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# Supplementary Materials for

## Foxc1 reinforces quiescence in self-renewing hair follicle stem cells

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**This PDF file includes**

**Supplementary Materials:**

## Materials and Methods

### Mice

Mice were bred and housed according to the guidelines of IACUC at a pathogen-free facility at the University of Colorado (Boulder, CO, USA). The following mouse lines were used: *K14-Cre* (E. Fuchs, Rockefeller University), *K14-H2BGFP* (E. Fuchs, Rockefeller University), *Foxc1*$^{fl/fl}$(*32*), *Foxc1-LacZ*(*9*), *K15-CrePR* (Jackson lab, #005249), *Foxn1-Cre*(*33*) (Nancy Manley, University of Georgia) and *Rosa26-LSL-tdTomato* (Jackson lab, #021876).

*K15-CrePR* induction was performed by topical application of 4% RU486 (dissolved in ethanol) for 7–9 days. For anagen deletion, RU486 treatment started at P18-P20 and proceeded for 7 days or 3-4 days after the back skin turned dark color, whichever came first. For telogen deletion, RU486 treatment started after back skin turn pink/white color, which was around P37-P40 and proceeded for 7-9 days. BrdU (50 mg/g body weight) or EdU (25 mg/g body weight) was injected i.p. twice within 24h before lethal administration of CO2. Gender matched littermates were analyzed for histology and FACS. Hair dyeing experiments were previously described(*20*). For counting BrdU/EdU (+) cells in Bulge+hair germ related to Fig 2G, 2H, at least 10 hair follicles with a median of 23 hair follicles were counted for each animal.

### Histology and Immunofluorescence

Immunofluorescence was performed as described previously(*34*). The following antibodies and dilutions were used: Foxc1 (rabbit, 1:200, Cell Signaling D8A6), Keratin 5 (K5, chicken, 1:2000, Covance, SIG-3475), BrdU (1:500, rat, Abcam, ab6326), Keratin 6 (K6, Ganna Bilousova and Dennis Roop, University of Colorado Anschutz Medical Campus), CD34 (1:200, rat, eBiosciences, 13-0341), β4-integrin (β4, rat, 1:200, BD Biosciences, 553745) Scd1 (1:200, Santa Cruz, sc-14719), active Caspase3 (1:200, R&D Systems, AF835), P-cadherin (1:200, R&D Systems, AF761). Nuclei were stained using 4060-diamidino-2-phenylindole (DAPI).

For β-gal staining, thick sections (25μm) were fixed at 0.2% glutaraldehyde for 10min at 4°C and washed twice with detergent rinse, incubated in staining solution containing 1mg/ml X-gal at 37°C for 24h. Nuclear fast red was used as counter stain. Microscopy images were obtained using a Leica DM5500B microscope with either a Leica camera (bright field) or Hamamatsu C10600-10B camera (fluorescence) and processed with MetaMorph (MDS Analytical Technologies) and Fiji software.

**FACS**

Back skin was dissected and subcutaneous fat was removed by a scalpel. Hair cycle stage was confirmed by examining sample under dissection microscope based K14-H2BGFP-labeled hair follicle morphology, or by embedding part of the sample in OCT and examining morphology by cryosection. The remaining skin sample was minced and incubated with 0.25% collagenase (Worthington, LS004188) in 1x HBSS buffer at 37°C for 2h and then 0.05% Trypsin (GIBCO) at 37°C for 8min. Single cell suspensions were

obtained by filtration and centrifugation, and cells were incubated with the appropriate antibodies for 30-45 min on ice. DAPI was used to exclude dead cells. Hair follicle stem cells (HFSCs) of *K14Cre*-based and *Foxn1Cre*-based experiments were isolated by enriching $DAPI^{neg}$, K14-$H2BGFP^{hi}$, $Sca1^{lo}$, $\alpha6^{hi}$ and $CD34^{hi}$ cells. HFSCs of *K15CrePR*-based experiments were isolated by enriching $DAPI^{neg}$, K14-$H2BGFP^{hi}$ (if available), $tdtomato^{hi}$, $Sca1^{lo}$, $\alpha6^{hi}$ (if available) and $CD34^{hi}$ cells. The following antibodies were used: integrin α6 (CD49f, 1:75; eBioscience, PE-conjugated, 12-0495; APC-conjugated, 17-0495), CD34 (1:50; eBioscience, eFluor 660-conjugated, 50-0341), Sca1 (Ly-6A/E, 1:500; eBiosciences, PerCP-Cy5.5-conjugated, 45-5981). FACS was performed on MoFlo XDP machine (Beckman Coulter). FACS data were analyzed with FlowJo.

**Chromatin Immunoprecipitation**

ChIP experiments are performed following previous procedures(*34*). Foxc1 antibody was the same antibody used in IF and rabbit IgG control was from Cell Signaling #2729.

**Real-Time PCR**

Total RNAs from FACS-purified cells were isolated using TRIZOL reagent (Invitrogen). 200ng of RNA (when available) was reverse-transcribed and qPCR was performed using the iQ SYBR Green Supermix system (BioRad) and BioRad CFX-384 machine. Fold-changes were computed using the ΔΔCt formula normalized to Hprt values. In all qPCR figures error bars denote standard errors of the mean. All PCR primers are listed in table S4.

**Statistics**

The following statistical test were performed: two-tailed Student t-test (Fig 2G, 2L, 3C, 4I, S4B, S4C, S4D); two sample Z-test (Fig 2H, S3A, S6D, S8B) or otherwise described in bioinformatics analysis. The 0.05 level of confidence was accepted for statistical significance. For all measurement, at least 3 biological replicates (gender-match, age-matched animals, usually littermates) were chosen as the minimum number necessary to achieve statistically significant differences between groups. No statistical method was used to pre-determine sample size. The experiments were not randomized. The investigators were not blinded to allocation during experiments and outcome assessment.

**RNA-seq assay**

Total RNAs from FACS-purified cells RNA integrity numbers (RIN)>8 were used to perform RNA-seq assay. Libraries were prepared using NEBNext Ultra Directional RNA Library Prep Kit and sequenced at BioFrontiers Next Generation Sequencing Facility at University of Colorado Boulder and Genomics and Microarray Core Facility at University Of Colorado Denver on Illumina HiSeq 2000 and 2500 machines.

**ATAC-seq assay**

Assay for transposase accessible chromatin followed by sequencing (ATAC-seq) was performed as previously described(*17*) with following modifications: An average of 100,000 FACS-sorted HFSCs were collected PBS containing 3% chelated fetal bovine serum (FBS) and pelleted by centrifugation for 5min at 500g at 4°C. Cell pellets were re-suspended in 50ul of lysis buffer per 100,000 cells processed (10mM Tris-HCl pH 7.4,

10mM NaCl, 3mM MgCl2, 0.1% Igepal CA-630) and nuclei were pelleted by centrifugation for 25min at 500g, 4°C using a swing rotor with low acceleration and brake settings. Supernatant was carefully discarded and nuclei were re-suspended in 50 ul reaction buffer containing 2ul of Tn5 transposase and 22.5ul of TD buffer (Nextera DNA Sample Preparation Kit, Illumina). The reaction was incubated at 37°C for 30min and terminated by adding 10ul of clean-up buffer (900mM NaCl, 300mM EDTA) and immediately purified using MinElute PCR Purification Kit (QIAGEN). Library amplification was performed following the manufacturer's protocol (Nextera DNA Sample Preparation Kit, Illumina) except using 2.5ul of each primer and 2min of extension time in PCR reaction. PCR cycle number was determined by a pilot 15ul qPCR reaction containing 1x EvaGreen (Biotium) on 10% of unamplified library. Libraries were sized-selected to enrich 250-800bp of size and sequenced as single-end or paired-end for at least 40 million reads per sample.

**RNA-seq analysis**

RNA-seq reads (101 bp, single-ended) were aligned to the mouse genome (NCBI37/mm10) using TopHat2 (version 2.0.13). Expression measurement of each gene was calculated from the resulting alignment bam file by HT-seq(*35*). Differentially expressed genes were determined using DEseq2(*36*) with inclusion of littermates factors and p-value cutoff of 0.05 (B-H adjustment).

**Gene Ontology (GO) and GSEA analysis**

GO-term enrichment analysis was performed by DAVID Bioinformatics Resources 6.7 (*37*) using gene symbols as input. GSEA (*15*) analysis was performed using ranked fold change values (cKO vs. WT) for the displayed dataset, and gene sets selected from the referenced publications.

**Principle component analysis (PCA)**

Transcriptome profiling of HFSCs and stem cell lineages were obtained from microarray dataset in the following publications: Greco et al., Cell Stem Cell, 2009 (*12*); Zhang et al., Cell Stem Cell, 2009 (*16*) and Lien et al., Cell Stem Cell, 2011 (*8*). For each dataset, fold change values were calculated using following normalization sample: Greco et al: P43_Bulge; Zhang et al: P18-P21 Bulge 0 division replicate #1; Lien et al: quiescent HFSC replicate #1. Presence/absence call was performed and genes with both counterparts of the fold change comparison classified as presence were included in downstream analysis. Fold change were calculated using the difference of log transformed intensity measurements. If multiple probes were mapped to a single gene, fold change of each individual probes were first calculated and the median of all values was selected as the representative fold change of the gene. Fold change data of P47 Foxc1 cKO were obtained from DEseq2 output. All fold change data were merged in to a table, and lines containing missing values were excluded. The remaining data were further down-sized by selecting genes with >2 fold change in at least one of the following samples: aHFSC, qHFSC and TAC from Lien et al. (*8*); P56 bulge, P69 bulge, P43 HG, P56 HG and P69 HG from Greco et al. (*12*). A total of 2684 genes were selected for PCA plotting. Data matrix was centered by subtracting the mean of each column. PCA was

performed using the function of prcomp in R and the first two principal components were used for plotting. Linear Discriminant Analysis (LDA) was performed using R library MASS (*38*).

**ATAC-seq, ChIP-seq and motif analysis**

ATAC-seq reads (single-end or paired-end) and ChIP-seq reads (*21*) were aligned to mouse genome (NCBI37/mm10) using Bowtie2 (version 2.2.3) (*39*). Duplicate reads were removed by Picard tools (http://broadinstitute.github.io/picard/). Mitochondrial reads were removed and peak calling was performed on each individual sample by MACS (version 2.0.9) (*40*). Peaks from different ATAC-seq samples were merged for downstream analysis. De novo motif searching was performed using the HOMER (*41*). For Foxc1 motif discovery, the top 500 peaks (based on MACS2 output p value) were used with regions of 500bp around peak center. For motif analysis using ATAC-peaks, all ATAC peaks were first used for motif discovery, with mm10 genome sequence as background. Then ATAC peaks associated with differentially expressed gene in P30 cKO-vs-WT RNA-seq were used as target sequence set and motif discovery was performed against sequenced of ATAC peaks that associated with non-RNAseq hits genes. In both cases, enriched motifs from the default HOMER motif were analyzed, as shown in Fig 5h. Sequencing data tracks were presented by Integrative Genomics Viewer (*42*).

**Data Accession**

Sequencing data have been deposited to GEO with the accession number GSE67404 and GSE68288.

Figs. S1-S12

Tables S1-S4

References (32-42)


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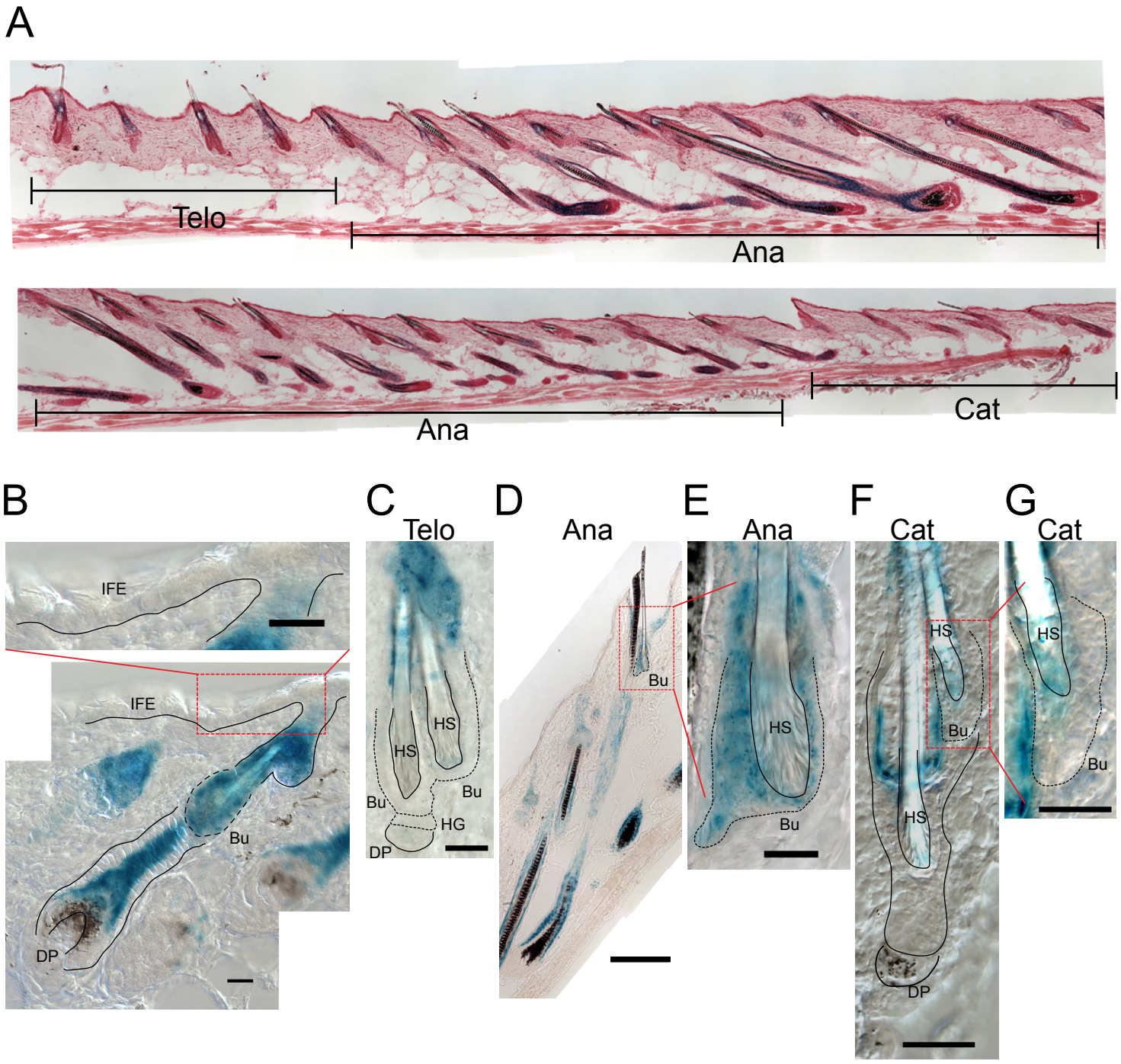
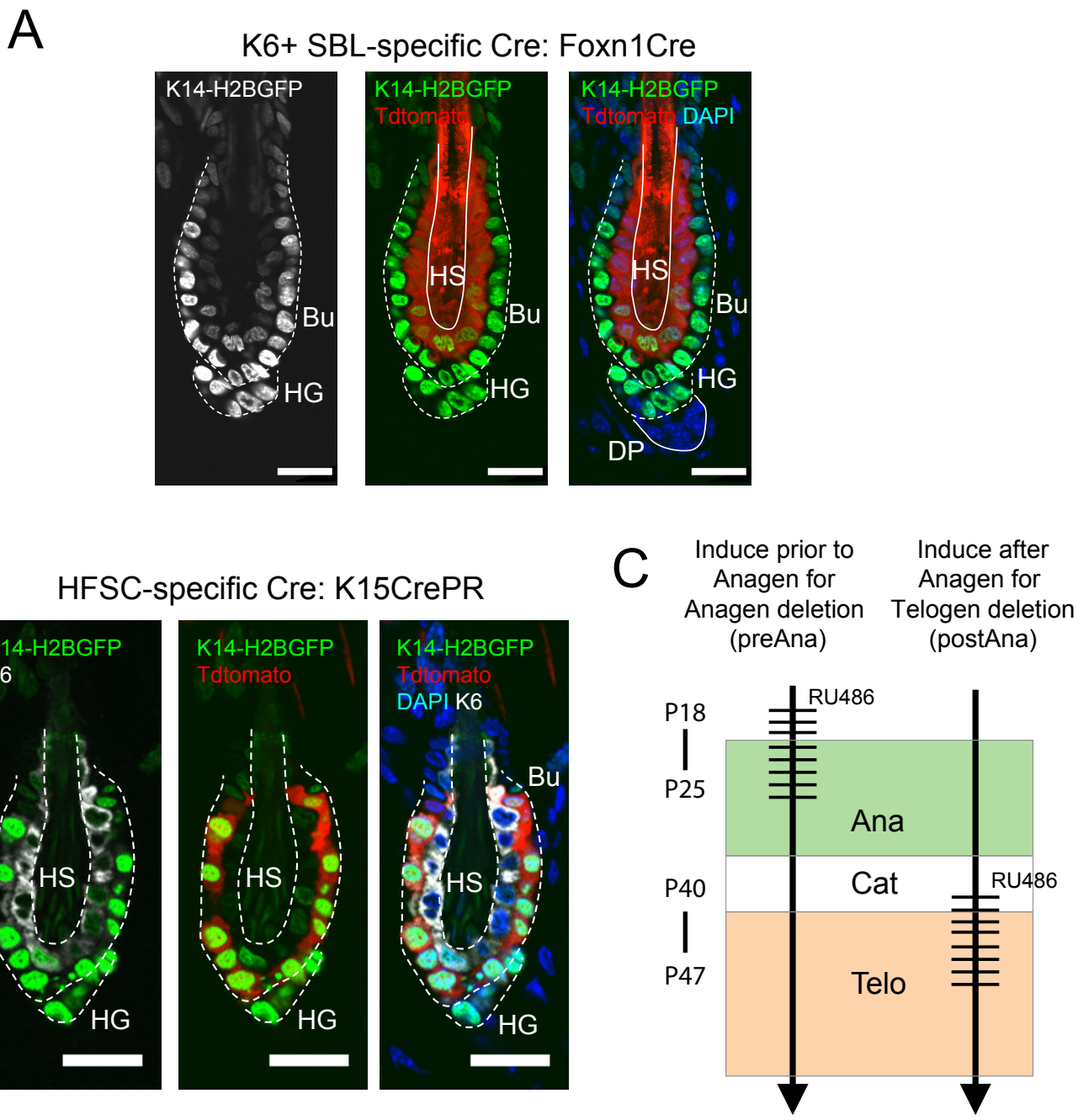
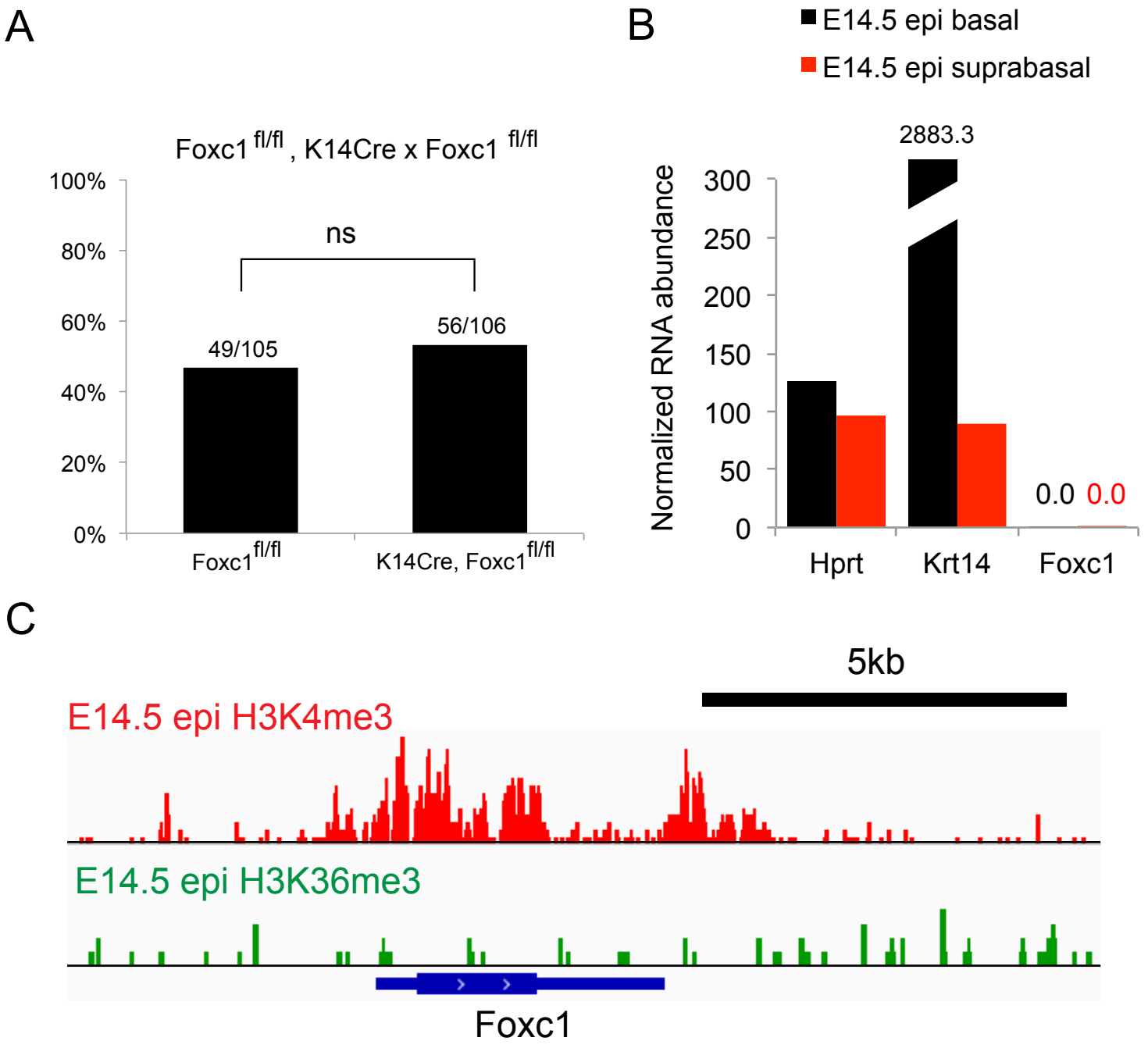
Figure S1




**Supplementary Figure 1 Foxc1 Expression levels correlates with hair cycle progression.**
(A) Hair follicle morphology of a 15-month old mouse. Section was stained with LacZ and nuclear fast red. (B-G) Foxc1 expression is detected by LacZ staining and IF staining in skin sections of Foxc1-LacZ knock-in mice. (B) Foxc1 expression is absent in the interfollicular epidermis (IFE). (C) Foxc1 expression is absent in the bulge and hair germ of telogen hair follicle. (D-E) Foxc1 is induced in the bulge of angen hair follicle. (F-G) Bulge expression of Foxc1 wanes in categen hair follicle. Red dashed square indicates the amplified region in the next panel. Telo, Telogen; Ana, Anagen; Cat, Catagen; Bu, bulge; HG, hair germ; DP, dermal papillae; HS, hair shaft; Scale bar: 25μm in C, 200μm in D, 20μm in B and E, 50um in F and 10um in G.

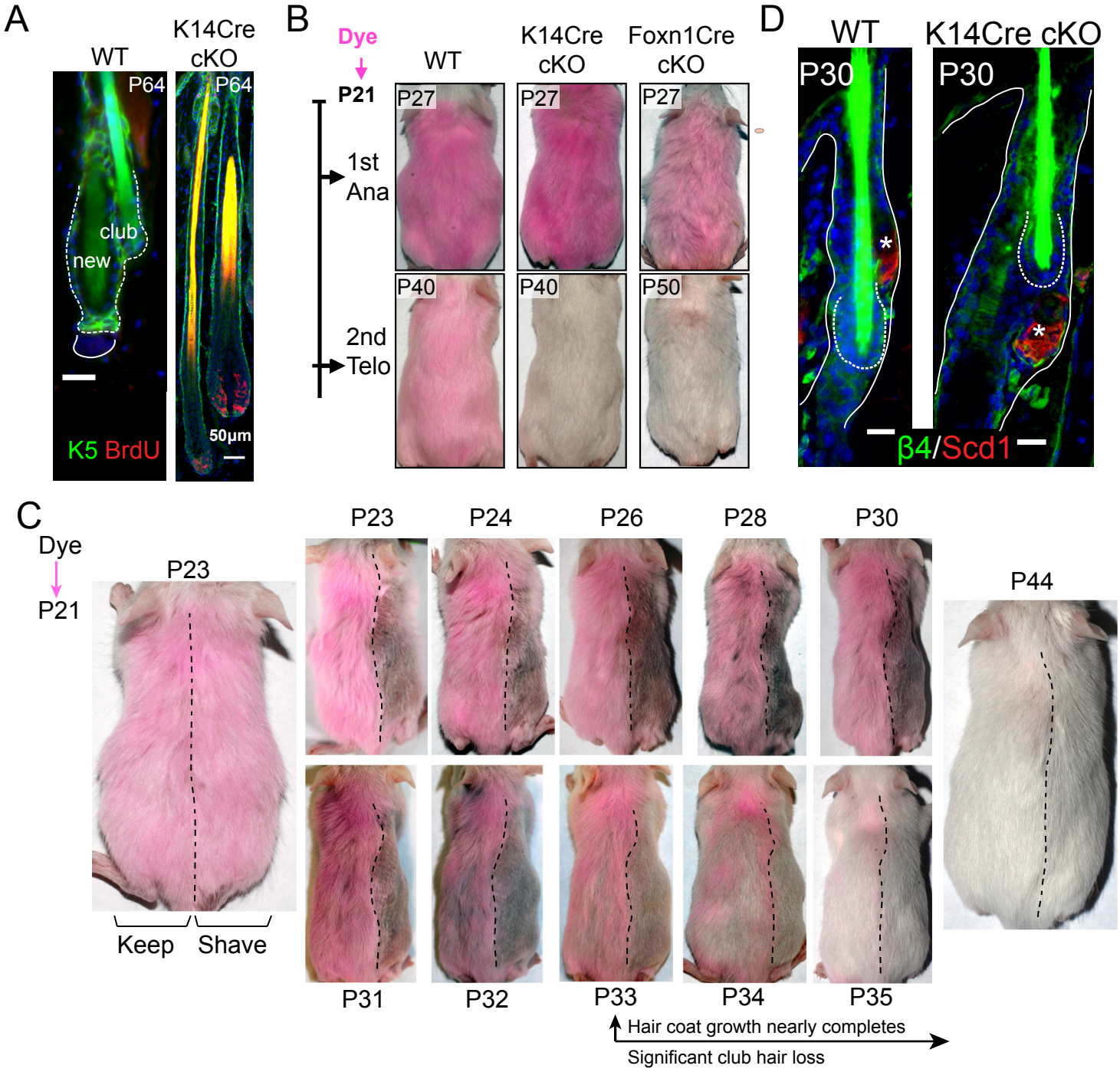



**Supplementary Figure 2 Lineage-specific cre recombinase in HF bulge.**
(A) Foxn1Cre specifically induces Cre expression in K6+ suprabasal bulge layer (SBL). Note that K14-H2BGFP transgene has high GFP expression in CD34+ HFSC layer and low GFP expresion in SBL. (B) K15CrePR, upon RU486 induction, specifically induces Cre expression in CD34+, HFSC layer. (C) K15CrePR induction scheme. horizontal bars across the time arrow indicate single RU486 topical treatment. Bu, bulge; HG, hair germ; DP, dermal papillae; HS, hair shaft; Scale bar: 20μm.

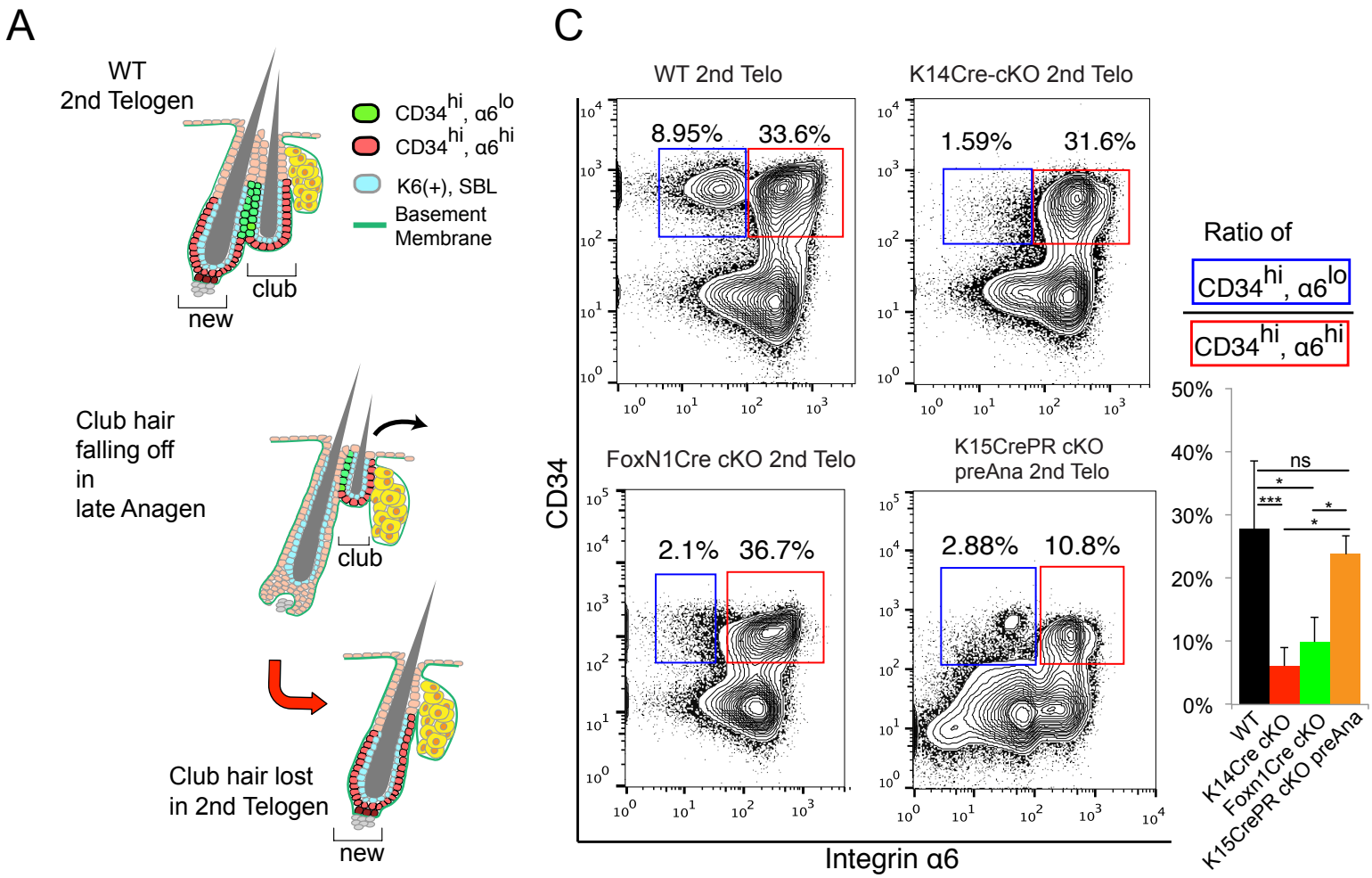



**Supplementary Figure 3 Lack of *Foxc1* expression in embryonic skin progenitors**
(A) Both WT and cKO animals were born at the expected Mendelian ratio. (B) Normalized RNA abundance is calculated using read per million reads mapped (RPM) in 3Seq data from E14.5 epidermis (epi) lineages. (C) Snapshot of H3K4me3 and H3K36me3 ChIP-seq data from E14.5 epidermis lineages indicates absence of active transcriptional elongation at Foxc1 locus.

Figure S4


A
WT
K14Cre cKO
P64
P64
club
new
K5 BrdU
50μm
B
Dye
P21
1st Ana
2nd Telo
WT
K14Cre cKO
Foxn1Cre cKO
P27
P27
P27
P40
P40
P50
D
WT
K14Cre cKO
P30
P30
β4/Scd1
C
Dye
P21
P23
Keep
Shave
P23
P24
P26
P28
P30
P31
P32
P33
P34
P35
P44
Hair coat growth nearly completes
Significant club hair loss
E
WT
K14Cre cKO
P30
P30
Bu
Bu
CD34 Caspase3
# of Caspase3(+) cells per follicle per section
ns
P26-P33 WT
P26-P33 K14Cre cKO
F
WT
K14Cre cKO
P26
P26
Bu
Bu
# of BrdU(+) cells per follicle per section
ns
P26-P30 WT
P26-P30 K14Cre cKO

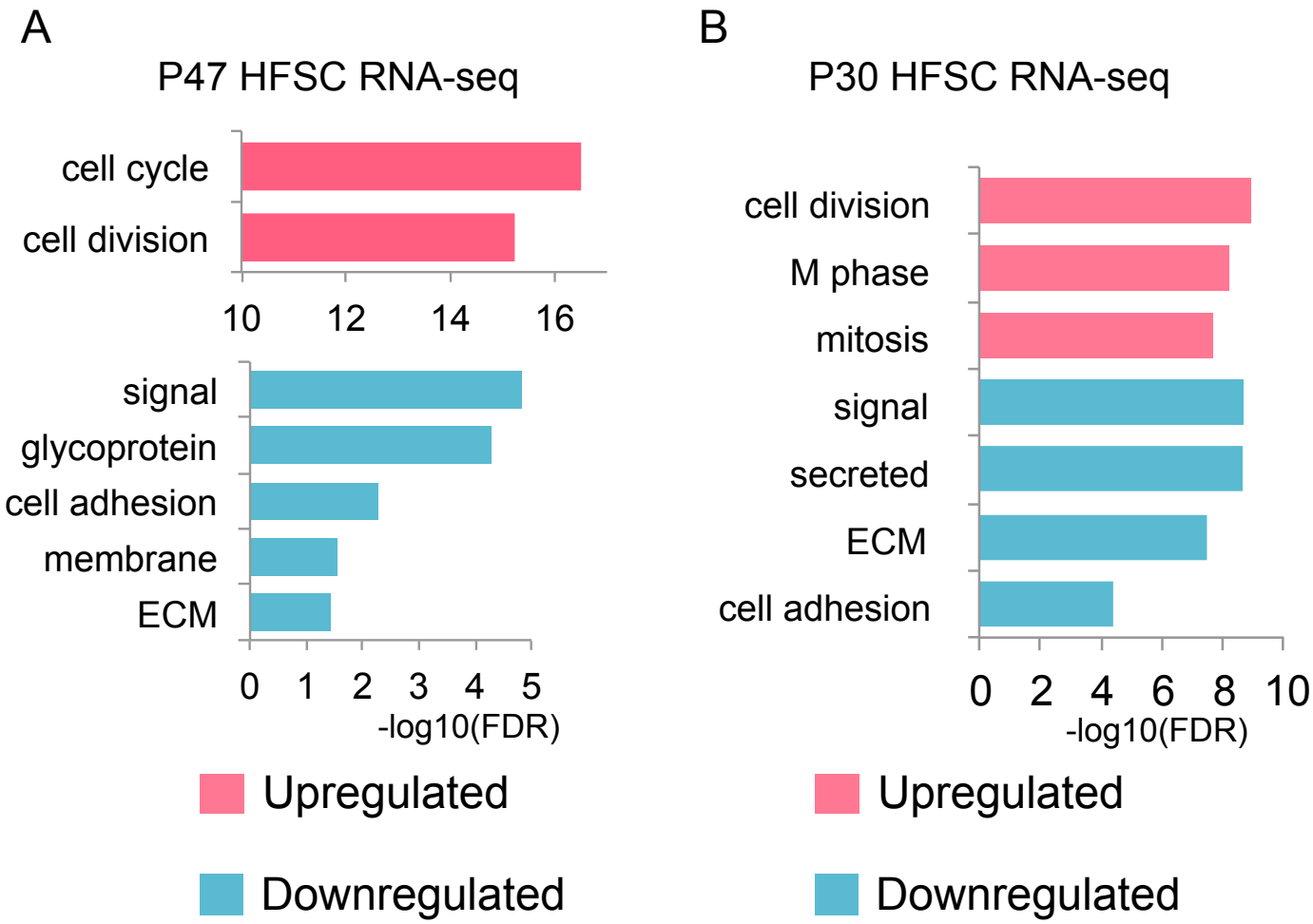
**Supplementary Figure 4 Deletion of Foxc1 in the suprabasal bulge layer leads to loss of the club hair.** (A) Immunofluorescence of EdU incorporation for WT and K14Cre cKO HFs at P64.The cKO HFs have entered anagen while WT HFs are still in telogen and showed no sign of proliferation. (B) Dyed hair coat shows both K14Cre cKO and Foxn1Cre cKO animals lost the club hairs during mid to late anagen. (C) Timing of the club hair loss. Hair coat from the first cycle was dyed at P21. The right half of back hair coat was shaved and monitored to the next cycle. Significant amount of dyed hair started to shed at P33-P35, when the new hair shafts nearly complete the growth phase. (D) Loss of club hair correlates with upward movement of the hair. Note the relative position of the club hair and the sebaceous gland. (E-F) No defects in apoptosis (E) or proliferation (F) were observed in middle to late anagen in K14Cre cKO Bulge compared to WT. n=4 in B and n=3 in C for each genotypes. Scale bar: 20 μm in A, D, E, F or otherwise labeled.



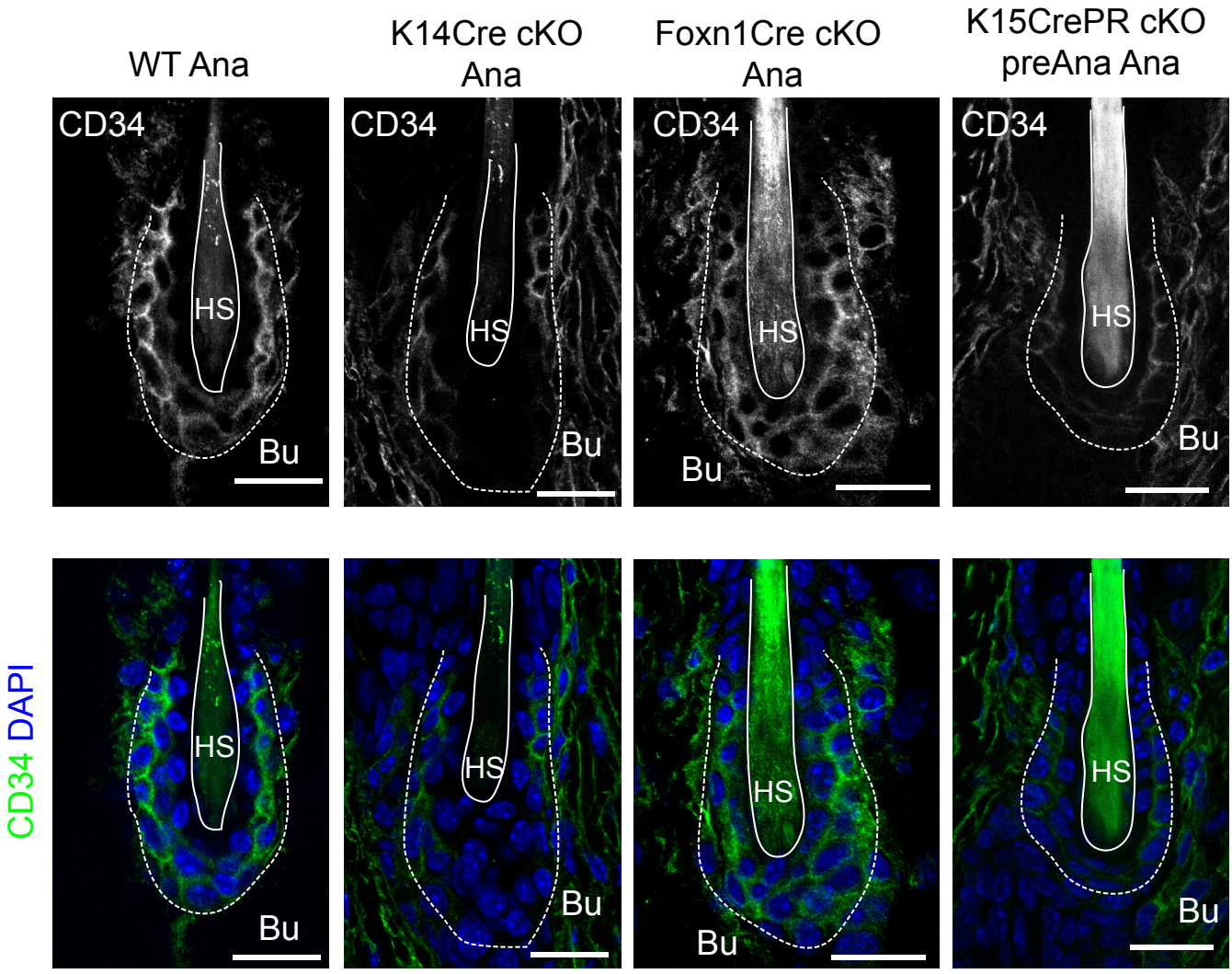

| Geometric mean | $CD34^{Lo}$ | $CD34^{Hi}$ |
|---|---|---|
| WT | 15.2 | 418 |
| K14Cre cKO | 17.7 | 285 |

**Supplementary Figure 5 Using FACS to examine the club hair loss phenotype.** (A) Schematic of the loss of club hair. Loss of club hair is likely due to defect of club hair anchorage in late anagen and can be examined by FACS profiling of $CD34^{hi}$, $\alpha6^{lo}$ population (green). (B) Flow cytometry profile of HFSCs during the first anagen for WT and K14Cre cKO mice. Ratio of $CD34^{hi}$, $\alpha6^{lo}$ (blue rectangle) over $CD34^{hi}$, $\alpha6^{hi}$ (red rectangle) is used for quantification. (C) Flow cytometry analysis and quantification of the loss of club hair by the second telogen. Anagen: n=3; telogen: n=8. (D) CD34 histogram from flow cytometry shows decreased level of CD34 expression. * $p<0.05$, *** $p<0.001$, ns: not significant.

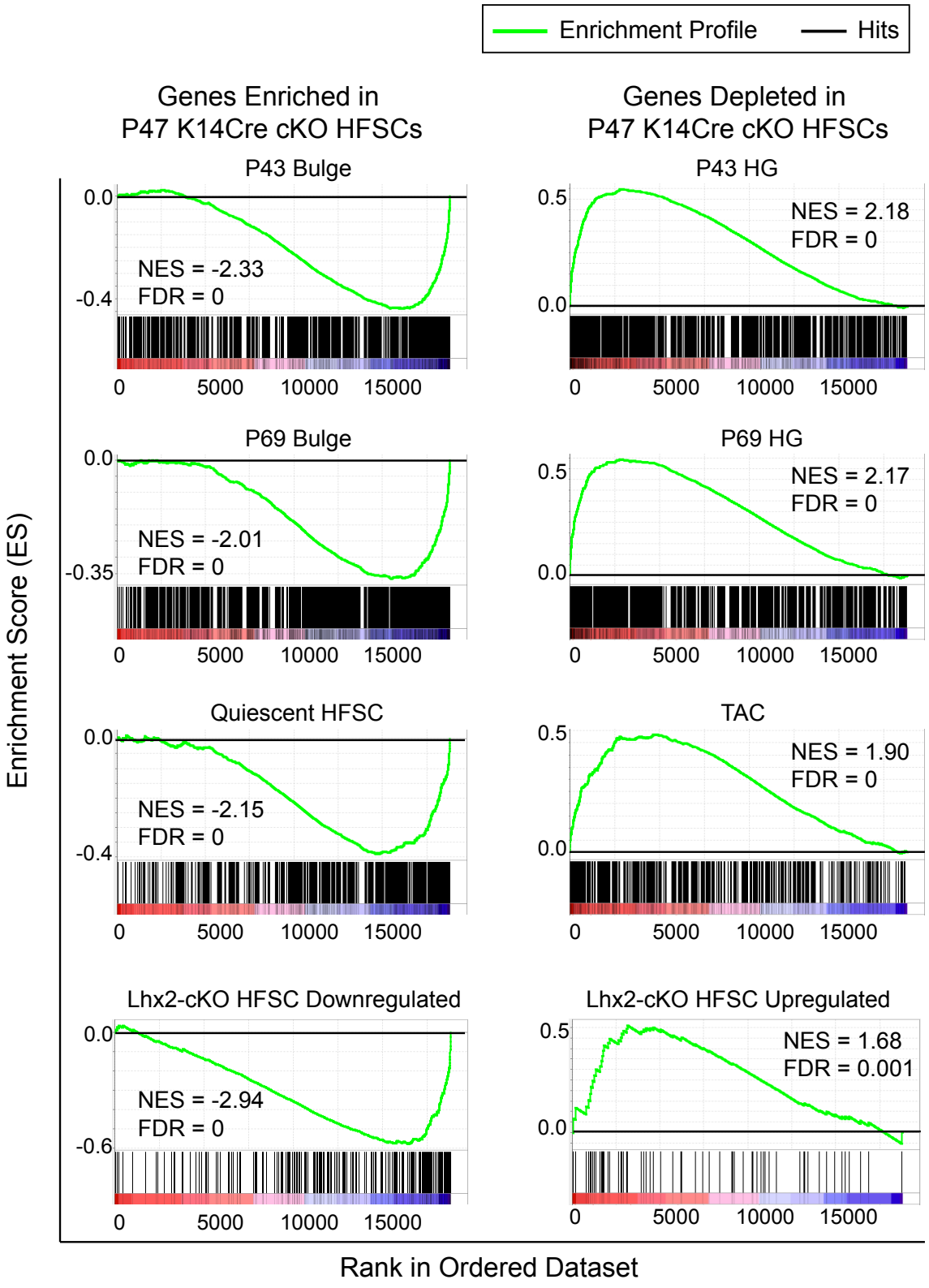
Figure S6




**Supplementary Figure 6 GO term analysis of HFSC RNA-seq.** (A) Gene Ontology of all differentially expressed genes in P47 KO HFSCs. (B) Gene Ontology of all differentially expressed genes in P30 KO HFSCs.

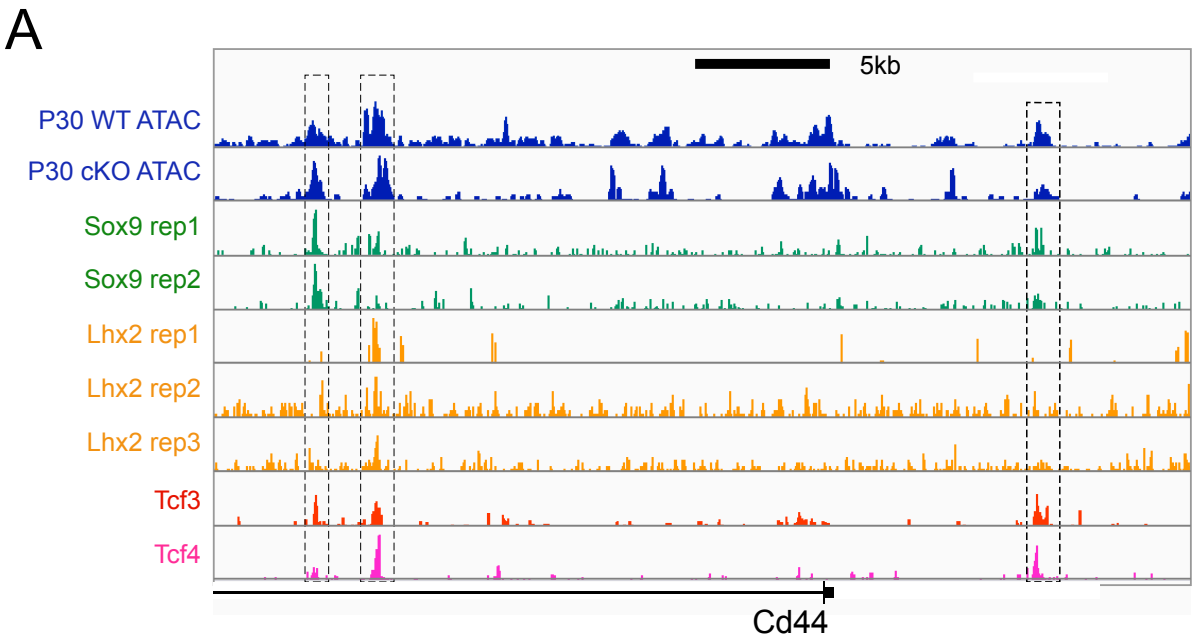


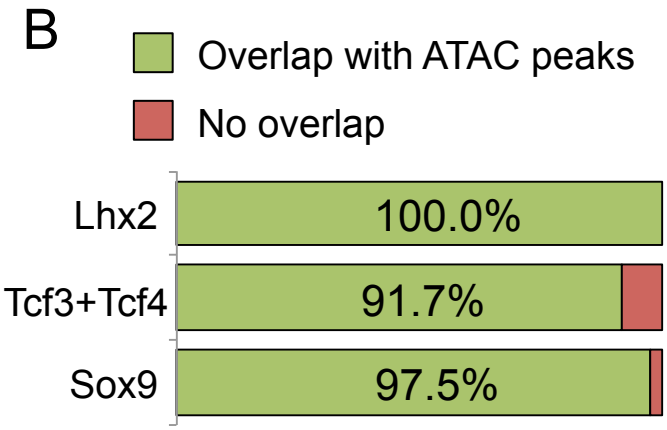

**Supplementary Figure 7 Downregulation of CD34 when Foxc1 is depleted in activated HFSCs.** CD34 immunofluorescence was examined in anagen bulge of WT, K14Cre cKO, Foxn1Cre cKO and K15CrePR preAna cKO mice. Bulge (Bu) is outlined with dashed line and hair shaft (HS) is outlined with solid line. Hair shaft has auto fluorescence for the green channel. CD34 staining intensity was decreased in K14Cre cKO and K15CrePR preAna cKO but not for Foxn1Cre cKO, compared to WT control. Scale bar: 20μm.

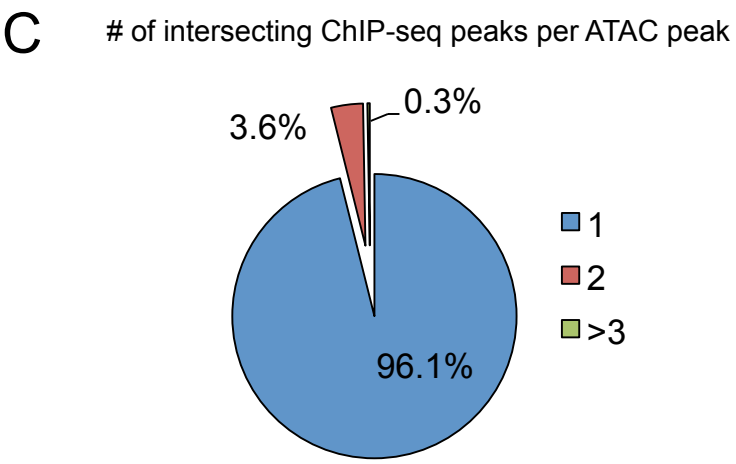


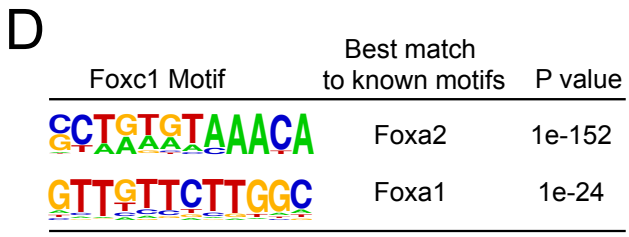

**Supplementary Figure 8 GSEA of P47 HFSC RNA-seq.** Ranked fold changes of gene expression ofP47 HFSC RNA-seq were tested using GSEA with signature genes of quiescent (left panels) and activated (right panels) HFSCs. All quiescent signature genes were depleted (preferentially downregulated) in P47 cKO HFSCs and all activated signature genes were enriched (preferentially upregulated) in P47 cKO HFSCs.

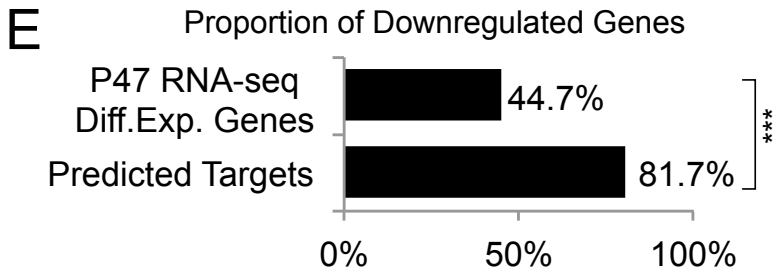
Figure S9



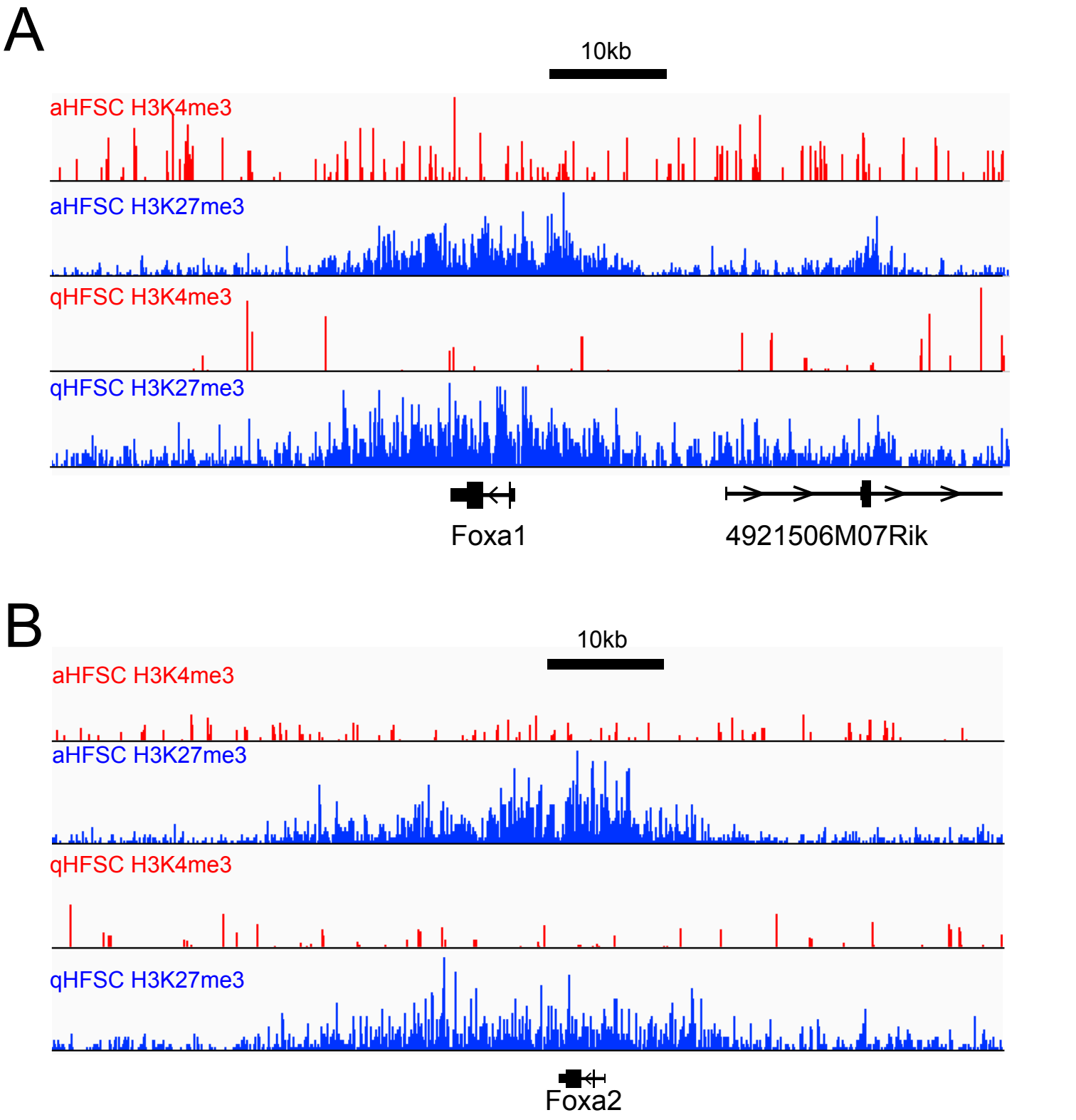



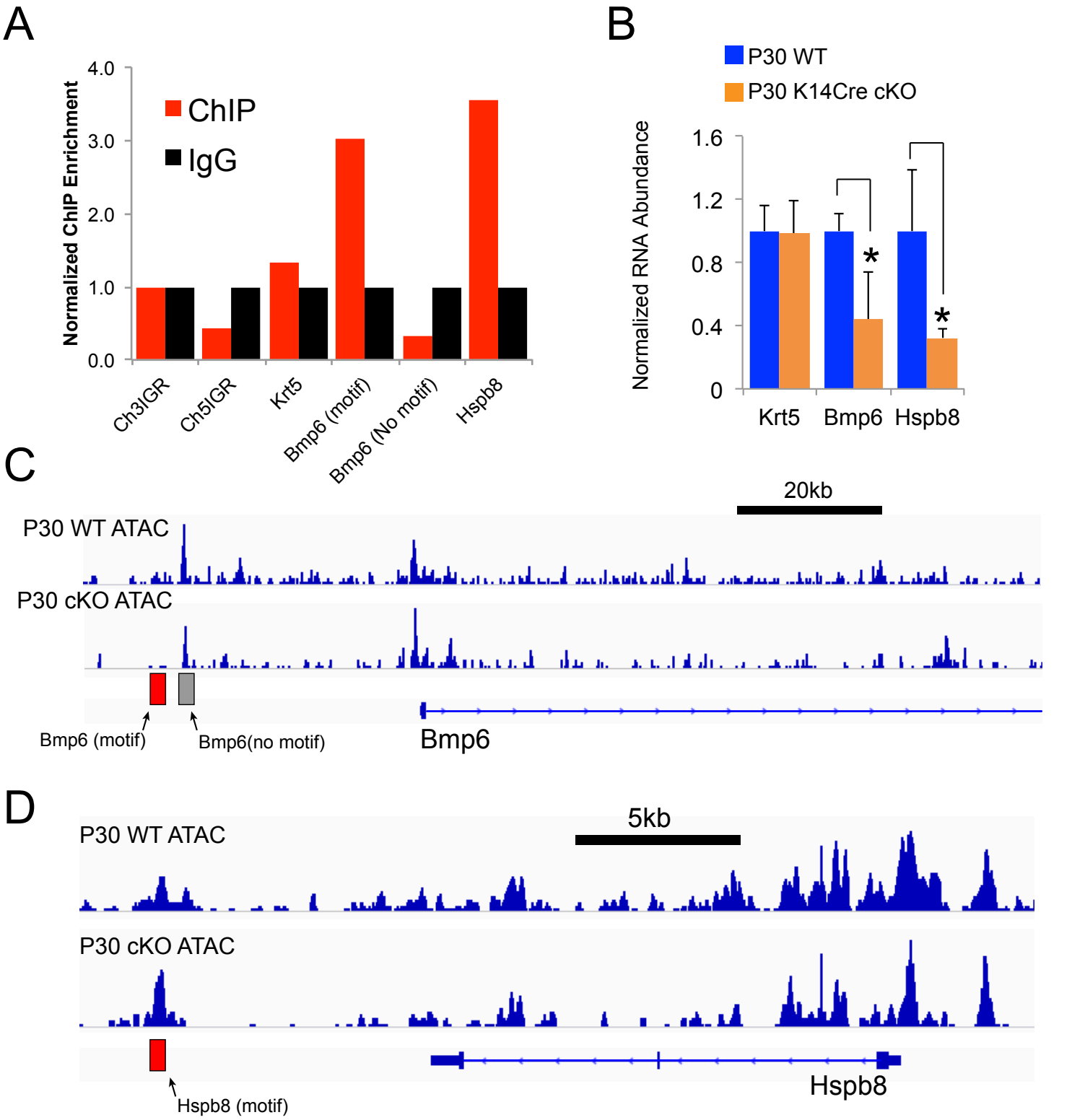




**Supplementary Figure 9 Using ATAC-Seq to predict Foxc1 targets.** (A) Cd44 locus shows the overlapping peaks of ATAC-seq and ChIP-Seq signals of Sox9, Lhx2, Tcf3/4. (B) Percentage of ChIP-Seq peaks of Lhx2, Tcf3/4, and Sox9 that were detected by ATAC-seq. (C) Number of intersecting ChIP-Seq peaks per ATAC peak in All ChIP seq peaks examined in A and B. (D) De novo motif discovery of Foxc1 ChIP-seq data identifies Foxc1 recognition motifs.(E) Percentage of downregulated gene in P47 Foxc1 HFSC cKO RNA-seq and among predicted Foxc1 targets in P30, compared to WT.

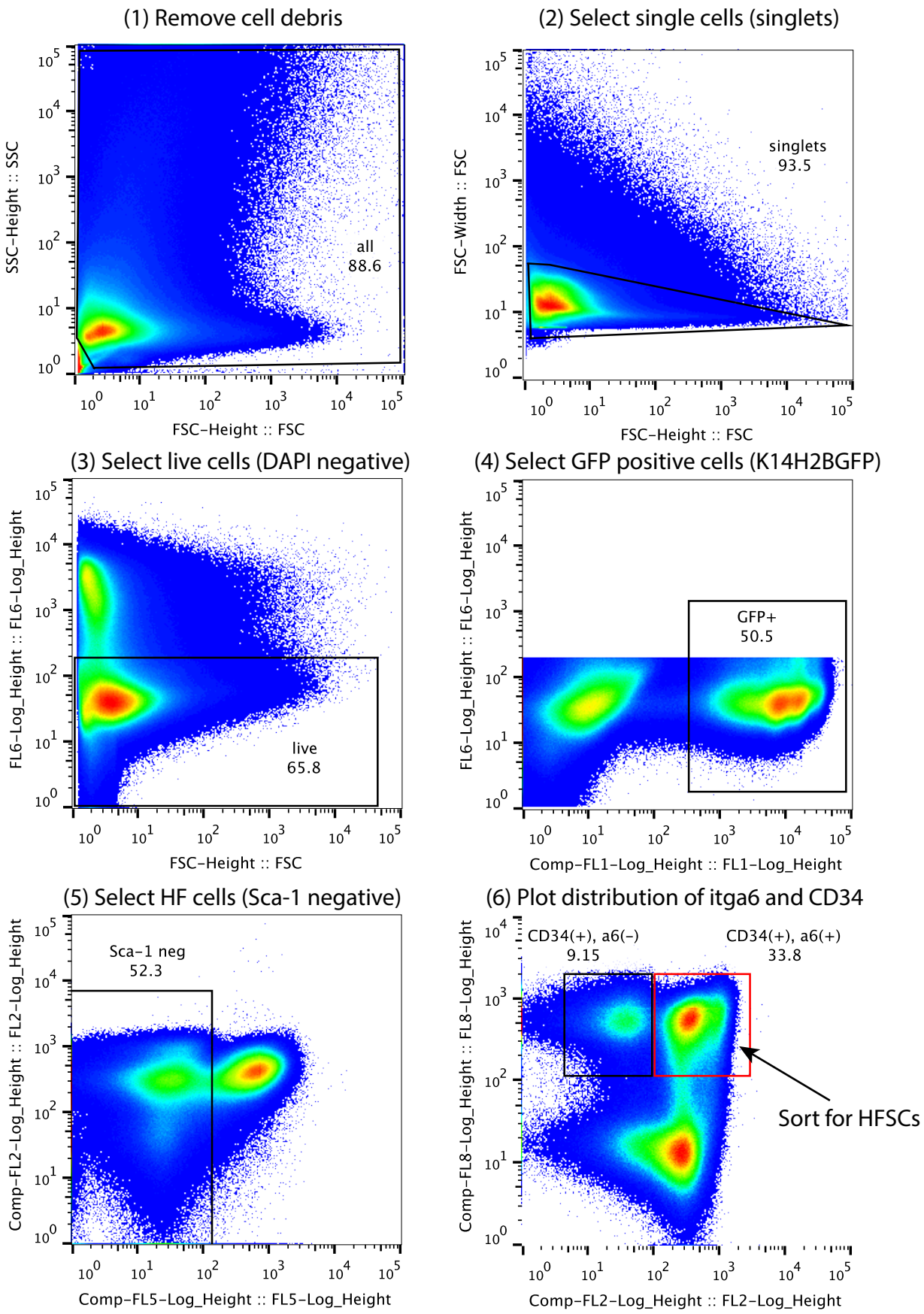



**Supplementary Figure 10 *Foxa1* and *Foxa2* loci are epigenetically silenced in the HFSCs.** Snapshot of H3K4me3 and H3K27me3 ChIP-seq of *Foxa1* (**A**) and *Foxa2* (**B**) loci in activated HFSCs (aHFSC) and quiescence HFSCs (qHFSC) ) shows depletion of H3K4me3 marks accumulation of H3K27me3 marks at both locus, indicating strong gene silencing. ChIP-seq data are from Lien et al., *Cell Stem Cell*, 2011.




**Supplementary Figure 11 Foxc1 derictly binds Bmp6 and Smads target Hspb8**

(A) Foxc1 ChIP-PCR of intergeric region in chr3 (Chr3IGR) and chr5 (Chr5IGR), Krt5, Bmp6 and Hspb8. ChIP quantities were normalized to Chr3IGR and fold change in ChIP over IgG control is displayed. (B) Normalized RNA abundance of Krt5, Bmp6 and Hspb8 from P30 RNA-seq. * $p < 0.05$, two-tail t test. (C-D) ATAC-Seq track of P30 WT and K14Cre cKO HFSCs of Bmp6 locus (upstream and 5' end, C) and Hspb8. Primers targeting ATAC-Seq peaks that contains Foxc1 motif (red rectangle) or does not contain a motif (grey rectangle) are labeled.




**Supplementary Figure 12 Sorting logic for HFSC isolation**

# Supplementary Table S1 Predicted *Foxc1* target genes

| Gene | Fold Change (P30 cKO vs WT) | p value (B-H) |
|---|---|---|
| Tgm5 | -28.25 | 8.94E-65 |
| Atp2a3 | -26.49 | 5.36E-06 |
| Gfra1 | -11.25 | 5.93E-41 |
| Ccdc88c | -10.37 | 1.51E-22 |
| Trpm3 | -9.30 | 7.94E-05 |
| Npas2 | -8.67 | 1.94E-09 |
| Fam46c | -7.25 | 2.90E-28 |
| Tmem108 | -6.97 | 2.51E-05 |
| Cacna1c | -6.64 | 5.07E-08 |
| Pknox2 | -6.00 | 0.001779 |
| Col4a3 | -5.98 | 0.000307 |
| Duox1 | -5.58 | 8.39E-15 |
| Pvt1 | -5.52 | 0.003601 |
| Bdnf | -5.29 | 1.06E-11 |
| Adamts17 | -5.28 | 5.05E-06 |
| Me3 | -5.15 | 0.000956 |
| Aff3 | -4.79 | 6.96E-09 |
| Aqp3 | -4.70 | 7.08E-15 |
| Ngf | -4.58 | 2.13E-11 |
| Bmp2 | -4.53 | 1.65E-14 |
| Ogdhl | -4.27 | 0.001555 |
| Ptpre | -4.24 | 1.80E-07 |
| Fam25c | -4.22 | 1.64E-10 |
| Hivep3 | -4.15 | 6.43E-08 |
| Arhgap44 | -4.14 | 3.99E-11 |
| Zbtb16 | -4.09 | 2.80E-05 |
| Ptn | -3.93 | 2.33E-11 |
| Slc6a4 | -3.93 | 0.000687 |
| Cadm1 | -3.91 | 4.08E-14 |
| Lypd6 | -3.87 | 0.000508 |
| Cdon | -3.74 | 1.18E-11 |
| Antxr1 | -3.73 | 9.28E-10 |

| | | |
|---|---|---|
| Slc39a8 | -3.69 | 1.91E-08 |
| Trim16 | -3.64 | 6.25E-11 |
| Robo2 | -3.61 | 9.18E-05 |
| Hspb8 | -3.38 | 5.74E-12 |
| Agpat9 | -3.34 | 0.001227 |
| Slc38a3 | -3.29 | 0.000433 |
| Nrcam | -3.29 | 3.73E-05 |
| Fam213a | -3.20 | 4.56E-06 |
| Moxd1 | -3.18 | 5.22E-09 |
| Trim2 | -3.17 | 1.76E-07 |
| Tle4 | -3.16 | 3.24E-05 |
| Sdk2 | -3.14 | 1.60E-07 |
| S100a3 | -3.11 | 1.30E-05 |
| Dap | -3.07 | 7.94E-08 |
| Tspan2 | -3.06 | 0.008170 |
| Scel | -3.03 | 2.16E-09 |
| Cgnl1 | -2.99 | 7.95E-07 |
| Calml3 | -2.91 | 1.68E-09 |
| Fgf1 | -2.90 | 0.000507 |
| Vit | -2.84 | 0.003654 |
| Ank | -2.84 | 5.94E-05 |
| Gm973 | -2.78 | 5.12E-06 |
| Tns4 | -2.75 | 5.11E-07 |
| Piezo1 | -2.74 | 0.000303 |
| Asap2 | -2.73 | 2.48E-05 |
| Fst | -2.72 | 0.000292 |
| Itgb6 | -2.66 | 1.84E-07 |
| Serpinb2 | -2.62 | 4.68E-08 |
| Inpp4b | -2.61 | 0.006124 |
| Nfatc1 | -2.59 | 0.000198 |
| Bmp6 | -2.59 | 0.008821 |
| Crispld1 | -2.52 | 0.004250 |
| Gmds | -2.51 | 0.000286 |
| Sh3kbp1 | -2.51 | 0.001433 |
| Lmo7 | -2.49 | 0.000160 |

| | | |
|---|---|---|
| Hmcn1 | -2.44 | 3.40E-05 |
| Mfap3l | -2.37 | 9.07E-05 |
| Sulf2 | -2.36 | 2.89E-05 |
| Igfbp3 | -2.36 | 2.58E-06 |
| Ppp2r3a | -2.34 | 6.01E-05 |
| Kank1 | -2.27 | 1.30E-05 |
| Sema3e | -2.22 | 0.000272 |
| Prlr | -2.22 | 0.000172 |
| Tmem40 | -2.20 | 0.009422 |
| Gpc6 | -2.20 | 0.001063 |
| Gpr161 | -2.17 | 0.004268 |
| Rora | -2.15 | 0.000478 |
| Enox1 | -2.15 | 0.001287 |
| Ankrd10 | -2.14 | 0.000188 |
| Efnb2 | -2.09 | 0.000188 |
| Cyr61 | -2.06 | 0.000125 |
| Cry1 | -2.05 | 0.004932 |
| Actb | -2.03 | 0.000972 |
| Myo1e | -1.98 | 0.009521 |
| Ccdc3 | -1.97 | 0.002518 |
| Hopx | -1.96 | 0.001558 |
| Net1 | -1.90 | 0.001539 |
| Slc6a6 | -1.90 | 0.001418 |
| Cd44 | -1.88 | 0.004205 |
| Gpr126 | -1.85 | 0.008605 |
| Arid5b | -1.83 | 0.009456 |
| Peli2 | -1.82 | 0.009282 |
| Tfap2b | -1.82 | 0.009285 |
| Trabd2b | -1.81 | 0.008936 |
| Insig2 | 1.76 | 0.008605 |
| Gja1 | 1.88 | 0.002947 |
| Tnc | 2.07 | 0.000325 |
| Bhlhe41 | 2.08 | 0.002151 |
| Hist1h1c | 2.09 | 0.001025 |
| Smox | 2.12 | 0.000877 |

| | | |
|---|---|---|
| Prickle1 | 2.15 | 0.000227 |
| Car12 | 2.20 | 0.003233 |
| Abcg2 | 2.22 | 0.001400 |
| Parm1 | 2.29 | 0.007433 |
| Slc22a23 | 2.30 | 0.000275 |
| Btbd3 | 2.43 | 0.000200 |
| Pla2g7 | 2.45 | 3.64E-05 |
| Nrg1 | 2.75 | 1.30E-05 |
| Ppp1r3b | 3.11 | 4.06E-09 |
| Serpine2 | 3.22 | 1.87E-07 |
| Ctsc | 3.23 | 3.35E-10 |
| AU018091 | 3.34 | 0.001194 |
| Pamr1 | 3.65 | 0.007829 |
| Slc4a4 | 5.20 | 1.01E-05 |
| Serpina3k | 18.45 | 0.000227 |

**Supplementary Table S2 Foxc1/Nfatc1/Smad motif distribution in differentially expressed genes of P30 Foxc1 cKO HFSC RNA-seq**

| gene | log2FoldChange | pval | Foxc1 motif | Nfatc1 motif | Smad motif |
|---|---|---|---|---|---|
| Abcg2 | 1.1538 | 0.001399551 | Foxc1 | Nfatc1 | Smad |
| Adamts17 | -2.4005 | 5.05E-06 | Foxc1 | Nfatc1 | Smad |
| Aff3 | -2.2600 | 6.96E-09 | Foxc1 | NA | Smad |
| Agpat9 | -1.7415 | 0.001226964 | Foxc1 | Nfatc1 | Smad |
| Ank | -1.5062 | 5.94E-05 | Foxc1 | Nfatc1 | Smad |
| Ankrd10 | -1.0999 | 0.000188118 | Foxc1 | NA | Smad |
| Ankrd35 | -1.5166 | 0.00630418 | Foxc1 | NA | Smad |
| Antxr1 | -1.8982 | 9.28E-10 | Foxc1 | Nfatc1 | Smad |
| Arhgap44 | -2.0485 | 3.99E-11 | Foxc1 | Nfatc1 | Smad |
| Arid5b | -0.8712 | 0.009456243 | Foxc1 | Nfatc1 | Smad |
| Atp2a3 | -4.7274 | 5.36E-06 | Foxc1 | NA | NA |
| AU018091 | 1.7410 | 0.001193734 | Foxc1 | Nfatc1 | Smad |
| Bdnf | -2.4042 | 1.06E-11 | Foxc1 | NA | Smad |
| Bhlhe41 | 1.0592 | 0.002150978 | Foxc1 | NA | NA |
| Bmp2 | -2.1788 | 1.65E-14 | Foxc1 | Nfatc1 | Smad |
| Bmp6 | -1.3723 | 0.008821217 | Foxc1 | NA | Smad |
| Btbd3 | 1.2787 | 0.000200031 | Foxc1 | Nfatc1 | Smad |
| Cacna1c | -2.7313 | 5.07E-08 | Foxc1 | NA | Smad |
| Cadm1 | -1.9675 | 4.08E-14 | Foxc1 | Nfatc1 | Smad |
| Calml3 | -1.5433 | 1.68E-09 | Foxc1 | NA | Smad |
| Ccdc88c | -3.3743 | 1.51E-22 | Foxc1 | NA | Smad |
| Cd44 | -0.9092 | 0.004204617 | Foxc1 | Nfatc1 | Smad |
| Cdc42ep1 | -1.8977 | 5.90E-10 | Foxc1 | NA | Smad |
| Cdon | -1.9048 | 1.18E-11 | Foxc1 | NA | Smad |
| Col4a3 | -2.5801 | 0.000307394 | Foxc1 | Nfatc1 | Smad |
| Col4a4 | -2.7337 | 5.65E-07 | Foxc1 | NA | Smad |
| Crispld1 | -1.3313 | 0.004250351 | Foxc1 | NA | Smad |
| Ctsc | 1.6931 | 3.35E-10 | Foxc1 | Nfatc1 | Smad |
| Cyr61 | -1.0393 | 0.000124504 | Foxc1 | Nfatc1 | Smad |
| Efnb2 | -1.0643 | 0.000188118 | Foxc1 | Nfatc1 | Smad |
| Emp1 | -1.2376 | 1.89E-05 | Foxc1 | Nfatc1 | Smad |
| Enox1 | -1.1016 | 0.001287267 | Foxc1 | Nfatc1 | Smad |
| Esyt3 | -2.6480 | 3.98E-14 | Foxc1 | NA | Smad |
| Fabp5 | 1.5796 | 5.78E-08 | Foxc1 | Nfatc1 | NA |
| Fam171b | -3.0589 | 3.85E-14 | Foxc1 | Nfatc1 | Smad |
| Fam46c | -2.8571 | 2.90E-28 | Foxc1 | NA | Smad |
| Flnc | -1.0055 | 0.001396379 | Foxc1 | NA | Smad |
| Fmn1 | -1.4249 | 0.002484435 | Foxc1 | Nfatc1 | Smad |
| Foxp1 | -0.9264 | 0.009790922 | Foxc1 | Nfatc1 | Smad |
| Fst | -1.4416 | 0.000291843 | Foxc1 | Nfatc1 | Smad |
| Gfra1 | -3.4913 | 5.93E-41 | Foxc1 | Nfatc1 | Smad |
| Gja1 | 0.9106 | 0.002947016 | Foxc1 | Nfatc1 | Smad |
| Gjb4 | -1.3712 | 2.08E-06 | Foxc1 | NA | Smad |
| Gmds | -1.3293 | 0.000286321 | Foxc1 | Nfatc1 | Smad |
| Gpc6 | -1.1358 | 0.001062881 | Foxc1 | Nfatc1 | Smad |
| Gpr126 | -0.8860 | 0.008605465 | Foxc1 | Nfatc1 | Smad |
| Hmcn1 | -1.2883 | 3.40E-05 | Foxc1 | Nfatc1 | Smad |
| Hmox1 | -1.2904 | 8.94E-05 | Foxc1 | NA | Smad |

| | | | | | |
|---|---|---|---|---|---|
| Hopx | -0.9706 | 0.001558148 | Foxc1 | Nfatc1 | Smad |
| Hspb8 | -1.7579 | 5.74E-12 | Foxc1 | Nfatc1 | Smad |
| Igfbp3 | -1.2387 | 2.58E-06 | Foxc1 | Nfatc1 | Smad |
| Il31ra | -4.3966 | 4.95E-30 | Foxc1 | Nfatc1 | Smad |
| Inpp4b | -1.3816 | 0.006123833 | Foxc1 | Nfatc1 | Smad |
| Itgb6 | -1.4119 | 1.84E-07 | Foxc1 | NA | Smad |
| Kcnma1 | -4.4234 | 2.99E-07 | Foxc1 | Nfatc1 | Smad |
| Lmo7 | -1.3157 | 0.000160327 | Foxc1 | Nfatc1 | Smad |
| Lrrn3 | -2.0658 | 0.000313448 | Foxc1 | NA | Smad |
| Lypd6 | -1.9522 | 0.000508392 | Foxc1 | Nfatc1 | Smad |
| Marveld3 | -1.6722 | 3.77E-05 | Foxc1 | NA | NA |
| Me3 | -2.3637 | 0.000956227 | Foxc1 | Nfatc1 | Smad |
| Moxd1 | -1.6703 | 5.22E-09 | Foxc1 | Nfatc1 | Smad |
| Net1 | -0.9269 | 0.001538596 | Foxc1 | NA | Smad |
| Nfatc1 | -1.3733 | 0.000198344 | Foxc1 | Nfatc1 | Smad |
| Ngf | -2.1949 | 2.13E-11 | Foxc1 | Nfatc1 | Smad |
| Nrcam | -1.7182 | 3.73E-05 | Foxc1 | Nfatc1 | Smad |
| Nrg1 | 1.4580 | 1.30E-05 | Foxc1 | Nfatc1 | Smad |
| Pamr1 | 1.8670 | 0.007828742 | Foxc1 | NA | Smad |
| Parm1 | 1.1936 | 0.007433048 | Foxc1 | Nfatc1 | Smad |
| Peli2 | -0.8656 | 0.009282301 | Foxc1 | Nfatc1 | Smad |
| Pla2g7 | 1.2955 | 3.64E-05 | Foxc1 | NA | Smad |
| Ppp1r3b | 1.6387 | 4.06E-09 | Foxc1 | Nfatc1 | Smad |
| Prickle1 | 1.1016 | 0.000227008 | Foxc1 | Nfatc1 | Smad |
| Prlr | -1.1498 | 0.000172146 | Foxc1 | Nfatc1 | Smad |
| Ptn | -1.9761 | 2.33E-11 | Foxc1 | NA | Smad |
| Pvt1 | -2.4656 | 0.003601033 | Foxc1 | Nfatc1 | Smad |
| Robo2 | -1.8520 | 9.18E-05 | Foxc1 | Nfatc1 | Smad |
| Rora | -1.1060 | 0.000477547 | Foxc1 | Nfatc1 | Smad |
| S100a3 | -1.6367 | 1.30E-05 | Foxc1 | NA | Smad |
| Scel | -1.6002 | 2.16E-09 | Foxc1 | Nfatc1 | Smad |
| Sdk2 | -1.6498 | 1.60E-07 | Foxc1 | NA | Smad |
| Sema3c | -0.8774 | 0.006123833 | Foxc1 | Nfatc1 | Smad |
| Sema3e | -1.1526 | 0.000272114 | Foxc1 | Nfatc1 | Smad |
| Serpinb8 | -1.1560 | 0.000565233 | Foxc1 | Nfatc1 | Smad |
| Serpine2 | 1.6874 | 1.87E-07 | Foxc1 | Nfatc1 | Smad |
| Sh3kbp1 | -1.3274 | 0.001433448 | Foxc1 | Nfatc1 | Smad |
| Slc22a23 | 1.1987 | 0.000275335 | Foxc1 | Nfatc1 | Smad |
| Slc39a8 | -1.8838 | 1.91E-08 | Foxc1 | NA | Smad |
| Slc4a4 | 2.3778 | 1.01E-05 | Foxc1 | Nfatc1 | Smad |
| Slc6a6 | -0.9257 | 0.001417723 | Foxc1 | NA | Smad |
| Smarca2 | -1.3758 | 2.23E-07 | Foxc1 | NA | Smad |
| Smox | 1.0845 | 0.000877018 | Foxc1 | Nfatc1 | Smad |
| Stfa3 | -2.0422 | 5.29E-10 | Foxc1 | Nfatc1 | Smad |
| Tnc | 1.0467 | 0.000325187 | Foxc1 | Nfatc1 | Smad |
| Tns4 | -1.4574 | 5.11E-07 | Foxc1 | Nfatc1 | Smad |
| Trabd2b | -0.8557 | 0.008935975 | Foxc1 | Nfatc1 | Smad |
| Trim16 | -1.8632 | 6.25E-11 | Foxc1 | NA | Smad |
| Trim2 | -1.6633 | 1.76E-07 | Foxc1 | Nfatc1 | Smad |
| Trpm3 | -3.2175 | 7.94E-05 | Foxc1 | Nfatc1 | Smad |
| Tspan2 | -1.6116 | 0.00816966 | Foxc1 | NA | Smad |
| Tuba4a | -0.9092 | 0.001865625 | Foxc1 | NA | NA |

| | | | | | |
|---|---|---|---|---|---|
| Ucp2 | 0.9052 | 0.003800326 | Foxc1 | NA | Smad |
| Unc5b | -1.0096 | 0.007893428 | Foxc1 | NA | Smad |
| Vit | -1.5071 | 0.00365376 | Foxc1 | NA | Smad |
| Zdhhc2 | -2.0589 | 0.000558137 | Foxc1 | Nfatc1 | Smad |
| 1810011O10Rik | 1.2752 | 0.003996684 | NA | Nfatc1 | Smad |
| 4732456N10Rik | -1.9007 | 0.005718684 | NA | NA | NA |
| Ablim1 | -1.3446 | 2.79E-05 | NA | Nfatc1 | Smad |
| Ache | -2.9973 | 2.65E-06 | NA | Nfatc1 | NA |
| Ackr4 | -1.2066 | 0.000111881 | NA | NA | Smad |
| Acsbg1 | -1.1076 | 0.003437838 | NA | Nfatc1 | Smad |
| Acta2 | 1.6405 | 1.34E-06 | NA | Nfatc1 | Smad |
| Actb | -1.0188 | 0.000971648 | NA | NA | Smad |
| Actg1 | -0.8728 | 0.003521374 | NA | NA | Smad |
| Adamtsl4 | -2.2282 | 2.34E-15 | NA | Nfatc1 | Smad |
| Adcy1 | -3.9658 | 4.57E-41 | NA | NA | Smad |
| Adrb2 | -1.6122 | 2.55E-08 | NA | Nfatc1 | Smad |
| Afap1l1 | 1.3140 | 0.008056303 | NA | NA | Smad |
| AI661453 | -0.9177 | 0.004557753 | NA | NA | Smad |
| Ak3 | -0.9796 | 0.003315456 | NA | NA | Smad |
| Aldh1a2 | 2.7177 | 6.56E-11 | NA | NA | Smad |
| Aldh3a1 | -2.2093 | 4.68E-08 | NA | NA | NA |
| Alox12e | -1.2808 | 0.000188118 | NA | NA | Smad |
| Alox8 | -2.0492 | 0.000164332 | NA | NA | NA |
| Aloxe3 | -2.0016 | 3.40E-10 | NA | NA | Smad |
| Alpl | 1.6288 | 0.000500133 | NA | NA | NA |
| Ano1 | -2.7121 | 4.38E-11 | NA | NA | Smad |
| Anpep | -1.3105 | 2.79E-05 | NA | NA | Smad |
| Anxa3 | 1.4131 | 0.00010305 | NA | NA | Smad |
| Anxa8 | -1.6437 | 8.61E-11 | NA | NA | Smad |
| Aqp3 | -2.2338 | 7.08E-15 | NA | NA | Smad |
| Arhgap23 | -1.2650 | 9.60E-06 | NA | NA | Smad |
| Arrdc3 | 1.1492 | 0.000209491 | NA | Nfatc1 | Smad |
| Arrdc4 | 0.9930 | 0.001046049 | NA | Nfatc1 | Smad |
| Asap2 | -1.4468 | 2.48E-05 | NA | Nfatc1 | Smad |
| Aspn | -1.7531 | 0.000641614 | NA | NA | Smad |
| Atoh8 | -2.3714 | 1.20E-05 | NA | Nfatc1 | Smad |
| Atp6v0e2 | -2.0111 | 0.002422271 | NA | NA | Smad |
| Avpi1 | -1.2316 | 9.16E-06 | NA | NA | NA |
| Baiap2 | -1.0197 | 0.008192995 | NA | Nfatc1 | Smad |
| BC064078 | 0.9992 | 0.00875729 | NA | NA | Smad |
| Bok | -1.7146 | 8.35E-08 | NA | Nfatc1 | NA |
| Cacna2d2 | -2.6330 | 9.47E-08 | NA | Nfatc1 | Smad |
| Cadm4 | -1.9973 | 0.000662869 | NA | NA | Smad |
| Camk4 | -3.0750 | 1.80E-26 | NA | NA | NA |
| Camkk1 | -1.9972 | 1.30E-07 | NA | Nfatc1 | Smad |
| Car12 | 1.1394 | 0.0032333 | NA | NA | Smad |
| Card10 | -1.2558 | 9.07E-05 | NA | Nfatc1 | NA |
| Ccdc3 | -0.9785 | 0.002518273 | NA | NA | Smad |
| Ccl27a | -1.3031 | 0.00813563 | NA | Nfatc1 | Smad |
| Ccnb2 | 1.2562 | 0.003266714 | NA | NA | NA |
| Cd200 | 0.9038 | 0.004505948 | NA | Nfatc1 | Smad |
| Cd207 | -1.9370 | 0.000188362 | NA | NA | NA |

| | | | | | |
|---|---|---|---|---|---|
| Cd276 | 1.0544 | 0.009731004 | NA | Nfatc1 | NA |
| Cd59a | 0.9637 | 0.004884904 | NA | NA | NA |
| Cdca8 | 1.2315 | 0.005315007 | NA | NA | Smad |
| Cdh13 | -1.9387 | 8.71E-09 | NA | Nfatc1 | Smad |
| Cdk1 | 1.2660 | 0.002938117 | NA | NA | Smad |
| Cenpe | 1.3297 | 0.001870907 | NA | Nfatc1 | Smad |
| Cers4 | 1.0109 | 0.003282894 | NA | Nfatc1 | Smad |
| Cers5 | -0.9224 | 0.005099877 | NA | NA | NA |
| Ces2g | -1.0170 | 0.007495317 | NA | NA | Smad |
| Cgnl1 | -1.5813 | 7.95E-07 | NA | NA | Smad |
| Cgref1 | -1.5555 | 0.008935975 | NA | NA | Smad |
| Chat | -3.9175 | 2.70E-18 | NA | NA | NA |
| Clca2 | -1.3276 | 0.000445915 | NA | NA | NA |
| Clcf1 | -1.3269 | 2.59E-06 | NA | Nfatc1 | Smad |
| Cldn4 | -1.2522 | 2.13E-05 | NA | NA | Smad |
| Clic3 | -2.1515 | 2.76E-09 | NA | NA | Smad |
| Cmah | 1.2364 | 1.02E-05 | NA | NA | Smad |
| Cnksr3 | -1.6787 | 4.27E-10 | NA | Nfatc1 | Smad |
| Cnn3 | 0.9587 | 0.001553566 | NA | Nfatc1 | NA |
| Cntn2 | 2.1407 | 4.98E-07 | NA | NA | Smad |
| Col14a1 | -1.4099 | 9.91E-05 | NA | Nfatc1 | Smad |
| Col6a1 | -3.4520 | 2.04E-32 | NA | Nfatc1 | Smad |
| Col6a2 | -1.8754 | 1.05E-09 | NA | NA | NA |
| Col7a1 | -0.9908 | 0.000458064 | NA | NA | NA |
| Col8a2 | -2.7821 | 1.51E-22 | NA | NA | Smad |
| Cpa4 | -2.8090 | 4.16E-27 | NA | Nfatc1 | Smad |
| Crlf1 | -2.9592 | 1.51E-22 | NA | NA | NA |
| Cry1 | -1.0390 | 0.0049324 | NA | NA | Smad |
| Csn3 | 2.0179 | 0.001514014 | NA | NA | NA |
| Ctgf | -1.2436 | 8.33E-06 | NA | Nfatc1 | Smad |
| Cxcl10 | 1.5832 | 0.001845649 | NA | NA | Smad |
| Cyp4b1 | -1.7728 | 2.77E-06 | NA | NA | NA |
| Cystm1 | -1.8845 | 5.45E-07 | NA | NA | Smad |
| D17H6S56E-5 | 1.1336 | 0.001898451 | NA | NA | NA |
| Dach1 | 0.8977 | 0.007495317 | NA | Nfatc1 | Smad |
| Dap | -1.6185 | 7.94E-08 | NA | NA | Smad |
| Dedd2 | -1.1377 | 0.000135529 | NA | NA | Smad |
| Dhrs2 | -3.2561 | 2.19E-07 | NA | Nfatc1 | Smad |
| Dhx32 | -1.1036 | 0.004387595 | NA | NA | Smad |
| Dmkn | -1.9037 | 1.60E-15 | NA | Nfatc1 | Smad |
| Duox1 | -2.4797 | 8.39E-15 | NA | NA | Smad |
| Dusp4 | 1.5049 | 1.35E-05 | NA | Nfatc1 | NA |
| Dusp7 | -1.0112 | 0.000790902 | NA | NA | Smad |
| Ecm1 | -2.0504 | 3.34E-11 | NA | NA | Smad |
| Eda | -1.1451 | 0.003208001 | NA | Nfatc1 | NA |
| Ednra | -3.5106 | 3.50E-18 | NA | NA | Smad |
| Egfl6 | -1.3751 | 5.05E-06 | NA | NA | Smad |
| Ehd3 | 1.3201 | 0.002540937 | NA | Nfatc1 | Smad |
| Eif2s3y | -8.6144 | 7.95E-32 | NA | NA | NA |
| Eml1 | -2.5642 | 7.11E-07 | NA | NA | Smad |
| Eps8l1 | -1.2890 | 0.006377176 | NA | NA | Smad |
| Ereg | -1.7765 | 0.00883146 | NA | NA | NA |

| | | | | | |
|---|---|---|---|---|---|
| Evpl | -1.3468 | 8.74E-07 | NA | NA | Smad |
| Fads3 | 1.3608 | 0.000405697 | NA | NA | Smad |
| Fads6 | -1.8731 | 0.005774605 | NA | NA | NA |
| Faim2 | -2.9180 | 0.000110424 | NA | NA | NA |
| Fam19a5 | -2.3746 | 0.001948144 | NA | NA | Smad |
| Fam213a | -1.6769 | 4.56E-06 | NA | Nfatc1 | Smad |
| Fam25c | -2.0770 | 1.64E-10 | NA | NA | Smad |
| Fam84a | 0.9338 | 0.001803975 | NA | Nfatc1 | Smad |
| Fcgbp | -2.0408 | 1.54E-08 | NA | NA | Smad |
| Fchsd1 | -1.0630 | 0.000411714 | NA | NA | NA |
| Fgf1 | -1.5364 | 0.000506602 | NA | Nfatc1 | Smad |
| Fgf18 | -3.1202 | 1.16E-05 | NA | NA | Smad |
| Foxc1 | -7.1912 | 6.64E-67 | NA | NA | Smad |
| Galnt15 | -3.0004 | 5.52E-05 | NA | NA | NA |
| Gfra2 | -1.6068 | 0.007709063 | NA | NA | Smad |
| Ggt1 | 1.5550 | 0.00020566 | NA | NA | NA |
| Gjb2 | 1.3988 | 3.79E-07 | NA | NA | Smad |
| Gjb6 | 1.2831 | 0.000200031 | NA | NA | Smad |
| Gm6969 | -6.6848 | 2.45E-13 | NA | NA | NA |
| Gm7694 | -2.2975 | 1.25E-06 | NA | Nfatc1 | NA |
| Gm973 | -1.4771 | 5.12E-06 | NA | NA | Smad |
| Gpr161 | -1.1198 | 0.004267601 | NA | Nfatc1 | Smad |
| Gpx2 | 2.7084 | 7.09E-09 | NA | NA | NA |
| Grem1 | -2.7895 | 7.88E-20 | NA | NA | NA |
| Grik1 | -4.1114 | 8.71E-05 | NA | Nfatc1 | Smad |
| Guca2a | -2.8281 | 1.48E-06 | NA | NA | NA |
| Hhip | -2.9837 | 2.00E-06 | NA | NA | Smad |
| Hid1 | -3.4540 | 5.78E-08 | NA | NA | NA |
| Hist1h1c | 1.0614 | 0.001024664 | NA | Nfatc1 | Smad |
| Hivep3 | -2.0519 | 6.43E-08 | NA | Nfatc1 | Smad |
| Hk2 | -1.2723 | 1.80E-05 | NA | Nfatc1 | Smad |
| Hoxa7 | -1.5478 | 2.39E-06 | NA | NA | Smad |
| Hoxc13 | 0.8382 | 0.00875729 | NA | NA | Smad |
| Hs3st3a1 | 2.2853 | 1.25E-06 | NA | Nfatc1 | Smad |
| Hsp90aa1 | -0.8907 | 0.001942955 | NA | NA | Smad |
| Hspa1a | -1.1093 | 4.20E-05 | NA | NA | Smad |
| Hspa1b | -1.2023 | 8.36E-06 | NA | NA | Smad |
| Hspb1 | -1.1102 | 2.79E-05 | NA | NA | Smad |
| Igdcc4 | -1.7351 | 1.07E-07 | NA | NA | NA |
| Igfbp5 | -2.3138 | 8.31E-18 | NA | NA | Smad |
| Insig2 | 0.8175 | 0.008605465 | NA | Nfatc1 | Smad |
| Irx4 | 0.8895 | 0.003982278 | NA | Nfatc1 | Smad |
| Itga8 | 2.0963 | 0.004412929 | NA | Nfatc1 | Smad |
| Kank1 | -1.1843 | 1.30E-05 | NA | NA | Smad |
| Kcnc4 | -2.4302 | 4.39E-07 | NA | NA | Smad |
| Kcnf1 | 2.2435 | 3.10E-11 | NA | NA | Smad |
| Kcnh3 | -2.1602 | 0.000143913 | NA | NA | NA |
| Kctd9 | -0.9499 | 0.007330706 | NA | NA | NA |
| Kif26a | -1.6792 | 0.000303326 | NA | NA | Smad |
| Klf2 | -1.1946 | 0.00342966 | NA | NA | NA |
| Klhl21 | -0.8942 | 0.007330706 | NA | NA | NA |
| Klk10 | -1.1816 | 0.004412929 | NA | NA | Smad |

| | | | | | |
|---|---|---|---|---|---|
| Klk7 | -1.2616 | 4.74E-05 | NA | NA | NA |
| Knstrn | 1.5310 | 0.000288715 | NA | NA | Smad |
| Kprp | -1.4687 | 0.001117229 | NA | NA | Smad |
| Krt15 | -1.8538 | 1.17E-14 | NA | NA | NA |
| Krt16 | -1.0508 | 0.000441076 | NA | NA | NA |
| Krt24 | -3.8062 | 7.14E-52 | NA | NA | NA |
| Krt80 | -2.0225 | 2.32E-09 | NA | Nfatc1 | Smad |
| Lamb3 | -1.2186 | 5.38E-06 | NA | Nfatc1 | Smad |
| Lgals9 | 1.0764 | 0.000718787 | NA | NA | NA |
| Lgr6 | -2.1222 | 5.53E-09 | NA | Nfatc1 | Smad |
| Lrrfip1 | -0.9523 | 0.003276225 | NA | Nfatc1 | Smad |
| Ltbp1 | -1.8357 | 9.61E-07 | NA | Nfatc1 | Smad |
| Ltbp2 | -1.2902 | 0.000410499 | NA | Nfatc1 | Smad |
| Lurap1l | 1.6887 | 2.51E-05 | NA | Nfatc1 | Smad |
| Mafk | -1.0359 | 0.000218007 | NA | Nfatc1 | NA |
| Map2k3 | -0.8822 | 0.00635124 | NA | Nfatc1 | Smad |
| Marveld1 | -1.1969 | 6.09E-05 | NA | NA | Smad |
| Mbd1 | 1.0436 | 0.003648519 | NA | NA | NA |
| Mcm6 | 1.3417 | 0.000581044 | NA | NA | NA |
| Mertk | -1.0333 | 0.002775385 | NA | NA | Smad |
| Mettl20 | 1.5652 | 0.009171888 | NA | NA | Smad |
| Mfap3l | -1.2449 | 9.07E-05 | NA | Nfatc1 | Smad |
| Mir27a | -2.0848 | 0.00348925 | NA | NA | NA |
| Mitf | -2.8100 | 1.48E-13 | NA | Nfatc1 | Smad |
| Mki67 | 1.0714 | 0.000854876 | NA | Nfatc1 | Smad |
| Mme | -2.9208 | 5.44E-06 | NA | NA | Smad |
| Mrgprf | -2.6605 | 3.05E-16 | NA | NA | NA |
| Myh14 | -2.0567 | 1.47E-16 | NA | Nfatc1 | Smad |
| Myo1e | -0.9890 | 0.009520936 | NA | Nfatc1 | Smad |
| Ncald | 1.3182 | 0.00829638 | NA | Nfatc1 | Smad |
| Neu2 | -1.9509 | 8.87E-06 | NA | NA | NA |
| Ngef | -4.3897 | 2.09E-17 | NA | NA | Smad |
| Niacr1 | 1.1377 | 7.72E-05 | NA | NA | NA |
| Nkd1 | -2.0431 | 2.51E-05 | NA | NA | Smad |
| Nlrp10 | 1.0614 | 0.002181163 | NA | NA | NA |
| Nod2 | -1.3086 | 5.48E-05 | NA | NA | Smad |
| Nog | -3.0027 | 1.72E-09 | NA | NA | Smad |
| Npas2 | -3.1153 | 1.94E-09 | NA | Nfatc1 | Smad |
| Npnt | -1.9054 | 6.33E-07 | NA | Nfatc1 | Smad |
| Nppb | -1.1608 | 0.007513545 | NA | NA | Smad |
| Nptx1 | -3.3346 | 1.16E-16 | NA | NA | NA |
| Nr1d1 | -0.9595 | 0.000909645 | NA | Nfatc1 | Smad |
| Nr3c2 | -2.5421 | 0.006407435 | NA | NA | Smad |
| Nrep | -1.0811 | 0.002634776 | NA | Nfatc1 | Smad |
| Nrip3 | -1.4876 | 0.000156313 | NA | NA | Smad |
| Nrtn | -1.8142 | 1.80E-05 | NA | NA | Smad |
| Nt5dc2 | -1.0626 | 0.002921347 | NA | NA | NA |
| Nt5e | -2.3542 | 4.89E-18 | NA | Nfatc1 | Smad |
| Nxpe4 | -1.9277 | 0.000303667 | NA | NA | Smad |
| Ogdhl | -2.0957 | 0.001555434 | NA | Nfatc1 | Smad |
| Ovol1 | -1.0054 | 0.00951081 | NA | Nfatc1 | Smad |
| Pacsin3 | -1.2760 | 0.000167485 | NA | NA | Smad |

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|---|---|---|---|---|---|
| Papln | -1.7603 | 1.72E-08 | NA | NA | Smad |
| Pard6b | -1.2572 | 3.31E-05 | NA | Nfatc1 | Smad |
| Pcbp3 | -1.0543 | 0.008127229 | NA | NA | NA |
| Pcdh7 | -1.1347 | 0.000797489 | NA | Nfatc1 | Smad |
| Pcolce2 | -1.7459 | 0.007996183 | NA | NA | Smad |
| Pcp4 | 3.3145 | 2.98E-09 | NA | NA | Smad |
| Pcsk6 | -2.5444 | 9.81E-17 | NA | NA | Smad |
| Pdlim3 | -1.3478 | 0.00011219 | NA | NA | Smad |
| Pdzrn4 | -1.8741 | 2.59E-09 | NA | NA | Smad |
| Peg3 | -1.5076 | 1.25E-06 | NA | NA | NA |
| Piezo1 | -1.4518 | 0.000303326 | NA | Nfatc1 | Smad |
| Pknox2 | -2.5854 | 0.001778778 | NA | Nfatc1 | Smad |
| Plod1 | -1.0240 | 0.001538596 | NA | NA | Smad |
| Pmaip1 | 1.1217 | 0.000490253 | NA | NA | Smad |
| Ppap2a | -1.4717 | 0.000122945 | NA | NA | NA |
| Ppap2b | -0.9793 | 0.007709063 | NA | Nfatc1 | Smad |
| Ppif | -1.4567 | 9.35E-09 | NA | NA | Smad |
| Ppp2cb | 0.9670 | 0.007330706 | NA | NA | Smad |
| Ppp2r3a | -1.2247 | 6.01E-05 | NA | Nfatc1 | Smad |
| Prkcz | -2.0200 | 0.000913641 | NA | NA | Smad |
| Prnp | -1.2943 | 1.49E-05 | NA | Nfatc1 | Smad |
| Ptges | -1.6783 | 1.54E-08 | NA | NA | Smad |
| Ptpre | -2.0837 | 1.80E-07 | NA | Nfatc1 | Smad |
| Racgap1 | 1.1218 | 0.004150883 | NA | NA | Smad |
| Ramp3 | -1.7892 | 6.07E-05 | NA | NA | NA |
| Rapgef3 | -1.4508 | 0.002526823 | NA | NA | Smad |
| Rarres1 | -1.8002 | 0.003069944 | NA | NA | Smad |
| Rbp1 | 1.0599 | 0.004687749 | NA | NA | Smad |
| Rcan1 | -1.6713 | 3.65E-07 | NA | NA | Smad |
| Rhov | 1.0892 | 0.002673519 | NA | NA | Smad |
| Rnf208 | -1.7779 | 5.20E-09 | NA | NA | Smad |
| Rnf39 | -0.9473 | 0.002794214 | NA | NA | Smad |
| Rorc | -1.5659 | 0.000275335 | NA | NA | NA |
| RP24-390G17.1 | -2.0922 | 1.91E-08 | NA | NA | NA |
| Rufy4 | -1.2887 | 0.002526823 | NA | NA | NA |
| S100a4 | -2.5757 | 1.85E-16 | NA | NA | NA |
| Sbsn | -1.4048 | 2.90E-08 | NA | NA | NA |
| Scd2 | 1.3157 | 6.49E-05 | NA | Nfatc1 | Smad |
| Scn5a | -4.5545 | 4.42E-09 | NA | NA | Smad |
| Scrg1 | 1.1714 | 0.000492458 | NA | NA | Smad |
| Scube2 | -1.2724 | 0.001033256 | NA | NA | Smad |
| Sepp1 | 0.8660 | 0.005502974 | NA | Nfatc1 | Smad |
| Serpina3k | 4.2055 | 0.000227008 | NA | NA | NA |
| Serpinb10 | -1.5309 | 1.88E-05 | NA | NA | Smad |
| Serpinb11 | -2.5536 | 6.36E-16 | NA | NA | Smad |
| Serpinb2 | -1.3907 | 4.68E-08 | NA | Nfatc1 | Smad |
| Serpinb3b | -2.6127 | 1.43E-05 | NA | Nfatc1 | Smad |
| Serpinf1 | 1.0805 | 0.003375481 | NA | NA | NA |
| Sgms2 | -1.8189 | 5.36E-06 | NA | Nfatc1 | NA |
| Sh3rf2 | -1.8322 | 6.16E-07 | NA | Nfatc1 | Smad |
| Skint10 | -2.0353 | 0.000751229 | NA | NA | NA |
| Slc16a2 | -1.3747 | 0.000134742 | NA | Nfatc1 | Smad |

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|---|---|---|---|---|---|
| Slc16a6 | 1.9522 | 1.21E-07 | NA | NA | NA |
| Slc25a45 | 1.3656 | 0.00816966 | NA | NA | Smad |
| Slc26a9 | -1.4587 | 0.004284346 | NA | NA | Smad |
| Slc35e4 | -0.8768 | 0.007495317 | NA | NA | NA |
| Slc38a3 | -1.7199 | 0.0004334 | NA | NA | NA |
| Slc6a2 | 1.0200 | 0.007712176 | NA | Nfatc1 | Smad |
| Slc6a4 | -1.9745 | 0.000686606 | NA | NA | Smad |
| Slc6a9 | -1.0553 | 0.003718224 | NA | NA | Smad |
| Smad9 | -3.4743 | 2.37E-07 | NA | Nfatc1 | Smad |
| Smim5 | -1.7751 | 0.002674666 | NA | NA | Smad |
| Sms | -2.0005 | 5.38E-07 | NA | NA | Smad |
| Sncg | -3.2016 | 1.41E-05 | NA | NA | NA |
| Sned1 | -1.2716 | 0.003331641 | NA | NA | NA |
| Snn | 1.1657 | 0.000976669 | NA | NA | Smad |
| Sostdc1 | -1.3113 | 2.98E-05 | NA | NA | Smad |
| Sphkap | -5.2819 | 1.49E-13 | NA | Nfatc1 | Smad |
| Spock2 | -1.2343 | 0.006681372 | NA | NA | NA |
| Spon2 | -1.1411 | 0.002076387 | NA | NA | NA |
| Srd5a2 | 4.9740 | 1.27E-07 | NA | NA | Smad |
| Srf | -0.9443 | 0.007437061 | NA | NA | NA |
| Srgap3 | -1.2459 | 0.003731033 | NA | Nfatc1 | Smad |
| Sulf2 | -1.2417 | 2.89E-05 | NA | NA | Smad |
| Susd2 | -1.6430 | 1.12E-05 | NA | NA | NA |
| Tead4 | -1.5703 | 0.003437838 | NA | NA | Smad |
| Tekt2 | -1.8341 | 4.44E-10 | NA | Nfatc1 | Smad |
| Tenc1 | -1.0725 | 0.000885688 | NA | NA | Smad |
| Tfap2b | -0.8629 | 0.00928501 | NA | Nfatc1 | Smad |
| Tgm5 | -4.8200 | 8.94E-65 | NA | Nfatc1 | Smad |
| Tgm7 | -1.9056 | 0.005000353 | NA | NA | Smad |
| Timp3 | 1.1480 | 1.53E-05 | NA | NA | NA |
| Tle4 | -1.6602 | 3.24E-05 | NA | Nfatc1 | Smad |
| Tmem108 | -2.8003 | 2.51E-05 | NA | Nfatc1 | Smad |
| Tmem40 | -1.1385 | 0.009421823 | NA | Nfatc1 | Smad |
| Tmem45a | -1.6595 | 7.46E-07 | NA | Nfatc1 | Smad |
| Tmtc1 | -1.5493 | 0.000529905 | NA | Nfatc1 | Smad |
| Tnfrsf11b | -1.9695 | 8.35E-07 | NA | Nfatc1 | Smad |
| Tns1 | -1.8510 | 8.01E-13 | NA | NA | Smad |
| Top2a | 0.9077 | 0.007893428 | NA | NA | NA |
| Trf | 1.6195 | 4.35E-06 | NA | NA | NA |
| Tslp | -1.6753 | 0.00238777 | NA | NA | NA |
| Ttc39b | -1.2855 | 0.0004334 | NA | Nfatc1 | Smad |
| Tubb2b | 1.4947 | 2.90E-06 | NA | NA | Smad |
| Tubb4b | -0.8132 | 0.008196179 | NA | NA | Smad |
| Ubash3b | -1.5722 | 0.000200031 | NA | NA | Smad |
| Ugdh | -0.9265 | 0.006123833 | NA | NA | Smad |
| Unc13b | -1.2943 | 0.008935975 | NA | NA | Smad |
| Upb1 | -2.2315 | 9.20E-06 | NA | NA | NA |
| Usp2 | -0.9588 | 0.002526823 | NA | Nfatc1 | Smad |
| Uty | -5.7140 | 1.69E-15 | NA | NA | NA |
| Vps37b | -1.0612 | 0.00020566 | NA | Nfatc1 | Smad |
| Vwa2 | -2.7765 | 1.11E-23 | NA | NA | NA |
| Wfdc3 | 1.9477 | 4.20E-05 | NA | NA | NA |

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|---|---|---|---|---|---|
| Wif1 | -1.2033 | 0.006516727 | NA | NA | Smad |
| Wipi2 | -0.8385 | 0.008965218 | NA | NA | Smad |
| Wnt11 | -1.2791 | 0.002217554 | NA | Nfatc1 | Smad |
| Wnt4 | -1.1996 | 0.000437973 | NA | NA | Smad |
| Wnt7b | -1.2350 | 0.000383246 | NA | NA | Smad |
| Zbtb16 | -2.0306 | 2.80E-05 | NA | NA | Smad |
| Zfand1 | 1.1012 | 0.006233126 | NA | NA | Smad |
| Zfp750 | 1.5096 | 0.000976669 | NA | NA | Smad |
| Zyx | -0.8839 | 0.003428783 | NA | Nfatc1 | Smad |

## Supplementary Table S3 ATAC peaks containing motifs of Foxc1/Nfatc1/Smad in differentially expressed gene of P30 Foxc1 cKO HFSC RNA-seq

| chromosome | start | end | Associated gene | Matched motif |
|---|---|---|---|---|
| chr1 | 17740379 | 17740788 | Crispld1 | Smad |
| chr1 | 17743770 | 17744179 | Crispld1 | Foxc1 |
| chr1 | 19208694 | 19211434 | Tfap2b | Nfatc1,Smad |
| chr1 | 19211650 | 19214230 | Tfap2b | Nfatc1 |
| chr1 | 19215753 | 19218865 | Tfap2b | Smad |
| chr1 | 19219324 | 19221477 | Tfap2b | Smad |
| chr1 | 19233823 | 19234282 | Tfap2b | Smad |
| chr1 | 19269562 | 19270067 | Tfap2b | Smad |
| chr1 | 19438290 | 19438490 | Tfap2b | Nfatc1 |
| chr1 | 19450770 | 19451204 | Tfap2b | Smad |
| chr1 | 19567816 | 19568222 | Tfap2b | Nfatc1 |
| chr1 | 38251505 | 38252268 | Aff3 | Smad |
| chr1 | 38291951 | 38292472 | Aff3 | Foxc1 |
| chr1 | 38307904 | 38308816 | Aff3 | Smad |
| chr1 | 38478289 | 38478935 | Aff3 | Foxc1 |
| chr1 | 38628163 | 38628647 | Aff3 | Smad |
| chr1 | 39192494 | 39193385 | Npas2 | Nfatc1 |
| chr1 | 39193969 | 39195478 | Npas2 | Nfatc1 |
| chr1 | 39228678 | 39230100 | Npas2 | Nfatc1 |
| chr1 | 39251343 | 39252168 | Npas2 | Smad |
| chr1 | 59549141 | 59549626 | Gm973 | Smad |
| chr1 | 72871735 | 72872207 | Igfbp5 | Smad |
| chr1 | 72887788 | 72888393 | Igfbp5 | Smad |
| chr1 | 73947002 | 73948411 | Tns1 | Smad |
| chr1 | 74027420 | 74028051 | Tns1 | Smad |
| chr1 | 75214317 | 75215297 | Tuba4a | Foxc1 |
| chr1 | 79819080 | 79819280 | Serpine2 | Smad |
| chr1 | 79858901 | 79859347 | Serpine2 | Nfatc1 |
| chr1 | 79869750 | 79870049 | Serpine2 | Smad |
| chr1 | 79895151 | 79895358 | Serpine2 | Smad |
| chr1 | 79898224 | 79898424 | Serpine2 | Foxc1,Nfatc1,Smad |
| chr1 | 82476438 | 82477044 | Col4a4 | Smad |
| chr1 | 82578021 | 82578221 | Col4a4 | Foxc1 |
| chr1 | 82597058 | 82597781 | Col4a3 | Foxc1 |
| chr1 | 82634475 | 82635099 | Col4a3 | Foxc1,Smad |
| chr1 | 82687406 | 82688338 | Col4a3 | Nfatc1 |
| chr1 | 82711849 | 82712156 | Col4a3 | Foxc1,Nfatc1 |

| | | | | |
|---|---|---|---|---|
| chr1 | 83407802 | 83408552 | Sphkap | Smad |
| chr1 | 83611671 | 83614068 | Sphkap | Nfatc1 |
| chr1 | 87483465 | 87483712 | Ngef | Smad |
| chr1 | 91024079 | 91024504 | Lrrfip1 | Nfatc1 |
| chr1 | 91044089 | 91044703 | Lrrfip1 | Nfatc1 |
| chr1 | 91077180 | 91078510 | Lrrfip1 | Smad |
| chr1 | 91078699 | 91079135 | Lrrfip1 | Nfatc1,Smad |
| chr1 | 91126759 | 91127362 | Lrrfip1 | Smad |
| chr1 | 93679650 | 93680815 | Bok | Nfatc1 |
| chr1 | 107129933 | 107130197 | Serpinb3b | Nfatc1 |
| chr1 | 107214703 | 107215080 | Serpinb3b | Smad |
| chr1 | 107365147 | 107366621 | Serpinb11 | Smad |
| chr1 | 107495389 | 107496000 | Serpinb2 | Smad |
| chr1 | 107501967 | 107502422 | Serpinb2 | Nfatc1 |
| chr1 | 107512178 | 107519995 | Serpinb2 | Nfatc1 |
| chr1 | 107562218 | 107562476 | Serpinb10 | Smad |
| chr1 | 107592120 | 107595723 | Serpinb8 | Smad |
| chr1 | 107600510 | 107600741 | Serpinb8 | Foxc1 |
| chr1 | 107602980 | 107603387 | Serpinb8 | Smad |
| chr1 | 107607395 | 107608454 | Serpinb8 | Nfatc1 |
| chr1 | 107634585 | 107635166 | Serpinb8 | Smad |
| chr1 | 107644439 | 107644893 | Serpinb8 | Smad |
| chr1 | 121241055 | 121241438 | Insig2 | Smad |
| chr1 | 121243588 | 121243864 | Insig2 | Smad |
| chr1 | 121249791 | 121251315 | Insig2 | Smad |
| chr1 | 121261791 | 121262637 | Insig2 | Nfatc1 |
| chr1 | 121275969 | 121278395 | Insig2 | Smad |
| chr1 | 121280457 | 121280865 | Insig2 | Smad |
| chr1 | 121301294 | 121302248 | Insig2 | Smad |
| chr1 | 121320474 | 121320908 | Insig2 | Smad |
| chr1 | 121329375 | 121331057 | Insig2 | Smad |
| chr1 | 131733323 | 131733814 | Slc26a9 | Smad |
| chr1 | 131751449 | 131752690 | Slc26a9 | Smad |
| chr1 | 132544414 | 132545042 | Cntn2 | Smad |
| chr1 | 135018802 | 135020929 | Lgr6 | Nfatc1 |
| chr1 | 135021953 | 135022365 | Lgr6 | Smad |
| chr1 | 150536265 | 150536680 | Hmcn1 | Nfatc1 |
| chr1 | 150577187 | 150577387 | Hmcn1 | Smad |
| chr1 | 150907481 | 150908343 | Hmcn1 | Nfatc1 |
| chr1 | 150918021 | 150918782 | Hmcn1 | Nfatc1 |
| chr1 | 150951422 | 150953484 | Hmcn1 | Smad |
| chr1 | 150958978 | 150960961 | Hmcn1 | Smad |
| chr1 | 150971366 | 150972070 | Hmcn1 | Smad |

| | | | | |
|---|---|---|---|---|
| chr1 | 150992929 | 150994103 | Hmcn1 | Foxc1,Nfatc1 |
| chr1 | 151008824 | 151009757 | Hmcn1 | Nfatc1,Smad |
| chr1 | 151019245 | 151019840 | Hmcn1 | Smad |
| chr1 | 151062109 | 151062749 | Hmcn1 | Foxc1,Nfatc1,Smad |
| chr1 | 165277323 | 165278646 | Gpr161 | Nfatc1 |
| chr1 | 165301043 | 165303770 | Gpr161 | Smad |
| chr1 | 165319897 | 165320195 | Gpr161 | Smad |
| chr1 | 170292409 | 170292934 | Gm7694 | Nfatc1 |
| chr1 | 193294045 | 193294246 | Lamb3 | Smad |
| chr1 | 193298095 | 193298613 | Lamb3 | Smad |
| chr1 | 193300013 | 193300568 | Lamb3 | Smad |
| chr1 | 193300711 | 193302458 | Lamb3 | Nfatc1 |
| chr1 | 193326638 | 193327729 | Lamb3 | Smad |
| chr2 | 5165377 | 5166531 | Ccdc3 | Smad |
| chr2 | 5176517 | 5177194 | Ccdc3 | Smad |
| chr2 | 11963091 | 11963291 | Itga8 | Smad |
| chr2 | 12053608 | 12054743 | Itga8 | Nfatc1 |
| chr2 | 12236452 | 12236728 | Itga8 | Smad |
| chr2 | 12249359 | 12249743 | Itga8 | Nfatc1,Smad |
| chr2 | 12255563 | 12256199 | Itga8 | Smad |
| chr2 | 12300838 | 12302430 | Itga8 | Smad |
| chr2 | 25223781 | 25225713 | Tubb4b | Smad |
| chr2 | 25243384 | 25244014 | Rnf208 | Smad |
| chr2 | 25455706 | 25457800 | Clic3 | Smad |
| chr2 | 30919950 | 30920755 | Ptges | Smad |
| chr2 | 50015457 | 50015889 | Lypd6 | Nfatc1 |
| chr2 | 50049084 | 50049384 | Lypd6 | Smad |
| chr2 | 50093620 | 50094432 | Lypd6 | Foxc1 |
| chr2 | 50101548 | 50101941 | Lypd6 | Smad |
| chr2 | 50104106 | 50104542 | Lypd6 | Smad |
| chr2 | 50110023 | 50110590 | Lypd6 | Smad |
| chr2 | 60600885 | 60601207 | Itgb6 | Smad |
| chr2 | 60639253 | 60641040 | Itgb6 | Smad |
| chr2 | 60667393 | 60669060 | Itgb6 | Smad |
| chr2 | 60672161 | 60674943 | Itgb6 | Smad |
| chr2 | 60688558 | 60689773 | Itgb6 | Smad |
| chr2 | 60699743 | 60700552 | Itgb6 | Smad |
| chr2 | 60720203 | 60720634 | Itgb6 | Smad |
| chr2 | 60735197 | 60735465 | Itgb6 | Foxc1,Smad |
| chr2 | 83812278 | 83813117 | Fam171b | Smad |
| chr2 | 83813351 | 83814591 | Fam171b | Smad |
| chr2 | 83815319 | 83815749 | Fam171b | Smad |
| chr2 | 83883588 | 83885179 | Fam171b | Foxc1,Nfatc1 |

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|---|---|---|---|---|
| chr2 | 91254917 | 91255510 | Pacsin3 | Smad |
| chr2 | 91255604 | 91258334 | Pacsin3 | Smad |
| chr2 | 102530965 | 102531696 | Pamr1 | Smad |
| chr2 | 102544144 | 102544533 | Pamr1 | Smad |
| chr2 | 102552054 | 102552364 | Pamr1 | Foxc1 |
| chr2 | 102807499 | 102808039 | Cd44 | Nfatc1 |
| chr2 | 102827074 | 102827501 | Cd44 | Smad |
| chr2 | 102837614 | 102839379 | Cd44 | Nfatc1 |
| chr2 | 102849405 | 102851947 | Cd44 | Smad |
| chr2 | 102862310 | 102862963 | Cd44 | Nfatc1 |
| chr2 | 102871664 | 102875784 | Cd44 | Smad |
| chr2 | 102893168 | 102895958 | Cd44 | Foxc1,Nfatc1 |
| chr2 | 102908909 | 102909929 | Cd44 | Smad |
| chr2 | 102939661 | 102941496 | Cd44 | Smad |
| chr2 | 102947938 | 102949108 | Cd44 | Smad |
| chr2 | 102957877 | 102960017 | Cd44 | Nfatc1 |
| chr2 | 109524051 | 109524900 | Bdnf | Foxc1 |
| chr2 | 109563121 | 109563377 | Bdnf | Smad |
| chr2 | 109693264 | 109695325 | Bdnf | Smad |
| chr2 | 109721750 | 109723159 | Bdnf | Smad |
| chr2 | 113363605 | 113364908 | Fmn1 | Smad |
| chr2 | 113374131 | 113374761 | Fmn1 | Nfatc1 |
| chr2 | 113386562 | 113387656 | Fmn1 | Foxc1,Nfatc1,Smad |
| chr2 | 113397454 | 113398374 | Fmn1 | Smad |
| chr2 | 113404815 | 113405522 | Fmn1 | Smad |
| chr2 | 113420589 | 113422045 | Fmn1 | Nfatc1,Smad |
| chr2 | 113428242 | 113429074 | Fmn1 | Smad |
| chr2 | 113449414 | 113450548 | Fmn1 | Smad |
| chr2 | 113469274 | 113469898 | Fmn1 | Nfatc1 |
| chr2 | 113494621 | 113495124 | Fmn1 | Smad |
| chr2 | 113544831 | 113545040 | Fmn1 | Smad |
| chr2 | 113548607 | 113549213 | Fmn1 | Nfatc1,Smad |
| chr2 | 118813886 | 118814694 | Knstrn | Smad |
| chr2 | 119262974 | 119263575 | Rhov | Smad |
| chr2 | 121056000 | 121056436 | Tgm5 | Nfatc1,Smad |
| chr2 | 121068357 | 121070962 | Tgm5 | Smad |
| chr2 | 121071627 | 121072366 | Tgm5 | Nfatc1,Smad |
| chr2 | 121117933 | 121118152 | Tgm7 | Smad |
| chr2 | 122336530 | 122337180 | Duox1 | Smad |
| chr2 | 122340886 | 122341738 | Duox1 | Smad |
| chr2 | 122344416 | 122346658 | Duox1 | Smad |
| chr2 | 128709076 | 128711091 | Mertk | Smad |
| chr2 | 131495175 | 131495426 | Smox | Nfatc1,Smad |

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|---|---|---|---|---|
| chr2 | 131509491 | 131510520 | Smox | Smad |
| chr2 | 131522750 | 131522950 | Smox | Foxc1 |
| chr2 | 131902518 | 131903623 | Prnp | Smad |
| chr2 | 131909328 | 131911015 | Prnp | Smad |
| chr2 | 131934987 | 131936157 | Prnp | Nfatc1 |
| chr2 | 133263672 | 133263942 | Bmp2 | Smad |
| chr2 | 133305231 | 133306599 | Bmp2 | Smad |
| chr2 | 133326299 | 133327093 | Bmp2 | Foxc1 |
| chr2 | 133336130 | 133336448 | Bmp2 | Nfatc1 |
| chr2 | 133378483 | 133379178 | Bmp2 | Smad |
| chr2 | 133391560 | 133393711 | Bmp2 | Smad |
| chr2 | 133397491 | 133398051 | Bmp2 | Smad |
| chr2 | 133431586 | 133433044 | Bmp2 | Smad |
| chr2 | 133443401 | 133444063 | Bmp2 | Smad |
| chr2 | 133455575 | 133456106 | Bmp2 | Smad |
| chr2 | 133551933 | 133553444 | Bmp2 | Smad |
| chr2 | 137710184 | 137710973 | Btbd3 | Smad |
| chr2 | 137715909 | 137716365 | Btbd3 | Smad |
| chr2 | 137719802 | 137720320 | Btbd3 | Nfatc1 |
| chr2 | 137757028 | 137757986 | Btbd3 | Smad |
| chr2 | 138241022 | 138241738 | Btbd3 | Smad |
| chr2 | 138247741 | 138248394 | Btbd3 | Nfatc1 |
| chr2 | 138279675 | 138280014 | Btbd3 | Smad |
| chr2 | 138281498 | 138282216 | Btbd3 | Nfatc1,Smad |
| chr2 | 138283327 | 138283661 | Btbd3 | Smad |
| chr2 | 138291194 | 138291983 | Btbd3 | Nfatc1 |
| chr2 | 138294494 | 138294702 | Btbd3 | Smad |
| chr2 | 138320628 | 138322168 | Btbd3 | Foxc1,Nfatc1,Smad |
| chr2 | 138437714 | 138438089 | Btbd3 | Smad |
| chr2 | 138477151 | 138477515 | Btbd3 | Smad |
| chr2 | 138477747 | 138477976 | Btbd3 | Nfatc1 |
| chr2 | 138483785 | 138484365 | Btbd3 | Smad |
| chr2 | 138485775 | 138486056 | Btbd3 | Smad |
| chr2 | 138503820 | 138504208 | Btbd3 | Nfatc1 |
| chr2 | 138548772 | 138549484 | Btbd3 | Smad |
| chr2 | 166116090 | 166116307 | Sulf2 | Smad |
| chr2 | 168045709 | 168046189 | Pard6b | Nfatc1 |
| chr2 | 168072802 | 168073488 | Pard6b | Smad |
| chr2 | 168080412 | 168081317 | Pard6b | Smad |
| chr3 | 9974263 | 9974681 | Fabp5 | Foxc1,Nfatc1 |
| chr3 | 10349630 | 10349830 | Zfand1 | Smad |
| chr3 | 10350308 | 10351945 | Zfand1 | Smad |
| chr3 | 54754846 | 54756703 | Smad9 | Smad |

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|---|---|---|---|---|
| chr3 | 54764145 | 54764718 | Smad9 | Nfatc1 |
| chr3 | 63412987 | 63414338 | Mme | Smad |
| chr3 | 67481392 | 67481688 | Rarres1 | Smad |
| chr3 | 84190604 | 84192025 | Trim2 | Smad |
| chr3 | 84259431 | 84259901 | Trim2 | Smad |
| chr3 | 84287162 | 84287362 | Trim2 | Smad |
| chr3 | 84314603 | 84315153 | Trim2 | Foxc1,Smad |
| chr3 | 84318543 | 84320503 | Trim2 | Smad |
| chr3 | 84323798 | 84325274 | Trim2 | Nfatc1,Smad |
| chr3 | 90597377 | 90598757 | S100a3 | Foxc1 |
| chr3 | 90599980 | 90602594 | S100a3 | Smad |
| chr3 | 92822429 | 92822654 | Kprp | Smad |
| chr3 | 92825968 | 92826168 | Kprp | Smad |
| chr3 | 95674266 | 95676237 | Adamtsl4 | Nfatc1 |
| chr3 | 95696260 | 95696950 | Adamtsl4 | Smad |
| chr3 | 95732774 | 95735708 | Ecm1 | Smad |
| chr3 | 95738365 | 95739875 | Ecm1 | Smad |
| chr3 | 96669549 | 96670734 | Ankrd35 | Smad |
| chr3 | 96675127 | 96675363 | Ankrd35 | Foxc1 |
| chr3 | 100505968 | 100508026 | Fam46c | Foxc1,Smad |
| chr3 | 102430258 | 102430663 | Ngf | Smad |
| chr3 | 102469716 | 102470537 | Ngf | Foxc1,Smad |
| chr3 | 102500888 | 102501826 | Ngf | Nfatc1 |
| chr3 | 102574403 | 102574788 | Ngf | Nfatc1 |
| chr3 | 102738328 | 102739035 | Tspan2 | Foxc1,Smad |
| chr3 | 107399857 | 107400428 | Kcnc4 | Smad |
| chr3 | 107445714 | 107446341 | Kcnc4 | Smad |
| chr3 | 107458291 | 107458915 | Kcnc4 | Smad |
| chr3 | 121424645 | 121425960 | Cnn3 | Nfatc1 |
| chr3 | 131327475 | 131328308 | Sgms2 | Nfatc1 |
| chr3 | 132880758 | 132881517 | Npnt | Nfatc1 |
| chr3 | 132893735 | 132894605 | Npnt | Smad |
| chr3 | 132915301 | 132916323 | Npnt | Smad |
| chr3 | 132945578 | 132946312 | Npnt | Smad |
| chr3 | 135155059 | 135156338 | Cenpe | Smad |
| chr3 | 135245575 | 135245998 | Cenpe | Nfatc1,Smad |
| chr3 | 135816492 | 135817156 | Slc39a8 | Foxc1 |
| chr3 | 135824354 | 135826924 | Slc39a8 | Smad |
| chr3 | 135886543 | 135886961 | Slc39a8 | Smad |
| chr3 | 145651232 | 145651864 | Cyr61 | Nfatc1 |
| chr3 | 145681266 | 145681847 | Cyr61 | Smad |
| chr3 | 145684570 | 145685704 | Cyr61 | Foxc1 |
| chr4 | 41082750 | 41083562 | Aqp3 | Smad |

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|---|---|---|---|---|
| chr4 | 41813695 | 41814008 | Ccl27a | Smad |
| chr4 | 41822346 | 41823476 | Ccl27a | Nfatc1,Smad |
| chr4 | 43058407 | 43059566 | Unc13b | Smad |
| chr4 | 43208997 | 43209996 | Unc13b | Smad |
| chr4 | 63949691 | 63950648 | Tnc | Smad |
| chr4 | 63958528 | 63959370 | Tnc | Smad |
| chr4 | 63982513 | 63982715 | Tnc | Smad |
| chr4 | 63982979 | 63983212 | Tnc | Smad |
| chr4 | 63996128 | 63996493 | Tnc | Nfatc1,Smad |
| chr4 | 64009739 | 64010294 | Tnc | Smad |
| chr4 | 64046476 | 64047562 | Tnc | Smad |
| chr4 | 64048275 | 64048616 | Tnc | Nfatc1 |
| chr4 | 64092202 | 64093402 | Tnc | Smad |
| chr4 | 64131955 | 64132869 | Tnc | Smad |
| chr4 | 64142234 | 64142985 | Tnc | Smad |
| chr4 | 64156300 | 64156614 | Tnc | Smad |
| chr4 | 64175972 | 64176172 | Tnc | Smad |
| chr4 | 64219886 | 64220419 | Tnc | Foxc1 |
| chr4 | 64237660 | 64238634 | Tnc | Smad |
| chr4 | 64281118 | 64281352 | Tnc | Smad |
| chr4 | 64306891 | 64307202 | Tnc | Nfatc1,Smad |
| chr4 | 64324324 | 64324815 | Tnc | Nfatc1 |
| chr4 | 64431369 | 64432797 | Tnc | Smad |
| chr4 | 64451189 | 64452268 | Tnc | Nfatc1,Smad |
| chr4 | 64497798 | 64498210 | Tnc | Nfatc1 |
| chr4 | 80886533 | 80887195 | Lurap1l | Smad |
| chr4 | 80910606 | 80911605 | Lurap1l | Nfatc1 |
| chr4 | 83301849 | 83303883 | Ttc39b | Nfatc1,Smad |
| chr4 | 83342500 | 83343263 | Ttc39b | Smad |
| chr4 | 83350458 | 83351578 | Ttc39b | Nfatc1,Smad |
| chr4 | 105156872 | 105157872 | Ppap2b | Smad |
| chr4 | 105158154 | 105158579 | Ppap2b | Smad |
| chr4 | 105175524 | 105175724 | Ppap2b | Smad |
| chr4 | 105213937 | 105214983 | Ppap2b | Nfatc1,Smad |
| chr4 | 105225609 | 105225928 | Ppap2b | Smad |
| chr4 | 105242158 | 105242618 | Ppap2b | Smad |
| chr4 | 105245595 | 105246122 | Ppap2b | Smad |
| chr4 | 105328660 | 105329597 | Ppap2b | Nfatc1 |
| chr4 | 105352790 | 105353204 | Ppap2b | Smad |
| chr4 | 105480057 | 105480618 | Ppap2b | Smad |
| chr4 | 105608389 | 105608642 | Ppap2b | Smad |
| chr4 | 105640822 | 105641781 | Ppap2b | Smad |
| chr4 | 105692362 | 105692942 | Ppap2b | Nfatc1 |

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|---|---|---|---|---|
| chr4 | 114348883 | 114349980 | Trabd2b | Foxc1,Smad |
| chr4 | 114361016 | 114361920 | Trabd2b | Smad |
| chr4 | 114370984 | 114371192 | Trabd2b | Smad |
| chr4 | 114377400 | 114378924 | Trabd2b | Smad |
| chr4 | 114382460 | 114383473 | Trabd2b | Nfatc1 |
| chr4 | 114384745 | 114388832 | Trabd2b | Smad |
| chr4 | 114394539 | 114394905 | Trabd2b | Smad |
| chr4 | 114405589 | 114407889 | Trabd2b | Smad |
| chr4 | 114410359 | 114410884 | Trabd2b | Foxc1,Nfatc1 |
| chr4 | 114411946 | 114412415 | Trabd2b | Smad |
| chr4 | 114509121 | 114510935 | Trabd2b | Smad |
| chr4 | 114545501 | 114546123 | Trabd2b | Smad |
| chr4 | 114564277 | 114564648 | Trabd2b | Foxc1,Smad |
| chr4 | 114601309 | 114602245 | Trabd2b | Smad |
| chr4 | 114610858 | 114613273 | Trabd2b | Nfatc1 |
| chr4 | 114613947 | 114614789 | Trabd2b | Smad |
| chr4 | 114635829 | 114636285 | Trabd2b | Smad |
| chr4 | 114665598 | 114666164 | Trabd2b | Nfatc1,Smad |
| chr4 | 114688535 | 114688836 | Trabd2b | Nfatc1 |
| chr4 | 117829534 | 117829959 | Slc6a9 | Smad |
| chr4 | 119739194 | 119740384 | Hivep3 | Smad |
| chr4 | 119785027 | 119785319 | Hivep3 | Smad |
| chr4 | 119786926 | 119787126 | Hivep3 | Smad |
| chr4 | 119789435 | 119790125 | Hivep3 | Smad |
| chr4 | 119932189 | 119933693 | Hivep3 | Smad |
| chr4 | 119998137 | 119999164 | Hivep3 | Nfatc1 |
| chr4 | 120031532 | 120033545 | Hivep3 | Smad |
| chr4 | 120071414 | 120072838 | Hivep3 | Smad |
| chr4 | 120131495 | 120131995 | Hivep3 | Smad |
| chr4 | 124936645 | 124937483 | Cdca8 | Smad |
| chr4 | 126309812 | 126310246 | Col8a2 | Smad |
| chr4 | 126320972 | 126322221 | Tekt2 | Smad |
| chr4 | 126324934 | 126325752 | Tekt2 | Nfatc1 |
| chr4 | 126326813 | 126328494 | Tekt2 | Nfatc1,Smad |
| chr4 | 127347519 | 127350559 | Gjb4 | Smad |
| chr4 | 127352240 | 127353224 | Gjb4 | Foxc1 |
| chr4 | 137271820 | 137272098 | Wnt4 | Smad |
| chr4 | 147936265 | 147939183 | Plod1 | Smad |
| chr4 | 147993200 | 147994426 | Nppb | Smad |
| chr4 | 155275617 | 155276234 | Prkcz | Smad |
| chr4 | 155360827 | 155362119 | Prkcz | Smad |
| chr5 | 13915207 | 13915448 | Sema3e | Nfatc1 |
| chr5 | 13932380 | 13932793 | Sema3e | Smad |

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|---|---|---|---|---|
| chr5 | 13974630 | 13975059 | Sema3e | Smad |
| chr5 | 13977235 | 13977506 | Sema3e | Smad |
| chr5 | 13983740 | 13984631 | Sema3e | Smad |
| chr5 | 13992563 | 13993515 | Sema3e | Smad |
| chr5 | 13993932 | 13994430 | Sema3e | Smad |
| chr5 | 14022737 | 14023168 | Sema3e | Smad |
| chr5 | 14026626 | 14026969 | Sema3e | Foxc1 |
| chr5 | 14032168 | 14032493 | Sema3e | Smad |
| chr5 | 14048671 | 14049165 | Sema3e | Smad |
| chr5 | 14059709 | 14061390 | Sema3e | Foxc1,Nfatc1,Smad |
| chr5 | 14062529 | 14064922 | Sema3e | Smad |
| chr5 | 14072876 | 14073557 | Sema3e | Smad |
| chr5 | 14074875 | 14075226 | Sema3e | Nfatc1 |
| chr5 | 14075807 | 14076115 | Sema3e | Smad |
| chr5 | 14087487 | 14089104 | Sema3e | Smad |
| chr5 | 14089534 | 14091535 | Sema3e | Nfatc1 |
| chr5 | 14177799 | 14178015 | Sema3e | Nfatc1 |
| chr5 | 14198614 | 14198916 | Sema3e | Smad |
| chr5 | 14198922 | 14199224 | Sema3e | Nfatc1 |
| chr5 | 14230663 | 14231760 | Sema3e | Nfatc1 |
| chr5 | 14271300 | 14271500 | Sema3e | Smad |
| chr5 | 14306421 | 14306999 | Sema3e | Smad |
| chr5 | 14313687 | 14314118 | Sema3e | Foxc1 |
| chr5 | 14315630 | 14315842 | Sema3e | Nfatc1 |
| chr5 | 14317196 | 14317464 | Sema3e | Smad |
| chr5 | 17539260 | 17539460 | Sema3c | Nfatc1 |
| chr5 | 17544246 | 17545022 | Sema3c | Smad |
| chr5 | 17571212 | 17572240 | Sema3c | Smad |
| chr5 | 17573476 | 17576757 | Sema3c | Foxc1 |
| chr5 | 17623236 | 17623859 | Sema3c | Nfatc1 |
| chr5 | 17641773 | 17642344 | Sema3c | Smad |
| chr5 | 17711339 | 17711706 | Sema3c | Smad |
| chr5 | 30945194 | 30946272 | Cgref1 | Smad |
| chr5 | 57713917 | 57720265 | Pcdh7 | Smad |
| chr5 | 57721991 | 57722848 | Pcdh7 | Smad |
| chr5 | 57732544 | 57733819 | Pcdh7 | Smad |
| chr5 | 57755645 | 57756334 | Pcdh7 | Nfatc1,Smad |
| chr5 | 57765325 | 57765626 | Pcdh7 | Smad |
| chr5 | 57801732 | 57803684 | Pcdh7 | Smad |
| chr5 | 57884765 | 57885442 | Pcdh7 | Nfatc1 |
| chr5 | 57906963 | 57907177 | Pcdh7 | Smad |
| chr5 | 57918968 | 57919406 | Pcdh7 | Nfatc1 |
| chr5 | 57940474 | 57940902 | Pcdh7 | Nfatc1,Smad |

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|---|---|---|---|---|
| chr5 | 57942689 | 57944629 | Pcdh7 | Smad |
| chr5 | 57961984 | 57963205 | Pcdh7 | Smad |
| chr5 | 57976129 | 57976843 | Pcdh7 | Smad |
| chr5 | 57986686 | 57987919 | Pcdh7 | Nfatc1 |
| chr5 | 57996296 | 57996496 | Pcdh7 | Smad |
| chr5 | 58034026 | 58034791 | Pcdh7 | Smad |
| chr5 | 58050906 | 58051298 | Pcdh7 | Smad |
| chr5 | 65428301 | 65429506 | Ugdh | Smad |
| chr5 | 65434755 | 65437500 | Ugdh | Smad |
| chr5 | 77074817 | 77075430 | Hopx | Foxc1 |
| chr5 | 77080350 | 77081744 | Hopx | Smad |
| chr5 | 77085657 | 77085857 | Hopx | Smad |
| chr5 | 77089256 | 77089680 | Hopx | Nfatc1 |
| chr5 | 77091997 | 77093170 | Hopx | Smad |
| chr5 | 77094672 | 77096426 | Hopx | Nfatc1 |
| chr5 | 77114669 | 77115772 | Hopx | Smad |
| chr5 | 77122932 | 77123232 | Hopx | Foxc1 |
| chr5 | 77136614 | 77137087 | Hopx | Nfatc1 |
| chr5 | 88853307 | 88854053 | Slc4a4 | Foxc1,Smad |
| chr5 | 88886041 | 88886290 | Slc4a4 | Smad |
| chr5 | 88949947 | 88950740 | Slc4a4 | Nfatc1 |
| chr5 | 88956130 | 88956390 | Slc4a4 | Smad |
| chr5 | 88956820 | 88957445 | Slc4a4 | Smad |
| chr5 | 88994576 | 88994788 | Slc4a4 | Smad |
| chr5 | 89002353 | 89002553 | Slc4a4 | Nfatc1,Smad |
| chr5 | 89101979 | 89102188 | Slc4a4 | Nfatc1 |
| chr5 | 89139914 | 89140114 | Slc4a4 | Smad |
| chr5 | 91476661 | 91477158 | Parm1 | Smad |
| chr5 | 91491486 | 91492151 | Parm1 | Smad |
| chr5 | 91517292 | 91518059 | Parm1 | Smad |
| chr5 | 91574272 | 91574552 | Parm1 | Nfatc1,Smad |
| chr5 | 91606305 | 91607449 | Parm1 | Smad |
| chr5 | 91620322 | 91621733 | Parm1 | Smad |
| chr5 | 91651226 | 91651625 | Parm1 | Foxc1 |
| chr5 | 91653042 | 91653960 | Parm1 | Foxc1 |
| chr5 | 92348747 | 92349192 | Cxcl10 | Smad |
| chr5 | 96790188 | 96790539 | Anxa3 | Smad |
| chr5 | 96792737 | 96793107 | Anxa3 | Smad |
| chr5 | 96804238 | 96804786 | Anxa3 | Smad |
| chr5 | 96905947 | 96906631 | Anxa3 | Smad |
| chr5 | 100865421 | 100866686 | Agpat9 | Smad |
| chr5 | 100869127 | 100869744 | Agpat9 | Foxc1 |
| chr5 | 100886193 | 100886922 | Agpat9 | Smad |

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| chr5 | 100917458 | 100917731 | Agpat9 | Smad |
| chr5 | 100919215 | 100919492 | Agpat9 | Nfatc1 |
| chr5 | 101020822 | 101021077 | Agpat9 | Foxc1 |
| chr5 | 101057045 | 101057373 | Agpat9 | Nfatc1 |
| chr5 | 101091130 | 101091722 | Agpat9 | Smad |
| chr5 | 101126268 | 101126611 | Agpat9 | Smad |
| chr5 | 101163115 | 101163601 | Agpat9 | Nfatc1 |
| chr5 | 101172680 | 101173411 | Agpat9 | Smad |
| chr5 | 101173839 | 101174744 | Agpat9 | Smad |
| chr5 | 101216805 | 101217649 | Agpat9 | Nfatc1 |
| chr5 | 101241167 | 101241367 | Agpat9 | Smad |
| chr5 | 116392643 | 116393284 | Hspb8 | Smad |
| chr5 | 116394881 | 116395423 | Hspb8 | Smad |
| chr5 | 116399982 | 116400653 | Hspb8 | Foxc1 |
| chr5 | 116410163 | 116412080 | Hspb8 | Smad |
| chr5 | 116417171 | 116418420 | Hspb8 | Nfatc1,Smad |
| chr5 | 116419124 | 116421289 | Hspb8 | Smad |
| chr5 | 116421623 | 116424555 | Hspb8 | Smad |
| chr5 | 124006568 | 124007926 | Vps37b | Nfatc1,Smad |
| chr5 | 134946914 | 134947295 | Cldn4 | Smad |
| chr5 | 134951110 | 134951646 | Cldn4 | Smad |
| chr5 | 134965916 | 134966909 | Cldn4 | Smad |
| chr5 | 135887295 | 135891657 | Hspb1 | Smad |
| chr5 | 137293157 | 137295011 | Ache | Nfatc1 |
| chr5 | 139796011 | 139797621 | Mafk | Nfatc1 |
| chr5 | 142628981 | 142629939 | Wipi2 | Smad |
| chr5 | 142920648 | 142921315 | Actb | Smad |
| chr6 | 29430831 | 29433705 | Flnc | Foxc1,Smad |
| chr6 | 30567930 | 30571307 | Cpa4 | Nfatc1,Smad |
| chr6 | 36691605 | 36691869 | Ptn | Smad |
| chr6 | 36701104 | 36701453 | Ptn | Smad |
| chr6 | 36771865 | 36772801 | Ptn | Smad |
| chr6 | 36797439 | 36797785 | Ptn | Foxc1,Smad |
| chr6 | 36808136 | 36810529 | Ptn | Smad |
| chr6 | 42339750 | 42340965 | Zyx | Nfatc1,Smad |
| chr6 | 42351453 | 42352677 | Zyx | Smad |
| chr6 | 42352844 | 42353747 | Zyx | Smad |
| chr6 | 48537144 | 48537936 | Atp6v0e2 | Smad |
| chr6 | 52216863 | 52218400 | Hoxa7 | Smad |
| chr6 | 58536380 | 58536580 | Abcg2 | Nfatc1 |
| chr6 | 58594057 | 58594517 | Abcg2 | Smad |
| chr6 | 58608499 | 58608721 | Abcg2 | Nfatc1 |
| chr6 | 58610590 | 58611039 | Abcg2 | Smad |

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|---|---|---|---|---|
| chr6 | 58652455 | 58653044 | Abcg2 | Foxc1 |
| chr6 | 58751264 | 58751707 | Abcg2 | Nfatc1 |
| chr6 | 72220352 | 72220788 | Atoh8 | Nfatc1 |
| chr6 | 72242432 | 72243768 | Atoh8 | Smad |
| chr6 | 72261174 | 72261641 | Atoh8 | Smad |
| chr6 | 82702681 | 82703064 | Hk2 | Smad |
| chr6 | 82740116 | 82740856 | Hk2 | Smad |
| chr6 | 82750623 | 82751483 | Hk2 | Nfatc1,Smad |
| chr6 | 82771842 | 82775390 | Hk2 | Smad |
| chr6 | 87160006 | 87160758 | Antxr1 | Smad |
| chr6 | 87161190 | 87161732 | Antxr1 | Smad |
| chr6 | 87186388 | 87187603 | Antxr1 | Smad |
| chr6 | 87189842 | 87190130 | Antxr1 | Foxc1,Nfatc1,Smad |
| chr6 | 87222985 | 87223324 | Antxr1 | Smad |
| chr6 | 87277483 | 87277863 | Antxr1 | Foxc1 |
| chr6 | 87281902 | 87282660 | Antxr1 | Smad |
| chr6 | 91617142 | 91617572 | Slc6a6 | Smad |
| chr6 | 91647177 | 91648075 | Slc6a6 | Smad |
| chr6 | 91652072 | 91653069 | Slc6a6 | Smad |
| chr6 | 91675291 | 91675578 | Slc6a6 | Smad |
| chr6 | 91679252 | 91679660 | Slc6a6 | Foxc1,Smad |
| chr6 | 91683690 | 91684731 | Slc6a6 | Smad |
| chr6 | 97743724 | 97744709 | Mitf | Smad |
| chr6 | 97894509 | 97894905 | Mitf | Nfatc1 |
| chr6 | 98121021 | 98121316 | Mitf | Smad |
| chr6 | 98666523 | 98666744 | Foxp1 | Smad |
| chr6 | 98667317 | 98667640 | Foxp1 | Foxc1,Smad |
| chr6 | 98726621 | 98726965 | Foxp1 | Smad |
| chr6 | 98779104 | 98779373 | Foxp1 | Smad |
| chr6 | 98842823 | 98843306 | Foxp1 | Smad |
| chr6 | 98850711 | 98851440 | Foxp1 | Smad |
| chr6 | 98947295 | 98949341 | Foxp1 | Foxc1,Nfatc1,Smad |
| chr6 | 98949586 | 98950517 | Foxp1 | Smad |
| chr6 | 99030099 | 99030527 | Foxp1 | Smad |
| chr6 | 99084433 | 99085389 | Foxp1 | Smad |
| chr6 | 99171783 | 99172303 | Foxp1 | Foxc1 |
| chr6 | 99217777 | 99218352 | Foxp1 | Smad |
| chr6 | 99266334 | 99266534 | Foxp1 | Smad |
| chr6 | 99284127 | 99284340 | Foxp1 | Smad |
| chr6 | 99350601 | 99350933 | Foxp1 | Smad |
| chr6 | 99388448 | 99389198 | Foxp1 | Smad |
| chr6 | 99392542 | 99393035 | Foxp1 | Smad |
| chr6 | 99440186 | 99440513 | Foxp1 | Foxc1,Nfatc1 |

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|---|---|---|---|---|
| chr6 | 99527983 | 99529705 | Foxp1 | Foxc1 |
| chr6 | 112818312 | 112818953 | Srgap3 | Smad |
| chr6 | 112822996 | 112823580 | Srgap3 | Nfatc1 |
| chr6 | 112842560 | 112842761 | Srgap3 | Nfatc1 |
| chr6 | 112946145 | 112947639 | Srgap3 | Smad |
| chr6 | 115760853 | 115761729 | Tmem40 | Nfatc1,Smad |
| chr6 | 115762343 | 115762625 | Tmem40 | Smad |
| chr6 | 118791798 | 118792578 | Cacna1c | Smad |
| chr6 | 119018217 | 119019607 | Cacna1c | Smad |
| chr6 | 119081714 | 119082102 | Cacna1c | Foxc1,Smad |
| chr6 | 119089103 | 119089709 | Cacna1c | Smad |
| chr6 | 119104347 | 119105132 | Cacna1c | Smad |
| chr6 | 119174864 | 119175920 | Cacna1c | Smad |
| chr6 | 128281878 | 128283035 | Tead4 | Smad |
| chr6 | 128308320 | 128308673 | Tead4 | Smad |
| chr6 | 128992040 | 128993590 | BC064078 | Smad |
| chr6 | 135343990 | 135344622 | Emp1 | Smad |
| chr6 | 135377364 | 135386988 | Emp1 | Nfatc1 |
| chr6 | 135387827 | 135388027 | Emp1 | Foxc1 |
| chr6 | 135398698 | 135399385 | Emp1 | Smad |
| chr6 | 135430533 | 135431024 | Emp1 | Smad |
| chr6 | 135444717 | 135445039 | Emp1 | Smad |
| chr6 | 135504549 | 135504951 | Emp1 | Nfatc1,Smad |
| chr6 | 145881688 | 145882362 | Bhlhe41 | Foxc1 |
| chr6 | 148315684 | 148315959 | Tmtc1 | Smad |
| chr6 | 148335262 | 148335663 | Tmtc1 | Nfatc1 |
| chr6 | 148336622 | 148337043 | Tmtc1 | Smad |
| chr6 | 148360482 | 148361244 | Tmtc1 | Smad |
| chr6 | 148442551 | 148444899 | Tmtc1 | Smad |
| chr6 | 148454769 | 148455639 | Tmtc1 | Smad |
| chr6 | 148468994 | 148470640 | Tmtc1 | Smad |
| chr6 | 149132367 | 149132841 | Mettl20 | Smad |
| chr6 | 149138010 | 149138210 | Mettl20 | Smad |
| chr7 | 3149945 | 3151278 | AU018091 | Foxc1 |
| chr7 | 3184418 | 3184627 | AU018091 | Nfatc1,Smad |
| chr7 | 4463565 | 4465762 | Eps8l1 | Smad |
| chr7 | 4475642 | 4476687 | Eps8l1 | Smad |
| chr7 | 24480154 | 24482051 | Cadm4 | Smad |
| chr7 | 24499957 | 24500808 | Cadm4 | Smad |
| chr7 | 25208795 | 25209959 | Dedd2 | Smad |
| chr7 | 25217518 | 25221889 | Dedd2 | Smad |
| chr7 | 28100599 | 28101012 | Fcgbp | Smad |
| chr7 | 30762524 | 30764212 | Dmkn | Nfatc1 |

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|---|---|---|---|---|
| chr7 | 30775613 | 30777804 | Dmkn | Smad |
| chr7 | 43788166 | 43788470 | Klk10 | Smad |
| chr7 | 44661794 | 44663359 | Myh14 | Nfatc1,Smad |
| chr7 | 44667948 | 44670002 | Myh14 | Smad |
| chr7 | 44672263 | 44672672 | Myh14 | Smad |
| chr7 | 65872489 | 65874155 | Pcsk6 | Smad |
| chr7 | 65881215 | 65881614 | Pcsk6 | Smad |
| chr7 | 66842074 | 66842417 | Adamts17 | Foxc1 |
| chr7 | 66933305 | 66934548 | Adamts17 | Nfatc1 |
| chr7 | 67024850 | 67025099 | Adamts17 | Smad |
| chr7 | 67064584 | 67064784 | Adamts17 | Nfatc1,Smad |
| chr7 | 67186356 | 67186568 | Adamts17 | Smad |
| chr7 | 68681974 | 68683532 | Arrdc4 | Smad |
| chr7 | 68691271 | 68691829 | Arrdc4 | Smad |
| chr7 | 68717595 | 68718517 | Arrdc4 | Smad |
| chr7 | 68722864 | 68723409 | Arrdc4 | Smad |
| chr7 | 68736659 | 68736973 | Arrdc4 | Smad |
| chr7 | 68747624 | 68750204 | Arrdc4 | Smad |
| chr7 | 68823212 | 68823658 | Arrdc4 | Smad |
| chr7 | 68829999 | 68830284 | Arrdc4 | Smad |
| chr7 | 68833524 | 68833845 | Arrdc4 | Nfatc1,Smad |
| chr7 | 69086799 | 69086999 | Arrdc4 | Smad |
| chr7 | 79829362 | 79829575 | Anpep | Smad |
| chr7 | 88214367 | 88215678 | Ctsc | Nfatc1,Smad |
| chr7 | 88248816 | 88249201 | Ctsc | Smad |
| chr7 | 88270918 | 88272256 | Ctsc | Nfatc1 |
| chr7 | 88344711 | 88344911 | Ctsc | Smad |
| chr7 | 88346261 | 88346563 | Ctsc | Nfatc1 |
| chr7 | 88365590 | 88365883 | Ctsc | Foxc1,Smad |
| chr7 | 89581046 | 89581260 | Me3 | Smad |
| chr7 | 89610872 | 89611914 | Me3 | Nfatc1,Smad |
| chr7 | 89687812 | 89688126 | Me3 | Smad |
| chr7 | 89698302 | 89698637 | Me3 | Smad |
| chr7 | 89707587 | 89708651 | Me3 | Smad |
| chr7 | 89712557 | 89713273 | Me3 | Smad |
| chr7 | 89769218 | 89769801 | Me3 | Foxc1 |
| chr7 | 89787121 | 89788781 | Me3 | Smad |
| chr7 | 89799611 | 89801570 | Me3 | Smad |
| chr7 | 89809282 | 89809907 | Me3 | Smad |
| chr7 | 89835470 | 89836226 | Me3 | Nfatc1,Smad |
| chr7 | 89837297 | 89838976 | Me3 | Foxc1,Smad |
| chr7 | 98788449 | 98789159 | Wnt11 | Smad |
| chr7 | 98815057 | 98818366 | Wnt11 | Smad |

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|---|---|---|---|---|
| chr7 | 98837660 | 98839201 | Wnt11 | Nfatc1,Smad |
| chr7 | 100493707 | 100494250 | Ucp2 | Foxc1 |
| chr7 | 100495091 | 100496081 | Ucp2 | Smad |
| chr7 | 100500125 | 100500340 | Ucp2 | Smad |
| chr7 | 109781028 | 109782620 | Nrip3 | Smad |
| chr7 | 109836690 | 109838016 | Scube2 | Smad |
| chr7 | 109852508 | 109853695 | Scube2 | Smad |
| chr7 | 109872655 | 109873165 | Scube2 | Smad |
| chr7 | 133780704 | 133780916 | Dhx32 | Smad |
| chr7 | 135537275 | 135538537 | Ptpre | Smad |
| chr7 | 135572073 | 135572624 | Ptpre | Smad |
| chr7 | 135605114 | 135605752 | Ptpre | Nfatc1 |
| chr7 | 135609574 | 135611046 | Ptpre | Smad |
| chr7 | 135612357 | 135613538 | Ptpre | Smad |
| chr7 | 135631865 | 135632224 | Ptpre | Nfatc1 |
| chr7 | 135653300 | 135654737 | Ptpre | Smad |
| chr7 | 135659291 | 135660029 | Ptpre | Smad |
| chr7 | 135699262 | 135699836 | Mki67 | Nfatc1 |
| chr7 | 135728013 | 135728667 | Mki67 | Nfatc1,Smad |
| chr7 | 135734452 | 135736784 | Mki67 | Smad |
| chr7 | 135740158 | 135740949 | Mki67 | Nfatc1,Smad |
| chr7 | 135748948 | 135749626 | Mki67 | Smad |
| chr7 | 135768439 | 135768946 | Mki67 | Nfatc1,Smad |
| chr7 | 135889142 | 135889510 | Mki67 | Nfatc1,Smad |
| chr7 | 144684577 | 144684827 | Ano1 | Smad |
| chr8 | 4433082 | 4433785 | Cers4 | Nfatc1 |
| chr8 | 4436375 | 4436887 | Cers4 | Smad |
| chr8 | 4481349 | 4482298 | Cers4 | Nfatc1,Smad |
| chr8 | 4483088 | 4484444 | Cers4 | Smad |
| chr8 | 4491498 | 4494318 | Cers4 | Nfatc1 |
| chr8 | 4495204 | 4496781 | Cers4 | Smad |
| chr8 | 4505111 | 4505812 | Cers4 | Smad |
| chr8 | 4507592 | 4508123 | Cers4 | Smad |
| chr8 | 4512029 | 4512663 | Cers4 | Smad |
| chr8 | 7469096 | 7469874 | Efnb2 | Nfatc1 |
| chr8 | 7876408 | 7876608 | Efnb2 | Smad |
| chr8 | 7944179 | 7944751 | Efnb2 | Smad |
| chr8 | 7944889 | 7945412 | Efnb2 | Nfatc1 |
| chr8 | 7946043 | 7946903 | Efnb2 | Smad |
| chr8 | 7977010 | 7977644 | Efnb2 | Foxc1,Smad |
| chr8 | 8040827 | 8041253 | Efnb2 | Foxc1,Nfatc1,Smad |
| chr8 | 8050735 | 8051531 | Efnb2 | Nfatc1,Smad |
| chr8 | 8102348 | 8103078 | Efnb2 | Smad |

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| chr8 | 8107731 | 8107977 | Efnb2 | Smad |
| chr8 | 8109298 | 8110448 | Efnb2 | Smad |
| chr8 | 8122874 | 8123627 | Efnb2 | Smad |
| chr8 | 8132373 | 8133685 | Efnb2 | Smad |
| chr8 | 8142017 | 8143490 | Efnb2 | Nfatc1 |
| chr8 | 8246074 | 8247233 | Efnb2 | Smad |
| chr8 | 8254505 | 8255363 | Efnb2 | Nfatc1 |
| chr8 | 8260018 | 8261089 | Efnb2 | Smad |
| chr8 | 8273663 | 8275760 | Efnb2 | Smad |
| chr8 | 8303241 | 8303442 | Efnb2 | Smad |
| chr8 | 8307155 | 8308193 | Efnb2 | Smad |
| chr8 | 8315775 | 8315986 | Efnb2 | Nfatc1 |
| chr8 | 8365544 | 8366223 | Efnb2 | Foxc1 |
| chr8 | 8452094 | 8452923 | Efnb2 | Smad |
| chr8 | 8457641 | 8458048 | Efnb2 | Nfatc1,Smad |
| chr8 | 8461901 | 8462101 | Efnb2 | Nfatc1 |
| chr8 | 8488429 | 8489536 | Efnb2 | Smad |
| chr8 | 8499926 | 8500269 | Efnb2 | Smad |
| chr8 | 8567238 | 8569036 | Efnb2 | Smad |
| chr8 | 8639356 | 8640658 | Efnb2 | Smad |
| chr8 | 8648767 | 8650957 | Efnb2 | Nfatc1,Smad |
| chr8 | 8652448 | 8652809 | Efnb2 | Nfatc1 |
| chr8 | 8653072 | 8653341 | Efnb2 | Smad |
| chr8 | 11628262 | 11629031 | Ankrd10 | Smad |
| chr8 | 11632466 | 11634138 | Ankrd10 | Foxc1 |
| chr8 | 11634353 | 11638290 | Ankrd10 | Smad |
| chr8 | 24317539 | 24318425 | 1810011O10Rik | Nfatc1 |
| chr8 | 24364355 | 24365786 | 1810011O10Rik | Smad |
| chr8 | 24419739 | 24421324 | 1810011O10Rik | Nfatc1 |
| chr8 | 24427702 | 24428315 | 1810011O10Rik | Nfatc1 |
| chr8 | 24430189 | 24431896 | 1810011O10Rik | Smad |
| chr8 | 24450246 | 24450874 | 1810011O10Rik | Smad |
| chr8 | 31713940 | 31715065 | Nrg1 | Foxc1 |
| chr8 | 31720464 | 31721130 | Nrg1 | Smad |
| chr8 | 31812869 | 31813069 | Nrg1 | Foxc1 |
| chr8 | 31847087 | 31847287 | Nrg1 | Foxc1 |
| chr8 | 31875790 | 31875990 | Nrg1 | Smad |
| chr8 | 31906815 | 31907103 | Nrg1 | Smad |
| chr8 | 31907851 | 31908051 | Nrg1 | Smad |
| chr8 | 31927654 | 31928515 | Nrg1 | Nfatc1 |
| chr8 | 33601485 | 33601778 | Ppp2cb | Smad |
| chr8 | 33606160 | 33606505 | Ppp2cb | Smad |
| chr8 | 33607250 | 33607678 | Ppp2cb | Smad |

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|---|---|---|---|---|
| chr8 | 34804242 | 34809185 | Dusp4 | Nfatc1 |
| chr8 | 35205408 | 35205866 | Ppp1r3b | Smad |
| chr8 | 35223966 | 35224680 | Ppp1r3b | Smad |
| chr8 | 35243048 | 35244309 | Ppp1r3b | Foxc1,Nfatc1 |
| chr8 | 35275993 | 35277030 | Ppp1r3b | Smad |
| chr8 | 35300383 | 35301335 | Ppp1r3b | Smad |
| chr8 | 35358393 | 35358628 | Ppp1r3b | Smad |
| chr8 | 35401401 | 35402098 | Ppp1r3b | Smad |
| chr8 | 35419838 | 35420435 | Ppp1r3b | Smad |
| chr8 | 40424788 | 40425180 | Zdhhc2 | Foxc1 |
| chr8 | 40464474 | 40465768 | Zdhhc2 | Smad |
| chr8 | 40485384 | 40486492 | Zdhhc2 | Nfatc1,Smad |
| chr8 | 45875101 | 45875858 | Pdlim3 | Smad |
| chr8 | 57428804 | 57429875 | Scrg1 | Smad |
| chr8 | 60597683 | 60597903 | Mfap3l | Nfatc1,Smad |
| chr8 | 60605419 | 60605821 | Mfap3l | Nfatc1 |
| chr8 | 60627427 | 60628575 | Mfap3l | Smad |
| chr8 | 60639497 | 60640818 | Mfap3l | Nfatc1 |
| chr8 | 60728926 | 60729503 | Mfap3l | Smad |
| chr8 | 60773322 | 60773949 | Mfap3l | Smad |
| chr8 | 75083211 | 75084769 | Hmox1 | Foxc1,Smad |
| chr8 | 75089248 | 75090304 | Hmox1 | Smad |
| chr8 | 75098353 | 75098554 | Hmox1 | Smad |
| chr8 | 75100491 | 75101753 | Hmox1 | Smad |
| chr8 | 76973150 | 76973617 | Nr3c2 | Smad |
| chr8 | 77132742 | 77133430 | Nr3c2 | Smad |
| chr8 | 77723489 | 77724781 | Ednra | Smad |
| chr8 | 77774645 | 77775452 | Ednra | Smad |
| chr8 | 77775497 | 77775814 | Ednra | Smad |
| chr8 | 77787639 | 77788120 | Ednra | Smad |
| chr8 | 79903865 | 79904176 | Hhip | Smad |
| chr8 | 80057351 | 80058059 | Hhip | Smad |
| chr8 | 81341454 | 81342098 | Inpp4b | Smad |
| chr8 | 81342500 | 81343031 | Inpp4b | Smad |
| chr8 | 81383965 | 81384556 | Inpp4b | Smad |
| chr8 | 81480010 | 81480247 | Inpp4b | Smad |
| chr8 | 81624462 | 81624868 | Inpp4b | Smad |
| chr8 | 81625716 | 81625925 | Inpp4b | Nfatc1 |
| chr8 | 81736291 | 81736576 | Inpp4b | Smad |
| chr8 | 81745500 | 81745783 | Inpp4b | Nfatc1,Smad |
| chr8 | 81756572 | 81758183 | Inpp4b | Smad |
| chr8 | 81767078 | 81768255 | Inpp4b | Foxc1 |
| chr8 | 81812210 | 81812628 | Inpp4b | Smad |

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| chr8 | 81849687 | 81850762 | Inpp4b | Nfatc1,Smad |
| chr8 | 81854102 | 81855842 | Inpp4b | Smad |
| chr8 | 81859828 | 81861993 | Inpp4b | Foxc1,Smad |
| chr8 | 81947021 | 81947379 | Inpp4b | Foxc1 |
| chr8 | 81991965 | 81992581 | Inpp4b | Smad |
| chr8 | 81996352 | 81997371 | Inpp4b | Smad |
| chr8 | 81998864 | 81999122 | Inpp4b | Smad |
| chr8 | 88536982 | 88537446 | Nkd1 | Smad |
| chr8 | 88683446 | 88684248 | Nod2 | Smad |
| chr8 | 92960337 | 92961516 | Slc6a2 | Nfatc1 |
| chr8 | 92965649 | 92966520 | Slc6a2 | Nfatc1 |
| chr8 | 92972756 | 92973533 | Slc6a2 | Smad |
| chr8 | 92984275 | 92985020 | Slc6a2 | Smad |
| chr8 | 92994458 | 92994658 | Slc6a2 | Smad |
| chr8 | 104961247 | 104962326 | Ces2g | Smad |
| chr8 | 109947506 | 109948824 | Marveld3 | Foxc1 |
| chr8 | 118285482 | 118287880 | Cdh13 | Nfatc1 |
| chr8 | 118316398 | 118317254 | Cdh13 | Smad |
| chr8 | 118374702 | 118375336 | Cdh13 | Smad |
| chr8 | 118376560 | 118377383 | Cdh13 | Smad |
| chr8 | 118435223 | 118435667 | Cdh13 | Smad |
| chr8 | 118518725 | 118519156 | Cdh13 | Nfatc1 |
| chr8 | 118565150 | 118565645 | Cdh13 | Smad |
| chr8 | 119064564 | 119064841 | Cdh13 | Smad |
| chr8 | 122525865 | 122526958 | Piezo1 | Smad |
| chr8 | 122536767 | 122537948 | Piezo1 | Nfatc1,Smad |
| chr9 | 35424693 | 35425091 | Cdon | Smad |
| chr9 | 35467361 | 35467980 | Cdon | Foxc1 |
| chr9 | 35493257 | 35494066 | Cdon | Smad |
| chr9 | 35522635 | 35524918 | Cdon | Smad |
| chr9 | 36890496 | 36890949 | Pknox2 | Smad |
| chr9 | 36894668 | 36895603 | Pknox2 | Nfatc1 |
| chr9 | 36933703 | 36934242 | Pknox2 | Nfatc1 |
| chr9 | 36941584 | 36942176 | Pknox2 | Smad |
| chr9 | 37145257 | 37146069 | Pknox2 | Smad |
| chr9 | 37176830 | 37177504 | Pknox2 | Smad |
| chr9 | 41020680 | 41020969 | Ubash3b | Smad |
| chr9 | 41021642 | 41022184 | Ubash3b | Smad |
| chr9 | 41028526 | 41028726 | Ubash3b | Smad |
| chr9 | 41031413 | 41032389 | Ubash3b | Smad |
| chr9 | 44066599 | 44068560 | Usp2 | Nfatc1 |
| chr9 | 44087628 | 44088608 | Usp2 | Smad |
| chr9 | 47283550 | 47284095 | Cadm1 | Foxc1 |

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|---|---|---|---|---|
| chr9 | 47343595 | 47344039 | Cadm1 | Nfatc1,Smad |
| chr9 | 47350159 | 47350708 | Cadm1 | Smad |
| chr9 | 47357726 | 47358640 | Cadm1 | Nfatc1,Smad |
| chr9 | 47389833 | 47390503 | Cadm1 | Smad |
| chr9 | 47529552 | 47530575 | Cadm1 | Smad |
| chr9 | 47589308 | 47590465 | Cadm1 | Smad |
| chr9 | 47625078 | 47626157 | Cadm1 | Foxc1,Nfatc1,Smad |
| chr9 | 47674766 | 47675120 | Cadm1 | Smad |
| chr9 | 47792547 | 47793037 | Cadm1 | Nfatc1 |
| chr9 | 47813010 | 47813937 | Cadm1 | Smad |
| chr9 | 48407748 | 48408099 | Nxpe4 | Smad |
| chr9 | 48707486 | 48707956 | Zbtb16 | Smad |
| chr9 | 48739997 | 48740618 | Zbtb16 | Smad |
| chr9 | 54629618 | 54630184 | Acsbg1 | Smad |
| chr9 | 54635080 | 54636519 | Acsbg1 | Nfatc1,Smad |
| chr9 | 54642336 | 54643848 | Acsbg1 | Smad |
| chr9 | 54668544 | 54669097 | Acsbg1 | Smad |
| chr9 | 58555421 | 58556008 | Cd276 | Nfatc1 |
| chr9 | 66713437 | 66714147 | Car12 | Smad |
| chr9 | 66722317 | 66722695 | Car12 | Smad |
| chr9 | 68786832 | 68787307 | Rora | Smad |
| chr9 | 68944111 | 68944455 | Rora | Smad |
| chr9 | 68972336 | 68972634 | Rora | Smad |
| chr9 | 69010999 | 69011199 | Rora | Foxc1 |
| chr9 | 69213715 | 69214174 | Rora | Smad |
| chr9 | 69289166 | 69290064 | Rora | Nfatc1 |
| chr9 | 69306654 | 69307340 | Rora | Foxc1,Smad |
| chr9 | 70207004 | 70208976 | Myo1e | Smad |
| chr9 | 70211206 | 70212353 | Myo1e | Smad |
| chr9 | 70248707 | 70250592 | Myo1e | Nfatc1 |
| chr9 | 70290505 | 70291143 | Myo1e | Smad |
| chr9 | 71321420 | 71322014 | Aldh1a2 | Smad |
| chr9 | 71355548 | 71356425 | Aldh1a2 | Smad |
| chr9 | 71771006 | 71771754 | Cgnl1 | Smad |
| chr9 | 88058232 | 88059333 | Nt5e | Smad |
| chr9 | 88177634 | 88178283 | Nt5e | Nfatc1 |
| chr9 | 88259060 | 88261232 | Nt5e | Smad |
| chr9 | 88276777 | 88277806 | Nt5e | Smad |
| chr9 | 88325607 | 88327157 | Nt5e | Smad |
| chr9 | 88330060 | 88331316 | Nt5e | Smad |
| chr9 | 88332278 | 88333256 | Nt5e | Smad |
| chr9 | 88339711 | 88340199 | Nt5e | Nfatc1 |
| chr9 | 95624111 | 95624445 | Pcolce2 | Smad |

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|---|---|---|---|---|
| chr9 | 95672370 | 95672701 | Pcolce2 | Smad |
| chr9 | 98417930 | 98419086 | Rbp1 | Smad |
| chr9 | 98421431 | 98422353 | Rbp1 | Smad |
| chr9 | 98432753 | 98434824 | Rbp1 | Smad |
| chr9 | 99319515 | 99320080 | Esyt3 | Smad |
| chr9 | 99339812 | 99340870 | Esyt3 | Smad |
| chr9 | 99354723 | 99355430 | Esyt3 | Foxc1 |
| chr9 | 99357537 | 99359523 | Esyt3 | Smad |
| chr9 | 101168682 | 101168882 | Ppp2r3a | Smad |
| chr9 | 101228859 | 101229079 | Ppp2r3a | Nfatc1,Smad |
| chr9 | 101250986 | 101252205 | Ppp2r3a | Smad |
| chr9 | 101265410 | 101266545 | Ppp2r3a | Nfatc1,Smad |
| chr9 | 103506876 | 103507737 | Tmem108 | Smad |
| chr9 | 103550414 | 103551618 | Tmem108 | Smad |
| chr9 | 103597869 | 103598106 | Tmem108 | Smad |
| chr9 | 103847798 | 103848805 | Tmem108 | Nfatc1,Smad |
| chr9 | 104102094 | 104102628 | Ackr4 | Smad |
| chr9 | 106367021 | 106373131 | Dusp7 | Smad |
| chr9 | 106376656 | 106379627 | Dusp7 | Smad |
| chr9 | 106392345 | 106392632 | Dusp7 | Smad |
| chr9 | 106394365 | 106394942 | Dusp7 | Smad |
| chr9 | 107396277 | 107396929 | Cacna2d2 | Nfatc1,Smad |
| chr9 | 107526543 | 107526972 | Cacna2d2 | Smad |
| chr9 | 119511058 | 119511351 | Scn5a | Smad |
| chr9 | 119558172 | 119558639 | Scn5a | Smad |
| chr9 | 119579083 | 119580039 | Scn5a | Smad |
| chr9 | 119580472 | 119581181 | Scn5a | Smad |
| chr10 | 7118085 | 7118665 | Cnksr3 | Smad |
| chr10 | 7214586 | 7215216 | Cnksr3 | Smad |
| chr10 | 7219588 | 7219788 | Cnksr3 | Smad |
| chr10 | 7257848 | 7259388 | Cnksr3 | Nfatc1 |
| chr10 | 7269157 | 7269676 | Cnksr3 | Smad |
| chr10 | 7289512 | 7290096 | Cnksr3 | Smad |
| chr10 | 7295635 | 7297195 | Cnksr3 | Smad |
| chr10 | 14331799 | 14333283 | Gpr126 | Foxc1 |
| chr10 | 14385706 | 14386120 | Gpr126 | Smad |
| chr10 | 14413122 | 14413767 | Gpr126 | Smad |
| chr10 | 14418273 | 14419751 | Gpr126 | Foxc1 |
| chr10 | 14482375 | 14482886 | Gpr126 | Nfatc1,Smad |
| chr10 | 14491641 | 14492515 | Gpr126 | Smad |
| chr10 | 14543635 | 14545635 | Gpr126 | Nfatc1 |
| chr10 | 14582889 | 14583863 | Gpr126 | Nfatc1 |
| chr10 | 24210545 | 24211427 | Moxd1 | Smad |

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|---|---|---|---|---|
| chr10 | 24223059 | 24223848 | Moxd1 | Smad |
| chr10 | 24245286 | 24245536 | Moxd1 | Nfatc1 |
| chr10 | 24259882 | 24260121 | Moxd1 | Smad |
| chr10 | 24276434 | 24276847 | Moxd1 | Foxc1 |
| chr10 | 24298474 | 24298984 | Moxd1 | Foxc1,Smad |
| chr10 | 24379415 | 24380129 | Moxd1 | Smad |
| chr10 | 24445920 | 24448269 | Moxd1 | Smad |
| chr10 | 24463101 | 24463862 | Ctgf | Smad |
| chr10 | 24478545 | 24479585 | Ctgf | Nfatc1 |
| chr10 | 24573739 | 24574037 | Ctgf | Smad |
| chr10 | 24595157 | 24596280 | Ctgf | Smad |
| chr10 | 56339070 | 56339554 | Gja1 | Smad |
| chr10 | 56364084 | 56364361 | Gja1 | Nfatc1,Smad |
| chr10 | 56373022 | 56373525 | Gja1 | Foxc1,Nfatc1 |
| chr10 | 56376088 | 56379512 | Gja1 | Nfatc1 |
| chr10 | 56384809 | 56386417 | Gja1 | Smad |
| chr10 | 56396761 | 56397180 | Gja1 | Smad |
| chr10 | 56415832 | 56416485 | Gja1 | Smad |
| chr10 | 56424800 | 56425634 | Gja1 | Nfatc1,Smad |
| chr10 | 56431235 | 56432224 | Gja1 | Nfatc1,Smad |
| chr10 | 56455894 | 56456495 | Gja1 | Nfatc1 |
| chr10 | 56474954 | 56475424 | Gja1 | Smad |
| chr10 | 56484630 | 56485791 | Gja1 | Smad |
| chr10 | 56495136 | 56495877 | Gja1 | Smad |
| chr10 | 56500789 | 56501267 | Gja1 | Smad |
| chr10 | 56535261 | 56535639 | Gja1 | Smad |
| chr10 | 56566327 | 56567270 | Gja1 | Smad |
| chr10 | 56597978 | 56598722 | Gja1 | Nfatc1 |
| chr10 | 56606333 | 56607213 | Gja1 | Nfatc1,Smad |
| chr10 | 56611579 | 56612881 | Gja1 | Smad |
| chr10 | 56642590 | 56642994 | Gja1 | Nfatc1 |
| chr10 | 56660182 | 56661465 | Gja1 | Nfatc1 |
| chr10 | 56724602 | 56724944 | Gja1 | Nfatc1 |
| chr10 | 56774978 | 56775547 | Gja1 | Foxc1,Smad |
| chr10 | 56781906 | 56782735 | Gja1 | Nfatc1 |
| chr10 | 56783834 | 56784368 | Gja1 | Nfatc1 |
| chr10 | 56796483 | 56796813 | Gja1 | Foxc1 |
| chr10 | 56831083 | 56832545 | Gja1 | Foxc1,Smad |
| chr10 | 56910702 | 56911692 | Gja1 | Smad |
| chr10 | 56913981 | 56915466 | Gja1 | Nfatc1 |
| chr10 | 60760105 | 60760855 | Unc5b | Smad |
| chr10 | 60800450 | 60800822 | Unc5b | Foxc1 |
| chr10 | 60805172 | 60806280 | Unc5b | Smad |

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|---|---|---|---|---|
| chr10 | 68110116 | 68111711 | Arid5b | Smad |
| chr10 | 68121521 | 68122647 | Arid5b | Smad |
| chr10 | 68136083 | 68138132 | Arid5b | Smad |
| chr10 | 68142110 | 68142931 | Arid5b | Smad |
| chr10 | 68156224 | 68158443 | Arid5b | Smad |
| chr10 | 68229480 | 68231335 | Arid5b | Foxc1,Nfatc1,Smad |
| chr10 | 68237711 | 68239137 | Arid5b | Smad |
| chr10 | 68248185 | 68249901 | Arid5b | Foxc1,Smad |
| chr10 | 68268546 | 68269202 | Arid5b | Smad |
| chr10 | 68282488 | 68283728 | Arid5b | Smad |
| chr10 | 69321158 | 69322357 | Cdk1 | Smad |
| chr10 | 69383233 | 69383780 | Cdk1 | Smad |
| chr10 | 69398041 | 69399617 | Cdk1 | Smad |
| chr10 | 76668932 | 76669189 | Col6a1 | Smad |
| chr10 | 76729831 | 76730944 | Col6a1 | Nfatc1,Smad |
| chr10 | 76732855 | 76733786 | Col6a1 | Smad |
| chr10 | 85161482 | 85162348 | Cry1 | Smad |
| chr10 | 121160128 | 121162152 | Wif1 | Smad |
| chr11 | 6898883 | 6900659 | Adcy1 | Smad |
| chr11 | 7205664 | 7206147 | Igfbp3 | Nfatc1,Smad |
| chr11 | 7206439 | 7206900 | Igfbp3 | Foxc1,Smad |
| chr11 | 7211371 | 7211673 | Igfbp3 | Smad |
| chr11 | 7215845 | 7216698 | Igfbp3 | Smad |
| chr11 | 7226566 | 7226991 | Igfbp3 | Foxc1,Smad |
| chr11 | 7423148 | 7424528 | Igfbp3 | Nfatc1,Smad |
| chr11 | 7425299 | 7425702 | Igfbp3 | Smad |
| chr11 | 7446116 | 7446502 | Igfbp3 | Smad |
| chr11 | 7455041 | 7455794 | Igfbp3 | Nfatc1,Smad |
| chr11 | 7526469 | 7526669 | Igfbp3 | Smad |
| chr11 | 7603829 | 7604288 | Igfbp3 | Smad |
| chr11 | 7794056 | 7794657 | Igfbp3 | Smad |
| chr11 | 32998998 | 33000354 | Fgf18 | Smad |
| chr11 | 33146295 | 33148911 | Fgf18 | Smad |
| chr11 | 60941068 | 60941793 | Map2k3 | Nfatc1,Smad |
| chr11 | 60953717 | 60954159 | Map2k3 | Smad |
| chr11 | 62814071 | 62814285 | Trim16 | Smad |
| chr11 | 62819920 | 62821432 | Trim16 | Smad |
| chr11 | 62841299 | 62841575 | Trim16 | Foxc1,Smad |
| chr11 | 62841684 | 62841892 | Trim16 | Smad |
| chr11 | 64498304 | 64498642 | Hs3st3a1 | Nfatc1 |
| chr11 | 64502702 | 64503634 | Hs3st3a1 | Smad |
| chr11 | 64518049 | 64518629 | Hs3st3a1 | Smad |
| chr11 | 64644206 | 64644594 | Hs3st3a1 | Smad |

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|---|---|---|---|---|
| chr11 | 64718657 | 64719147 | Hs3st3a1 | Smad |
| chr11 | 65023949 | 65024956 | Arhgap44 | Smad |
| chr11 | 65039241 | 65040200 | Arhgap44 | Foxc1 |
| chr11 | 65048648 | 65049619 | Arhgap44 | Smad |
| chr11 | 65067281 | 65067879 | Arhgap44 | Smad |
| chr11 | 65128128 | 65129467 | Arhgap44 | Nfatc1 |
| chr11 | 65161207 | 65163210 | Arhgap44 | Foxc1 |
| chr11 | 69133601 | 69134787 | Aloxe3 | Smad |
| chr11 | 70288071 | 70288507 | Alox12e | Smad |
| chr11 | 72994320 | 72995196 | Atp2a3 | Foxc1 |
| chr11 | 73018124 | 73020107 | Camkk1 | Nfatc1,Smad |
| chr11 | 73020884 | 73023969 | Camkk1 | Smad |
| chr11 | 76997351 | 76998294 | Slc6a4 | Smad |
| chr11 | 89206183 | 89207700 | Nog | Smad |
| chr11 | 97434771 | 97436202 | Arhgap23 | Smad |
| chr11 | 97468461 | 97469203 | Arhgap23 | Smad |
| chr11 | 98768459 | 98769305 | Nr1d1 | Smad |
| chr11 | 98772526 | 98774717 | Nr1d1 | Nfatc1,Smad |
| chr11 | 99061776 | 99063870 | Tns4 | Foxc1,Smad |
| chr11 | 99080562 | 99084111 | Tns4 | Nfatc1 |
| chr11 | 99092329 | 99092672 | Tns4 | Smad |
| chr11 | 99098811 | 99099339 | Tns4 | Nfatc1 |
| chr11 | 113835190 | 113835528 | Sdk2 | Smad |
| chr11 | 113865571 | 113865927 | Sdk2 | Smad |
| chr11 | 113892762 | 113893243 | Sdk2 | Foxc1 |
| chr11 | 113951626 | 113952357 | Sdk2 | Smad |
| chr11 | 114066770 | 114067434 | Sdk2 | Smad |
| chr11 | 114080552 | 114081190 | Sdk2 | Smad |
| chr11 | 115899830 | 115900204 | Smim5 | Smad |
| chr11 | 116237848 | 116238998 | Evpl | Smad |
| chr11 | 119942436 | 119944082 | Baiap2 | Nfatc1 |
| chr11 | 119991187 | 119991580 | Baiap2 | Smad |
| chr11 | 120346202 | 120351684 | Actg1 | Smad |
| chr11 | 121515893 | 121516745 | Zfp750 | Smad |
| chr11 | 121517079 | 121517844 | Zfp750 | Smad |
| chr12 | 13928382 | 13928760 | Fam84a | Smad |
| chr12 | 13957134 | 13957383 | Fam84a | Smad |
| chr12 | 14068616 | 14069937 | Fam84a | Smad |
| chr12 | 14091264 | 14091464 | Fam84a | Smad |
| chr12 | 14106119 | 14106749 | Fam84a | Smad |
| chr12 | 14155155 | 14155838 | Fam84a | Smad |
| chr12 | 14157537 | 14158334 | Fam84a | Smad |
| chr12 | 14189219 | 14190155 | Fam84a | Nfatc1 |

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| chr12 | 17112704 | 17113538 | Kcnf1 | Smad |
| chr12 | 21092443 | 21093915 | Asap2 | Nfatc1 |
| chr12 | 21097191 | 21098583 | Asap2 | Smad |
| chr12 | 21135837 | 21136683 | Asap2 | Smad |
| chr12 | 21159890 | 21160832 | Asap2 | Nfatc1 |
| chr12 | 21166804 | 21167911 | Asap2 | Smad |
| chr12 | 21171527 | 21172432 | Asap2 | Smad |
| chr12 | 36308265 | 36309376 | Sostdc1 | Smad |
| chr12 | 36315428 | 36316136 | Sostdc1 | Smad |
| chr12 | 36317002 | 36317996 | Sostdc1 | Smad |
| chr12 | 36343270 | 36344965 | Sostdc1 | Smad |
| chr12 | 41483475 | 41484999 | Lrrn3 | Smad |
| chr12 | 41485204 | 41486039 | Lrrn3 | Foxc1 |
| chr12 | 44325648 | 44325849 | Nrcam | Smad |
| chr12 | 44328889 | 44329493 | Nrcam | Smad |
| chr12 | 44331973 | 44332493 | Nrcam | Foxc1 |
| chr12 | 44336055 | 44336284 | Nrcam | Smad |
| chr12 | 44345867 | 44347364 | Nrcam | Smad |
| chr12 | 44355136 | 44355756 | Nrcam | Smad |
| chr12 | 44524592 | 44525655 | Nrcam | Nfatc1 |
| chr12 | 44536132 | 44536640 | Nrcam | Foxc1 |
| chr12 | 44547905 | 44548216 | Nrcam | Smad |
| chr12 | 44572772 | 44573089 | Nrcam | Smad |
| chr12 | 44599675 | 44600035 | Nrcam | Smad |
| chr12 | 44601602 | 44602420 | Nrcam | Smad |
| chr12 | 44617621 | 44617821 | Nrcam | Foxc1 |
| chr12 | 44637711 | 44637911 | Nrcam | Smad |
| chr12 | 83767655 | 83769008 | Papln | Smad |
| chr12 | 83770066 | 83771033 | Papln | Smad |
| chr12 | 84805340 | 84806015 | Ltbp2 | Smad |
| chr12 | 84847421 | 84847933 | Ltbp2 | Nfatc1,Smad |
| chr12 | 84858674 | 84859103 | Ltbp2 | Smad |
| chr12 | 84860573 | 84862610 | Ltbp2 | Smad |
| chr12 | 84864890 | 84866199 | Ltbp2 | Smad |
| chr12 | 84876164 | 84877309 | Ltbp2 | Nfatc1,Smad |
| chr12 | 100925549 | 100926660 | Ccdc88c | Smad |
| chr12 | 100952186 | 100953010 | Ccdc88c | Foxc1 |
| chr12 | 100994254 | 100995100 | Ccdc88c | Smad |
| chr12 | 100999477 | 100999757 | Ccdc88c | Smad |
| chr12 | 101026361 | 101028278 | Ccdc88c | Foxc1,Smad |
| chr12 | 101028635 | 101029884 | Ccdc88c | Smad |
| chr12 | 108370432 | 108371274 | Eml1 | Smad |
| chr12 | 108393769 | 108394076 | Eml1 | Smad |

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| chr12 | 108497106 | 108497501 | Eml1 | Smad |
| chr12 | 110706381 | 110707253 | Hsp90aa1 | Smad |
| chr12 | 112182474 | 112182829 | Kif26a | Smad |
| chr12 | 112183529 | 112184723 | Kif26a | Smad |
| chr13 | 3742773 | 3743616 | Calml3 | Smad |
| chr13 | 3756595 | 3756989 | Calml3 | Smad |
| chr13 | 3769423 | 3771205 | Calml3 | Foxc1,Smad |
| chr13 | 3782277 | 3782970 | Calml3 | Smad |
| chr13 | 3803751 | 3805140 | Calml3 | Foxc1 |
| chr13 | 3888759 | 3889357 | Net1 | Foxc1,Smad |
| chr13 | 3891381 | 3892594 | Net1 | Foxc1,Smad |
| chr13 | 23736197 | 23736730 | Hist1h1c | Nfatc1,Smad |
| chr13 | 23738241 | 23740536 | Hist1h1c | Smad |
| chr13 | 24397146 | 24397637 | Cmah | Smad |
| chr13 | 24401870 | 24402752 | Cmah | Smad |
| chr13 | 24414686 | 24414915 | Cmah | Smad |
| chr13 | 24429945 | 24430246 | Cmah | Smad |
| chr13 | 24521604 | 24522615 | Cmah | Smad |
| chr13 | 31750921 | 31751282 | Foxc1 | Smad |
| chr13 | 31876857 | 31877613 | Gmds | Smad |
| chr13 | 32025433 | 32025992 | Gmds | Foxc1 |
| chr13 | 32118246 | 32118717 | Gmds | Smad |
| chr13 | 32169296 | 32170180 | Gmds | Smad |
| chr13 | 32242137 | 32242872 | Gmds | Nfatc1 |
| chr13 | 32298462 | 32299086 | Gmds | Nfatc1,Smad |
| chr13 | 32312457 | 32313068 | Gmds | Nfatc1,Smad |
| chr13 | 32337784 | 32339432 | Gmds | Smad |
| chr13 | 32370372 | 32371373 | Gmds | Smad |
| chr13 | 32478798 | 32479598 | Gmds | Smad |
| chr13 | 34129415 | 34132042 | Tubb2b | Smad |
| chr13 | 34189985 | 34190892 | Slc22a23 | Smad |
| chr13 | 34191887 | 34193108 | Slc22a23 | Smad |
| chr13 | 34211338 | 34211880 | Slc22a23 | Nfatc1 |
| chr13 | 34214796 | 34215609 | Slc22a23 | Nfatc1,Smad |
| chr13 | 34281471 | 34281707 | Slc22a23 | Nfatc1 |
| chr13 | 34281872 | 34282095 | Slc22a23 | Smad |
| chr13 | 34344437 | 34346182 | Slc22a23 | Smad |
| chr13 | 34370012 | 34370891 | Slc22a23 | Smad |
| chr13 | 34371862 | 34372582 | Slc22a23 | Smad |
| chr13 | 34392505 | 34392998 | Slc22a23 | Smad |
| chr13 | 34397886 | 34398511 | Slc22a23 | Foxc1,Smad |
| chr13 | 34446354 | 34446891 | Slc22a23 | Smad |
| chr13 | 38344685 | 38345351 | Bmp6 | Foxc1 |

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| chr13 | 38349634 | 38350513 | Bmp6 | Smad |
| chr13 | 38410492 | 38410936 | Bmp6 | Smad |
| chr13 | 49549674 | 49550009 | Aspn | Smad |
| chr13 | 73254478 | 73255287 | Irx4 | Smad |
| chr13 | 73257821 | 73258918 | Irx4 | Nfatc1,Smad |
| chr13 | 73273258 | 73273592 | Irx4 | Smad |
| chr13 | 79885151 | 79885477 | Arrdc3 | Smad |
| chr13 | 79908703 | 79908903 | Arrdc3 | Smad |
| chr13 | 80256079 | 80256834 | Arrdc3 | Smad |
| chr13 | 80267528 | 80268001 | Arrdc3 | Smad |
| chr13 | 80289204 | 80289433 | Arrdc3 | Smad |
| chr13 | 80387653 | 80388359 | Arrdc3 | Smad |
| chr13 | 80388481 | 80389537 | Arrdc3 | Smad |
| chr13 | 80393678 | 80394106 | Arrdc3 | Smad |
| chr13 | 80394161 | 80394363 | Arrdc3 | Nfatc1 |
| chr13 | 80519913 | 80520138 | Arrdc3 | Smad |
| chr13 | 80525478 | 80526191 | Arrdc3 | Smad |
| chr13 | 80542998 | 80543198 | Arrdc3 | Smad |
| chr13 | 80557109 | 80557515 | Arrdc3 | Smad |
| chr13 | 80862128 | 80862640 | Arrdc3 | Nfatc1 |
| chr13 | 80881651 | 80886662 | Arrdc3 | Smad |
| chr13 | 112556568 | 112557439 | Il31ra | Smad |
| chr13 | 112578105 | 112578420 | Il31ra | Smad |
| chr13 | 112584629 | 112585461 | Il31ra | Foxc1,Nfatc1 |
| chr13 | 114490570 | 114491406 | Fst | Nfatc1 |
| chr13 | 114500947 | 114501465 | Fst | Nfatc1,Smad |
| chr13 | 114523034 | 114523234 | Fst | Foxc1 |
| chr14 | 23305544 | 23306460 | Kcnma1 | Smad |
| chr14 | 23307780 | 23309555 | Kcnma1 | Smad |
| chr14 | 23389791 | 23389991 | Kcnma1 | Nfatc1,Smad |
| chr14 | 23494206 | 23495026 | Kcnma1 | Nfatc1,Smad |
| chr14 | 23624134 | 23625205 | Kcnma1 | Nfatc1,Smad |
| chr14 | 23626674 | 23628502 | Kcnma1 | Smad |
| chr14 | 23633131 | 23633332 | Kcnma1 | Foxc1 |
| chr14 | 23707399 | 23707772 | Kcnma1 | Nfatc1 |
| chr14 | 23903182 | 23903417 | Kcnma1 | Smad |
| chr14 | 23911144 | 23911630 | Kcnma1 | Foxc1 |
| chr14 | 25700138 | 25701702 | Ppif | Smad |
| chr14 | 32313328 | 32313716 | Ogdhl | Nfatc1,Smad |
| chr14 | 32321876 | 32322136 | Ogdhl | Smad |
| chr14 | 34085217 | 34090836 | Anxa8 | Smad |
| chr14 | 34355035 | 34356024 | Fam25c | Smad |
| chr14 | 40995297 | 40997233 | Fam213a | Smad |

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|---|---|---|---|---|
| chr14 | 40999730 | 41000562 | Fam213a | Nfatc1 |
| chr14 | 41004135 | 41006469 | Fam213a | Smad |
| chr14 | 41030679 | 41031851 | Fam213a | Nfatc1,Smad |
| chr14 | 48038251 | 48040103 | Peli2 | Nfatc1,Smad |
| chr14 | 48092568 | 48092859 | Peli2 | Smad |
| chr14 | 48098969 | 48099836 | Peli2 | Smad |
| chr14 | 48118992 | 48120411 | Peli2 | Smad |
| chr14 | 48137550 | 48137750 | Peli2 | Smad |
| chr14 | 48155128 | 48155581 | Peli2 | Smad |
| chr14 | 48172784 | 48175077 | Peli2 | Smad |
| chr14 | 48203710 | 48204088 | Peli2 | Foxc1 |
| chr14 | 48212764 | 48213968 | Peli2 | Smad |
| chr14 | 48224796 | 48225379 | Peli2 | Smad |
| chr14 | 48241250 | 48241856 | Peli2 | Smad |
| chr14 | 48318336 | 48318987 | Peli2 | Nfatc1 |
| chr14 | 55210819 | 55211027 | Dhrs2 | Smad |
| chr14 | 55318154 | 55318402 | Dhrs2 | Nfatc1 |
| chr14 | 57083932 | 57084433 | Gjb2 | Smad |
| chr14 | 57105848 | 57106424 | Gjb2 | Smad |
| chr14 | 57158544 | 57158914 | Gjb6 | Smad |
| chr14 | 57190438 | 57190738 | Gjb6 | Smad |
| chr14 | 70966073 | 70966432 | Gfra2 | Smad |
| chr14 | 70988703 | 70989012 | Gfra2 | Smad |
| chr14 | 77163763 | 77165510 | Enox1 | Smad |
| chr14 | 77174130 | 77174683 | Enox1 | Smad |
| chr14 | 77203961 | 77204607 | Enox1 | Smad |
| chr14 | 77209553 | 77211639 | Enox1 | Nfatc1 |
| chr14 | 77218065 | 77218935 | Enox1 | Smad |
| chr14 | 77225171 | 77225782 | Enox1 | Smad |
| chr14 | 77353238 | 77353890 | Enox1 | Smad |
| chr14 | 77406183 | 77407149 | Enox1 | Smad |
| chr14 | 77608397 | 77608871 | Enox1 | Foxc1 |
| chr14 | 97544255 | 97544850 | Dach1 | Smad |
| chr14 | 97731263 | 97731523 | Dach1 | Smad |
| chr14 | 97792641 | 97792970 | Dach1 | Smad |
| chr14 | 97982776 | 97983299 | Dach1 | Smad |
| chr14 | 98160672 | 98161796 | Dach1 | Nfatc1 |
| chr14 | 98170552 | 98171287 | Dach1 | Nfatc1 |
| chr14 | 98202015 | 98202495 | Dach1 | Smad |
| chr14 | 98380340 | 98380774 | Dach1 | Nfatc1 |
| chr14 | 98442096 | 98443133 | Dach1 | Nfatc1,Smad |
| chr14 | 98451857 | 98452606 | Dach1 | Smad |
| chr14 | 98471718 | 98472836 | Dach1 | Smad |

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|---|---|---|---|---|
| chr14 | 98482683 | 98483092 | Dach1 | Smad |
| chr14 | 98483181 | 98483941 | Dach1 | Smad |
| chr14 | 98505330 | 98505964 | Dach1 | Nfatc1,Smad |
| chr14 | 98589729 | 98590299 | Dach1 | Smad |
| chr14 | 101738375 | 101738954 | Lmo7 | Smad |
| chr14 | 101787540 | 101789398 | Lmo7 | Smad |
| chr14 | 101797749 | 101799189 | Lmo7 | Smad |
| chr14 | 101804947 | 101805750 | Lmo7 | Foxc1 |
| chr14 | 101822188 | 101822999 | Lmo7 | Smad |
| chr14 | 101831910 | 101832767 | Lmo7 | Nfatc1,Smad |
| chr14 | 101839557 | 101840998 | Lmo7 | Smad |
| chr14 | 101842244 | 101843104 | Lmo7 | Nfatc1,Smad |
| chr14 | 101908144 | 101909162 | Lmo7 | Nfatc1,Smad |
| chr14 | 101917666 | 101918943 | Lmo7 | Smad |
| chr14 | 101930451 | 101931362 | Lmo7 | Smad |
| chr14 | 101936909 | 101937418 | Lmo7 | Nfatc1 |
| chr14 | 101993734 | 101994221 | Lmo7 | Smad |
| chr14 | 102013300 | 102013642 | Lmo7 | Smad |
| chr14 | 102014566 | 102015598 | Lmo7 | Smad |
| chr14 | 102093049 | 102093493 | Lmo7 | Nfatc1,Smad |
| chr14 | 102117920 | 102118936 | Lmo7 | Smad |
| chr14 | 102135098 | 102136020 | Lmo7 | Smad |
| chr14 | 102142983 | 102143242 | Lmo7 | Nfatc1 |
| chr14 | 102149129 | 102149475 | Lmo7 | Smad |
| chr14 | 103451904 | 103452208 | Scel | Smad |
| chr14 | 103468980 | 103470620 | Scel | Smad |
| chr14 | 103499691 | 103499891 | Scel | Smad |
| chr14 | 103499993 | 103501335 | Scel | Smad |
| chr14 | 103502209 | 103503138 | Scel | Smad |
| chr14 | 103503273 | 103504051 | Scel | Smad |
| chr14 | 103526631 | 103527453 | Scel | Smad |
| chr14 | 103529317 | 103530532 | Scel | Foxc1 |
| chr14 | 103531687 | 103534079 | Scel | Smad |
| chr14 | 103545862 | 103546611 | Scel | Foxc1 |
| chr14 | 103567994 | 103569293 | Scel | Nfatc1 |
| chr14 | 116736161 | 116736361 | Gpc6 | Smad |
| chr14 | 116765774 | 116766689 | Gpc6 | Smad |
| chr14 | 116914067 | 116914600 | Gpc6 | Nfatc1 |
| chr14 | 116916676 | 116917853 | Gpc6 | Smad |
| chr14 | 116928006 | 116929599 | Gpc6 | Smad |
| chr14 | 116978297 | 116979760 | Gpc6 | Foxc1 |
| chr14 | 116980875 | 116982199 | Gpc6 | Smad |
| chr14 | 116987311 | 116987511 | Gpc6 | Smad |

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|---|---|---|---|---|
| chr14 | 117027846 | 117028663 | Gpc6 | Nfatc1 |
| chr14 | 117097698 | 117098544 | Gpc6 | Foxc1 |
| chr14 | 117243544 | 117244069 | Gpc6 | Smad |
| chr14 | 117396167 | 117396599 | Gpc6 | Foxc1,Smad |
| chr14 | 117413408 | 117414224 | Gpc6 | Nfatc1,Smad |
| chr14 | 117706450 | 117706995 | Gpc6 | Smad |
| chr14 | 117710330 | 117710875 | Gpc6 | Smad |
| chr14 | 117781673 | 117782342 | Gpc6 | Nfatc1,Smad |
| chr14 | 117783774 | 117784246 | Gpc6 | Smad |
| chr14 | 117831739 | 117832158 | Gpc6 | Smad |
| chr14 | 117929879 | 117931475 | Gpc6 | Smad |
| chr14 | 117951492 | 117952435 | Gpc6 | Smad |
| chr15 | 3204082 | 3204356 | Sepp1 | Smad |
| chr15 | 3214524 | 3215593 | Sepp1 | Nfatc1,Smad |
| chr15 | 3227234 | 3229352 | Sepp1 | Smad |
| chr15 | 3232837 | 3233820 | Sepp1 | Smad |
| chr15 | 10057835 | 10058608 | Prlr | Nfatc1,Smad |
| chr15 | 10087926 | 10088454 | Prlr | Foxc1 |
| chr15 | 10088490 | 10089573 | Prlr | Nfatc1,Smad |
| chr15 | 10116667 | 10117447 | Prlr | Nfatc1 |
| chr15 | 10125881 | 10126488 | Prlr | Smad |
| chr15 | 10177332 | 10179347 | Prlr | Smad |
| chr15 | 10189194 | 10189567 | Prlr | Smad |
| chr15 | 10213608 | 10213954 | Prlr | Nfatc1,Smad |
| chr15 | 10238258 | 10238977 | Prlr | Smad |
| chr15 | 10295325 | 10296051 | Prlr | Foxc1,Smad |
| chr15 | 10313719 | 10314034 | Prlr | Nfatc1,Smad |
| chr15 | 27189786 | 27190139 | Ank | Nfatc1,Smad |
| chr15 | 27325793 | 27327012 | Ank | Smad |
| chr15 | 27381413 | 27381986 | Ank | Nfatc1,Smad |
| chr15 | 27405330 | 27406610 | Ank | Smad |
| chr15 | 27418313 | 27419251 | Ank | Nfatc1 |
| chr15 | 27488177 | 27488620 | Ank | Smad |
| chr15 | 27506282 | 27507377 | Ank | Smad |
| chr15 | 27525309 | 27526058 | Ank | Smad |
| chr15 | 27536745 | 27538068 | Ank | Smad |
| chr15 | 27563566 | 27566698 | Ank | Nfatc1 |
| chr15 | 27569127 | 27570936 | Ank | Foxc1,Smad |
| chr15 | 31150769 | 31151093 | Dap | Smad |
| chr15 | 31183168 | 31183368 | Dap | Smad |
| chr15 | 31197218 | 31197418 | Dap | Smad |
| chr15 | 31245997 | 31246377 | Dap | Smad |
| chr15 | 31255817 | 31256141 | Dap | Smad |

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|---|---|---|---|---|
| chr15 | 31278124 | 31278444 | Dap | Smad |
| chr15 | 37432184 | 37433038 | Ncald | Nfatc1,Smad |
| chr15 | 37515846 | 37516120 | Ncald | Nfatc1,Smad |
| chr15 | 37607577 | 37607833 | Ncald | Smad |
| chr15 | 54177210 | 54177433 | Tnfrsf11b | Smad |
| chr15 | 54208354 | 54208627 | Tnfrsf11b | Nfatc1 |
| chr15 | 54278108 | 54279495 | Tnfrsf11b | Smad |
| chr15 | 54293846 | 54295173 | Tnfrsf11b | Nfatc1 |
| chr15 | 55396273 | 55396570 | Col14a1 | Smad |
| chr15 | 55464522 | 55466117 | Col14a1 | Smad |
| chr15 | 55493180 | 55493702 | Col14a1 | Smad |
| chr15 | 55513504 | 55513861 | Col14a1 | Nfatc1 |
| chr15 | 62043492 | 62044238 | Pvt1 | Nfatc1,Smad |
| chr15 | 62092493 | 62093148 | Pvt1 | Smad |
| chr15 | 62106563 | 62106774 | Pvt1 | Foxc1 |
| chr15 | 62165833 | 62166129 | Pvt1 | Nfatc1 |
| chr15 | 62421139 | 62422007 | Pvt1 | Smad |
| chr15 | 62465419 | 62465844 | Pvt1 | Smad |
| chr15 | 62466668 | 62467301 | Pvt1 | Smad |
| chr15 | 62768129 | 62768533 | Pvt1 | Nfatc1 |
| chr15 | 78815217 | 78816149 | Card10 | Nfatc1 |
| chr15 | 78826486 | 78827006 | Cdc42ep1 | Foxc1,Smad |
| chr15 | 78844252 | 78846402 | Cdc42ep1 | Smad |
| chr15 | 85523355 | 85523889 | Wnt7b | Smad |
| chr15 | 85581595 | 85582835 | Wnt7b | Smad |
| chr15 | 87179131 | 87179843 | Fam19a5 | Smad |
| chr15 | 87623825 | 87624526 | Fam19a5 | Smad |
| chr15 | 92386123 | 92386757 | Pdzrn4 | Smad |
| chr15 | 92596696 | 92597818 | Pdzrn4 | Smad |
| chr15 | 92639857 | 92641111 | Pdzrn4 | Smad |
| chr15 | 92867310 | 92867647 | Pdzrn4 | Smad |
| chr15 | 93513890 | 93514353 | Prickle1 | Nfatc1,Smad |
| chr15 | 93551959 | 93552587 | Prickle1 | Smad |
| chr15 | 93575810 | 93576307 | Prickle1 | Smad |
| chr15 | 93681707 | 93681959 | Prickle1 | Smad |
| chr15 | 93705759 | 93706037 | Prickle1 | Smad |
| chr15 | 93708107 | 93709318 | Prickle1 | Foxc1 |
| chr15 | 93710380 | 93711070 | Prickle1 | Smad |
| chr15 | 93733812 | 93734639 | Prickle1 | Smad |
| chr15 | 97774887 | 97775925 | Rapgef3 | Smad |
| chr15 | 99651535 | 99651860 | Racgap1 | Smad |
| chr15 | 101336318 | 101336960 | Krt80 | Nfatc1,Smad |
| chr15 | 101368387 | 101370828 | Krt80 | Smad |

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|---|---|---|---|---|
| chr15 | 102098995 | 102101308 | Tenc1 | Smad |
| chr15 | 102108510 | 102108710 | Tenc1 | Smad |
| chr15 | 102108821 | 102109393 | Tenc1 | Smad |
| chr15 | 102839564 | 102840376 | Hoxc13 | Smad |
| chr15 | 102920423 | 102922329 | Hoxc13 | Smad |
| chr16 | 11049994 | 11050821 | Snn | Smad |
| chr16 | 11050975 | 11051678 | Snn | Smad |
| chr16 | 36461300 | 36461639 | Stfa3 | Smad |
| chr16 | 36463407 | 36464863 | Stfa3 | Nfatc1 |
| chr16 | 36469004 | 36469896 | Stfa3 | Foxc1 |
| chr16 | 45335979 | 45336309 | Cd200 | Smad |
| chr16 | 45346262 | 45347468 | Cd200 | Smad |
| chr16 | 45352914 | 45353189 | Cd200 | Smad |
| chr16 | 45360491 | 45361139 | Cd200 | Nfatc1,Smad |
| chr16 | 45408414 | 45409377 | Cd200 | Smad |
| chr16 | 56807771 | 56808251 | Tmem45a | Smad |
| chr16 | 56808680 | 56809319 | Tmem45a | Nfatc1 |
| chr16 | 56842954 | 56843542 | Tmem45a | Smad |
| chr16 | 56869753 | 56872240 | Tmem45a | Smad |
| chr16 | 56872681 | 56874276 | Tmem45a | Nfatc1 |
| chr16 | 56879643 | 56881921 | Tmem45a | Smad |
| chr16 | 56884442 | 56885361 | Tmem45a | Nfatc1 |
| chr16 | 56891637 | 56891944 | Tmem45a | Nfatc1 |
| chr16 | 56897441 | 56898056 | Tmem45a | Smad |
| chr16 | 56919912 | 56920678 | Tmem45a | Smad |
| chr16 | 56942107 | 56942917 | Tmem45a | Smad |
| chr16 | 73483428 | 73483985 | Robo2 | Smad |
| chr16 | 73542389 | 73544441 | Robo2 | Nfatc1,Smad |
| chr16 | 73583735 | 73584001 | Robo2 | Nfatc1 |
| chr16 | 73762201 | 73764124 | Robo2 | Foxc1,Nfatc1 |
| chr16 | 73764654 | 73764854 | Robo2 | Smad |
| chr16 | 73766129 | 73766340 | Robo2 | Nfatc1 |
| chr16 | 73775351 | 73775713 | Robo2 | Smad |
| chr16 | 73786722 | 73787240 | Robo2 | Smad |
| chr16 | 73855561 | 73856474 | Robo2 | Nfatc1 |
| chr16 | 73861337 | 73861653 | Robo2 | Smad |
| chr16 | 73924150 | 73924605 | Robo2 | Smad |
| chr16 | 74130684 | 74130953 | Robo2 | Nfatc1,Smad |
| chr16 | 74235174 | 74235403 | Robo2 | Nfatc1,Smad |
| chr16 | 74307105 | 74308031 | Robo2 | Smad |
| chr16 | 74388831 | 74389744 | Robo2 | Smad |
| chr16 | 74400667 | 74401571 | Robo2 | Foxc1 |
| chr16 | 74411066 | 74413484 | Robo2 | Smad |

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|---|---|---|---|---|
| chr16 | 74426741 | 74427444 | Robo2 | Smad |
| chr16 | 74553841 | 74554041 | Robo2 | Nfatc1 |
| chr16 | 74628352 | 74628926 | Robo2 | Smad |
| chr16 | 74664457 | 74664667 | Robo2 | Foxc1 |
| chr16 | 74801265 | 74801800 | Robo2 | Smad |
| chr16 | 74821401 | 74821788 | Robo2 | Foxc1 |
| chr16 | 87915186 | 87915547 | Grik1 | Smad |
| chr16 | 88005171 | 88005371 | Grik1 | Smad |
| chr16 | 88064083 | 88064389 | Grik1 | Nfatc1 |
| chr16 | 88215373 | 88215765 | Grik1 | Smad |
| chr16 | 88243835 | 88246313 | Grik1 | Nfatc1 |
| chr16 | 88252721 | 88253030 | Grik1 | Smad |
| chr16 | 88358844 | 88360292 | Grik1 | Smad |
| chr16 | 92427979 | 92429082 | Rcan1 | Smad |
| chr16 | 96467546 | 96467835 | Pcp4 | Smad |
| chr17 | 34953621 | 34961762 | Hspa1b | Smad |
| chr17 | 34967616 | 34972947 | Hspa1a | Smad |
| chr17 | 36942052 | 36944647 | Rnf39 | Smad |
| chr17 | 43557633 | 43559223 | Pla2g7 | Foxc1 |
| chr17 | 43567507 | 43567967 | Pla2g7 | Smad |
| chr17 | 43569729 | 43570439 | Pla2g7 | Smad |
| chr17 | 47436065 | 47437354 | AI661453 | Smad |
| chr17 | 56747879 | 56748338 | Nrtn | Smad |
| chr17 | 73822495 | 73822695 | Ehd3 | Smad |
| chr17 | 73838715 | 73839511 | Ehd3 | Nfatc1,Smad |
| chr17 | 73989843 | 73990113 | Srd5a2 | Smad |
| chr17 | 74043837 | 74044037 | Srd5a2 | Smad |
| chr17 | 75006370 | 75006746 | Ltbp1 | Smad |
| chr17 | 75046772 | 75047215 | Ltbp1 | Smad |
| chr17 | 75094615 | 75094915 | Ltbp1 | Smad |
| chr17 | 75105791 | 75105991 | Ltbp1 | Nfatc1 |
| chr17 | 75163353 | 75163607 | Ltbp1 | Nfatc1 |
| chr17 | 75378842 | 75379084 | Ltbp1 | Smad |
| chr17 | 78554595 | 78555939 | Vit | Smad |
| chr17 | 78576849 | 78577049 | Vit | Smad |
| chr17 | 78603847 | 78604326 | Vit | Foxc1 |
| chr18 | 33350435 | 33350653 | Nrep | Smad |
| chr18 | 33377893 | 33378724 | Nrep | Smad |
| chr18 | 33463129 | 33463341 | Nrep | Nfatc1 |
| chr18 | 33463613 | 33464437 | Nrep | Smad |
| chr18 | 36335391 | 36335904 | Cystm1 | Smad |
| chr18 | 38846487 | 38847878 | Fgf1 | Nfatc1 |
| chr18 | 38882183 | 38882802 | Fgf1 | Nfatc1,Smad |

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|---|---|---|---|---|
| chr18 | 38917819 | 38920014 | Fgf1 | Smad |
| chr18 | 42033762 | 42034225 | Sh3rf2 | Smad |
| chr18 | 42042674 | 42042874 | Sh3rf2 | Smad |
| chr18 | 42042936 | 42043551 | Sh3rf2 | Smad |
| chr18 | 42056544 | 42057938 | Sh3rf2 | Smad |
| chr18 | 42116701 | 42117139 | Sh3rf2 | Smad |
| chr18 | 42123862 | 42124724 | Sh3rf2 | Smad |
| chr18 | 42128283 | 42128773 | Sh3rf2 | Nfatc1,Smad |
| chr18 | 61744342 | 61745083 | Afap1l1 | Smad |
| chr18 | 61745972 | 61747212 | Afap1l1 | Smad |
| chr18 | 62131365 | 62131775 | Adrb2 | Smad |
| chr18 | 62146179 | 62147050 | Adrb2 | Nfatc1 |
| chr18 | 66453261 | 66453491 | Pmaip1 | Smad |
| chr18 | 66457953 | 66459307 | Pmaip1 | Smad |
| chr18 | 66468909 | 66469131 | Pmaip1 | Smad |
| chr18 | 80653878 | 80657414 | Nfatc1 | Nfatc1 |
| chr18 | 80682708 | 80683263 | Nfatc1 | Smad |
| chr18 | 80718092 | 80718920 | Nfatc1 | Foxc1,Smad |
| chr19 | 4212273 | 4212547 | Clcf1 | Nfatc1,Smad |
| chr19 | 5544008 | 5544490 | Ovol1 | Nfatc1,Smad |
| chr19 | 5560026 | 5561573 | Ovol1 | Nfatc1 |
| chr19 | 5877767 | 5878624 | Slc25a45 | Smad |
| chr19 | 10039548 | 10039882 | Fads3 | Smad |
| chr19 | 10043570 | 10044015 | Fads3 | Smad |
| chr19 | 14469507 | 14470213 | Tle4 | Nfatc1,Smad |
| chr19 | 14511651 | 14512979 | Tle4 | Smad |
| chr19 | 14588252 | 14588887 | Tle4 | Smad |
| chr19 | 14622634 | 14623945 | Tle4 | Smad |
| chr19 | 14657119 | 14657515 | Tle4 | Smad |
| chr19 | 14692031 | 14692630 | Tle4 | Nfatc1 |
| chr19 | 14777131 | 14778036 | Tle4 | Nfatc1 |
| chr19 | 14791821 | 14792207 | Tle4 | Smad |
| chr19 | 14884224 | 14884424 | Tle4 | Smad |
| chr19 | 15003648 | 15004482 | Tle4 | Smad |
| chr19 | 15035601 | 15036007 | Tle4 | Smad |
| chr19 | 22249020 | 22249432 | Trpm3 | Nfatc1,Smad |
| chr19 | 22576475 | 22576769 | Trpm3 | Smad |
| chr19 | 22915775 | 22917452 | Trpm3 | Foxc1,Smad |
| chr19 | 22940516 | 22940998 | Trpm3 | Smad |
| chr19 | 22977076 | 22977726 | Trpm3 | Nfatc1 |
| chr19 | 23000034 | 23000778 | Trpm3 | Foxc1,Smad |
| chr19 | 23006627 | 23007343 | Trpm3 | Smad |
| chr19 | 23054434 | 23054925 | Trpm3 | Smad |

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|---|---|---|---|---|
| chr19 | 25341612 | 25342691 | Kank1 | Smad |
| chr19 | 25383351 | 25383956 | Kank1 | Smad |
| chr19 | 25397886 | 25398090 | Kank1 | Smad |
| chr19 | 25406338 | 25408006 | Kank1 | Smad |
| chr19 | 26338968 | 26340770 | Smarca2 | Smad |
| chr19 | 26389464 | 26390339 | Smarca2 | Smad |
| chr19 | 26472668 | 26472870 | Smarca2 | Smad |
| chr19 | 26501061 | 26501904 | Smarca2 | Smad |
| chr19 | 26502750 | 26503271 | Smarca2 | Smad |
| chr19 | 26604369 | 26605644 | Smarca2 | Smad |
| chr19 | 26606243 | 26608366 | Smarca2 | Foxc1,Smad |
| chr19 | 26733252 | 26734199 | Smarca2 | Smad |
| chr19 | 29041001 | 29041930 | Ak3 | Smad |
| chr19 | 29047478 | 29048775 | Ak3 | Smad |
| chr19 | 34243648 | 34244519 | Acta2 | Smad |
| chr19 | 34254331 | 34255220 | Acta2 | Smad |
| chr19 | 34255545 | 34255907 | Acta2 | Smad |
| chr19 | 34267894 | 34268194 | Acta2 | Smad |
| chr19 | 34270237 | 34270437 | Acta2 | Nfatc1,Smad |
| chr19 | 42146833 | 42149051 | Marveld1 | Smad |
| chr19 | 44280718 | 44281529 | Scd2 | Smad |
| chr19 | 44283874 | 44284838 | Scd2 | Smad |
| chr19 | 44295331 | 44296104 | Scd2 | Smad |
| chr19 | 44303611 | 44303959 | Scd2 | Smad |
| chr19 | 44314325 | 44315425 | Scd2 | Nfatc1 |
| chr19 | 57152434 | 57152699 | Ablim1 | Smad |
| chr19 | 57154961 | 57156632 | Ablim1 | Nfatc1 |
| chr19 | 57238235 | 57239822 | Ablim1 | Smad |
| chr19 | 58189068 | 58189269 | Gfra1 | Foxc1,Smad |
| chr19 | 58214975 | 58215708 | Gfra1 | Foxc1 |
| chr19 | 58226393 | 58227388 | Gfra1 | Smad |
| chr19 | 58271959 | 58272191 | Gfra1 | Smad |
| chr19 | 58453702 | 58454012 | Gfra1 | Nfatc1,Smad |
| chr19 | 58470963 | 58471338 | Gfra1 | Smad |
| chrX | 100085271 | 100085892 | Eda | Nfatc1 |
| chrX | 103793748 | 103793956 | Slc16a2 | Nfatc1,Smad |
| chrX | 157465357 | 157465639 | Sms | Smad |
| chrX | 157490865 | 157492679 | Sms | Smad |
| chrX | 159731315 | 159731922 | Sh3kbp1 | Nfatc1 |
| chrX | 159839191 | 159840704 | Sh3kbp1 | Smad |
| chrX | 159849090 | 159849614 | Sh3kbp1 | Smad |
| chrX | 159896276 | 159897097 | Sh3kbp1 | Smad |
| chrX | 159963190 | 159963445 | Sh3kbp1 | Foxc1 |

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|---|---|---|---|---|
| chrX | 166564396 | 166565916 | Egfl6 | Smad |
| chrX | 166584945 | 166585891 | Egfl6 | Smad |

## Table S4 Primers

| Gene | Forwad primer | Reverse primer |
|---|---|---|
| Bmp6 | CTGCGCACCAACCAAACTGAA | TTGGGGGAGGCGAACATTAGGTA |
| Ccna2 | CTGTCTCTTTACCCGGAGCA | CGTTCACTGGCTTGTCTTCT |
| Cd34 | AAGACCACACCAGCCATCTC | GGGGAAGTCTGTGGTTGTGA |
| Cdc20 | CAGGAGGAGGAACCAGTGAC | GTGGGGAGACCAGAGGATG |
| Fgf18 | ATCAAGGGCAAGGAGACAGA | CAGGGCCGTGTAGTTGTTTT |
| Foxc1-a | CACTCGGTGCGGGAAATGT | GTGCGGTACAGAGACTGACTG |
| Foxc1-b | CACTCGGTGCGGGAAATGT | GGTACAGAGACTGACTGGCA |
| Foxm1 | GAGCACTTGGAATCACAGCA | AGCAGAGGCTTCATCTTTCG |
| Hprt | TCAGTCAACGGGGGACATAAA | GGGGCTGTACTGCTTAACCAG |
| Kif23 | AGCGTGTTCAGCATTAAACTTG | GCTCCCAGCAAGATCTACCA |
| Top2a | TGGGAGTGAAGAAGACAGCA | ACGAGCACTCAAGGCTGAAT |
| Nfatc1 ChIP motif | AAACCTCATGGTGCATTGTG | AAACGCAACCCAGGTGTAAG |
| Nfatc1 ChIP no motif | CTGCATCTACCCAGCACAGA | CCTTCCAGAAAGCCTTACCC |
| Hspb8 ChIP | CGATTCACCTTGGGGTTTTA | GGCCAAGGTTCCTGTAACAA |
| Bmp6 ChIP motif | AACCTGGAGTCTCAGCTTCG | TGTTTATTTCTGTGTGGCTTGG |
| Nfatc1 ChIP no motif | GCAGCCCACAATGATCTCTT | AGAAGGCTAGCAGCACCTGA |
| Krt5 ChIP | CTGGAATATACCCAAGAAAAGAGG | AGGTCACCCACTTGACAATGA |
| Chr5IGR ChIP | CCCTCATCACAGACCCACTTCT | GTGGGAGTGGATGTATCTCTGACTT |
| Chr3IGR ChIP | TGTCTGGAATGTGGTGGTTTGA | GCCCACTGCTATAATTAGGAAGGA |

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