci assay can be used to monitor polyploidization in *FAN1* KO hPTECs.

(A) Representative microscopic images of parental and *FAN1* KO hPTECs stably expressing the tFucci(SA)5 construct. Cells appearing red (expressing AzaleaB5-hCdt1(30/100)) were designated as being in G1, cells appearing green (expressing h2-3-hGem(1/110)) were designated as being in late-S/G2/M, and cell expressing both reporter genes and thus appearing orange were designated as being in G1/S. Cells were +/- treated for 1 hr with 5 μ M cisplatin and imaged 48, 72, 96 hours or 7 days later. The parental cells appear to reacquire their baseline-like expression pattern of tFucci(SA)5 by day 7 after treatment with cisplatin. In contrast, the majority of the *FAN1* KO cells have an increased nuclear size, indicating polyploidy, and appear red, suggesting that they are quiescent. Scale bars 100 μ m.



Supplementary Figure 16. Inhibiting *Cdkn1a* expression blocks karyomegaly in human *FAN1* KO CRISPR/Cas9 kidney proximal tubule cells.

(A) Quantification of the nucleus area of *FAN1* KO hPTC cells vs the parental cell line in untreated, cisplatin treated and cisplatin + UC2288 treated cells 48 hours after 1 hour 5 µM cisplatin treatment reveals that inhibiting *Cdkn1a* expression with 5 µM UC2288 blocks the formation of karyomegaly in *FAN1* KO hPTC cells. DAPI staining was used to measure the nuclear area. *** $p < 0.001$, **** $p < 0.0001$, $n = 100$ nuclei per each condition. Data are presented as the mean \pm SEM, non-parametric Kruskal-Wallis test.

Supplementary Table 1. Differentially expressed genes between untreated control and untreated *Fan1* KO kidneys.

GeneID	Symbol	logFC	adj.P.Val
217066	Gm15698	-7.0716751	5.07E-06
207565	Camkk2	-1.382912	0.00013177
613254	AA465934	-2.9937482	0.00081794
11837	Rplp0	1.60775726	0.00081794
66161	Pop4	1.80011044	0.00081794
399609	C130046K22Rik	6.49196598	0.00081794
193217	BC018473	-8.2480059	0.00119904
64213	St7	-1.3242798	0.00160507
67704	1810037117Rik	-3.5019978	0.00160507
329002	Zfp236	0.84131029	0.00162906
100504344	Gm20186	2.84026187	0.00208155
435784	Rps15a-ps8	-8.6076967	0.00208155
14455	Gas5	1.2310201	0.00233869
18704	Pik3c2a	0.97852923	0.00233869
433855	Al506816	4.31247131	0.00233869
20445	St6galnac1	-5.747616	0.00233869
435328	Ighv1-67	-3.7120647	0.00287733
68695	Hddc3	-2.3618628	0.00305406
231287	Atp10d	-2.1792889	0.00379563
240058	Cpne5	-4.2994287	0.00379563
56747	Sez6l	-4.0307034	0.00379563
234825	Klhdc4	1.28494798	0.00540393
11431	Acp1	1.93530916	0.00601462
75472	Cfap126	3.79948385	0.00630441
100502888	Gm19434	5.30433721	0.00646006
27384	Akr1c13	-1.0476202	0.00652959
75986	Agmat	-1.3601324	0.00659294
622070	Gm15133	4.11056769	0.00659294
66526	Tceanc2	0.61229772	0.00762851
68528	Smim6	3.0884683	0.00826359
67475	Ero1lb	1.32316088	0.00826359
380683	Sec14l3	-1.5058055	0.00877472
626410	Gm20755	2.73891752	0.00877472
68161	A930005H10Rik	-1.5191125	0.0091659
223453	Dap	-0.8954449	0.0091659
227682	Trub2	-0.84613	0.00929988

232345	A2m	-3.3230476	0.00942022
17219	Mcm6	2.92861218	0.01009804
545641	Gm5860	3.78555195	0.01009804
16616	Klk1b21	1.36049828	0.01026946
66120	Fkbp11	-1.1619715	0.01059419
74937	4930481B07Rik	-1.8327347	0.01107537
69536	Hemk1	-0.8787011	0.01107537
76681	Trim12a	4.86659832	0.01107537
11858	Rnd2	-0.9145929	0.01118588
232408	Klrb1f	4.31525678	0.01226153
20745	Spock1	-3.0413485	0.0130579
83485	Ngrn	-0.7051558	0.01438691
20901	Strap	0.53186268	0.01438691
100862363	NA	2.24798579	0.01446073
67588	Rnf41	0.45340382	0.01456454
72203	2610507I01Rik	2.49882897	0.01515025
72393	Faim2	-4.5396667	0.01541501
11807	Apoa2	2.56720861	0.01617637
107993	Bfsp2	3.95566423	0.01617637
170733	Klra17	-3.8729795	0.01714109
241624	Exd1	-2.0262668	0.01747455
75627	Snpc1	1.04735229	0.01795079
20775	Sqle	-0.9377122	0.01805896
193280	C030037D09Rik	1.61035531	0.01860012
102278	Cpne7	3.29814345	0.01860012
20409	Ostf1	-0.7776553	0.01860012
245884	Fam71f2	-2.2215442	0.01860012
51902	Rnf24	-1.878648	0.01918396
74319	Mettl23	0.81852548	0.02059026
20957	Sycp1	-4.9359471	0.02059026
207175	Cetn4	1.11012473	0.02168949
22685	Zfp239	-1.494765	0.02168949
16619	Klk1b27	1.56166992	0.02168949
192136	Sugct	3.46917395	0.02168949
100038712	Gm10516	1.82623192	0.02427493
100502984	Gm19487	3.18327918	0.02558998
214585	Spg11	0.52797311	0.02585715
18685	Phtf1	0.6275655	0.02600861
70419	2810408A11Rik	-1.4985653	0.02664316

625901	Gm6634	-3.166146	0.02963642
326619	Hist1h4a	-2.078545	0.03005022
67487	Dhx40	0.54148826	0.03005022
71517	9030624J02Rik	0.51867462	0.03012741
276950	Sfn8	3.70264545	0.03115371
67937	Tmem59l	-3.2258619	0.03171237
54418	Fmn2	-3.5466157	0.03291734
17921	Myo7a	0.98808298	0.03344662
78725	D730001G18Rik	2.31274576	0.03362933
108653	Rimklb	1.46317781	0.03362933
238024	Fn3krp	0.66860593	0.03879445
619304	I830134H01Rik	2.7760406	0.03879445
554292	Methig1	3.36562915	0.03916687
18705	Pik3c2g	-2.2548221	0.04022661
623273	Alms1-ps2	3.1377467	0.04057352
105833	Ccdc65	-2.1410372	0.04280561
11811	Apobec2	2.03488907	0.04280561
330173	2610524H06Rik	-0.848222	0.04305815
73921	Scpep1os	1.36971461	0.04305815
26447	Poli	-0.8590682	0.04305815
227627	Obp2a	-2.1882535	0.04305815
15199	Hebp1	1.20116259	0.04305815
75530	Lym7	1.17464601	0.04362807
94094	Trim34a	2.16722591	0.04362807
234912	9230110C19Rik	-0.7085389	0.04362807
207592	Tbc1d16	-0.6580715	0.04370771
319184	Hist1h2bk	-2.3793364	0.04480577
319180	Hist1h2bf	3.42581408	0.04550802
100041621	Gm3435	-1.0374131	0.04550802
665155	Srp54b	0.6839561	0.04550802
230103	Npr2	-0.8438254	0.04550802
13646	Klk1b22	-5.0911668	0.04707906
327951	Cyb5d1	0.82412466	0.04707906
83453	Chrdl1	-2.0905602	0.04797226
66184	Rps4l	0.958852	0.04797226
100101806	Srp54c	0.58844519	0.04797226
52120	Hgsnat	0.42321761	0.04797226
12654	Chil1	-2.9782324	0.04815213
381062	Ermard	-0.7093107	0.04815213

319887	E030030I06Rik	4.04419147	0.04871269
71919	Rpap3	0.69017988	0.04871269
27421	Abcc6	1.27682001	0.04898752
634720	Gm11735	-4.3017523	0.04969328

Supplementary Table 2. Differentially expressed genes between untreated control and cisplatin treated control kidneys

GeneID	Symbol	logFC	adj.P.Val
20620	Plk2	2.20891701	0.01022916
23886	Gdf15	2.08647683	0.01022916
100628618	Mir5106	3.41467029	0.01522251
12575	Cdkn1a	3.47027765	0.0250149
16667	Krt17	3.79124009	0.02713213
27280	Phlda3	2.97218796	0.02713213
74041	Ddias	2.98043547	0.02713213
100042444	Trav6d-6	2.38975536	0.02713213
230784	Sesn2	1.15774959	0.03034261

Supplementary Table 3. Differentially expressed genes between cisplatin treated control and cisplatin treated *Fan1* KO kidneys

GeneID	Symbol	logFC	adj.P.Val
217066	Gm15698	-7.2214362	4.82E-06
22262	Uox	5.29807928	2.17E-05
20195	S100a11	2.48237377	4.88E-05
16668	Krt18	2.52957987	5.20E-05
99571	Fgg	3.38445719	6.18E-05
100502897	Gm12854	2.14029601	6.18E-05
18216	Ntsr1	5.32895435	6.18E-05
15361	Hmga1	3.11330917	0.00010096
74253	Klrg2	2.94998114	0.00010096
434437	Amt	-1.3525005	0.00012998
66161	Pop4	1.98632475	0.00013511
14455	Gas5	1.66546475	0.0001604
13014	Cstb	1.26959702	0.00018873
622070	Gm15133	5.86828869	0.00018873
71826	1700001F09Rik	4.80541042	0.00018873

11303	Abca1	1.83827332	0.00020356
435328	Ighv1-67	-4.8097822	0.00021534
20928	Abcc9	-2.0877955	0.00027263
242594	1700024P16Rik	2.07319136	0.00028666
232714	Mgam	-1.4671026	0.00028666
14060	F13b	-2.43518	0.00031016
14187	Akr1b8	2.88358181	0.0003258
613254	AA465934	-2.4606561	0.0003258
12305	Ddr1	0.95371959	0.0003258
11837	Rplp0	1.50514339	0.0003258
100504344	Gm20186	2.9566645	0.0003258
193217	BC018473	-8.0747513	0.0003258
106672	Al413582	1.53717674	0.00035609
22339	Vegfa	-1.0423771	0.00035609
433855	Al506816	5.05343458	0.00035609
399609	C130046K22Rik	6.07904425	0.00035609
11364	Acadm	-1.8170737	0.00039077
80292	Zxdc	0.69017453	0.00039083
52120	Hgsnat	0.8597817	0.00039083
20194	S100a10	1.16544513	0.00039083
213539	Bag2	1.18319501	0.00041283
100042342	Gm10375	3.8721516	0.00042893
330173	2610524H06Rik	1.22029955	0.00043171
78634	Spaca7	6.34080806	0.00046587
20200	S100a6	3.96819101	0.00047226
23886	Gdf15	1.68935211	0.00048562
100340	Smpdl3b	3.75324585	0.00057538
93672	Il24	5.52229047	0.00058741
16669	Krt19	3.4074159	0.00060684
72275	2200002D01Rik	2.46327072	0.00060684
75552	Paqr9	-1.9736125	0.00060684
67704	1810037117Rik	-2.9509327	0.00060684
74129	Dmgdh	-2.0777891	0.00060684
76681	Trim12a	7.02060077	0.00060684
20445	St6galnac1	-5.7993796	0.00064479
17918	Myo5a	-1.5410299	0.0006821
100043257	Gm15453	2.13824417	0.00076447
57784	Bin3	0.8057198	0.00078667
72205	Eml2	0.98765934	0.00078667

20682	Sox9	2.22398609	0.00079959
13685	Eif4ebp1	1.83467623	0.00079959
98256	Kmo	-2.1336524	0.00079959
67510	Tvp23b	-0.8206514	0.00079959
75272	Erich6b	4.58433705	0.00079959
75986	Agmat	-1.8354609	0.00081913
320145	Sp8	4.74428626	0.00081913
554292	Methig1	4.75010506	0.00085734
77552	Shisa4	1.57320459	0.00086401
21356	Tapbp	0.7814715	0.00086401
68528	Smim6	3.6364879	0.00089159
20197	S100a3	3.95589577	0.0008943
68695	Hddc3	-2.2766622	0.00092793
629059	Fam124a	2.43764578	0.00093238
70560	Wars2	-0.7676731	0.00093238
170770	Bbc3	1.81179361	0.00093238
236539	Phgdh	2.25433873	0.00093238
17219	Mcm6	3.36096931	0.00093238
16905	Lmna	0.96400867	0.00093238
380683	Sec14l3	-2.0543633	0.00093238
11603	Agrn	1.01255724	0.00093238
18810	Plec	0.9032714	0.00093238
67588	Rnf41	0.58259142	0.00093238
12740	Cldn4	1.92409931	0.00093238
16854	Lgals3	2.08218807	0.00093238
13419	Dnase1	-3.293229	0.00093238
56753	Tacstd2	1.71036469	0.00093238
12040	Bckdhb	-1.30974	0.00093238
74175	Crct1	6.41975665	0.00093238
11839	Areg	6.29077079	0.00093238
17189	Mb	5.34900455	0.00093238
100628618	Mir5106	-3.2137287	0.00093238
71773	Ugt2b1	2.77796975	0.00093238
243659	Styk1	2.647309	0.00094121
224419	Map3k7cl	-1.4566165	0.0009553
15979	Ifngr1	1.26430901	0.0009553
347708	Dppa1	4.80716993	0.00097464
21753	Tes	1.27145012	0.00104829
76113	Lpo	9.11305923	0.00104829

230779	Serinc2	1.38090404	0.00108864
18504	Pax2	0.65503755	0.00110959
114584	Clic1	1.17434227	0.00113784
24056	Sh3bp5	-1.0287289	0.00113784
233168	Al987944	0.76452867	0.00117557
18146	Npdc1	0.87063791	0.00117557
12558	Cdh2	1.99644986	0.0012071
227580	C1ql3	1.45739284	0.00121534
71768	Vwce	-1.4541209	0.00121534
209584	Tyw3	-2.1070942	0.00121534
22321	Vars	0.86429098	0.00121534
268860	Abat	-1.5958551	0.00121534
71770	Ap2b1	0.53709095	0.00121534
29812	Ndr3	-0.6515345	0.00121534
211401	Mtss1	-1.252954	0.00121534
435784	Rps15a-ps8	-7.0806836	0.00121534
112405	Egln1	-0.786141	0.00122681
11431	Acp1	1.98006747	0.0012661
14251	Flot1	1.07694397	0.00131064
75578	Fggy	-1.1511798	0.00132598
209176	Ido2	-4.7635633	0.00132904
19663	Rbpms	0.6646869	0.00132904
74150	Slc35f5	0.45249666	0.00132904
19275	Ptpn	3.09972979	0.00133067
19079	Prkab1	0.79774	0.00133291
272551	Gins2	2.51978441	0.00133437
59126	Nek6	1.03411419	0.00133912
330695	Ctxn1	1.91937817	0.00135322
18176	Nras	0.60914914	0.00135322
170733	Klra17	-4.5083825	0.00135322
110257	Hba-a2	-8.2384597	0.0013544
234825	Klhdc4	1.24021989	0.00141134
235106	Ntm	4.22538612	0.00143164
14121	Fbp1	-1.589539	0.00145197
77031	Slc9a8	-2.0698211	0.00151013
11745	Anxa3	3.31722535	0.00151026
70510	Rnf167	-0.6568797	0.00151452
76051	Ganc	-1.2205713	0.00151919
14693	Gnb2	0.59377838	0.00151919

64213	St7	-0.9215301	0.00153558
229699	Slc16a4	-2.2441699	0.00155211
54634	Magix	-1.4654621	0.00158267
241624	Exd1	-2.5284807	0.00158482
671878	Gm14680	-1.1983301	0.00158482
18038	Nfkbil1	0.79439427	0.0016035
12018	Bak1	1.13169271	0.00161681
17975	Ncl	0.64786693	0.00162052
217666	L2hgdh	-1.9126102	0.00162052
21346	Tagln2	0.7677467	0.00162052
52024	Ankrd22	2.20972181	0.00163258
319819	4932435O22Rik	2.20972181	0.00163258
72203	2610507I01Rik	2.78592892	0.00167174
66526	Tceanc2	0.60495142	0.00167174
11639	Ak4	-2.2329685	0.00167174
100037258	Dnajc3	-0.8296224	0.00167174
68133	Gcsh	-1.1319594	0.00167174
212647	Aldh4a1	-1.2669013	0.00167812
67369	Qpctl	0.76705377	0.00171629
15936	Ier2	0.81019101	0.00171629
13682	Eif4a2	-0.6375944	0.00171629
19249	Ptpn13	1.00831707	0.00171629
63993	Slc5a7	4.75180418	0.00171629
16691	Krt8	1.55883891	0.00172954
243084	Tmprss11e	2.87134367	0.00172954
21873	Tjp2	0.49775225	0.00178363
26949	Vat1	1.27049765	0.00178795
14619	Gjb2	-1.5416792	0.00178795
319625	Galm	-1.1413535	0.00178795
110648	Lmx1a	3.12708362	0.00178795
17133	Maff	1.93362141	0.00178951
71777	Ing3	-0.6370237	0.00178951
13595	Ebp	-0.8209342	0.00178951
12365	Casp14	5.72475984	0.00178951
74937	4930481B07Rik	-1.8886309	0.00180359
13639	Efna4	1.60908204	0.00180359
68949	1500012F01Rik	1.3451618	0.00180359
19244	Ptp4a2	0.56073266	0.00180359
11651	Akt1	0.47453409	0.00180359

110253	Triobp	0.79596128	0.00180359
76261	0610040J01Rik	0.79293582	0.00180359
22754	Zfp92	4.608811	0.00180359
71982	Snx10	1.92567089	0.00180574
16819	Lcn2	4.30119936	0.00180574
66184	Rps4l	1.25533235	0.00180574
12763	Cmah	-1.4905967	0.00180574
67903	Gipc1	0.87350152	0.00180574
329384	Pthr1	2.10966064	0.00183633
71684	Rbm43	0.89054969	0.00183633
15507	Hspb1	2.12889605	0.00183633
216825	Usp22	0.50768624	0.00184154
26436	Psg16	5.05555459	0.00184154
286940	Flnb	0.4327633	0.00184181
100038359	Gm10685	7.16203731	0.00185287
242773	Slc45a1	4.31734391	0.00185287
105193	Nhlrc1	-1.1850765	0.00185318
19826	Rnps1	0.92821543	0.00185318
13479	Dpep1	-1.8464863	0.00185318
64291	Osbpl1a	-0.7765551	0.00185318
13490	Drd3	2.65167494	0.00186488
626410	Gm20755	2.65167494	0.00186488
16878	Lif	1.89128027	0.00187689
15427	Hoxc9	1.26457434	0.00187689
17216	Mcm2	1.00694355	0.00187689
67041	Oxct1	-1.6348949	0.00187689
11854	Rhod	0.73019367	0.00187689
19719	Rfng	-1.1263738	0.00187689
18704	Pik3c2a	0.76080869	0.00187689
234407	Colgalt1	0.61114216	0.00187689
13392	Dlx2	2.95228677	0.00187689
99709	Clca4b	2.95228677	0.00187689
22286	Utf1	2.49316775	0.00187689
56473	Fads2	-1.0713266	0.00192769
282619	Sbsn	3.52856865	0.00198623
381633	Gm1673	2.47053057	0.00198623
64685	Nmi	0.98262867	0.00199939
14734	Gpc3	1.72792046	0.00199939
66795	Atg10	-0.7191765	0.0020597

111241	Hmga1-rs1	1.58500821	0.0020673
213760	Prepl	-0.9900025	0.0020673
22223	Uchl1	2.8224298	0.00207292
270058	Map1s	0.81729094	0.00207292
107869	Cth	-1.1975986	0.00207292
78038	Mccc2	-1.3222306	0.00207292
100042444	Trav6d-6	-2.1888137	0.00207292
68794	Finc	4.36814164	0.00212107
20603	Sms	-1.1899655	0.0021412
68697	1110036E04Rik	3.4821942	0.0021412
56489	lkbke	1.11991429	0.0021441
230904	Fbxo2	2.44219502	0.00217027
791405	Gm10002	2.86829063	0.00223844
69211	2310081J21Rik	-3.9713414	0.0022497
19652	Rbm3	0.92499589	0.0022539
20739	Spta1	-6.2094577	0.0022539
12224	Klf5	2.56097919	0.00226484
218138	Gmds	0.68884565	0.00228559
18590	Pdgfa	1.06898088	0.00232262
140577	Ankrd6	1.09630827	0.00232458
80877	Lrba	-0.5643045	0.00237571
73458	Aldh3b3	-2.9966582	0.00239706
75342	4930556J24Rik	-2.196756	0.00239706
16188	Il3ra	1.26986165	0.00239706
66945	Sdha	-0.9601197	0.00239706
195208	Dcdc2a	1.67556506	0.00239706
18034	Nfkb2	1.26267455	0.00239706
19201	Pstpip2	-1.1800251	0.00241609
330222	Sdk1	1.55746205	0.00245906
99010	Lpcat4	1.27080018	0.00245906
66353	Riid1	2.14023579	0.00245906
100502979	Gm17546	-1.3579663	0.0024663
100047183	NA	2.10737855	0.0024663
69581	Rhou	1.61416318	0.0024663
12638	Cftr	1.39522194	0.0024663
212933	Pm20d1	-1.8564755	0.0024663
72469	Plcd3	1.25331907	0.00249714
102693	Phldb1	0.98773641	0.00249714
66761	4933417A18Rik	-2.6098874	0.00256371

319482	9530053A07Rik	3.88639004	0.00256371
386463	Cdsn	4.14482289	0.00256371
211323	Nrg1	1.62904308	0.00256371
243085	Ugt2b35	6.57833994	0.00256371
13033	Ctsd	1.32579562	0.00256371
13645	Egf	-2.2772487	0.00256371
11534	Adk	-1.0003221	0.00256371
12828	Col4a3	-1.5047077	0.00256371
67003	Uqcrc2	-0.9190487	0.00259966
235973	A630095E13Rik	3.81495323	0.00260707
15894	Icam1	1.60019931	0.00263265
216019	Hkdc1	1.47450339	0.0026599
213233	Tapbpl	0.71672705	0.0026599
12557	Cdh17	5.74504411	0.00267799
67023	Use1	0.73800875	0.00271875
329002	Zfp236	0.58296788	0.00273189
104183	Chil4	5.59406467	0.00285389
226970	Arhgef4	1.38656903	0.00285415
15223	Foxj1	2.09910077	0.00285549
27367	Rpl3	2.43360087	0.00285549
272428	Acsn5	-1.7921877	0.00285549
54353	Skap2	0.41500566	0.00292043
100862033	NA	3.9624603	0.00292289
227627	Obp2a	2.67258481	0.00292289
215387	Ncaph	1.83304171	0.00292831
72273	Smim24	-0.8642647	0.00292831
12994	Csn3	3.18859959	0.00293442
94060	Lce3c	3.18859959	0.00293442
12069	Bex2	1.83417823	0.00295427
101809	Spred3	2.62295554	0.00295427
170718	Idh3b	-0.8272614	0.00295427
12488	Cd2ap	0.76052175	0.00295427
230103	Npr2	-1.0450048	0.00295427
20747	Spop	-0.6334	0.00301552
16852	Lgals1	1.96072434	0.00301634
241520	Fam171b	2.82789906	0.00303621
19701	Ren1	-3.9133595	0.00303621
11946	Atp5a1	-0.7424393	0.00303917
102103	Mtus1	-0.8881473	0.00303917

100041286	Gm11974	1.14533678	0.00306595
68161	A930005H10Rik	-1.2648701	0.00307581
15473	Hrsp12	-1.2031434	0.00307581
106795	Tcf19	1.27613257	0.00307827
66809	Krt20	4.90629521	0.00307827
107971	Frs3	-1.1979601	0.00307827
52118	Pvr	0.82740985	0.00307827
78004	Prr15	1.53391957	0.00307827
18824	Plp2	1.34830742	0.00307827
18674	Slc25a3	-0.6816691	0.00307827
13180	Pcbd1	-0.9604936	0.00307827
232078	Thns12	-1.1939341	0.00307827
67856	Echdc3	-0.8623112	0.00307827
50762	Fbxo6	0.87687261	0.00307827
14252	Flot2	0.59576135	0.00307827
100039748	Gm10020	0.58837816	0.00307827
11520	Plin2	2.15287022	0.00308446
78286	Nav2	-1.3595705	0.00308446
68876	Xrcc6bp1	-0.7389522	0.00309321
73723	Sh3bgrl3	1.62550246	0.00311766
22697	Zscan21	0.68975217	0.00313148
74012	Rap2b	1.41048139	0.00315629
67269	Agtppb1	-0.5978133	0.00319507
14765	Gpr50	2.9826059	0.00319507
97130	C77080	0.66756975	0.00319507
19092	Prkg2	1.73875821	0.00320561
100861754	NA	-3.1776554	0.00330482
67487	Dhx40	0.599966	0.00330482
69408	Dnajc17	1.10582476	0.00331086
21384	Tbx15	4.5624619	0.00331086
12334	Capn2	0.66441267	0.00331086
94094	Trim34a	2.46127321	0.00331133
209966	Pgbd5	3.52272994	0.00331133
14421	B4galnt1	2.72270079	0.00331133
13052	Cxadr	0.74259229	0.00333017
192192	Shkbp1	0.66498641	0.00334282
22388	Wdr1	0.50938193	0.00334282
13121	Cyp51	-1.3855084	0.00338036
13427	Dync1i2	0.54356792	0.00338292

381831	Igkv4-58	-4.5118499	0.00345428
56747	Sez6l	-3.0538685	0.00345428
77055	Krt76	3.17385512	0.00351458
15233	Hgd	-1.2831452	0.00355905
15422	Hoxc13	1.96634048	0.0035717
216797	Prss38	1.96634048	0.0035717
18705	Pik3c2g	-3.140959	0.00357575
15493	Hsd3b2	-4.9335107	0.00358233
246694	Hps5	-0.9268921	0.00358233
214901	Chtf18	1.70856514	0.00359842
192897	Itgb4	1.81070955	0.00359842
69123	Eci3	-2.2363354	0.00359842
12161	Bmp6	0.78532643	0.00359842
241589	D430041D05Rik	4.30030497	0.00361434
12739	Cldn3	1.89507644	0.00361479
394430	Ugt1a10	-1.0925225	0.00364043
80721	Slc19a3	-1.2246881	0.00364271
67392	4833420G17Rik	1.29548815	0.00369126
93734	Mpv17l	-1.407871	0.00369126
15122	Hba-a1	-8.3155419	0.00369323
373864	Col27a1	-1.3736275	0.00369323
66950	Tmem206	-0.9019854	0.00377045
77596	Adgrf1	2.91758862	0.00377307
74122	Tmem43	1.17977627	0.00379297
207592	Tbc1d16	-0.7557249	0.00379297
20761	Sprr2g	5.28117291	0.00379853
227736	1700019L03Rik	1.65763671	0.00379981
231287	Atp10d	-1.3760474	0.00379981
26462	Txnrd2	-0.521603	0.00379981
224824	Pex6	-0.6510413	0.00379981
12808	Cobl	0.58152519	0.00379981
99151	Cercam	2.3814526	0.00385476
102920	Cenpi	2.4450412	0.00393153
229927	Clca3b	4.75622716	0.00393153
56016	Hebp2	1.6787444	0.0039319
231050	Galnt11	-1.5967952	0.0039319
232431	Gprc5a	2.93569562	0.00393997
227682	Trub2	-0.6871773	0.00394891
20208	Saa1	6.25487997	0.00396223

109652	Acy1	-2.2154104	0.00396223
227197	Ndufs1	-1.0775094	0.00399843
386454	Rnf39	1.85153232	0.00402624
22409	Wnt10a	2.76740303	0.00402624
15129	Hbb-b1	-8.220306	0.00402624
237175	Adgrg2	1.73106019	0.00402624
57376	Smarce1	0.68404174	0.00402624
266645	Acmsd	-2.5628175	0.00402624
17850	Mut	-1.3232776	0.00402624
14381	G6pdx	0.56352947	0.00402624
100861774	NA	0.61321794	0.00402624
109254	Adtrp	-1.1287663	0.00402624
434460	Rps15a-ps2	2.58631075	0.00402776
22276	Uros	-1.1535899	0.00402776
74478	Snx29	-1.7135576	0.00402776
14107	Fat1	0.91026449	0.00402776
83485	Ngrn	-0.6346743	0.00402776
15980	lfngr2	0.79289949	0.00404437
70503	Ddo	-1.2725319	0.00411408
353287	Clec18a	2.92819602	0.00417339
67680	Sdhb	-0.8165589	0.00417955
16011	Igfbp5	-2.0288832	0.00417955
50773	Nt5c	0.72521076	0.00417955
12476	Cd151	0.7034704	0.00418022
23831	Car14	-1.965041	0.00419167
14261	Fmo1	-1.3421983	0.00419167
71517	9030624J02Rik	0.54586732	0.00419167
621603	Aldh3b2	-1.9333348	0.0042569
213819	Casd1	-0.5844417	0.0042569
57312	Mrps31	-0.800824	0.00427479
667552	Gm8700	-4.6104433	0.00428776
195046	Nlrp1a	5.09151442	0.00430298
329910	Acot11	-1.6255645	0.00430298
29813	Zfp385a	0.85511201	0.00430298
171095	Il17rc	0.60829705	0.00430298
67834	Idh3a	-0.5846297	0.00430298
54126	Arhgef7	-0.5026561	0.00430298
12874	Cpd	0.48447448	0.00430388
231086	Hadhb	-0.8540475	0.00430388

54419	Cldn6	1.9857093	0.00434694
231655	Oasl1	1.75069058	0.00441301
17218	Mcm5	1.28902636	0.00441301
94346	Tmem40	3.21139356	0.00441301
100502960	Gm19474	2.79950554	0.00441301
11992	Auh	-0.7253302	0.00441301
245650	Gucy2f	-3.0798408	0.00442693
14725	Lrp2	-1.7472958	0.00443341
13171	Dbt	-1.1748214	0.00447656
18140	Uhrf1	1.72079855	0.00454472
26447	Poli	-0.951853	0.00454472
102294	Cyp4v3	0.93633692	0.00454472
74366	4932422M17Rik	-0.584699	0.00454472
13992	Khdrbs3	-0.9432265	0.00454472
70300	Fuz	-0.6912828	0.00454472
66912	Bzw2	0.82018896	0.00455411
72350	Zc2hc1c	-0.9654431	0.00456297
433931	Pigg	-0.9440017	0.00457734
68201	Ccdc34	0.93558767	0.00457734
54124	Cks1b	1.30176555	0.00460366
100040617	Gm12603	4.66189016	0.00460366
212168	Zswim4	0.67120784	0.00460366
226564	Fmo4	-1.1982786	0.00460366
70791	Hars2	-0.6065095	0.00460366
225288	Fhod3	0.91480963	0.00460366
26909	Exo1	2.52787546	0.00461533
140709	Col26a1	1.64410651	0.00461533
100201	Tmem64	-1.5787514	0.0046633
104923	Adi1	-0.8879451	0.0046633
435965	Lrp3	-0.8925544	0.00466489
68728	Trp53inp2	-0.6855606	0.00469228
270685	Mthfd1l	0.95107054	0.00469249
226356	Cfap221	3.30665835	0.00475445
72297	B3gnt3	3.75866	0.00480999
20352	Sema4b	0.75862245	0.0048243
14368	Fzd6	0.97197867	0.00482817
56739	Rec8	2.54465529	0.00483667
230233	lkbkap	0.64497765	0.00483667
546546	Serpina3h	6.28165261	0.00484668

19698	Relb	1.43478105	0.00484668
208922	Cpeb3	-1.3159614	0.00484668
110821	Pcca	-1.2043638	0.00484668
71919	Rpap3	0.79206365	0.00486266
21952	Tnni1	2.95620185	0.00487302
14194	Fh1	-0.825458	0.00488231
93873	Pcdhb2	-3.1766423	0.00492042
226527	BC026585	-1.5761537	0.00495932
20760	Sprr2f	6.63900276	0.00496953
78784	Celf3	2.45313194	0.00498118
74528	Mgme1	-1.019348	0.00499414
319887	E030030I06Rik	4.2003464	0.00507668
216835	Usp43	0.97308235	0.00507668
11910	Atf3	1.69463279	0.00507668
69221	2410006H16Rik	1.25583514	0.00507668
13870	Ercc1	1.02606816	0.00507668
78388	Mvp	1.33451884	0.00513045
107765	Ankrd1	3.18454618	0.00514242
225579	Slc27a6	5.60644386	0.00514242
15893	Ica1	0.95727669	0.00514242
69815	Krtcap3	0.78896362	0.00514242
53322	Nucb2	1.70464859	0.00514242
72181	Nsun4	-0.4990521	0.00514242
57436	Gabarapl1	-0.6574978	0.00514242
26970	Pla2g2e	4.98782512	0.00514976
12124	Bik	3.16400799	0.00515298
19293	Pvalb	-5.1214344	0.00515298
67105	Timm21	-0.8170587	0.00515298
14431	Gamt	-0.9003795	0.00515298
58875	Hibadh	-1.3881379	0.00515298
74440	Cmip	-1.0636301	0.00515298
72320	Kif1bp	-0.5530283	0.00515298
28295	D10Jhu81e	-0.8170033	0.00515298
16157	Il11ra1	-0.6138302	0.00515298
638580	Gm7244	-2.8753701	0.00516652
16591	Kl	-1.6606224	0.00516652
20848	Stat3	0.99993564	0.00516792
100044509	Tgfbr3l	1.52615628	0.00518169
67738	Ppid	-0.5436909	0.00518204

30948	Bin1	0.74069328	0.00518919
14913	Guca1a	3.34859785	0.00519884
17289	Mertk	-0.7691565	0.00519884
20957	Sycp1	-4.5014027	0.00521622
57230	Sap30bp	0.50958509	0.0052167
110385	Pde4c	-1.2704666	0.0052167
20135	Rrm2	1.30984712	0.00525125
66314	Tpd52l2	0.4631604	0.00525125
110749	Chaf1b	2.17155765	0.00527141
75209	Sv2c	-2.3913426	0.00527141
71834	Zbtb43	-0.4404691	0.00527141
117147	Acsm1	-1.7182562	0.00527141
83946	Phip	0.65399513	0.00529182
26412	Map4k2	-0.6594394	0.00530068
69634	Clybl	-0.8501146	0.00530068
193280	C030037D09Rik	1.45524792	0.00534188
109361	D730005E14Rik	5.63791619	0.00534188
100503810	Gm13056	2.7635657	0.00534188
13614	Edn1	2.25047023	0.00534188
100124387	Traj16	3.10922155	0.00534188
76263	Gstk1	-0.8730932	0.00534188
20753	Sprr1a	3.85608007	0.00543635
68539	Tmem109	-0.4793624	0.00543635
69513	1700030C10Rik	4.86090954	0.0054672
17449	Mdh1	-0.9685952	0.0054672
20851	Stat5b	-0.7574817	0.0054672
17925	Myo9b	0.56669678	0.0054717
54486	Hpgds	3.37268297	0.00548223
83673	Snhg1	0.75907997	0.00548223
320982	Arl4c	1.7262116	0.00548223
66120	Fkbp11	-0.9077893	0.00551413
11488	Adam11	1.7850527	0.00551413
17306	Sypl2	-1.6174965	0.0055242
71701	Pnpt1	-0.717509	0.00556102
67900	Mtfp1	-1.0524661	0.005608
16956	Lpl	-2.4780766	0.00565082
228770	Rspo4	1.96347632	0.00565993
15364	Hmga2	3.57141561	0.00566156
100503884	Ccdc149	0.91767482	0.00566547

207704	Gtpbp10	-0.5605344	0.00566547
71897	Lypd6b	1.43767716	0.00567577
627984	Nlrp1c-ps	4.14092289	0.00567577
74556	Themis3	2.25106709	0.00570256
16782	Lamc2	1.68018867	0.00571097
13807	Eno2	1.52665393	0.00574621
100042130	Gm10376	2.51074225	0.00574621
100504068	Hotairm1	0.65389368	0.00574621
17921	Myo7a	0.9950351	0.00574621
232983	Cxcl17	3.62708708	0.0057845
74558	Gvin1	2.00587238	0.0057845
11443	Chrnbl	1.96984284	0.0057845
58801	Pmaip1	2.00479398	0.0057845
320806	Gfm2	-0.9263106	0.0057845
634720	Gm11735	-4.5754838	0.00579681
13002	Dnajc5	0.50741508	0.00581149
100066	Cyp2j11	-1.5972226	0.00581929
74597	4833418N02Rik	-1.406511	0.00583091
75538	Fam71e1	1.14691074	0.00583091
16780	Lamb3	2.71411658	0.00583091
232314	Ppp4r2	0.36744063	0.00583091
641361	Pinlyp	3.34460116	0.00587824
245857	Ssh3	0.50724341	0.00589102
70337	lyd	-0.9703253	0.00591201
76281	Tax1bp3	1.03506717	0.00595982
16776	Lama5	0.75303767	0.00597374
100502624	Gm13483	4.93967541	0.00599403
66885	Acadsb	-0.6910685	0.00599403
100503392	4833438C02Rik	0.88428356	0.00604609
108958	Fam73b	-0.4765662	0.00607471
20706	Serpib9b	4.74607384	0.00607566
100502888	Gm19434	3.83628928	0.00608002
16790	Anpep	-1.3739108	0.00608002
19697	Rela	0.58713121	0.00608002
18973	Pole	1.83728041	0.00615956
67099	Mettl21a	0.84648393	0.0061671
330485	Tmem145	2.73674084	0.00622865
228775	Trib3	2.37342913	0.00623747
29870	Gtse1	1.77463756	0.00623747

223631	BC025446	-1.3226766	0.00623747
20356	Sema5a	1.13603836	0.00623747
73710	Tubb2b	1.95460535	0.00624216
13542	Dvl1	-0.6269325	0.00624216
108114	Slc22a7	-1.5967063	0.00624216
213948	Atg9b	3.13033967	0.00630464
385493	AU015836	4.43554162	0.00630464
11796	Birc3	1.33534747	0.00630464
14063	F2rl1	1.70369151	0.00630464
68021	Bphl	-1.2470923	0.00630464
18148	Npm1	0.47510801	0.00630464
100039239	Gm2115	-2.1366688	0.00631853
71268	Lrrfip2	0.46098783	0.00634525
67037	Pmf1	0.67457158	0.00636899
319468	Ppm1h	-0.5529712	0.00640413
100504526	Gm20269	6.66673249	0.00644151
72080	Sapcd2	2.32508443	0.00644151
16520	Kcnj4	4.56184188	0.00644151
70572	Ipo5	0.42652956	0.00644151
15201	Hells	1.44963569	0.00645118
51902	Rnf24	-1.9251528	0.00646862
277496	Lkaaeear1	1.96250505	0.00650093
16548	Khk	-1.2475718	0.00650093
108960	Irak2	-0.7412637	0.0065105
80287	Apobec3	2.27226823	0.00653214
100008567	Gm14964	1.72960538	0.00656066
11514	Adcy8	2.77796975	0.00656066
93747	Echs1	-0.9731137	0.00656066
27279	Tnfrsf12a	2.04378487	0.00656066
12269	C4bp	3.31105622	0.0065684
20091	Rps3a1	1.75111788	0.0065684
19360	Rad50	0.53377968	0.0065684
23849	Klf6	1.81186048	0.0065684
68188	Sympk	0.49663996	0.0065684
230163	Aldob	-0.8273088	0.00656881
93695	Gpnmb	3.68609414	0.00664157
211253	Mtrf1	-0.6832919	0.00665822
17873	Gadd45b	1.97545817	0.00665822
12560	Cdh3	1.68045142	0.00665822

207819	4930539E08Rik	1.44011022	0.00666485
233033	Samd4b	0.54737089	0.00666485
18604	Pdk2	-0.9840526	0.00669786
100504586	Gm20300	-0.6945557	0.0067109
320595	Phf8	-0.4106945	0.00684622
239096	Cdh24	1.30597111	0.00686423
100042114	Gm3676	2.8095338	0.00686423
266632	Irak4	0.76546079	0.00686423
104718	Ttc7b	-1.4296707	0.00686423
17826	Fam89b	0.52643408	0.00686423
107392	Brms1	0.68378057	0.00686423
229211	Acad9	-1.1745869	0.00686423
15353	Hmg20b	0.44394438	0.00686423
15469	Prmt1	0.81395422	0.00686423
66108	Ndufa9	-0.5871147	0.00686569
69387	Dnajb13	1.56220032	0.00687705
14917	Gucy2c	3.11546772	0.00687705
21335	Tacc3	1.06593092	0.00689674
211389	Suox	-1.1938971	0.00691436
59287	Ncstn	0.38190405	0.00692061
13646	Klk1b22	-5.0748575	0.00692778
72267	Lrrc8e	1.80499314	0.00694202
18089	Nkx2-3	3.78711363	0.00694202
20924	Supt5	0.34266402	0.00694202
66313	Smurf2	-0.6078838	0.00694202
68585	Rtn4	1.0848318	0.00694827
16007	Cyr61	1.67780726	0.00694827
70478	Mipep	-0.8493787	0.00694827
54200	Sult2b1	2.40587277	0.00696677
320394	Cenpt	0.80049778	0.00696677
22629	Ywhah	0.58076495	0.00696677
100526503	NA	1.72000014	0.00701742
269224	Pask	1.11321433	0.00704582
77866	E130102H24Rik	-0.6876742	0.00704582
243897	Ggn	1.58640599	0.00705738
55925	Syt8	4.52503777	0.00708677
67963	Npc2	0.43834495	0.0070889
67629	Spc24	1.10203758	0.00712382
19879	Slc22a8	-2.0617844	0.00712382

12822	Col18a1	1.28204796	0.0071396
16418	Eif6	1.02571181	0.00718111
320311	Rnf152	-1.1090398	0.00718111
12231	Btn1a1	3.66120427	0.00723274
626316	Gm13051	3.34951605	0.00724481
13177	Eci1	-0.8682479	0.00725056
70549	Tln2	-1.2310517	0.00725807
14161	Fga	2.06212328	0.00727028
21376	Tbrg1	0.52723038	0.00732294
12567	Cdk4	0.47028635	0.0073531
26921	Map4k4	0.87440793	0.00737058
108156	Mthfd1	-0.6269592	0.00737069
12977	Csf1	2.39230754	0.0073716
57278	Bcam	2.04732288	0.00738873
17121	Mxd3	1.23157505	0.00741874
12189	Brca1	1.73818938	0.00741874
20210	Saa3	6.33231396	0.00741874
67304	3110070M22Rik	2.05636438	0.00741874
330409	Cecr2	-1.2420458	0.00741874
12359	Cat	-1.2068363	0.00741874
231507	Plac8	1.09328126	0.00741874
18795	Plcb1	-0.9359925	0.00741874
26415	Mapk13	1.00896928	0.00741874
20656	Sod2	-0.9667359	0.00741874
20402	Zfp106	-0.5506702	0.00741874
74901	Kbtbd11	-1.0162599	0.00741874
226517	Smg7	-0.5502559	0.00741874
70701	Nipal1	2.22547945	0.00743022
72701	Zfp618	0.8061101	0.00743022
228019	Mettl8	-0.9323942	0.00743022
227683	Coq4	-1.0011786	0.00743022
18458	Pabpc1	0.56981607	0.00743022
102278	Cpne7	2.39762811	0.00743625
18300	Oit1	5.36286352	0.00744851
381820	Smim10l1	-0.6227976	0.00744851
100862381	Gm21691	-2.4864617	0.00751112
72832	Crtac1	3.68989901	0.00751112
434232	lqck	1.51867196	0.00753269
545481	Arhgap40	4.57280917	0.00753269

18478	Pah	-1.7259654	0.00753269
20259	Scin	2.45486434	0.00753269
15374	Hn1	1.05398514	0.00753269
103149	Upb1	-1.2949888	0.00753269
69652	2310069B03Rik	3.5744928	0.00753755
242584	Wdr78	-0.7619665	0.00753755
20524	Slc25a17	-0.5471392	0.00753755
105841	Dennd3	-0.5934518	0.00755283
18793	Plaur	2.87901548	0.00756223
18000	2-Sep	0.41116597	0.00756223
18971	Pold1	1.12972735	0.00757071
17427	Mns1	2.53547666	0.00762366
271127	Adamts16	1.76456813	0.00762366
381598	2610005L07Rik	-0.8589107	0.00762366
13836	Epha2	1.86575443	0.00762366
12307	Calb1	-1.7126802	0.00762366
666028	Gm7897	2.24800173	0.00765403
73469	Rnf38	0.50107719	0.00769314
73910	Arhgap18	-0.906974	0.00769314
230726	Rhbdl2	3.21603758	0.0076954
100972	Rab28	-0.4037667	0.0076954
320560	Dennd5b	-0.667114	0.00771965
257630	Il17f	-3.7926567	0.00772995
320469	9930014A18Rik	1.20918762	0.00772995
225870	Rin1	1.91252851	0.00772995
260302	Gga3	-0.467998	0.00772995
20916	Sucla2	-1.0482567	0.00773073
22044	Trh	2.96679809	0.00773557
56708	Cicf1	2.65441284	0.00773557
379043	Raet1e	5.41438284	0.00775383
619304	I830134H01Rik	2.5916352	0.00775383
17967	Ncam1	1.91559547	0.00775383
16881	Lig1	1.47184862	0.00775383
229731	Slc25a24	2.20279211	0.00776054
101489	Ric8	0.59421018	0.007778
243339	Tmem130	2.21772684	0.00779129
100504343	Gm20185	2.60947613	0.00779129
333654	Ppp1r13l	0.88153492	0.00779129
71911	Bdh1	-1.4493742	0.00779129

20411	Sorbs1	-0.6341136	0.00779129
69318	1700007K09Rik	2.87478972	0.0078389
97998	Deptor	1.64041438	0.00787071
107045	Lars	0.43847002	0.00787071
100503915	Smpd5	1.6442546	0.00787299
12333	Capn1	0.60000597	0.00787299
77577	Spns3	1.43253616	0.0079062
56031	Ppie	0.4525056	0.0079062
109136	Mmaa	-0.6800267	0.00790804
20311	Cxcl5	5.06424377	0.00791995
380975	Higd1c	4.58913105	0.00791995
70829	Ccdc93	-0.7065245	0.00791995
20377	Sfrp1	-1.35936	0.00793074
66617	Ntmt1	0.58645447	0.00794914
100039719	Gm2386	-3.3862177	0.00798982
53374	Chst3	-1.716848	0.00804051
68352	Aspdh	-2.935101	0.00805517
100038668	Gm12526	-2.4735527	0.00808002
102093	Phkb	-0.8090738	0.00808002
72090	Entpd8	-0.9948679	0.00808881
434223	Gm1966	4.84882516	0.0080989
545645	Gm13283	3.26357118	0.0080989
11501	Adam8	2.22837036	0.0080989
100503659	Cbarp	0.70638538	0.00810558
16880	Lifr	-0.595387	0.00810558
211255	Kbtbd7	-0.6496642	0.00812544
30060	Mfi2	4.65341309	0.00817268
68763	1110038B12Rik	1.00995526	0.00817268
22240	Dpysl3	1.90843767	0.00817351
69440	Dennd6b	0.52030391	0.00818217
67602	Necap1	-0.5945146	0.00821941
54720	Rcan1	1.00077566	0.00821941
68014	Zwilch	1.35405369	0.00822649
71452	Ankrd40	-0.4748726	0.00823284
14972	H2-K1	1.11739053	0.00824589
56372	1110004F10Rik	0.38944228	0.00826079
59020	Pdzk1	-1.034475	0.00827189
28015	Polr2m	-0.3457622	0.00827189
245622	Fam199x	0.68337136	0.00827765

105689	Mycbp2	0.39672889	0.00829273
12759	Clu	2.00416084	0.00830053
12050	Bcl2l2	-0.4302109	0.00830792
14621	Gjb4	3.60912509	0.0083624
19335	Rab23	-0.8696881	0.00840435
100042856	Gm4070	1.49636157	0.00850997
18114	Rrp1	0.58612231	0.00850997
100101807	1700047117Rik2	1.20897256	0.00852676
83397	Akap12	3.31571828	0.00852952
210029	Metrn1	-0.6915253	0.00853253
76294	Asb5	3.26902209	0.00857883
78925	Srd5a1	1.96932419	0.00857883
11607	Agtr1a	-0.9594775	0.00860223
77022	2700099C18Rik	1.44035317	0.00861315
217845	Ifi2712b	4.8543084	0.00861315
76574	Mfsd2a	-2.2541692	0.00861315
72113	Adck1	-0.5419905	0.00863434
99982	Kdm1a	0.43214453	0.00863434
22038	Plscr1	0.60826788	0.00863434
20677	Sox4	1.7021806	0.00867159
72434	Lypd3	3.17331782	0.0086803
57911	Gsdma	4.3862091	0.00869126
74499	Sost	-4.5215213	0.00872453
75104	Mmd2	-1.4321033	0.00872453
234267	Gpm6a	-1.2032446	0.00872453
245527	Eda2r	1.71821635	0.00873133
212514	Spice1	-0.5862402	0.00873133
319513	Pced1a	-0.696265	0.00873133
20719	Serpib6a	1.54322299	0.00873724
56722	Litaf	1.62769019	0.00873724
70397	Tmem70	-0.9591546	0.00873724
16400	Itga3	1.27169958	0.00874918
332942	Gm853	-2.4701683	0.00875582
64540	Tspan4	0.75290713	0.00875582
50880	Scly	-0.7280007	0.00875582
20289	Scx	1.77833185	0.00880984
227289	Gpbar1	2.566102	0.00888208
52665	Echdc1	-0.7762694	0.00888208
18605	Enpp1	-0.725681	0.00888208

100504323	Gm20172	3.11459552	0.0089473
18218	Dusp8	1.04341679	0.00902074
234911	Mmp27	2.26629835	0.00903576
66659	Acp6	-1.1843821	0.00911893
21752	Tert	1.33221408	0.00913274
52829	Lurap1l	-0.8458397	0.00913274
170938	Zfp617	0.5237542	0.00915377
216760	Mfap3	0.77694516	0.00915377
68628	Fbxw9	0.8476951	0.00915377
56316	Ggcx	-0.9010171	0.00915422
69824	Glod5	-0.7397845	0.00918502
15561	Htr3a	5.02213241	0.00918946
104776	Aldh6a1	-1.3785476	0.00921398
12579	Cdkn2b	2.57848102	0.00922836
229589	Prune	0.67934015	0.00922836
56248	Ak3	-0.8802368	0.00928405
217219	Fam171a2	1.43645434	0.00928499
382686	3110053B16Rik	4.60856868	0.00929862
67043	Syap1	-0.5141064	0.00929862
545641	Gm5860	2.6545522	0.00935972
100504297	Gm20157	2.50702391	0.00936276
272396	Tarsl2	-0.6763308	0.00938492
22658	Pcgf2	0.51176341	0.00943021
98417	Cnih4	0.31965934	0.00943021
14156	Fen1	0.79558259	0.00949082
68044	Chac2	-1.343197	0.00949082
18115	Nnt	-1.281762	0.00949082
23945	Mgll	-1.4062164	0.00949082
68263	Pdhb	-0.6589698	0.00949082
544817	Arhgap27	0.55584455	0.00949082
20480	Clpb	-0.7239382	0.00949082
20532	Slc3a1	-0.9776508	0.00955755
14281	Fos	1.87822707	0.00961894
212517	Cfap44	4.24070509	0.00972493
56046	Uqcc1	-0.6056082	0.00972493
15366	Hmmr	2.22182322	0.00974647
72309	Tmem158	1.87974086	0.00974647
71242	Spata24	1.0323034	0.00974647
69692	Hddc2	1.02148936	0.00974647

382639	Zbtb42	0.9697315	0.00976939
68077	Gltscr2	0.6180708	0.00979101
219148	Fam167a	1.79093828	0.00980005
78725	D730001G18Rik	1.82893724	0.00983398
232408	Klrb1f	3.07427495	0.00984371
74041	Ddias	1.13746289	0.00984371
319953	Tll1	0.47113129	0.00986381
68743	Anln	2.12696356	0.00987254
21367	Cntn2	1.93397589	0.00990176
171282	Acot4	-0.9096875	0.00990176
21897	Tlr1	2.60179735	0.00994076
269198	Nbeal1	0.8263856	0.00994076
20273	Scn8a	1.74955484	0.00996436
69724	Rnaseh2a	0.54945859	0.00996436
78287	Rbsn	-0.7115447	0.00997241
26456	Sema4g	-1.1473888	0.00997241
70350	Basp1	2.90039842	0.00997546
667823	Trim5	3.67481614	0.01002105
231986	Jazf1	1.72549629	0.01002105
432763	Prr7	1.98694739	0.01003462
100503605	Hbb-bs	-8.4524863	0.01003462
240672	Dusp5	1.98842436	0.01003462
228608	Smox	1.20244536	0.01003462
100042880	Rpl17-ps10	0.46695518	0.01003462
73385	Fam177a	1.20292024	0.0100488
66102	Cxcl16	1.03510264	0.01005257
11944	Atp4a	2.87028612	0.01006156
66052	Sdhc	-0.6823989	0.01006156
78070	Cpt1c	2.68520563	0.01010925
12631	Cfl1	0.59563419	0.0101396
216527	Ccm2	0.5476702	0.0101396
70405	Calml3	2.47581111	0.01021401
667693	Gm8765	-3.835036	0.01023821
71601	Ceacam20	4.39360319	0.01026836
140494	Atp6v0a4	-0.5729175	0.01030695
56742	Psrc1	2.14203168	0.01037082
70101	Cyp4f16	1.16795015	0.01041713
11747	Anxa5	1.3102628	0.01041713
72503	2610507B11Rik	-0.7987195	0.01042776

109801	Glo1	-1.0435196	0.0104868
80888	Hspb8	1.2679189	0.01050745
67399	Pdlim7	1.22817422	0.01051143
233328	Lrrk1	0.61694211	0.01051143
20937	Suv39h1	0.6223709	0.01051482
14964	H2-D1	0.97442078	0.01051482
67121	Mastl	0.91713097	0.0105877
232943	Klc3	1.39091123	0.01061977
78266	Zfp687	0.45175767	0.01061977
20348	Sema3c	1.89301267	0.01061977
216350	Tspan8	1.76544168	0.01061977
52521	Zfp622	0.46534911	0.0106203
50784	Ppap2c	0.68268086	0.01066564
68789	Trmt61b	-1.1717326	0.01068625
382118	Zkscan7	-0.843401	0.01068625
114643	Oas1c	1.06094444	0.01068625
20624	Eftud2	0.39821099	0.01068625
66771	Gid4	-0.7685988	0.01068628
67878	Tmem33	-0.6867664	0.01068628
100434	Slc44a1	0.68957956	0.01070005
214585	Spg11	0.44452719	0.01070005
67689	Aldh3b1	0.65034656	0.01070005
15209	Hesx1	2.67469555	0.01070447
244882	Tnfaip8l3	2.97592109	0.0107612
12266	C3	2.75021568	0.0107612
75627	Snpc1	0.78329624	0.01076893
67217	L3hypdh	-1.2739529	0.01080717
68680	Fitm1	-1.2720274	0.01080717
13528	Dtnb	0.407463	0.01080717
23802	Amfr	-0.4761355	0.01080717
338348	Ttc16	1.42269108	0.01086903
223267	Ggact	-0.8522332	0.01086903
67873	Mri1	1.07204472	0.01089476
19294	Pvrl2	0.70470443	0.0109131
434218	Trim34b	-1.8971141	0.01093219
75812	Tasp1	-0.4385426	0.01093219
13448	Dok1	1.51160951	0.01103834
14766	Adgrg1	0.64731588	0.01104206
11841	Arf2	0.60727227	0.01104206

110310	Krt7	1.01427368	0.0110426
12904	Crabp2	3.04228279	0.01113626
69826	Ms4a10	3.86219889	0.01113626
108017	Fxyd4	1.40535073	0.01113626
13382	Dld	-0.8070818	0.01113626
74340	Ahcyl2	-1.3931814	0.01113626
29859	Sult4a1	2.72224194	0.01114219
19221	Ptgfrn	1.06197767	0.01118004
75404	Arhgap36	3.98954666	0.01120165
319765	Igf2bp2	0.87399021	0.01120165
246738	Dnajc28	-1.1626503	0.01120165
27280	Phlda3	1.43239144	0.01120165
74776	Ppa2	-0.7891755	0.01126555
71733	Susd2	-1.9617718	0.01127913
16438	Itpr1	-0.5984802	0.01131281
100040377	NA	1.271172	0.01134687
76338	Rab2b	-0.5812835	0.01134687
620140	Ighv1-83	-3.5184211	0.01134872
100038730	Gm10387	-1.6650159	0.01134872
50883	Chek2	1.04037925	0.01134872
319269	A130040M12Rik	3.68070594	0.01134872
12297	Cacnb3	1.32645381	0.01134872
101521	AI314278	-1.7790161	0.01134872
11571	Crisp1	3.78042705	0.01135079
234724	Tat	3.88782976	0.01135079
78830	Slc25a12	-0.4199755	0.01135079
71995	Erv3	2.37265896	0.01136958
67622	Mxra7	1.63259594	0.01136958
170731	Mfn2	-0.5361989	0.01136958
30941	Usp21	-0.482444	0.01146664
68618	1110012L19Rik	0.67134486	0.01146798
13198	Ddit3	0.99311071	0.01146798
231872	Aimp2	0.51498323	0.01146798
12830	Col4a5	0.60499605	0.01146798
67307	Pbld2	-0.7645287	0.01146798
70209	Tmem143	-0.6832605	0.0114854
75746	Morc4	-0.7322174	0.01149398
12669	Chrm1	1.9945458	0.01151515
108653	Rimklb	1.26026827	0.01159558

11669	Aldh2	-0.741113	0.01159558
22793	Zyx	0.61990683	0.01159945
58249	Fibp	0.49144339	0.01165748
110135	Fgb	4.77832489	0.01166742
626359	Wdr93	-1.4795394	0.01171266
110033	Kif22	1.30955415	0.01171266
67285	Cwc27	0.50146026	0.01171266
270076	Gcdh	-1.2781536	0.01171266
170835	Inpp5j	-0.8133897	0.01171266
98053	Gtf2f1	0.67387014	0.01171266
627110	Tubb2a-ps2	1.87799272	0.01171985
212965	BC024386	-2.4109278	0.01177627
72479	Hsdl2	-0.4888884	0.01179379
13653	Egr1	1.85838557	0.01188865
69876	Thap3	0.51567348	0.01188881
621156	Apoo-ps	-0.7794637	0.01188881
244556	Zfp791	-1.4526012	0.01189978
634731	Susd1	1.55285342	0.01189978
16477	Junb	1.66541198	0.01190454
213417	Klhdc8a	1.15556139	0.01194476
22630	Ywhaq	0.4536787	0.01194476
16560	Kif1a	1.83824866	0.01196636
14711	Gnmt	-1.2372141	0.01198866
18044	Nfya	-0.8345797	0.01198866
100861635	Gm21093	2.86484916	0.01202182
20776	Tmie	-0.9908319	0.01205254
114644	Slc13a3	-1.4577127	0.01205254
14678	Gnai2	0.49186293	0.01205254
68205	Urm1	0.57344412	0.01205254
22154	Tubb5	1.09176271	0.01213766
15982	lfrd1	0.72939272	0.01215514
53379	Hnrnpa2b1	-0.3409831	0.01219996
73095	Slc25a42	-1.4616649	0.01231921
11989	Slc7a3	1.83727536	0.01232139
13194	Ddb1	0.35846424	0.01233599
70984	4931406C07Rik	-1.5209102	0.01236271
319929	A630076J17Rik	-1.6717061	0.01239508
67938	Myl12b	0.40009345	0.01248419
214627	Papd5	-0.6540424	0.01248419

74365	Lonrf3	-0.8011531	0.01250611
100042055	Gm10377	1.88129457	0.01260678
15114	Hap1	1.74243679	0.01260793
71781	Slc16a14	-1.8416797	0.01260793
14694	Gnb2l1	0.49567301	0.01260793
14555	Gpd1	-0.990978	0.01261269
668724	Gm9320	0.58972683	0.01261269
433700	Spag8	-1.9784279	0.01262434
66694	Uqcrfs1	-0.9676226	0.01263529
26944	Tinag	-0.6985952	0.01263631
71891	Cdadcl1	-0.4766171	0.01266522
13039	Ctsl	0.7034126	0.01267375
381983	Lmtk3	1.9388982	0.01270017
68801	Elovl5	-0.7118651	0.01271259
14825	Cxcl1	3.0633833	0.01272265
14186	Fgfr4	-0.9806901	0.01272265
231070	Insig1	-0.8582042	0.01288074
105428	Fam149b	-0.6406987	0.01289997
230917	Tmem201	-0.44316	0.01292283
20620	Plk2	0.80186909	0.01293115
100502825	Rpl37rt	0.52712731	0.01298773
12879	Cys1	0.59163328	0.01298773
387160	Mir142	2.71075048	0.0130114
77045	Bcl7a	-0.7992584	0.01307589
668577	Ighv1-73	-2.6306839	0.0131019
69749	Epb4.1l4aos	1.12594968	0.0131019
66704	Rbm4b	-0.386066	0.0131019
74551	Pck2	0.82743414	0.0131019
76265	Tsen54	-0.5669347	0.01320814
142681	Slc34a3	-2.1332325	0.013277
100502635	Gm11525	2.55985574	0.01331404
226025	Trpm3	1.98280487	0.01333996
213464	Rbbp5	-0.3935508	0.01333996
239611	Muc19	4.77207042	0.01334653
103710	Slc35e4	0.76120406	0.01336477
17872	Ppp1r15a	0.7461657	0.01338962
50758	Fbxl17	-0.4105122	0.01338962
22245	Uck1	-0.6600508	0.01338962
11811	Apobec2	2.01386247	0.01344405

99326	Garnl3	1.63520612	0.01344405
330962	Slc51b	-0.5252118	0.01344405
107477	Guca1b	6.33893756	0.01349216
228413	Prrg4	1.95888931	0.01349216
207565	Camkk2	-0.3308743	0.01349845
72661	Serp2	1.34273566	0.01349993
381534	Ube2u	-0.7451965	0.01351098
72500	Ier5l	0.90765993	0.01351098
65969	Cubn	-1.2101525	0.01351098
54392	Ncapg	2.07116974	0.01355348
72054	Cyp4f18	3.61170896	0.01364345
100038605	E030047D23Rik	2.01291554	0.01364345
68888	Gkn3	-3.6147569	0.01364345
331374	Dgkk	3.36487514	0.01364345
56532	Ripk3	1.99012776	0.01364345
57914	Crlf2	1.00778809	0.01364345
328186	Gm10336	-1.0800988	0.01364345
75316	Taf1d	0.60654126	0.01364345
29815	Bcar3	-0.7359061	0.01364345
17025	Alad	-1.0486491	0.01364345
58246	Slc35b4	-0.6267752	0.01364345
67776	Vwa5a	0.69744917	0.01364345
68917	Hint2	-0.8594922	0.01364345
100041121	Gm10144	-2.1201338	0.01366764
79201	Tnfrsf23	2.73131373	0.01370986
104346	Gas8	0.65548518	0.01373113
66824	Pycard	1.18801671	0.01377093
170750	Xpnpep1	-0.8367431	0.01377093
12696	Cirbp	0.83035226	0.01377093
66365	Ccdc90b	-0.4075745	0.01377527
13803	Enc1	0.78079242	0.01383948
11867	Arpc1b	1.3548087	0.01384405
666009	Gm7889	-2.1175574	0.01390347
67446	Dusp28	-0.5461485	0.01391493
213603	Slc44a3	1.0345724	0.01391493
20878	Aurka	1.26364937	0.01397327
70358	Steap1	2.7798393	0.01407493
226419	Dyrk3	0.8669181	0.01408584
331535	Serpina7	3.02564122	0.01409629

100503021	Gm19510	3.55250707	0.01409629
664994	Isoc2a	-1.2225673	0.01410501
18125	Nos1	-3.6303692	0.01413239
15901	Id1	1.43330851	0.01413239
52064	Coq5	-0.614223	0.01413239
54391	Rfk	-0.4986504	0.01413239
15077	Hist2h3c1	-1.4101798	0.0141606
67442	Retsat	-0.9233273	0.0141606
210463	Slc22a22	-3.5553107	0.01421804
78920	Dlst	-0.7964897	0.01423203
109161	Ube2q2	-0.5277447	0.0142331
75472	Cfap126	2.16576059	0.01424561
14377	G6pc	-1.9012846	0.01424561
20520	Slc22a5	-0.9224026	0.01424561
11504	Adamts1	1.15043075	0.01424561
26420	Mapk9	-0.3886174	0.01424561
73132	Slc25a16	-0.8570991	0.01424561
170822	Usp33	-0.3832202	0.01424561
207785	Csrnp2	0.62420201	0.0142986
21813	Tgfbr2	0.76614971	0.0142986
235048	Zfp599	1.83123174	0.01429994
27060	Tcirg1	0.42669351	0.01429994
107993	Bfsp2	2.77284303	0.01432929
12890	Cplx2	0.76419865	0.01434232
78308	Gpr108	0.39886051	0.01434359
11947	Atp5b	-0.7579544	0.01437983
16563	Kif2a	0.38874577	0.01437983
18021	Nfatc3	-0.3177221	0.01437983
100042069	Gm15210	0.36137219	0.01439482
103175	D630029K05Rik	-2.8509573	0.01442971
209387	Trim30d	3.29508168	0.01447199
231991	Creb5	2.02450291	0.01447199
211331	Ighv1-54	-4.8927678	0.01447199
75530	Lym7	1.03622705	0.01447199
170483	Grin3b	-1.114301	0.01447199
78816	Gmip	0.52868188	0.01447199
19240	Tmsb10	1.87247693	0.01447199
18612	Etv4	1.54112899	0.01450092
399570	Kank4os	-2.6241618	0.01450232

18108	Nmt2	0.64336096	0.01450725
268949	Dpcr1	3.61204404	0.01455452
72258	Kcnk10	3.19759894	0.01461137
21942	Tnfrsf9	3.17367664	0.01461137
110084	Dnah1	2.64947189	0.01461677
628900	Serpina3i	4.83752009	0.01470334
80708	Pacsin3	0.85542187	0.01470334
100504175	Gm20100	-2.091679	0.01472247
64918	Bhmt2	-1.8299576	0.01472247
216860	Neur4	-0.8230989	0.01475146
57816	Tesc	1.17159886	0.01475881
231668	Vsig10	0.49660073	0.01478618
110809	Srsf1	-0.2758715	0.01484532
73689	Bloc1s2	0.71039255	0.01487309
192159	Prpf8	-0.3453808	0.01487309
102632	Acad11	-0.9406508	0.01487309
18510	Pax8	0.54037217	0.01488876
100038561	B230104I21Rik	1.84166899	0.01489611
209692	Dhtkd1	-1.9096819	0.01493063
100862031	NA	-0.7987821	0.01509488
71934	Car13	1.08816493	0.01513141
80859	Nfkbiz	1.52494334	0.01522379
269614	Pank4	-0.3940494	0.01522379
66222	Serpib1a	0.74543451	0.01522522
19041	Ppl	2.55431283	0.01522522
75788	Smurf1	0.51422651	0.0152595
15202	Gml2	-2.1838749	0.01529895
211535	Ccdc114	1.57280312	0.01529895
24066	Spry4	-1.3434371	0.01529895
213550	Dis3l	-0.5142231	0.01529895
242585	Slc35d1	-0.47168	0.01530659
319213	4930579C12Rik	2.00458033	0.0153953
100861610	Gm21075	5.3238032	0.01541928
66166	S100a14	1.52796196	0.01545133
17829	Muc1	1.54331889	0.01545133
13087	Cyp2a5	-2.5738771	0.01545133
67451	Pkp2	0.41612156	0.01545133
20054	Rps15	0.55981069	0.01545516
67771	Arpc5	0.58559432	0.01547242

668829	Gm9385	0.54789813	0.01548594
276950	Slfn8	2.64865635	0.01560092
12534	Cdk1	2.03611676	0.01561814
13197	Gadd45a	0.69656123	0.01563802
11608	Agtr1b	-3.3986286	0.01565725
217344	Rhbdf2	0.88493854	0.01566587
16196	Ii7	1.32915794	0.01569869
17420	Mnat1	0.60591755	0.01569869
12453	Ccni	-0.4331755	0.01569869
107503	Atf5	1.05786811	0.01569869
17194	Mbl1	-1.7592093	0.01574479
22248	Unc119	0.70149496	0.01574479
338350	Acad12	-1.0459743	0.01574479
234371	Tmem161a	-0.3534867	0.01575236
27762	Vwa7	1.92396722	0.01575322
17864	Mybl1	1.7857722	0.01575322
235505	Cd109	2.70421727	0.01575322
108853	Mtrf1l	-0.6333396	0.01575322
11605	Gla	0.64147724	0.01575322
545156	Kalrn	-0.7929153	0.01575322
226351	Tmem185b	-0.6797451	0.01575322
71562	Afmid	-1.6695478	0.01575322
19344	Rab5b	-0.3377567	0.01575322
225913	Tkfc	-0.7060664	0.0157743
246316	Lgi2	3.62112523	0.01578784
100505224	NA	-2.7369844	0.01581512
210853	Zfp947	0.95925499	0.01581512
665903	Gm7846	0.57504046	0.01581512
217125	Samd14	1.15117849	0.01581512
110842	Etfa	-1.0459719	0.01581512
56449	Ybx3	0.45300158	0.01581512
100040220	Gm9892	0.68192231	0.01581512
257633	Acsf3	-0.9426348	0.01581512
19158	Cyth2	0.57414433	0.01581512
80982	Cemip	4.22356244	0.01582479
433102	Sfta2	1.80826305	0.01589394
73921	Scpep1os	1.08399881	0.01589394
60411	Cenpk	1.63077496	0.01589394
69556	Bod1	-0.6310492	0.01589394

69192	Dhx16	-0.2784924	0.01589394
72900	Ndufv2	-0.4207639	0.01593857
665689	Gm12663	-0.6513584	0.01602325
19108	Prkx	0.61603724	0.01613568
56727	Miox	-1.7820445	0.01618476
50911	Exosc9	0.70841178	0.01620845
225283	Rprd1a	-0.4601251	0.01622564
12447	Ccne1	1.82026301	0.01623073
22341	Vegfc	-0.9422642	0.01623219
72400	Pinx1	0.81846959	0.01623219
18190	Nrxn2	1.28061221	0.01623219
27984	Efhd2	1.16655622	0.01623219
71382	Pex1	-0.788798	0.01629544
94216	Col4a6	2.31106663	0.01633612
619301	Tmem253	0.88675499	0.01633612
77583	Notum	-1.6824977	0.01633612
18975	Polg	-0.363962	0.01633612
76303	Osbp	-0.2807228	0.01633612
68026	2810417H13Rik	1.1702373	0.01637809
68070	Pdzd2	-1.4817335	0.01637809
52840	Dbndd2	0.76954986	0.01639232
28077	Med10	0.58822482	0.01642587
54135	Lsr	0.86728621	0.01647228
225651	Mppe1	-0.5222349	0.01648777
242864	Napepld	-0.5429262	0.01651278
107995	Cdc20	1.85267266	0.01651797
11807	Apoa2	2.04209535	0.01654717
12575	Cdkn1a	1.61090125	0.01654717
21973	Top2a	1.77142577	0.01655018
233208	Scaf1	0.35733502	0.01661668
71797	Chst13	1.17815393	0.01665605
67311	Nanp	-0.8015368	0.01665605
75736	Bcl2l12	0.51807289	0.01665605
434782	Gm5637	1.42797904	0.01665605
68015	Trap1	-0.836756	0.01665605
74747	Ddit4	1.33106663	0.01665605
80515	Chd3os	-1.1855248	0.01666197
11757	Prdx3	-0.8326872	0.01666197
16174	Il18rap	3.13208203	0.01666224

207806	Gm608	-0.5989007	0.01669482
70155	Ogfrl1	0.93271979	0.01670483
109901	Cela1	-1.2061024	0.01672409
195564	Skint3	4.39296218	0.01677127
110695	Aldh7a1	-1.0912088	0.01678477
18938	Ppp1r14b	1.03843804	0.01678477
11844	Arf5	0.43467563	0.01678477
320802	Ifitm10	2.13668955	0.01679003
15445	Hpd	-3.666459	0.01679724
14184	Fgfr3	-1.0449981	0.01685581
210710	Gab3	1.8564088	0.01686112
26381	Esrrg	-0.6214415	0.01686112
18806	Pld2	1.00559995	0.01691698
74302	Mtmr3	-0.3297589	0.01691698
71755	Dhdh	-0.6608919	0.01698332
66412	Arrdc4	0.76807995	0.01701447
18194	Nsdhl	-0.7720493	0.01701447
18645	Pfn2	0.51493978	0.01701755
625631	Bloc1s2-ps	0.96168696	0.0170262
73447	Wdr13	-0.4451349	0.0170262
12311	Calcr	1.37745476	0.01703117
53619	Blcap	0.38089291	0.01703117
66904	Pccb	-0.73701	0.01703611
381104	Prickle4	-2.5126479	0.0170742
330122	Cxcl3	3.17112211	0.0170742
99712	Cept1	-0.3781924	0.0170742
629967	Gm11677	-2.8474088	0.01710023
74354	Lrguk	1.2169267	0.01710023
434156	Eid2b	-0.4930347	0.01710023
100043497	Gm4477	-3.3226218	0.01710023
64384	Sirt3	-1.1203875	0.01710242
83453	Chrdl1	-2.172096	0.01717192
70683	Utp20	-0.856108	0.01717192
100503907	Gm19955	3.41656279	0.01721068
72640	Mex3a	0.9681181	0.01721068
245841	Polr2h	0.50336369	0.01721068
50790	Acsl4	1.03159126	0.01721068
236732	Rbm10	-0.4550969	0.01724008
66690	Tmem186	-0.4765983	0.01725313

225908	Myrf	1.0935774	0.01727538
15277	Hk2	1.87701476	0.01727555
246081	Defb11	3.54071695	0.01731801
23880	Fyb	1.74627577	0.01731801
69151	Lzic	0.47688251	0.01731801
232430	Crebl2	-0.6297527	0.01731801
227800	Rabgap1	0.29231055	0.01731801
19271	Ptprj	0.47905853	0.01731801
212980	Slc45a3	-0.7599539	0.01737784
19229	Ptk2b	-0.5071471	0.01737784
68493	Ndufaf4	-0.9843593	0.01740277
80720	Pbx4	3.14776178	0.01742522
69536	Hemk1	-0.5304893	0.01742522
16988	Lst1	1.59396341	0.01744115
100126034	Gm10644	-1.3983484	0.01753089
14933	Gk	-1.2768587	0.01753089
266614	Ly6g5b	1.3494036	0.01758308
71183	Clec12b	4.43722301	0.01761872
225724	Mapk4	0.67772215	0.01762239
22323	Vasp	0.77691222	0.01765528
18037	Nfkbie	1.09411876	0.01769571
101240	Wdr91	-0.5942475	0.01775597
227937	Pkp4	-0.5665157	0.01776316
13215	Defb2	1.61939851	0.01781318
20450	St8sia2	2.43536905	0.01781318
17345	Mki67	1.51508213	0.01781318
16869	Lhx1	-0.7574623	0.01781318
50754	Fbxw7	0.72170133	0.0178166
68371	Pbld1	-1.5223389	0.01781851
224523	4732491K20Rik	0.68828225	0.017819
224796	Clic5	-0.6402034	0.01782328
100040123	Gm2614	0.43400683	0.0178288
229524	Msto1	0.55060237	0.01784852
110308	Krt5	4.87265061	0.01788279
70892	Tll7	0.73531036	0.01788279
353169	Slc2a12	-1.2958311	0.01788279
116903	Calcb	3.35736754	0.01788384
18163	Ctnnd2	2.66941681	0.01788384
434800	Smim9	3.02442997	0.01788384

71997	Smg9	0.44141363	0.01788384
21859	Timp3	-1.5831056	0.01788384
18764	Pkd2	-0.6656236	0.01788384
214899	Kdm5a	0.54770386	0.01788384
55949	Eef1b2	0.435375	0.0178923
55938	Apom	-1.917664	0.0178923
83964	Jam3	-0.6681903	0.01789701
74257	Tspan17	0.92182171	0.01803824
69453	Prss56	3.94984437	0.01804736
103537	Mbtd1	0.34620065	0.01804736
66922	Rras2	0.53487804	0.01806002
71883	Coq2	-0.6241487	0.01807361
270086	Ogfod1	-0.4527837	0.01815757
14934	Gypa	-3.3393335	0.01823357
380824	Ighv1-66	-2.9372227	0.01836873
55942	Sertad1	0.65415565	0.01837545
17220	Mcm7	0.72184446	0.01837854
26401	Map3k1	0.98610435	0.01839698
268482	Krt12	3.39720219	0.01847332
100862237	NA	4.32480828	0.01847332
14087	Fanca	1.41412601	0.01847332
231830	Micall2	1.36909336	0.01847332
380863	Tmem171	1.42490288	0.01847332
22143	Tuba1b	0.66802733	0.01852548
16410	Itgav	0.54230082	0.01852548
76900	Ssbp4	1.25774269	0.01852774
211651	Fancd2	1.55920918	0.01854149
100503724	Dnajc19-ps	-1.195389	0.01855353
100502766	Kifc1	1.3484997	0.01857906
17698	Msn	0.85522882	0.01862346
18158	Nppb	3.03254927	0.0186294
18759	Prkci	0.46309619	0.0186294
217847	Serpina10	2.34989875	0.01863336
78655	Eif3j1	1.00278705	0.01870685
268930	Pkmyt1	1.67746875	0.01870851
229487	Gatb	-1.18956	0.01870891
327959	Xaf1	-1.3862958	0.01872417
13370	Dio1	-3.0642254	0.01872417
67163	Ccdc47	-0.4232034	0.01874753

20531	Slc34a2	1.78501259	0.01878472
100042173	Rps15a-ps6	-1.3127117	0.01879138
27221	Chaf1a	1.27680372	0.01880125
226646	Ndufs2	-0.4949868	0.01880125
216161	Sbno2	0.98992858	0.01880125
109299	C330006A16Rik	-0.357367	0.01888355
18720	Pip5k1a	0.40353831	0.01888875
667035	Gm8430	0.38072185	0.01891066
58208	Bcl11b	-1.0388188	0.01896544
76846	Rps9	0.56832667	0.01896544
14069	F8	-1.0174576	0.01898649
71819	Kif23	1.59744312	0.01899029
74386	Rmi1	-0.5596719	0.01899029
77422	C330018D20Rik	-0.6417629	0.01899029
70005	Znf41-ps	1.13995383	0.01900926
67978	Tctn2	-0.4004082	0.01900926
320438	Alg6	0.68693546	0.01901324
12306	Anxa2	2.13127302	0.01901324
101869	Unc45a	0.37089646	0.01902188
73852	D3Erttd751e	-0.9269156	0.01904549
22030	Traf2	0.61584741	0.01907031
14283	Fosl1	3.37215674	0.01909458
667410	Gm8615	-1.6033536	0.01915093
415115	Neur12	1.17227037	0.01917832
213084	Cdkl3	0.92489002	0.01917832
50721	Sirt6	0.52197129	0.01917832
14787	Rhpn1	-0.6616975	0.01917832
14409	Gabbr2	-2.0585279	0.01921604
627626	Ptchd4	2.33999886	0.0192201
68576	Lamtor5	-0.6352988	0.0192201
73824	Snhg6	0.82322771	0.01935808
20440	St6gal1	1.03871473	0.01936389
71795	Pitpnc1	-0.4422795	0.01936389
30805	Slc22a4	-1.1497629	0.019379
230991	B930041F14Rik	1.27580597	0.01939146
13169	Dbnl	0.30065634	0.01941452
171531	Mlph	1.04328004	0.01942619
223650	Eppk1	1.82015278	0.01943289
227377	Farp2	-0.6492008	0.01943289

24088	Tlr2	2.17065996	0.01949368
277353	Tcf15	4.30496569	0.01949814
12028	Bax	0.78730456	0.01949814
100217465	Snord111	2.53639347	0.01950257
71365	Pdss2	-1.0725428	0.01950257
212442	Lactb2	-1.594972	0.01950257
71538	Fbxo9	-0.7853674	0.01950257
14874	Gstz1	-1.0823248	0.01951314
67661	Ift172	-0.4116317	0.0195354
19724	Rfx1	-0.3457793	0.01953771
19361	Rad51	2.03138185	0.01958086
107351	Kank1	-0.4927422	0.01967041
625360	BC147527	2.6441895	0.01967863
228536	Bahd1	0.5125478	0.01968083
269582	Clsn	1.87988565	0.01979411
103768	Tubg2	1.41882958	0.01980446
667118	Zbed6	1.14118686	0.01987467
16599	Klf3	0.72360422	0.01987467
56412	Noa1	-0.8298015	0.01987467
208665	Akr1d1	-1.8277054	0.01993052
68631	Cryl1	-0.7695084	0.01993052
71817	Tmem50a	0.45005486	0.01993052
433752	AA415398	-0.8198666	0.02001277
17869	Myc	1.2295545	0.02001284
69309	Slc16a13	-1.4535857	0.02001284
230514	Leprot	0.66339411	0.02001284
235339	Dlat	-0.6790411	0.02003184
232493	Gys2	-2.5193432	0.02004843
67196	Ube2t	1.95662192	0.02008385
60345	Nrip2	1.38773523	0.02008385
243846	Ccdc9	0.68658973	0.02008385
14919	Gucy2e	5.25346611	0.0201068
12236	Bub1b	2.29439131	0.020132
72554	Utp14a	0.51563522	0.020132
94061	Mrpl1	-0.6088171	0.020132
18739	Pitpnm1	0.65460781	0.020132
22183	Zrsr1	-0.4211598	0.020132
12630	Cfi	3.05776159	0.02014567
18082	Nipsnap1	-0.7738964	0.02020423

67267	Uqcc2	0.61119076	0.02020423
385109	Igkv4-72	-1.6897154	0.0203167
16181	Il1rn	2.92609131	0.0203167
67039	Rbm25	0.56066728	0.0203167
76411	Ift43	0.55732495	0.02032227
22273	Uqcrc1	-0.6702669	0.02032834
100217469	Snord91a	-1.9132467	0.02038881
69617	Pitrm1	-0.599491	0.02042204
12660	Chka	0.39532215	0.02051924
229473	D930015E06Rik	0.70016698	0.02061562
74637	Shpk	-0.6031775	0.02061562
107771	Bmyc	0.76123463	0.02064466
214230	Pak6	1.68479249	0.02064466
16763	Lad1	0.87968405	0.02064466
12927	Bcar1	0.51764306	0.02064466
67116	Cuedc2	0.78334002	0.02064466
331401	Thoc2	0.35780529	0.02064525
319184	Hist1h2bk	-1.6502989	0.02072238
93674	Cml3	-2.8843757	0.02072238
433224	Gm5512	-1.0564075	0.02072238
110265	Msra	-1.0128175	0.02072238
50927	Nasp	0.34864065	0.02072238
68636	Fahd1	-0.6707247	0.02072238
68750	Rreb1	-0.5308694	0.02072238
16475	Ajuba	0.88922954	0.02072238
100316713	Mir1968	-3.0719286	0.02097943
170721	Papln	1.54038811	0.02097943
80915	Dusp12	-0.4180947	0.02097943
20658	Son	0.29964909	0.02097943
72129	Pex13	-0.5510379	0.02097943
99586	Dpyd	-0.7926264	0.02097943
67445	C1qtnf4	0.97504871	0.02098892
218232	Ptpdc1	-0.7104968	0.02098892
100043670	Gm4581	0.74456283	0.02098892
20733	Spint2	0.65585763	0.02103458
231003	Klhl17	-0.4754339	0.02103458
67789	Dalrd3	-0.6122323	0.02103458
20266	Scn1b	1.63650051	0.0210497
242122	Vtcn1	1.81391727	0.02116266

17768	Mthfd2	1.09470007	0.02126409
226153	Peo1	-0.5051132	0.02129114
75725	Phf14	0.39046821	0.02129241
18639	Pfkfb1	1.03289607	0.02141769
100502673	Gm19316	-3.1729554	0.02141769
16976	Lrpap1	-1.1467837	0.02141769
53978	Lpar2	0.8892254	0.02143041
72075	Ogfr	0.44087081	0.02143041
56440	Snx1	-0.3851104	0.02144486
108911	Rcc2	0.55142183	0.02144486
76894	Mettl15	-0.7782978	0.02148542
20522	Slc23a1	-1.0410795	0.02149232
54445	Unc93b1	0.57528831	0.0215345
109218	Tmem139	-1.0973093	0.021754
11656	Alas2	-5.5938582	0.02177672
232664	Ccdc136	1.26056855	0.02186039
102545	Cmtm7	0.72949427	0.02191925
228869	Ncoa5	-0.3228389	0.02196145
231326	Aasdh	-0.5354248	0.0220012
110391	Qdpr	-0.8494472	0.02200652
106389	Eaf2	-0.6692349	0.0220337
101613	Nlrp6	-1.1817033	0.0220337
433287	Gm15455	-0.4127949	0.02209136
233890	Zfp768	-0.476092	0.02211134
668727	Mrgpra2a	-2.4318583	0.02211343
56222	Cited4	0.89229238	0.02211343
100504195	Micalcl	-1.691989	0.02214682
232933	Ccdc61	0.8082226	0.02219324
56774	Slc6a14	3.56416415	0.02222166
269951	ldh2	-0.7452991	0.02222166
18987	Pou2f2	1.27054227	0.02226843
245867	Pcmt2	-0.3871821	0.02228624
97827	Exd2	-0.3454276	0.02229217
14284	Fosl2	1.18728809	0.02239704
13433	Dnmt1	0.40609867	0.02241824
100503471	Gm15867	2.81263722	0.02244433
73833	Fam98c	0.61146122	0.02244433
72119	Tpx2	1.77406409	0.02257519
212974	Athl1	-0.4808079	0.02257519

76507	Aoc1	1.53654168	0.0225839
14688	Gnb1	0.26928655	0.02261687
213522	Plekhg6	0.71745772	0.02263835
71887	Ppm1j	1.40551888	0.0227091
100041649	Mpc1-ps	-0.9304989	0.02280382
56397	Morf4l2	0.43808745	0.02280382
11797	Birc2	0.42376018	0.02281561
19858	Rnu3b1	3.88925239	0.02286456
235132	Zbtb44	-0.6412232	0.02286456
231583	Slc26a1	-1.8194361	0.02289454
381738	Drc1	1.94300187	0.02306688
27222	Atp1a4	-1.3912873	0.02307709
68310	Zmym1	-0.6603429	0.02307709
83965	Enpp5	-0.433808	0.02311101
12394	Runx1	2.0930275	0.02316411
104479	Ccdc117	-0.4532961	0.02318652
19186	Psme1	0.68938222	0.02318956
217119	Xylt2	-0.2877933	0.02325782
52076	Tmem38b	-0.5923956	0.02325782
15395	Hoxa10	-0.3961195	0.0232625
654467	Gm10052	0.57610464	0.02327686
385277	Igkv4-60	-2.5736193	0.02333004
66205	Cd302	-0.9863971	0.02333004
76137	Mcur1	-0.8880845	0.02333004
142682	Zcchc14	-0.5314709	0.02344735
22695	Zfp36	0.64021136	0.02347409
17761	Map7	-0.8774554	0.02347595
16211	Kpnb1	0.32233546	0.02348538
57429	Sult5a1	2.60076123	0.02348841
104831	Ptpn23	0.63444721	0.02352256
100862170	NA	3.34172321	0.02359079
20280	Scp2	-0.8866937	0.02359079
240753	Plekha6	-0.9868244	0.02359079
218977	Dlgap5	2.22718	0.02363337
246691	Prok1	-2.2220583	0.0236472
66931	1700010114Rik	1.24132672	0.0236472
13829	Dmtn	-0.6031741	0.0236472
170749	Mtmr4	-0.5579486	0.0236472
194974	Sun3	-1.7719682	0.02368322

77533	C030034I22Rik	0.84000832	0.02368322
232210	Hmces	0.35750389	0.02368322
99334	Zscan29	-0.3206547	0.02368322
19651	Rbl2	-0.6333203	0.02368322
105675	Ppif	-0.6405199	0.02369774
231807	BC037034	-0.2730907	0.02373239
17750	Mt2	2.17971727	0.02373239
667063	Gm8439	3.57305352	0.02381717
192173	Fam195b	0.53921724	0.02387901
19989	Rpl7	0.33550557	0.02388234
17279	Melk	1.95527696	0.02389226
69786	Tprkb	-0.7625849	0.02391568
75801	4930447C04Rik	-2.344066	0.02393761
18226	Nup62	0.34463255	0.02395473
231413	Grsf1	-0.8191367	0.02395907
18027	Nfia	-0.5759626	0.02399407
328563	Apol11b	-3.3757861	0.02402979
52855	Lair1	1.56372289	0.02402979
216858	Kctd11	1.10334402	0.02402979
102614	Rpp25	1.34842362	0.02403702
333050	Ksr2	-2.4267226	0.02404311
67886	Camsap2	-0.4705036	0.02404311
21929	Tnfaip3	1.16709833	0.0240695
68480	1110007C09Rik	0.55541148	0.0240695
63955	Cables1	-0.8531552	0.02408557
70591	5730455P16Rik	-0.3567026	0.02410077
233765	Plekha7	-0.5200986	0.02417458
320256	Dlec1	-0.5615829	0.02417458
18618	Pemt	0.7984692	0.02418194
620678	Gm12174	0.50590282	0.02418913
100042074	Gm3650	-1.0272098	0.0242048
66302	Rmdn1	-0.5798896	0.0242048
66646	Rpe	-0.5350156	0.0242048
59003	Maea	0.29075636	0.0242048
11821	Aprt	0.9273184	0.0242048
26366	Ceacam10	-1.7160999	0.02420668
210982	Gltscr1l	-0.411844	0.02420668
72190	2510009E07Rik	-0.554595	0.02420668
12227	Btg2	1.63794273	0.02420668

60599	Trp53inp1	0.89485569	0.02420668
67997	Ddx59	-0.5379632	0.02421374
18212	Ntrk2	-3.7509362	0.02422318
67426	Adck3	-0.6001429	0.02422318
94112	Med15	0.34985974	0.02429582
74772	Atp13a2	0.27040156	0.0243076
118446	Gjc3	-2.4318583	0.02433026
56150	Mad2l1	0.84565493	0.02433026
402734	C730036E19Rik	1.01810508	0.02434026
319224	6330410L21Rik	-2.3725566	0.02434283
20505	Slc34a1	-1.4595555	0.02434283
14385	Slc37a4	-1.131143	0.02434283
24017	Rnf13	-0.4593011	0.02434283
100041194	Ahnak2	1.60672234	0.02436212
229595	Adamtsl4	1.96440878	0.02436212
320024	Nceh1	-0.5917981	0.02436212
67283	Slc25a19	-0.7092151	0.02436212
230721	Pabpc4	0.5525557	0.02440977
20418	Shc3	-3.9321692	0.02446673
80892	Zfhx4	2.02473332	0.02446673
12235	Bub1	1.9560336	0.02446673
240261	Ccdc112	1.17639539	0.02446673
217708	Lin52	-0.7529613	0.02446673
27410	Abca3	-1.2163218	0.02446673
12648	Chd1	-0.3249929	0.02446673
66394	Nosip	0.39127188	0.02446673
100039571	Gm10335	0.38413939	0.02446673
18451	P4ha1	-0.7246795	0.02446673
26562	Ncdn	0.46885164	0.02447025
14620	Gjb3	3.03364902	0.02449133
99382	Abtb2	-0.6327136	0.02449133
735259	Mir670	-2.2447425	0.02452738
11740	Slc25a5	-0.5005765	0.02453841
12363	Casp4	1.74652733	0.02456155
230558	C8a	-2.0268863	0.0246739
320747	Lingo4	2.13715524	0.02469388
56752	Aldh9a1	-1.2031053	0.02469388
117591	Slc2a9	0.76043822	0.02469388
74166	Tmem38a	0.66737699	0.02473763

77864	Ypel2	1.09479054	0.02473763
69928	Apitd1	1.57306251	0.02473837
232313	Gxylt2	3.71739999	0.02480035
94218	Cnm3	-0.3244949	0.02480035
22121	Rpl13a	0.83758297	0.02480035
105853	Mal2	0.96010061	0.02480035
76088	Dock8	-0.547688	0.02480035
320604	Ccdc169	-3.7160279	0.02483648
234839	Piezo1	0.77518353	0.02484352
23872	Ets2	0.39897323	0.0249265
230596	Prpf38a	0.29460151	0.02497289
239719	Mkl2	0.41407159	0.02497289
18552	Pcsk5	-0.5953104	0.02497289
56485	Slc2a5	-1.1835557	0.02497289
21405	Hnf1a	-0.9485474	0.02497289
71091	Cdkl1	-0.8806942	0.0249778
171206	Vmn1r27	-2.3428662	0.02500567
93834	Peli2	-0.8012223	0.02514295
625732	Gm11893	-2.0740331	0.02520657
100504341	Gm20184	2.20972181	0.02520657
170772	Glcci1	-0.4947514	0.02520657
228852	Ppp1r16b	-1.4601315	0.02520657
52633	Nit2	-1.0046519	0.02520664
52793	Fam3b	3.35457374	0.02534187
69923	Agk	-0.4911155	0.02540897
83671	Sytl2	1.79549605	0.02542736
100503862	Gm19932	3.55147676	0.02545349
665622	Hist1h2br	-2.0122544	0.02545349
27053	Asns	0.69868022	0.02545349
15415	Hoxb7	0.39367092	0.02545349
74978	Lrriq1	1.44270656	0.02546286
268782	Agxt2	-1.2937743	0.02547594
66075	Chchd3	-0.5359993	0.02550794
666485	Gm8127	3.50947804	0.0255235
14362	Fzd1	-0.7159992	0.0255235
242700	Ifnlr1	0.66334785	0.02568204
320720	Fastkd1	-0.7406753	0.02578883
76614	Immt	-0.60563	0.02579195
107932	Chd4	0.37188235	0.0258034

66333	Aqp11	-1.0016626	0.02583127
54375	Azin1	-0.4205534	0.02589886
22691	Zscan2	0.56252949	0.02604397
54216	Pcdh7	2.02306827	0.02607243
216892	Spns2	1.35816066	0.02607243
15013	H2-Q2	1.75449423	0.02611646
12929	Crkl	-0.4385553	0.02611646
70617	5730508B09Rik	1.13853757	0.02614062
237320	Aldh8a1	-1.4834038	0.02614062
20439	Siah2	-0.8407402	0.02616429
75608	Chmp4b	0.44423561	0.02617592
13356	Dgcr2	-0.4517547	0.02617592
675713	Gm17758	2.42930049	0.02617987
54648	Ccdc120	0.74650398	0.02617987
269587	Epb4.1	-0.5547655	0.02617987
30962	Slc7a9	-0.8247973	0.02617987
67772	Chd8	0.32445399	0.02617987
216616	Efemp1	1.11263577	0.02618074
217698	Acot5	1.32044068	0.02621307
12182	Bst1	4.32334084	0.02621502
243743	Plxna4	-1.1271828	0.02635252
73474	Snhg9	2.61259641	0.02643191
12737	Cldn1	1.30434272	0.02643191
20382	Srsf2	-0.3332056	0.02648307
20911	Stxbp2	0.53552701	0.02648307
29858	Pmm1	0.64948739	0.02652904
544763	Hbq1b	-3.4586941	0.0265333
68725	1110032F04Rik	-2.0995106	0.02656606
319646	D630013N20Rik	-1.0404217	0.02674329
77920	A330102I10Rik	3.33329009	0.02683635
73192	Xpot	-0.5869783	0.02687741
140474	Muc4	3.96106779	0.02691947
100039123	Gm14295	0.96960455	0.02697344
20148	Dhrs3	-0.899794	0.0269814
13195	Ddc	-1.1434341	0.02704206
18035	Nfkbia	1.0012899	0.0270909
20969	Sdc1	1.07489135	0.02710235
72296	Rusc1	0.55538306	0.02710235
29816	Hip1r	0.54691099	0.02710235

108912	Cdca2	1.24845837	0.02717867
64177	Trpv6	1.16771766	0.02717867
68644	Abhd14a	-1.1120714	0.02717867
13638	Efna3	1.71724205	0.02718795
12908	Crat	-0.7878065	0.02721822
232087	Mat2a	-0.9988159	0.02722909
12505	Cd44	1.80189815	0.02728315
74244	Atg7	0.43218418	0.02731851
52538	Acaa2	-1.2211153	0.02736385
21745	Tep1	0.32227629	0.02744491
233274	Siglech	-1.8598065	0.02747808
73942	Fam151b	-0.6515701	0.02747808
218038	Amph	2.32338185	0.0274912
214895	Lman2l	-0.7484134	0.0274912
100316775	Mir1950	-2.4622235	0.02752298
100504703	A730063M14Rik	0.93777451	0.02752298
14772	Grk4	0.71507592	0.02752298
64452	Slc5a4a	-2.2406793	0.0275299
26886	Cenph	1.66373424	0.0275299
668253	Dleu2	-0.9227768	0.0275299
68298	Ncapd2	0.55977926	0.0275299
216516	Ccdc157	-0.5106906	0.0275299
70472	Atad2	1.05100586	0.02762955
100041677	Gm13157	1.42756406	0.02762955
381822	1190002F15Rik	1.34897086	0.02764289
70839	P2ry12	2.50959708	0.02769504
234788	Slc38a8	2.49439914	0.02770484
243529	H1fx	1.32905497	0.02779469
67013	Oma1	-0.4639647	0.02780559
230737	Gnl2	0.31568239	0.02780559
20319	Sfrp2	-2.8806672	0.02782052
74376	Myo18b	3.61925772	0.0278236
18049	Ngf	1.98206645	0.02785933
22599	Slc6a20b	-1.6545693	0.02791894
667766	Gm8801	-2.4968733	0.02793212
105785	Kdelr3	1.92536195	0.02797264
67880	Dcxr	-0.5911598	0.02797264
14390	Gabpa	-0.581921	0.02797264
72395	2610028E06Rik	3.08228452	0.0280056

67027	Mkrm2	-0.2640928	0.02803545
214239	A430105I19Rik	1.84979007	0.02813969
66199	Commd4	0.43119128	0.02820664
15903	Id3	1.24688456	0.02822325
228785	Mylk2	2.20973705	0.02831914
233987	Zfp958	0.4933294	0.02831914
52552	Parp8	0.70805022	0.02831914
384281	Gatc	-0.4115572	0.02831914
15388	Hnrnp1	0.23109318	0.02831914
67863	Slc25a11	-0.5627953	0.02831914
12351	Car4	-2.0265308	0.02831914
207683	Igsf11	-1.0671099	0.02831914
85305	Kars	0.21442884	0.02831914
235574	Atp2c1	-0.4689629	0.02831914
218543	Srek1	0.31622425	0.02831914
100862128	NA	1.37228636	0.02839307
108037	Shmt2	-1.4649205	0.02839307
71985	Acad10	-1.2092404	0.02839307
66854	Trim35	0.66265221	0.02839307
230753	Thrap3	0.31830338	0.02839831
52502	Carhsp1	0.48212264	0.02839831
194952	Jmjd4	-0.4183783	0.02844858
20725	Serpib8	-0.6073061	0.02850282
50905	Ii17rb	0.64810634	0.0285257
15929	Idh3g	-0.7634944	0.02858239
109050	Fam212b	1.15384459	0.02860147
319982	5930430L01Rik	1.86845666	0.02863575
78263	4632411P08Rik	1.51056142	0.02869479
242126	Slc22a15	1.5557742	0.02869479
74116	Pi16	-1.7952193	0.02869479
51792	Ppp2r1a	0.30064521	0.02869479
16476	Jun	1.23023558	0.02869479
57138	Slc12a5	-1.4090884	0.0287182
74393	Map10	-0.6409744	0.0287182
13627	Eef1a1	0.31941015	0.0287182
69666	Psmg4	0.38519396	0.02874292
432466	Gm5424	-1.6830162	0.02885826
11765	Ap1g1	-0.45862	0.02885826
56786	Tmem9b	-0.3390007	0.02885826

236690	Nyx	1.41401439	0.02893691
13076	Cyp1a1	-2.2447841	0.02893691
68226	Efcab2	-0.5970489	0.02893691
240328	F830016B08Rik	3.8712615	0.02901742
100861913	LOC100861913	2.00438427	0.02901742
69577	Fastkd3	-0.6189176	0.02901742
71779	8-Mar	-0.6216166	0.02901742
11746	Anxa4	0.52777719	0.02902218
329547	Bpi	2.8867254	0.02903468
17708	COX1	-0.9006569	0.02903468
71778	Klhl5	-0.4892424	0.02903468
77644	C330007P06Rik	-0.5677189	0.02903468
18457	Bloc1s6	-0.4309162	0.02903468
21780	Tfam	-0.6094732	0.02903604
67092	Gatm	-1.5316431	0.02904271
18191	Nrxn3	1.84080633	0.02911478
224250	Cldnd1	-0.2970272	0.02911478
101214	Tra2a	-0.4454453	0.02913967
68178	Cgnl1	-0.5647826	0.02915832
83945	Dnaja3	-0.7388564	0.02915832
66162	Bola2	0.73540504	0.02920892
230863	Sh2d5	3.96543227	0.02922889
94224	Srd5a2	-1.3719219	0.02922889
67874	Rprm	1.84519076	0.02922889
227327	B3gnt7	1.52926111	0.02922889
26397	Map2k3	-0.3123607	0.02922889
237222	Ofd1	0.55276714	0.0292549
384061	Fndc5	-0.6828313	0.02937834
233836	Slc5a11	-0.8164355	0.02937834
100502777	Gm38422	1.27365104	0.02941994
18750	Prkca	-0.5717301	0.02941994
66917	Chordc1	-0.8940629	0.02941994
12442	Ccnb2	1.97340439	0.02944521
16600	Klf4	1.26562831	0.02944521
67048	Vma21	-0.4267083	0.02944521
68041	Mid1ip1	0.76316446	0.02944521
17060	Blnk	0.90755601	0.02944849
70918	Nsun7	1.57420855	0.02945381
223332	Ranbp3l	-1.2879094	0.02945381

53381	Prdx4	-0.4906391	0.02945381
11950	Atp5f1	-0.7067944	0.02945381
66586	Crls1	-0.4355612	0.02945381
27364	Srr	-1.0027421	0.02945381
215015	Fam20b	-0.4933405	0.02945381
59049	Slc22a17	-0.5581309	0.02945381
67846	Tmem39a	-0.3605375	0.02952568
20277	Scnn1b	0.72632136	0.02952568
20877	Aurkb	1.87013363	0.02954754
641178	Ighv5-9-1	-2.7626956	0.02959359
320078	Olfml2b	-2.3086258	0.02975093
17384	Mmp10	2.58018517	0.02982636
50765	Tfr2	2.5637412	0.02982636
12449	Ccnf	1.88146135	0.02982636
20511	Slc1a2	1.36769029	0.02982636
19024	Ppfbp2	-0.4064313	0.02982636
15107	Hadh	-1.0677649	0.02986595
100502992	Gm19491	-1.1752501	0.02987386
24060	Slc35a1	-0.3138839	0.02987386
234404	Nxn1	-1.9445019	0.02989671
212712	Satb2	-0.6540431	0.02989671
791090	Ighv2-6-8	-5.1595005	0.02992966
353025	Caps2	1.67985394	0.02998213
66371	Chmp4c	0.70417692	0.02998213
215193	Diexf	-0.4113973	0.02998213
233065	Alkbh6	0.63875039	0.02998213
69190	Dym	-0.8309222	0.02998213
83924	Gpr137b	-1.5952219	0.02998213
230775	Adgrb2	1.7655454	0.03001689
16364	Irf4	1.15098386	0.03001689
71909	Haus5	0.55487359	0.03001689
231532	Arhgap24	-0.5278215	0.03001689
171211	Edaradd	1.07758643	0.03003404
192662	Arhgdia	0.31011274	0.03003404
98685	Trmt1l	-0.3518291	0.03003404
12862	Cox6a2	-1.4659511	0.03005888
225745	Haus1	0.51658526	0.03007689
320487	Heatr5a	-0.4312272	0.03007689
97820	4833439L19Rik	-1.0668236	0.03007689

226139	Cox15	-0.6892801	0.03007689
22619	Siae	-0.4182776	0.03018867
109689	Arrb1	-0.6295644	0.03027968
192191	Med9	0.35136536	0.03037056
225362	Reep2	1.68012481	0.03049063
240068	Zfp563	-0.551772	0.03049063
233011	Itpkc	0.48448858	0.03049063
20666	Sox11	2.83721894	0.03051201
70361	Lman1	-0.3531378	0.0306045
83675	Bicc1	0.59084381	0.0306045
74319	Mettl23	0.5173577	0.03067907
69549	2310009B15Rik	0.74451613	0.03068486
13051	Cx3cr1	1.6822865	0.03068486
217593	Slc25a21	-1.8656205	0.03068486
72068	Cnot2	-0.2262987	0.03068486
16873	Lhx5	2.44020209	0.03070687
77106	Tmem181a	0.63932994	0.03074819
244198	Olfml1	-1.4351927	0.03074819
66515	Cul7	0.75583922	0.03074819
214804	Syde2	-0.7819569	0.03077168
381925	Ppapdc1a	2.49316775	0.03077587
66505	Zmynd11	-0.2665189	0.03078454
74293	1700095J03Rik	3.13361012	0.03084567
19347	Dennd5a	-0.346911	0.03087245
12652	Chga	4.32694334	0.03092791
70310	Plscr3	0.50385294	0.03092791
226591	Tiprl	-0.298093	0.03092791
67075	Magt1	-0.6242825	0.03092791
18569	Pdcd4	0.55935378	0.03092791
19820	Rlim	0.2751263	0.03092791
71147	Oxsm	-0.9635293	0.03093791
58804	Cdc42ep5	1.18540795	0.03103078
13510	Dsg1a	2.93584999	0.0310971
50873	Park2	-0.9369798	0.03111111
71941	Cars2	-0.478353	0.03113151
19886	Ros1	3.26352262	0.03115162
259097	Olf558	-1.1316927	0.03115162
72354	Ttc4	-0.2570544	0.03115162
99152	Anapc2	0.30968069	0.03124857

791370	A130051J06Rik	1.78080351	0.03138282
74194	Rnd3	0.90822156	0.03138282
56451	Suclg1	-0.8472452	0.03140789
230259	E130308A19Rik	0.64454306	0.0314316
105348	Golm1	2.16570077	0.0314316
217370	BC017643	0.29377406	0.03148018
99138	Stard7	-0.7887334	0.03148018
66725	Lrrk2	-1.164703	0.03148018
72805	Zfp839	-0.3654791	0.03149632
28084	Vps25	0.37359369	0.03150703
19729	Slc50a1	0.58118216	0.03151087
227696	Phyhd1	-0.8936877	0.03151087
258022	Olfr1318	2.90646513	0.03167051
68964	Ctc1	0.43224467	0.03167051
11949	Atp5c1	-0.5185151	0.03173761
75572	Acyp2	-0.7872446	0.03175408
667728	Hist1h2al	-1.4012251	0.031762
268417	Zkscan17	0.36432314	0.031762
20510	Slc1a1	-1.0826246	0.031762
269423	3110057O12Rik	-1.2639374	0.0319521
78908	Igsf3	0.47093566	0.03197915
14302	Frk	0.95349009	0.03197915
100034684	BC100530	2.936933	0.03198931
230257	Ptbp3	0.54668942	0.03198931
14824	Grn	0.56213965	0.03199672
80904	Dtx3	-0.333772	0.03207267
246782	Atpaf2	-0.488451	0.03209716
75172	Ccdc146	-2.1080543	0.03212446
63953	Dusp10	1.74877329	0.03215242
231646	Myo1h	2.86013928	0.03218513
11461	Actb	0.45932551	0.03219957
19934	Rpl22	0.34604944	0.03225605
55948	Sfn	2.89634077	0.03228246
11429	Aco2	-0.7129505	0.03231971
71890	Mad2l2	0.95769304	0.03233264
70808	4632415L05Rik	-0.4507217	0.03233264
12345	Capzb	0.32970774	0.03246034
668178	Mettl7a3	-1.2246508	0.03246034
238021	Fscn2	2.48656069	0.03249596

77090	Ocel1	-1.4466338	0.03253813
67937	Tmem59l	1.83898628	0.0325566
208501	1810043H04Rik	-0.4177051	0.0325566
545647	Gm13289	2.79885487	0.03260947
544990	Gm5795	1.96347632	0.03260947
67604	Get4	0.68182311	0.03260947
666678	Gm8232	3.13189269	0.03265689
72668	Skida1	-0.6773011	0.0326626
54383	Phc2	0.37771383	0.03269927
66569	Gdpd1	1.12885314	0.03275049
105243	Slc9a3	-1.3422453	0.03275049
66046	Ndufb5	-0.5871947	0.03275049
12794	Cnih2	1.28799448	0.03276727
224171	C330027C09Rik	1.36267511	0.03276727
75516	Ttc32	-0.4239771	0.03276727
207151	Slc22a19	-2.2570514	0.03276727
106861	Abhd3	-1.5046793	0.03276727
17184	Matr3	0.29253032	0.03276727
57317	Srsf4	-0.3339641	0.03276727
242570	Raver2	-1.3454943	0.03281596
100041724	Gm15217	-1.5751104	0.03282772
218973	Wdhd1	1.37990103	0.03288274
75668	Rasl10a	1.78256169	0.03300065
226751	Cdc42bpa	-0.4152976	0.0330449
12234	Btrc	-0.2431036	0.03314884
71988	Esco2	2.16778887	0.03328943
22151	Tubb2a	1.13084414	0.03331268
102680	Slc6a20a	-1.1422476	0.03331872
280662	Afm	-1.3434447	0.03335184
15975	lfnar1	0.4169593	0.03335184
100306954	Snora17	1.11591738	0.03348946
74053	Grip1	0.98498188	0.03353131
218214	Kdm1b	-0.7515689	0.03353131
319965	Cc2d1b	0.42218816	0.03353131
666532	Gm13139	0.96780996	0.03353143
26372	Clcn6	-0.9182143	0.03368252
12684	Cideb	-1.2697961	0.03368252
54418	Fmn2	-2.1254578	0.03369065
14963	H2-BI	-3.2897793	0.03375681

56506	Cib2	0.49655161	0.03379325
18811	Prl2c2	2.46699796	0.03380005
209737	Kif15	1.25103902	0.03380005
107829	Thoc5	0.38601378	0.03380005
433632	Gm5544	2.20972181	0.03380527
11438	Chrna4	-0.9409882	0.03380697
319711	E230029C05Rik	1.99905897	0.03381858
381318	Nsl1	1.89925654	0.03381858
27207	Rps11	0.52943046	0.03382469
63913	Fam129a	1.42879681	0.03388586
67732	lah1	-0.7651748	0.03392768
100038569	Gm10558	2.75305315	0.03424408
224624	Rab40c	0.44401517	0.03424408
100504632	Gm11478	1.13819381	0.03435188
23972	Papss2	-1.263307	0.03435188
67621	Bend5	-1.0324992	0.03435188
76478	Haus8	1.13145373	0.03448252
13518	Dst	-0.4899397	0.03449238
319263	Pcmt1	-0.3556851	0.03449238
208836	Fanci	0.63954719	0.03450422
104112	Acly	-0.6917348	0.03450422
208628	Kntc1	1.66905459	0.03457985
219114	Ska3	1.011449	0.03462548
76917	Flywch2	1.36055293	0.03462548
100526469	Mir3064	-0.7786148	0.03462548
207911	Mchr1	1.77595759	0.03466482
20502	Slc16a2	-1.4835686	0.03467253
319178	Hist1h2bb	-2.4837361	0.03467738
11688	Alox8	1.93826108	0.03472678
27214	Dbf4	0.73185949	0.03472678
66714	4921524J17Rik	-0.4109114	0.03472678
100043813	Rps27rt	0.45807449	0.03482116
23853	Def6	0.97300767	0.03484036
72658	2700097O09Rik	-0.5853933	0.03485552
381346	Gm13194	-1.4148035	0.03489884
52609	Cbx7	0.71446029	0.03489884
109284	R3hdm4	0.32063506	0.03491033
16551	Kif11	1.1793053	0.0349221
52014	Nus1	-0.8364552	0.0349221

56077	Dgke	0.72964873	0.03508145
232878	Zscan22	-0.521899	0.03510142
105732	Fam83h	0.28289709	0.03510142
109082	Fbxw17	0.89519466	0.03510665
381280	Hjrp	1.28515912	0.0351108
56089	Ramp3	-0.9515611	0.0351108
67471	Gpatch1	0.51373153	0.0351108
17765	Mtf2	0.35036382	0.0351108
59056	Evc	-1.0795867	0.0351108
103711	Pnpo	-0.8402788	0.0351108
67453	Slc25a46	-0.5333198	0.0351108
19752	Rnase1	-2.3251257	0.03511099
58186	Rad18	1.29650554	0.03514841
100503499	Gm16136	1.07946445	0.03514841
100503447	Gm19696	-1.4261168	0.03514841
64697	Keg1	-1.2781305	0.03514841
66995	Zcchc18	1.0214156	0.03516946
71583	9130008F23Rik	0.97998522	0.03516946
67425	Eps81	1.39631357	0.03516946
107305	Vps37c	0.32134937	0.03516946
27276	Plekhb1	-1.3092262	0.0352571
332937	Tfap2e	3.05762928	0.03527288
16426	Itih3	1.31162526	0.03527288
71746	Rgl3	0.37208089	0.03527288
353502	Hcfc1r1	0.37422483	0.03530994
20716	Serpina3n	1.59064491	0.03533196
20473	Six3	2.95620185	0.03537963
12649	Chek1	1.15303306	0.03537963
78751	Zc3h6	0.76548205	0.03537963
66901	Proz	-2.2844821	0.03542146
18984	Por	-0.6760364	0.03543629
67758	Aadac	-0.9824117	0.03543629
100038479	Gm10787	-1.3251005	0.03549514
110596	Arhgef28	0.45222656	0.03555249
319604	Fam168a	-0.3576892	0.03555282
21784	Tff1	-1.3532185	0.03561027
68778	Gucd1	-0.6296677	0.03561027
12121	Bicd1	0.54552021	0.03570926
19946	Rpl30	1.14224528	0.03574358

76843	Dtl	1.77906134	0.03579441
21857	Timp1	2.42160948	0.03579441
66566	Ntpcr	0.43372557	0.03579441
99011	Pomt1	-0.8142907	0.03579441
271047	Serpina3b	4.54030474	0.03579941
219072	Haus4	0.4709626	0.03579941
67201	Glod4	-0.5205421	0.03579941
12484	Cd24a	1.43958623	0.03581825
319216	4932441J04Rik	2.8671825	0.03596882
56703	Pigo	-0.4541447	0.03599574
14613	Gja5	-2.5344558	0.03603078
18822	Plod1	-0.4771361	0.03604934
100038391	Gm10287	-3.2386234	0.03605141
230718	Nt5c1a	2.17622549	0.03605381
18011	Neur1a	1.18433197	0.03605381
12380	Cast	0.67911954	0.03608163
16855	Lgals4	1.66928239	0.03611461
210106	Papd7	-0.7424671	0.03612927
69574	Cmb1	-1.200131	0.03612927
74123	Foxp4	0.45034316	0.03612927
22401	Zmat3	0.59716116	0.03612927
230674	Kdm4a	0.32118401	0.03612927
236794	Slc9a6	-0.5794616	0.03618821
100039307	Gm2149	-2.5742334	0.03620358
320872	Arhgap15os	2.87522915	0.03630499
13874	Ereg	3.26914445	0.03630499
232821	Ccdc106	0.95562916	0.03630499
100504089	Gm20056	-0.5830231	0.03630499
380674	Rdh18-ps	-1.9333894	0.03630499
21815	Tgif1	0.72829789	0.03630499
68364	0610030E20Rik	-0.3798136	0.03630499
18408	Slc25a15	-1.022578	0.03630499
18105	Nqo2	-0.47554	0.03630499
66420	Polr2e	0.38436744	0.03630499
19385	Ranbp1	0.51557853	0.03630499
114570	Crip3	-1.4409939	0.03631839
99870	AW047730	2.74288799	0.03633612
26370	Cetn2	-0.2983779	0.03633612
22278	Usf1	0.29459289	0.03647636

230648	Efcab14	-0.3505303	0.03653276
21789	Tfpi2	-1.5357754	0.03671528
20517	Slc22a1	-0.8673413	0.03671528
11782	Ap4s1	0.31163321	0.03678603
21847	Klf10	0.91936252	0.03680537
269261	Rpl12	0.76616791	0.03682941
236798	Adgrg4	-2.6880168	0.03698044
89867	Sec16b	1.13735482	0.03698058
625599	Gml	2.77964454	0.03699736
14990	H2-M2	1.3287815	0.03699736
668661	2410002F23Rik	0.54038283	0.03708465
68606	Ppm1f	-0.3342303	0.03715945
69674	Mif4gd	-0.3926271	0.03715945
268420	Alkbh5	-0.461584	0.03722268
66805	Tspan1	-0.7197642	0.03722268
242297	Fam110b	0.9525521	0.03726573
68291	Mto1	-0.8365418	0.03732518
494448	Cbx6	0.48459341	0.03732518
67115	Rpl14	0.36550758	0.03734058
223453	Dap	-0.433464	0.03734386
22710	Zfp52	1.03818753	0.03741197
11792	Apex1	0.7686295	0.03741295
16866	Lhb	3.52582761	0.03741793
68992	Zfp580	0.88282305	0.03741793
100041680	Gm3470	-0.8854639	0.03741793
26384	Gnpda1	-0.9149114	0.03741793
66948	Acad8	-0.6734081	0.03741793
64050	Yeats4	0.26765352	0.03741882
236193	Zfp709	-0.5375503	0.03747029
18968	Pola1	0.54288614	0.03747522
100526511	Mir3108	1.72000014	0.03754117
215772	Adgb	2.83684135	0.03754117
18534	Pck1	-1.2129503	0.03754117
57394	Tmem27	-1.1794669	0.03754117
226525	Rasal2	-0.3322651	0.03754117
223337	Ugt3a2	-2.0925231	0.03754117
13640	Efna5	0.95778776	0.03756196
100216530	Snord118	2.55951462	0.03756707
234362	Zfp868	-1.0158533	0.03756707

21812	Tgibr1	0.37177606	0.03756707
22059	Trp53	0.46403763	0.03760619
100342	Fam46b	1.24672388	0.037646
629159	1700008J07Rik	-0.6756783	0.0376641
170728	Rtn4ip1	-0.9411954	0.0376641
22259	Nr1h3	-0.8694509	0.03766911
224705	Vps52	-0.4252318	0.03773192
22165	Txk	1.64442967	0.03775179
23801	Aloxe3	3.22153748	0.03776926
19212	Pter	-0.7743373	0.03776926
15939	Ier5	0.87794075	0.03776926
59057	Zfp191	-0.4903419	0.03776926
57764	Ntn4	0.5218023	0.03776926
75789	4930444M15Rik	1.71908083	0.03783014
329716	BC107364	4.39711124	0.03783344
170460	Stard5	-0.5080613	0.03783344
71732	Vps11	0.3273358	0.0379301
100503730	Gm19860	-1.4551681	0.03796693
69665	Upk3bl	4.1209659	0.03799212
545864	Gm5879	1.01408484	0.03799212
98682	Mfsd6	0.31443783	0.03799212
73694	Ndufaf7	-0.3820189	0.03799212
26926	Aifm1	-0.6966201	0.03799212
71807	Tars2	-0.3758193	0.03799212
100042424	Gm3837	0.49626297	0.03799212
105887	Ugt3a1	-2.493402	0.03800859
16571	Kif4	1.55876024	0.03805191
225875	Lrfr4	0.84586971	0.03805191
170625	Snx18	-0.5569666	0.03819635
22142	Tuba1a	1.05038342	0.03828589
21763	Tex2	-0.8310826	0.03828589
100862257	NA	0.60769086	0.03828689
19743	Rhag	2.78037102	0.0384125
12821	Col17a1	2.27070065	0.03842775
15487	Hsd17b3	-3.1620291	0.03849517
100504489	Gm16867	1.77586759	0.03849517
72012	1600020E01Rik	-0.5951431	0.03849517
27886	Dgcr14	0.37489237	0.03849517
18643	Pfn1	0.52523844	0.03849517

70387	Ttc9c	-0.3040464	0.03849517
69161	Manbal	0.67044169	0.03849517
74580	Pyroxd2	-0.8950798	0.03849517
59040	Rhot1	-0.5116653	0.03849517
52874	D19Bwg1357e	0.25731206	0.03850938
216976	BC030499	-1.8232684	0.03851933
18476	Pafah1b3	1.03299381	0.03851933
194219	Sifnl1	2.15177308	0.03854797
12418	Cbx4	-0.4649893	0.03855542
76080	Ttpal	0.38098854	0.03856179
28254	Slco1a6	-1.66997	0.0385779
20103	Rps5	0.53325428	0.0385779
110948	Hlcs	0.64834621	0.03868921
18400	Slc22a18	-1.275242	0.03868921
211329	Ncoa7	-0.7186992	0.03875754
108672	Zdhhc15	1.37069821	0.03875974
78194	4930546K05Rik	3.73545322	0.03883444
104156	Etv5	-0.8608865	0.03887646
68944	Tmco1	-0.563331	0.03897775
21927	Tnfaip1	0.33033457	0.03902807
13861	Epx	3.75824515	0.03903984
234199	Fgl1	4.05747805	0.03903984
67071	Rps6ka6	0.94675083	0.03903984
27354	Nbn	-0.47029	0.03903984
106014	Fam19a5	0.60474388	0.03905989
72180	Zfp661	-0.5163546	0.03908389
381605	Tbc1d2	0.93290034	0.03908389
14600	Ghr	-1.1600533	0.03908389
20742	Sptbn1	-0.3401433	0.03908389
55990	Fmo2	-1.3690831	0.03908389
192201	Wfdc15b	-1.2197701	0.03908389
56226	Espn	-0.5436597	0.03908389
100503078	Gm19541	-1.9634388	0.03916374
791303	Gm10277	0.61218205	0.0392037
666259	Gm15573	-2.325144	0.03921875
11826	Aqp1	-1.03283	0.03923848
52705	Krr1	-0.2955516	0.03923848
215798	Adgrg6	1.84027	0.03928347
97114	Hist2h3c2	-1.5014839	0.03928347

231832	Tmem184a	-0.3637101	0.03928347
18597	Pdha1	-0.6853437	0.03928347
14865	Gstm4	-0.5242757	0.0393685
216543	Cep68	-0.312536	0.0393685
17288	Mep1b	-1.6859518	0.0393685
225339	Ammecr1l	-0.4251786	0.0393685
67382	Brd3	0.32612886	0.03938994
320111	Prr18	-2.3900698	0.03939494
74435	Lrriq3	-1.0272159	0.03942309
74732	Stx11	1.68841267	0.03946976
71710	Lrrcc1	0.42602412	0.03950998
52857	Gramd1a	0.47444536	0.03950998
14784	Grb2	0.24202976	0.03950998
68400	0610043K17Rik	-0.8350528	0.03951332
320950	9330104G04Rik	1.55458054	0.03951695
16939	Lor	2.00747537	0.03954282
17769	Mthfr	-0.6795311	0.03954282
18016	Nf2	-0.2745002	0.03954282
78653	Bola3	-0.6308095	0.03954282
75906	Fam184a	-0.6389139	0.03958633
17387	Mmp14	1.90519854	0.03967926
11933	Atp1b3	-0.311962	0.03967926
15259	Hipk3	-0.3641711	0.03970513
80286	Tusc3	-0.3584316	0.03988623
21834	Thrb	-0.5531307	0.03992197
52276	Cdca8	1.16828849	0.03999466
66929	Asf1b	1.09812376	0.04003135
319504	Nrcam	2.03381943	0.04019217
71169	Nbas	-0.4515133	0.04030315
12615	Cenpa	1.17316179	0.04037641
17242	Mdk	-1.4411311	0.04042802
11459	Acta1	1.45025495	0.04047553
73804	Kif2c	1.2734441	0.04047553
237436	Gas2l3	1.10901271	0.04047553
27274	Zfp354b	-0.8087976	0.04047553
69790	Med30	0.48240294	0.04047553
66451	2610528J11Rik	-0.9424844	0.04047553
65111	Dap3	-0.4325828	0.04047553
17909	Myo10	0.42545506	0.0404855

68533	Mphosph6	0.5234634	0.04049236
76425	Gid8	-0.2505294	0.04049236
53624	Cldn7	1.33110887	0.0405024
232539	Klhl42	0.52729554	0.04050616
100503855	Gm19929	3.20723025	0.04052243
103551	E130012A19Rik	1.91121723	0.04052243
109264	Me3	-0.7375157	0.04052243
77411	Esrp2	-0.6037103	0.04052695
75965	Zdhhc20	0.58172883	0.04067976
74480	Samd4	1.55275489	0.04071117
12176	Bnip3	-0.4402612	0.04071117
67238	Fam220a	-0.4130302	0.0408281
71973	Rbpms2	-0.8262794	0.04090239
69350	1700003G18Rik	-3.258311	0.04092462
217738	Ism2	3.07687717	0.04092462
71566	Clmp	-0.5717658	0.04092462
76560	Prss8	-0.5753152	0.04092462
212139	Cc2d1a	0.33385906	0.04099116
18631	Pex11a	-0.9529551	0.04101649
73167	Arhgap8	0.62834618	0.04101649
53599	Cd164	-0.4892315	0.04101649
207182	Ggt7	1.04779819	0.04103039
21408	Zfp354a	-0.5432515	0.04103039
12655	Chil3	2.79176478	0.04114263
72045	2010001E11Rik	-1.2383543	0.04115291
229841	Cenpe	1.31503753	0.04120989
232089	Elmod3	-0.373974	0.0412105
12702	Socs3	1.83770947	0.04122951
21391	Tbxas1	-1.0257715	0.04122951
73442	Hspa12a	-0.6862166	0.04122951
11699	Ambp	1.69314753	0.04125817
22592	Ercc5	0.57101716	0.04126758
93697	Ice2	-0.3760173	0.04128225
226539	Dars2	-0.702935	0.04128225
13716	Eil	0.48247322	0.04128225
237542	Osbpl8	-1.1530686	0.04128225
76132	Faxc	1.30309881	0.04130558
211770	Trib1	0.73037174	0.04130558
26365	Ceacam1	-0.745474	0.04136481

66445	Cyc1	-0.5000161	0.04137581
76866	Morn1	0.51600734	0.0413912
17777	Mttp	-0.789135	0.04152884
100861936	NA	-1.9796501	0.04162333
545085	Wdr70	0.37211527	0.0417439
54373	Prss16	3.17187178	0.04178359
109229	Fam118b	0.52614278	0.04178359
67711	Nsmce1	0.37699509	0.04190666
50772	Mapk6	0.59474074	0.04194319
20403	Itsn2	0.34674434	0.04194319
100417831	Gm18853	2.66353965	0.04196785
13047	Cux1	-0.802098	0.04216286
76491	Abhd14b	-0.9905911	0.04219743
52372	D6Ert527e	2.8741103	0.04224221
14570	Arhgdig	0.89374962	0.04224221
66859	Slc16a9	-1.2952581	0.04227769
76808	Rpl18a	0.54985917	0.04233394
100043125	Gm11711	-2.5472397	0.04248141
67891	Rpl4	0.2535459	0.04250591
100503868	Gm19935	2.78302629	0.04260753
20530	Slc31a2	0.48157908	0.04266467
100504267	Trp53cor1	2.39442472	0.04270176
245666	Iqsec2	-0.86917	0.04270672
100502946	Gm16796	1.63134697	0.04280394
12164	Bmp8b	2.91872994	0.04284312
107702	Rnh1	0.47644413	0.04284312
67636	Lym5	-0.7774708	0.04284312
66881	Pcyox1	0.38575262	0.04284312
216395	Tmem5	0.24040968	0.04285524
378462	Morn2	-0.6382904	0.04285733
28199	Dcaf11	-0.3693341	0.04286157
23936	Lynx1	1.67788062	0.04289421
434341	Nlrc5	1.37507034	0.04289996
18293	Ogdh	-0.6016664	0.04298255
14211	Smc2	0.63447762	0.04300835
22249	Unc13b	0.96677366	0.04303796
319556	A330041J22Rik	-2.0235796	0.04308708
15216	Hfe	1.09354556	0.04317697
434609	Ighv1-84	-3.6315183	0.04325084

27204	Syn3	-2.0506025	0.04325084
109711	Actn1	1.35097743	0.04328051
67669	I7Rn6	-0.4825423	0.04328179
224648	Uhrf1bp1	-0.3556635	0.04348319
74211	1700017B05Rik	0.46021331	0.0435543
105722	Ano6	0.34262398	0.04359445
100169	Phactr4	-0.4789774	0.04382406
12896	Cpt2	-0.903764	0.04384779
268697	Ccnb1	1.6605277	0.04385551
76965	Slitrk1	2.97101509	0.04388657
18787	Serpine1	1.61810383	0.04389053
100504710	Gm11128	-2.316421	0.04389053
723962	Mir26a-2	2.5593762	0.04405708
381339	Tmem182	-3.5206252	0.04408572
14056	Ezh2	0.53984598	0.04408572
72102	Dusp11	-0.3301989	0.04410627
76608	Hectd3	-0.4743941	0.04413522
52285	D6Ert474e	2.96301612	0.04420376
12316	Aspm	1.60894999	0.04420376
100042740	Rpl31-ps9	0.68862029	0.04420376
51875	Tmem141	0.2666056	0.04420376
21807	Tsc22d1	0.74636372	0.04420376
319651	Usp37	-0.4263445	0.04420376
11370	Acadvl	-2.3861474	0.04420376
21894	Tln1	-0.3749277	0.04420376
13589	Mapre1	0.21790524	0.04420376
209378	Itih5	-0.9833755	0.04428332
17537	Meis3	1.50856632	0.04436244
73130	Tmed5	0.73755511	0.04436244
15218	Foxn1	3.49372448	0.04441506
100043147	Gm4262	3.5606399	0.04444887
100126224	Gm11747	3.36235177	0.04444887
171283	Havcr1	2.90059535	0.04446782
69956	Ptcd3	-0.5446918	0.04447408
241041	Gm4956	-1.8031968	0.04456889
69660	Tmbim1	0.52836273	0.04464254
432502	Gm5428	0.4192748	0.04464254
110417	Pigh	-0.5749427	0.04469057
19714	Rev3l	0.47114608	0.04476416

100504223	Gm20120	-2.9521098	0.04481408
23830	Capn10	-0.4043589	0.04481408
20390	Sftpd	3.36467996	0.04485168
22421	Wnt7a	3.60692853	0.04485168
74134	Cyp2s1	1.21530722	0.04485168
71970	Zbed5	-0.5461073	0.04485168
20500	Slc13a2	-0.7041041	0.04485168
234413	Zfp961	-0.4925283	0.04485193
70650	Zcchc8	-0.2631077	0.04490263
22063	Trpc1	-0.9964938	0.04524672
243382	Ppm1k	-0.7358561	0.04530053
12985	Csf3	3.2263041	0.04533891
52389	Adgra1	4.00382783	0.04533891
72306	Zfp777	0.29841164	0.04533891
16008	Igfbp2	1.98137878	0.04539563
14085	Fah	-1.0402205	0.04539563
69227	Selt	-0.6432346	0.04539563
14938	Gzma	-3.0546561	0.04540836
233147	Zfp939	-0.7794472	0.04543419
26912	Gcat	-0.8464671	0.04543419
102657	Cd276	2.13046122	0.04555437
77619	Preli2	1.49989546	0.04563695
613258	A730017L22Rik	-0.6383124	0.04573368
791408	Gm16496	1.99372541	0.04576177
106585	Ankrd12	0.56501258	0.04576177
20586	Smarca4	0.31827329	0.04580405
238271	Kcnh5	2.59220679	0.04580863
68195	Rnaset2b	0.52744119	0.04580863
20425	Shmt1	-0.9366685	0.04580863
105246	Brd9	0.39030115	0.04581334
70441	2610100L16Rik	-2.1927339	0.04590262
15043	H2-T3	-3.5114022	0.04611651
72549	Reep4	0.44766	0.04611651
12257	Tspo	0.48176011	0.04617038
50496	E2f6	-0.5491899	0.04618032
15485	Hsd17b1	-1.2797177	0.04621183
30956	Aass	-1.411606	0.04621183
64294	Iitm2c	0.60062754	0.04622045
66775	Hacd4	1.34733396	0.04626429

69367	Glr2	-0.6208728	0.04626429
13819	Epas1	-1.2685111	0.04639939
231912	Katnal1	-0.6522133	0.04653219
211446	Exoc3	-0.236061	0.04653915
15247	Hiat1	-0.4067536	0.04655321
242819	Rundc3b	-1.087816	0.04664125
100504536	Gm20273	-0.7968726	0.04664125
54448	Il1f6	2.60704199	0.04664125
665596	Hist1h2bq	-1.7769076	0.04664125
229715	Amigo1	-0.5788152	0.04664125
11428	Aco1	-0.7622984	0.04664125
68953	Chmp2a	0.34371764	0.04664125
20130	Rras	1.13687176	0.04664125
66085	Eif3f	0.34965582	0.04667854
58251	BC100451	3.05911916	0.04680694
17716	ND1	-0.8498202	0.04680694
216987	Utp6	-0.2793835	0.04690982
11421	Ace	-1.5886145	0.04702554
217732	Cipc	-0.3671686	0.04703474
68839	Ankrd46	-0.2874125	0.04703474
215951	Lace1	-0.6854454	0.04705181
68977	Haghl	0.44103973	0.04724572
229706	Slc6a17	2.00678215	0.04744128
20698	Sphk1	1.63066491	0.04744128
70470	Rprd1b	-0.3380375	0.04744128
233902	Fbxl19	0.33003205	0.04744128
18024	Nfe2l2	0.43133275	0.04744128
11982	Atp10a	1.53315358	0.04745871
51797	Ctps	0.89872743	0.04745871
71750	R3hdm2	-0.345063	0.04745871
11911	Atf4	0.4443412	0.04745871
12974	Cs	-0.4556258	0.04746147
442825	A230083G16Rik	-1.0076404	0.0474786
257632	Nod2	-1.9823069	0.0474786
231430	Cox18	-0.9103154	0.0474786
627317	Gm6745	0.59899193	0.0474786
19366	Rad54l	1.06368679	0.04757332
320267	Fubp3	0.29172768	0.04757583
21452	Tcn2	-1.2967422	0.04764255

66658	Ccdc51	-0.5773858	0.04765272
66980	Zdhhc6	-0.4804539	0.04769158
50799	Slc25a13	-0.746433	0.04772102
382051	Pdp2	-1.0358951	0.04777501
22003	Tpm1	0.91132955	0.04777501
66377	Ndufc1	-0.5030192	0.04784425
619287	Zcchc16	-1.3377529	0.0479414
319748	Zfp865	0.27005678	0.0479414
636462	Ighv8-11	-3.2027276	0.04808303
68229	Al846148	0.33156533	0.04808572
13664	Eif1a	0.43634555	0.04808572
211550	Tifa	1.20247974	0.04813936
19331	Rab19	0.89273236	0.04827096
15510	Hspd1	-1.1645239	0.04827096
11416	Slc33a1	-0.9613059	0.04827096
12426	Cckbr	-3.8654656	0.04832086
228357	Lrp4	-0.62145	0.04832086
22171	Tyms	0.56570703	0.04838948
100504329	Gm20176	0.56916228	0.04843744
406218	Panx2	2.9238298	0.04843865
26558	Homer3	1.20181225	0.04848579
27219	Sgk2	-0.8149385	0.04850149
214579	Aldh5a1	-0.9744587	0.04850149
67865	Rgs10	1.06949164	0.04870698
68128	Fam120aos	-0.4634915	0.04882687
212307	Mapre2	-0.44804	0.04885433
242553	Kank4	-2.4230013	0.04885903
64655	Mrps22	-0.6972065	0.04885903
52864	Slx4	0.36441633	0.04889962
106064	AW549877	-0.4630437	0.04889962
11717	Ampd3	1.05874954	0.04899355
208647	Creb3l2	-0.6913016	0.04900484
66696	Snx31	6.68101468	0.04903069
71122	4933408N05Rik	2.12864092	0.04909782
432530	Adcy1	1.23439033	0.04909782
108888	Atad3a	-0.4316287	0.04909782
57908	Zfp318	-0.3197443	0.04913734
14004	Chchd2	-0.5596853	0.04914973
13722	Aimp1	0.47747184	0.04914973

74143	Opa1	-0.5896649	0.04914973
245865	Spag4	-1.938057	0.04918107
100861753	Gm21188	-0.6129836	0.04918107
100043899	R3hdml	-1.6907653	0.04921785
384009	Glipr2	1.33944176	0.04921785
67946	Spata6	0.57656565	0.04921816
97961	Nol12	0.51199491	0.04923652
17134	Mafg	-0.5448495	0.04923652
632778	Erich4	-1.0210559	0.04925054
268973	Nlrc4	3.80495145	0.04932265
108837	Ibtk	-0.256353	0.04932265
171463	Il17rd	0.5269744	0.04942012
100040792	Gm11627	-2.8042454	0.04944276
17720	ND4L	-1.0155753	0.0495276
13099	Cyp2c40	-2.3261562	0.04956185
66381	Rnf113a2	0.4027035	0.04956185
69216	Ccdc23	0.58942797	0.04956185
100042049	Gm15421	0.42287508	0.04956185
11787	Apbb2	-0.3831278	0.04956185
74411	Ppapdc2	-0.3038251	0.04956185
83669	Wdr6	0.47826404	0.04956185
11927	Atox1	0.524731	0.04956185
73331	1700034P13Rik	-1.3006482	0.04957121
23808	Ash2l	0.24138478	0.04960822
12226	Btg1	0.76583815	0.04971225
217038	Mrm1	-0.3329023	0.04977719
226421	Rab7b	1.94511661	0.04978718
72748	Hdhd3	-1.248617	0.04978718
76267	Fads1	-0.6873724	0.04978718
52174	Tmem222	0.28817292	0.04978718
75111	4930512H18Rik	-3.2729854	0.04985418
56535	Pex3	-0.5475272	0.04985418
14683	Gnas	-0.2526206	0.04997173

Supplementary Table 4. List of primary antibodies used in this study.

Antibody	Source	Identifier
Rabbit Phospho-Rb (Ser807/811)	Cell Signaling	#8516
Mouse GFP	ProteinTech	50430-2-AP
Rabbit PCNA (D3H8P)	Cell Signaling	#13110
Rabbit Phospho-Histone H2A.X (Ser139)	Cell Signaling	#9718
Mouse Phospho-Histone H2A.X (Ser139)	Millipore	05-636
Rabbit Collagen 3	Proteintech	22734-1-AP
Rabbit cyclin A (C-19)	Santa Cruz	sc-596
Mouse cyclin D1	Santa Cruz	sc-8396
Rabbit β -Actin (D6A8)	Cell Signaling	#8457
Mouse Gapdh	Santa Cruz	sc-47724
Rat TIM-1/KIM-1/HAVCR	R&D systems	MAB1817
Mouse 53BP1	Millipore	MAB3804
Rabbit 53BP1	Novus Biologicals	NB100-304
LTL lectin	VectorLaboratories	FL-1321
Rabbit Sox9	Millipore	AB5535
Mouse Krt20	Dako	M7019
Rabbit MCM6	Proteintech	13347-2-AP
Rabbit MCM2	Cell Signaling	#3619
Rabbit p16	Proteintech	10883-1-AP
Rabbit Ki67	ThermoScientific	PA5-19462
Rabbit p21	Cell Signaling	#2947
Mouse p21	Santa Cruz	sc-6246
Mouse Phospho-ATM (Ser1981)	Santa Cruz	sc-47739
Rabbit Fancd2	Abcam	ab108928
Rabbit Phospho-RPA32 (S4/S8)	Bethyl Laboratories	A300-245A
Rabbit Histone H3	Cell Signaling	#9715
Rabbit Phospho-Histone H3 (Ser10)	Cell Signaling	#53348
Goat uPAR	R&D systems	AF534
Rabbit a/b Tubulin	Cell Signaling	#2148
Rabbit LC3	ProteinTech	12135-1-AP
Rabbit Phospho-KAP1	Bethyl Laboratories	A300-767A-M
Mouse PAX2	DSHB	AB_2722284
Rabbit Vimentin (D21H3)	Cell Signaling	#5741
Rabbit Fan1	Novus Biologicals	#42677
Rabbit Fan1	Abcam	ab56425
Rabbit Fan1	Abcam	ab129488
Rabbit Vcam1	ThermoScientific	PA5-80213
Mouse Ccl2	ThermoScientific	MA5-17040
Rabbit 8-OHdG	Biossusa	Bs-1278R

Supplementary Table 5. List of quantitative RT-PCR primers and sgRNA sequence used in this study.

Gene	Species	Forward	Reverse
Aurkb	mouse	TGCAGGGGAACTGAAGATTG	CGATGCACCATAGATCTACCATT
Gapdh	mouse	GACTTCAACAGCAACTCCCA	TGTAGCCGTATTCATTGTCATACC
Bak	mouse	ATATTAACCGGCGCTACGAC	AGGCGATCTTGGTGAAGAGT
Bcl2l1	mouse	CCACTATCCCACGCTGCTAAC	ACCGCAATGATATTATTGGCAGA
Birc5	mouse	GGAATTGGAAGGCTGGGAA	CCATCTGCTTCTTGACAGTGA
Brca1	mouse	CGAATCTGAGTCCCCTAAAGAGC	AAGCAACTTGACCTTGGGGTA
Ccnb1	mouse	TGAGCCTGAACCTGAACTTG	ACATCAGAGAAAGCCTGACAC
Ccne1	mouse	GTGGCTCCGACCTTTCAGTC	CACAGTCTTGCAATCTTGGCA
Cdkna1	mouse	GCAGATCCACAGCGATATCC	CAACTGCTCACTGTCCACGG
Cdkn2a	mouse	AATCTCCGCGAGGAAAGC	GTCTGCAGCGGACTCCAT
Ccnd1	mouse	CCCAACAACCTTCTCTCCTG	TCCAGAAGGGCTTCAATCTG
Ccl2	mouse	CCCAATGAGTAGGCTGGAGA	TCTGGACCCATTCTTCTTG
Col1	mouse	GCAGGTTACCTACTCTGTCTT	CTTGCCCATTCATTTGCT
Dock10	mouse	GATGCTGGTGGACCTTCAAT	CACAGGGTTGGGTGTCTTCT
Erc1	mouse	TTCGGTGAGGTGATTCCCGAT	GATGAGGTTGTGGTAGCGG
Exo1	mouse	TGGCTGTGGATACCTACTGTT	ATCGGCTTGACCCCATAGAC
Fn1	mouse	GCTCAGCAAATCGTGCAGC	CTAGGTAGGT CCGTTCCCACT
Havcr1	mouse	AGGAAGTCAGCATCTCTAAGCG	ACACAGAAAATCGCCTTGGC
Il6	mouse	GTTCTCTGGGAAATCGTGGA	GGTACTCCAGAAGACCAGAGGA
Il1b	mouse	GCACTACAGGCTCCGAGATGAAC	TTGTCGTTGCTTGGTTCTCCTGT
Krt20	mouse	GCAGTGGTACGAAACCAACG	CTGCAGCCAGCTTAGCATTG
Mcp1	mouse	CCCAATGAGTAGGCTGGAGA	TCTGGACCCATTCTTCTTG
Ngal	mouse	CAAGCAATACTTCAAAATTACCCTGTA	GCAAAGCGGGTGAAACGTT
Pai	mouse	TGGCTCAGAGCAACAAGTTC	GCAGTTCACGACGTCATACTCG
Pkmyt	mouse	TCAAGGTGCGCTCTAAGGAAG	AGTTTACGAGTTCGGTCTTTGG
Rad51	mouse	ATTCCGAAGTGGGAAGACAC	ATGTACATGGCCCTCCCTTC
Sox9	mouse	GTGCAAGCTGGCAAAGTTGA	TGCTCAGTTCACCGATGCC
Tgfb	mouse	AGCCCGAAGCGGACTACTAT	TCCACATGTTGCTCCACACT
Tp53	mouse	AGCGCTGCTCCGATGGT	TTCTTCCACCCGGATAAGA
Vcam1	mouse	GCACAAAGAAGGCTTTGAAGCA	GATTTGAGCAATCGTTTTGTATTGAG
sgRNA target sequence			
FAN1	human	ACTTCGTTCAAGTGATCCAGGG	

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