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Supplementary Information for

IκBζ is a key transcriptional regulator of IL-36-driven psoriasis-related gene expression in keratinocytes

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Supplementary Information Text

SI Materials and Methods

Cell culture and treatment. HaCaT cells were maintained in DMEM with 10% FCS and antibiotics. Human primary KC were freshly isolated from foreskin and maintained in CnT-07S medium with gentamycin (CELLnTEC). Recombinant human IL-36α (aa 6-158), full-length IL-36α (aa 1-158), IL-36γ (aa 18-169) or mouse human IL-36α (aa 6-160) were purchased from R&D or kindly provided by Amgen. Recombinant IL-17A (11340174), TNFα (11343013), IFNγ (11343536) and IL-1β (11340013) were from Immunotools. The following inhibitors were purchased from Selleckchem: Trametinib (MEK1/2 inhibition), SCH772984 (ERK1/2 inhibition), BMS-345541 (IKK1/2 inhibition) SP600125 (JNK inhibition), IMD0354 (IKK2 inhibition).

Generation of knockdown cells. Lentiviral particles were produced in HEK293T cells using the lentiviral vector pMD2.G and a second-generation packaging system (psPAX2, Addgene). HaCaT cells or primary KC were transduced in the presence of 8 µg/mL polybrene, packaging plasmids and 5 µg of the respective shRNA construct: pLKO.1-puro (sh ctrl); pLKO.1-TRCN0000147551 (sh NFKBIZ); pLKO.1-TRCN0000014686 (sh RELA); pLKO.1-TRCN0000008025 (sh1 MyD88); pLKO.1-TRCN0000011223 (sh2 MyD88); pLKO.1-TRCN0000020840 (sh1 STAT3); pLKO.1-TRCN0000020843 (sh2 STAT3), followed by puromycin selection (1 ng/mL, Invitrogen).

Luciferase constructs and reporter assays. The promoter 2 region of *NFKBIZ* (chr3: 101848459-101850067) containing the binding sites for STAT3 (CTTCCAGGAC), NFκB (CGGGGTTTCCC), AP1 (TGACTCC), KLF4 (TGGGCGGAGCCGGGCGGGCGGGGC) and STAT1/STAT3 (ATTTTACTGGAAATC) was cloned into a pGL3 basic construct. For deletion of transcription factor-binding sites a double PCR was performed using specific forward and reverse primers (Table S4). Successful generation of the constructs was checked by sequencing. For transfection 10^5 HaCaT cells were transfected with 5 µg luciferase construct and 1.25 µg TK-Renilla-expressing construct using Lipofectamine 3000 reagent (Life Technologies). 24 h later, cells were stimulated for 24 h with 100 ng/mL IL-36α or 200 ng/mL IL-17A, before luciferase activity was measured with the Firefly Luciferase Assay Kit (Promega). Expression of the reporter constructs was calculated as fold induction over unstimulated transfected cells from data of three independent experiments.

Western blot analysis. Cells were washed in PBS and resuspended in lysis buffer containing 20 mM TRIS-HCl pH 7.5, 150 mM NaCl, 1% Triton X-100, 1 mM Na_2EDTA, 1 mM EGTA, 1 mM β-glycerophosphate, 2 M urea and 1x protease inhibitor cocktail (Roche). After 10 min on ice, samples were briefly sonicated to disrupt DNA–protein complexes. Afterwards, samples were separated by SDS-PAGE and transferred to a nitrocellulose membrane. The following antibodies were used for Western blot analysis and purchased from Cell Signaling: anti-IκBζ (9244), anti-p-STAT3 (phospho-STAT3 at Tyr705; 9145), anti-STAT3 (12640), anti-p65 (8242), anti-p-p65 (phospho-p65 at Ser536, 3031), anti-p-JNK (phospho-JNK at Thr183/Tyr185, 4668), anti-JNK (9252), anti-p-p44/42 MAPK (phospho-Erk1/2 at Thr202/Tyr204, 4370), anti-p44/42 MAPK (4695), anti-p-IκBα (phospho-IκBα at Ser32, 2859), anti-IκBα (4814), anti-MyD88 (4283), anti-GAPDH (2118) and anti-β-actin (3700). Anti-HSC70 (sc-7298) was obtained from Santa Cruz Biotechnology. For detection of mouse IκBζ, a self-made antibody was used.

Chromatin immunoprecipitation. ChIP assays were performed as described (1). After sonification, chromatin was incubated with protein G-coupled Dynabeads (Invitrogen) and 2 µg of p65 (Diagenode, C15310256), STAT3 (Thermo Fisher, MA1-13042), RNA-polymerase II (Abcam, ab5095) or IgG control antibodies (Abcam, ab46540) overnight at 4°C. The promoter

region of *MYOD1* served as an internal negative control (forward: 5´-CTCTGCTCCTTTGCCACAAC-3´, reverse: 5´-GAGTGCTCTTCGGGTTTCAG-3´). ChIP primers corresponding to the promoter region 2 of *NFKBIZ* variant 1 were self-designed (primer for readout of STAT3 ChIP: forward 5´-GCCTTAACTGGGCTAACAGC-3´, reverse 5´-CTGGCAAGTCCTGGAAGGAG-3´; primer for readout p65 and Pol II ChIP: forward 5´-GAAGGGCAGGCAAACAAC-3´, reverse 5´-GATGCGTCCGATTTCCAG-3´). Data are presented as the percentage of input from 2 independent experiments.

Gene expression analysis by qPCR. Total RNA was isolated using Qiazol (Qiagen). After digestion of genomic DNA with DNase I, cDNA synthesis was performed using M-MuLV reverse transcriptase and random hexamer primers (Thermo Fisher Scientific). Relative gene expression was quantified by real-time PCR using Maxima SYBR Green master mix (Thermo Fisher Scientific) and self-designed primers (Suppl. Table S3). PCR conditions were as follows: initial denaturation 15 min at 95°C, followed by 40 cycles of 95°C for 15 s and 60°C for 45 s. Relative mRNA levels were calculated by normalization to the reference genes *RPL37A* or *ACTB* using the $2^{-\Delta\Delta CT}$ method.

RNAseq. For RNAseq analysis, libraries were constructed with the Ultra RNA Library Prep Kit at the Core Facility Genomics in Münster, Germany. Sequencing was performed using the Illumina NextSeq High Output kit. Mapping against the human reference genome hg19 was performed by HISAT2 (2). From raw gene counts, differentially expressed genes between wild-type and knockdown cells were computed using the Bioconductor R package DESeq2. Genes were called differentially expressed if their adjusted p-value (false discovery rate) was < 0.05 and the absolute fold change > 1.

Mice. Experiments were conducted in accordance with the German law guidelines of animal care. Tamoxifen-inducible IκBζ knockout mice were generated by crossing B6.Cg-Nfkbiz<tm1.1Muta> mice (RIKEN) to B6.129-*Gt(ROSA)26Sor*$^{tm1(cre/ERT2)Tyj}$/J mice (Jackson Laboratory). IκBζ deletion was induced by intraperitoneal injection of 75 mg/kg tamoxifen (T5648, Sigma-Aldrich) for 4 consecutive days. As control, *Nfkbiz* flox/flox mice (B6.Cg-Nfkbiz<tm1.1Muta>) received tamoxifen injections in parallel. Three days after the last tamoxifen injection, mice received for 5 consecutive days intradermal injections to the ear, containing 1 µg murine IL-36α or PBS vehicle alone. At day 6, mice were sacrificed and analyzed.

Flow cytometry. Three ears per group were chopped and digested with 300 µg/ml Liberase (Roche) and 50 U/ml DNase I (Thermo Fisher) in 5% FCS in RPMI for 2 h at 37°C. For generation of single cell suspensions, cells were passed through a cell strainer (100 µm). After cell counting, 10^5 cells were treated with Fc-Block (BioRad, BUF041) and surface-stained with the following antibodies from BioLegend: anti-CD45 FITC (103107), anti-CD3 PerCP (100325), anti-CD4 PE (100407), anti-CD8 APC (100711), anti-CD11b PacificBlue (101223), anti-Ly6G PE (127607), anti-F4/80 APC (123115). Anti-γδ-TCR APC was from Thermo Fisher. Data were acquired on a LSRII flow cytometer (Becton Dickson) and gates were set based on the respective isotype controls.

Histology. After fixation in formaldehyde and paraffin-embedding, 5-µm sections were prepared and incubated with the following antibodies: MPO (AF3667, R&D, 1:200), F4/80 (70076, Cell Signaling, 1:400) or Ki67 (ab15580, Abcam, 1:1000). Antigen retrieval was performed in 1 mM EDTA pH 8.0 for MPO, and in 10 mM citrate pH 6.0 for F4/80 and Ki67. After incubation with peroxidase-coupled secondary antibodies, sections were stained with DAB substrate.

Cytokine antibody array. For detection cytokine secretion, protein lysates from 2 mouse ears per group were pooled. 600 µg total protein lysate was analyzed with a cytokine array (R&D Systems, ARY006). Mean pixel density of each spot was quantified using the dot blot analyzer (ImageJ).

Analysis of patient data. Gene expression data originated from GEO data set GSE13355 (3, 4). Pre-normalized gene expression values from each sample was directly taken from the GEO profile data set GDS4602. The following reporters were taken for analysis: *NFKBIZ*: ID 223218_s_at, *IL17A*: ID 216876_s_at, *IL36G*: ID 220322_at and *LCN2*: ID 212531_at.

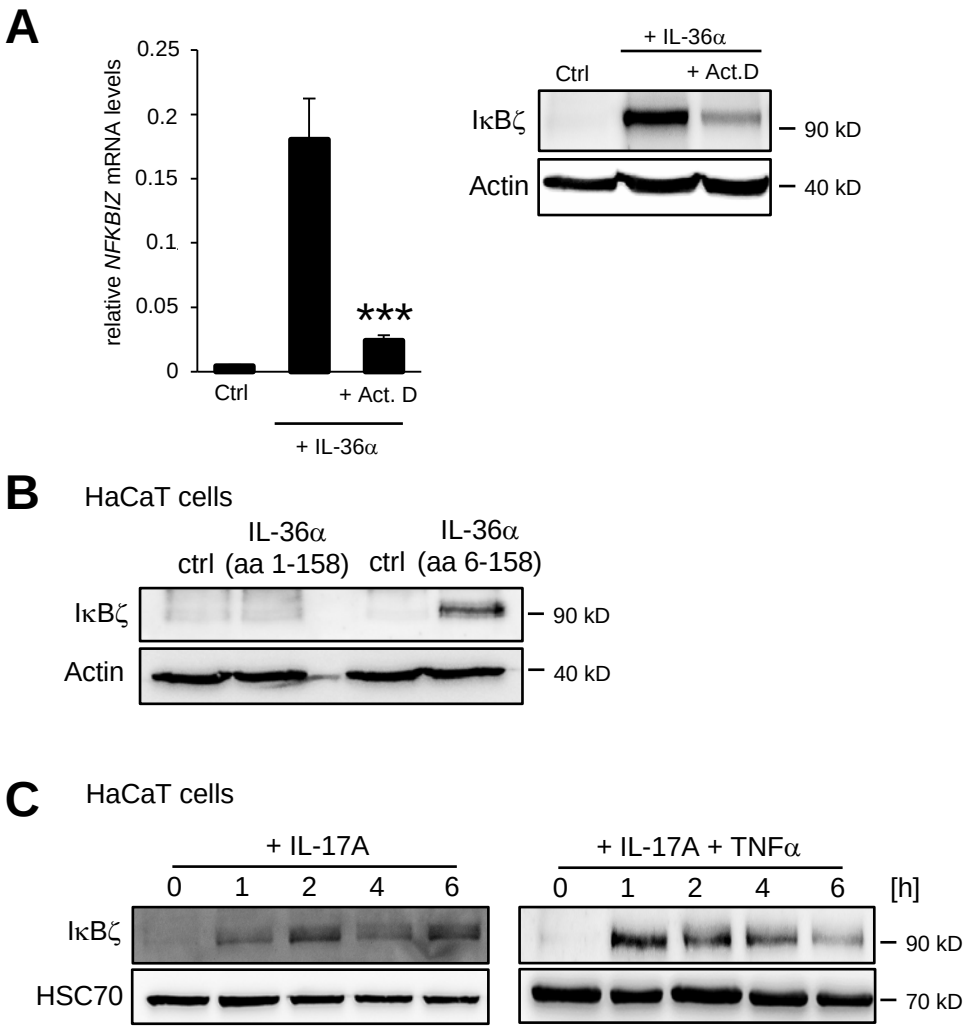

Fig. S1. Induction of IκBζ protein expression by full-length and truncated IL-36α as well as by IL-17A and TNFα. (A) IκBζ is transcriptionally induced by IL-36α. HaCaT cells were pre-treated for 30 min with 100 ng/mL of active IL-36α followed by the addition of 5 µg/mL actinomycin D or a DMSO control for 30 min. *NFKBIZ* mRNA levels were analyzed by qPCR and normalized to *RPL37A*. IκBζ protein levels were detected by Western blot in parallel. **(B)** IκBζ is not induced by full-length IL-36α. HaCaT cells were stimulated for 24 h with 2 µg/mL biologically inactive full-length IL-36α (aa 1-158) or 200 ng/mL truncated IL-36α (aa 6-158), followed by immunoblot analysis. **(C)** IL-17A, alone or in combination with TNFα, induces IκBζ. HaCaT cells were treated for the indicated times with 100 ng/mL IL-17A alone (*left)* or in combination with 10 ng/mL TNFα (*right*).

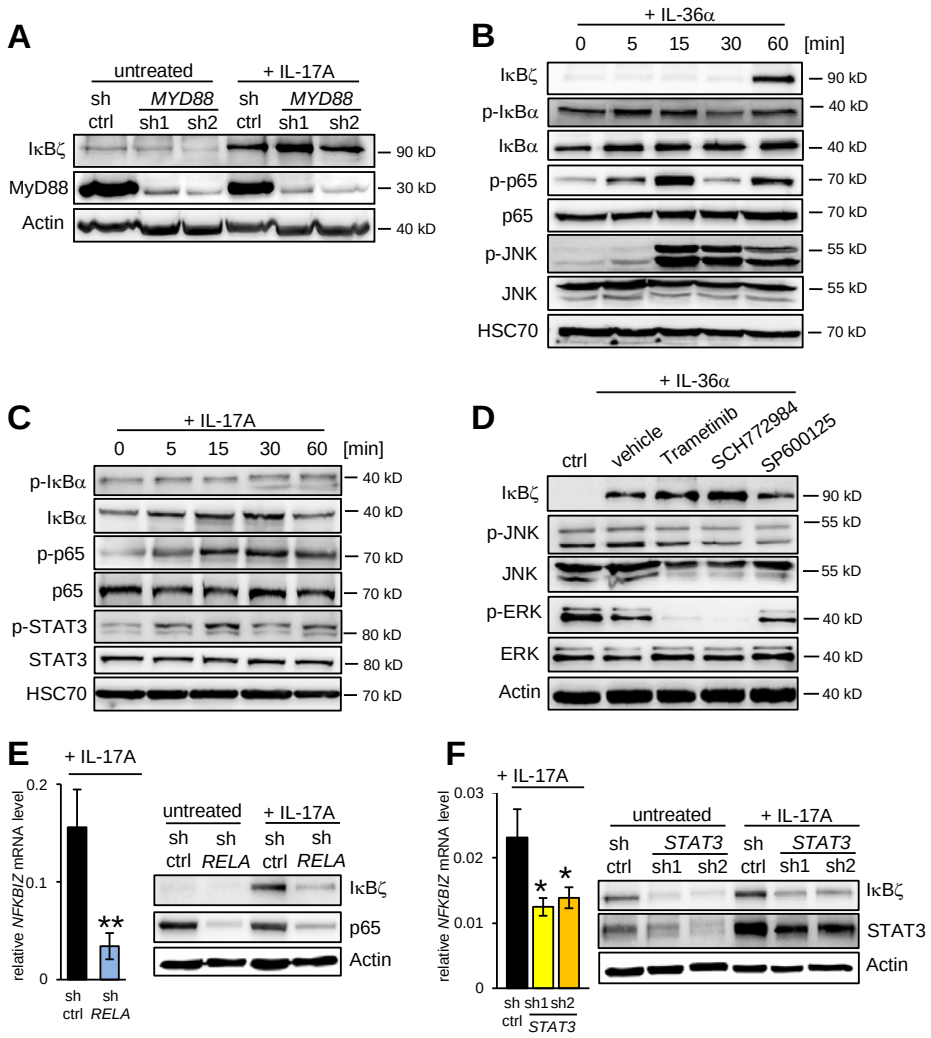

Fig. S2. Mechanism of IκBζ induction by IL-17A. In all experiments, HaCaT cells were stimulated with 200 ng/mL IL-17A. **(A)** HaCaT cells stably expressing a control shRNA (sh ctrl) or two different shRNAs targeting *MyD88* were treated for 2 h with IL-17A and analyzed by Western blotting. **(B)** Upstream signaling of IL-36α-treated primary KC. Cells were stimulated with 100 ng/mL IL-36α for the indicated time. NF-κB activation was detected by staining for the phosphorylated forms of IκBα (p-IκBα at Ser32) and p65 (p-p65 at Ser536). Activation of the MAPK pathway was detected by phosphorylated JNK (p-JNK at Thr183/ Tyr185). **(C)** Immunoblot analysis of IL-17A-treated HaCaT cells. NF-κB and STAT3 activation was detected with antibodies against the phosphorylated forms of IκBα (p-IκBα at Ser32) p65 (p-p65 at Ser536) and STAT3 (p-STAT3 at Tyr705). **(D)** HaCaT cells were either left untreated (Ctrl) or stimulated for 2 h with 100 ng/mL IL-36α together with the vehicle control DMSO, 50 nM Trametinib (MEK inhibitor), 1 µM SCH772984 (ERK1/2 inhibitor) or 10 µM SP600125 (JNK inhibitor). The status of phosphorylated ERK (p-ERK1/2) and p-JNK was measured as a control for kinase inhibition. **(E)** Gene expression and Western blot analysis of IκBζ in control and *RELA* (p65) knockdown cells after 1 h treatment with IL-17A. Knockdown efficiency was controlled by immunoblot detection of p65. *NFKBIZ* mRNA levels were normalized to *RPL37A*. **(F)** Relative mRNA and protein levels of IκBζ in control and *STAT3* knockdown HaCaT cells after 1 h of treatment with IL-17A. Knockdown efficiency of *STAT3* was controlled by immunoblot analysis. mRNA levels were normalized to *RPL37A*.

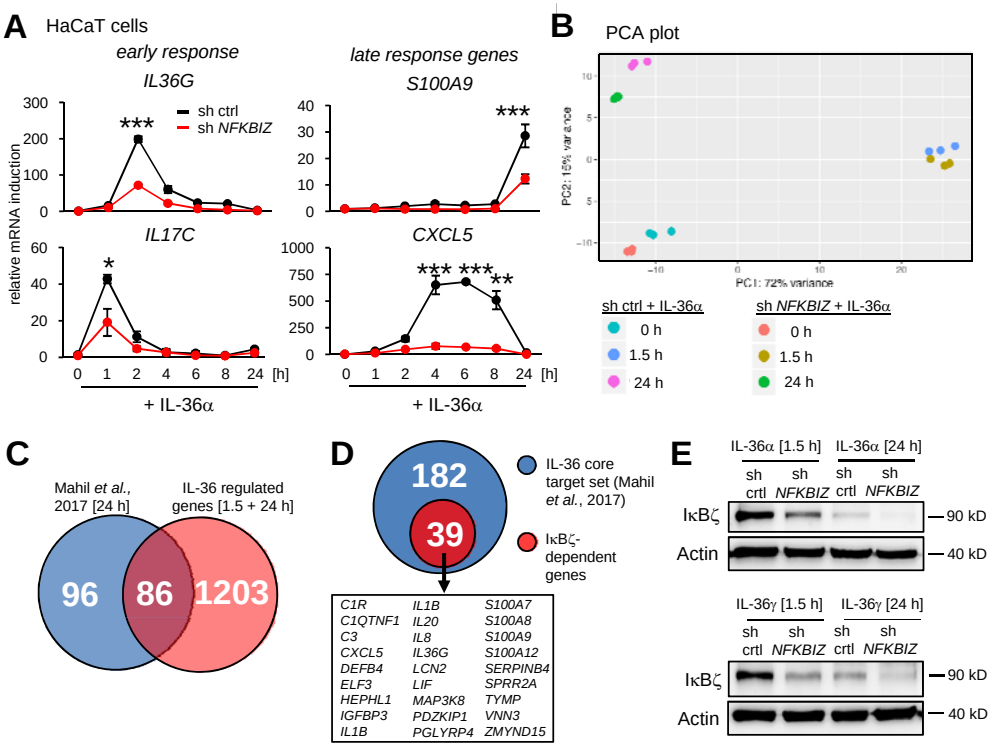

Fig. S3. Characterization of IκBζ-mediated gene expression in keratinocytes. (A) Induction of psoriasis-related gene expression by IL-36α in the presence and absence of IκBζ. Biological triplicates from control and *NFKBIZ* shRNA-transduced HaCaT cells were stimulated with 100 ng/mL IL-36α for the indicated times. Expression of *IL36G*, *S100A9*, *IL17C* and *CXCL5* was analyzed by qPCR and relative mRNA induction was calculated after normalization to the reference gene *RPL37A*. Significance is shown by asterisks (*p < 0.05; ** p < 0.01; *** p < 0.001). **(B)** Principle component analysis (PCA) of IL-36α-modulated gene expression in primary KC expressing a control or *NFKBIZ*-specific shRNA. PCA revealed only minor variances between the triplicate samples, whereas the transcripts of untreated cells or cells treated with IL-36α for either 1.5 h or 24 h were strongly different. Moreover, comparison of the transcript clusters between wildtype and *NFKBIZ* knockdown cells revealed that only a specific subset of IL-36α-regulated genes was affected by IκBζ depletion. **(C)** Venn diagram showing the overlap of IL-36-regulated genes identified in our RNAseq analysis and previously published data (5). A core set of 182 IL-36 target genes defined by Mahil *et al.* (Ref. 5) was compared to our RNAseq data containing the merged sets of IL-36 target genes after 1.5 and 24 h of stimulation. Note that our data set included genes of a late (24 h) and early (1.5 h) stimulation time point which latter was not analyzed by Mahil *et al.* (2017). **(D)** Overlap of the IL-36 core target gene set (Ref. 5) and IκBζ-dependent target genes. Examples of overlapping target genes are depicted below. **(E)** Western blot analysis of the IκBζ knockdown in HaCaT cells expressing a control or *NFKBIZ*-specific shRNA after the indicated times of treatment with IL-36α or IL-36γ.

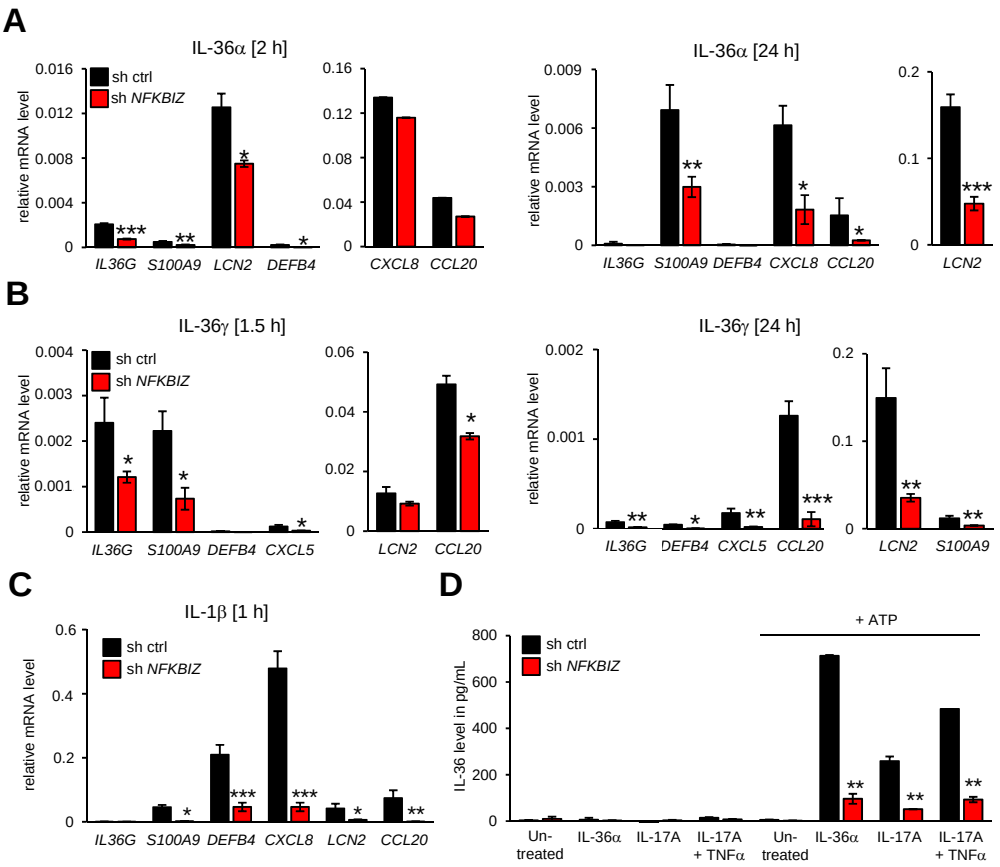

Fig. S4. Characterization of the IL-36/IκBζ axis in keratinocytes. Control and *NFKBIZ* knockdown HaCaT cells (corresponding to Fig. S3E) were treated for 2 and 24 h with 100 ng/mL IL-36α **(A)**, for 1.5 and 24 h with IL-36γ **(B)**, or for 1 h with 100 ng/mL IL-1β **(C)**. Expression of *IL36G*, *S100A9*, *DEFB4*, *LCN2*, *CCL20* and *CXCL5* was analyzed by qPCR and normalized to the reference gene *RPL37A*. **(D)** IL-36 protein levels in cytokine-stimulated HaCaT cells. Control and *NFKBIZ*-depleted HaCaT cells were stimulated for 48 h with IL-36α (100 ng/mL), IL-17A (100 ng/mL) or IL-17A (100 ng/mL) + TNFα (10 ng/mL). 30 min before harvest cells were additionally treated with 5 mM ATP to facilitate IL-36γ release by P2X7 receptor-mediated exosome formation. IL-36γ was determined in the supernatant using an IL-36G ELISA. Significance is shown by asterisks (*p < 0.05; ** p < 0.01; *** p < 0.001).

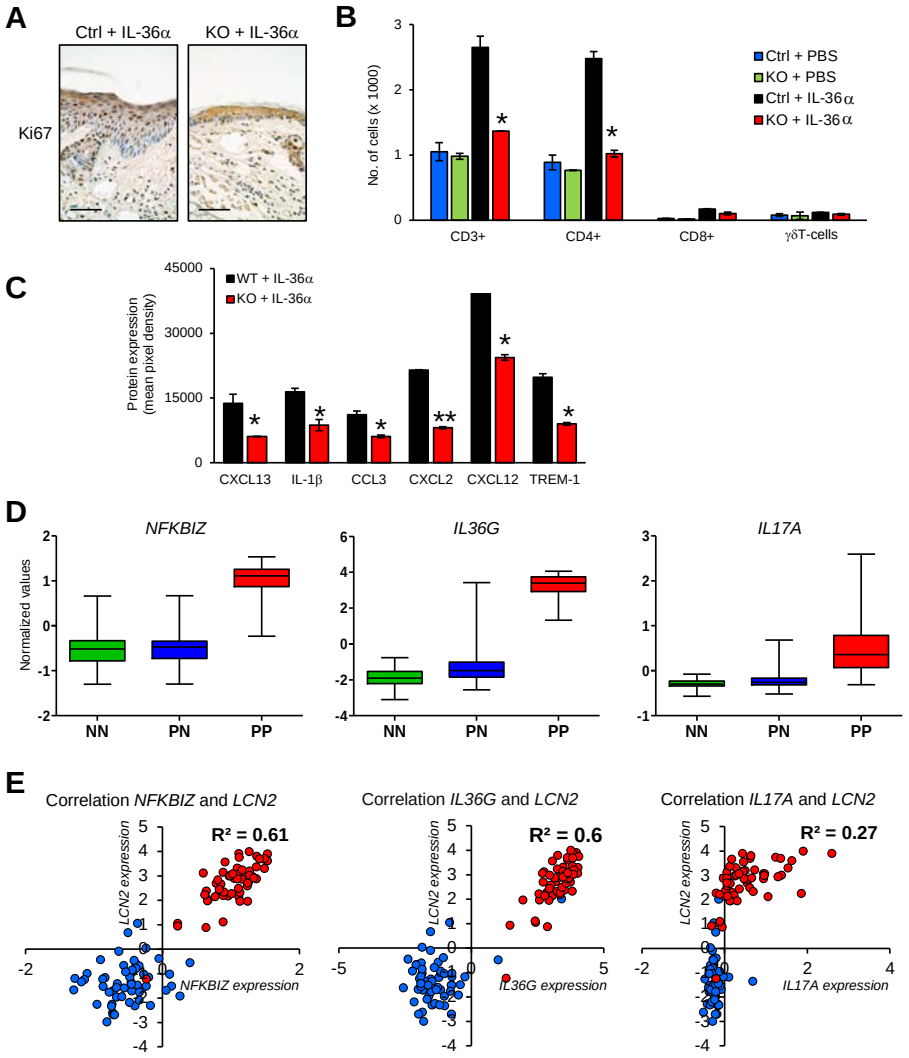

Fig. S5. Further characterization of the IL-36/IκBζ axis *in vivo*. (A) IHC analysis of Ki67 in IL-36α-treated ears as a marker for keratinocyte hyperproliferation. **(B)** Analysis of T-cell subpopulations in PBS and IL-36α-treated ears by flow cytometry. Single cell suspensions were prepared from 3 pooled ears per group and T-cells were identified as CD45+ and CD3+ cells. For further discrimination of T-cell subpopulations cells co-stained with CD4 or CD8. γδT-cells were identified as CD45+, CD3+ and γδ-TCR+. Error bars derive from two independent measurements (*p < 0.05; ** p < 0.01; *** p < 0.001). **(C)** Quantification of secreted cytokines in IL-36α-treated ear tissue. Pooled protein lysates of two ears from either IL-36α-treated control or KO mice were analyzed using a cytokine antibody array. For both samples, equal amounts of protein were used, and equal loading controlled by analyzing reference spots on the membranes. Depicted is the mean pixel density of two dots per cytokine. Significance is shown by asterisks (*p < 0.05; ** p < 0.01; *** p < 0.001; n.s. = not significant). **(D)** Expression data from skin biopsies of 64 healthy patients and 58 psoriasis patients were analyzed from the GEO profile data set GDS4602 (48, 49), using the GEO Dataset Analysis Tool (GDS browser from NCBI). Shown is the mean normalized expression of *NFKBIZ* (ID: 223218_s_at), *IL17A* (ID: 216876_s_at) and *IL36G* (ID: 220322_at) in normal skin (NN) of healthy individuals as well as in uninvolved skin (PN) and psoriatic lesions (PP) from psoriasis patients. **(E)** Normalized expression values from *LCN2* (ID: 212531_at) were plotted against *NFKBIZ*, *IL36G* and *IL17A*.

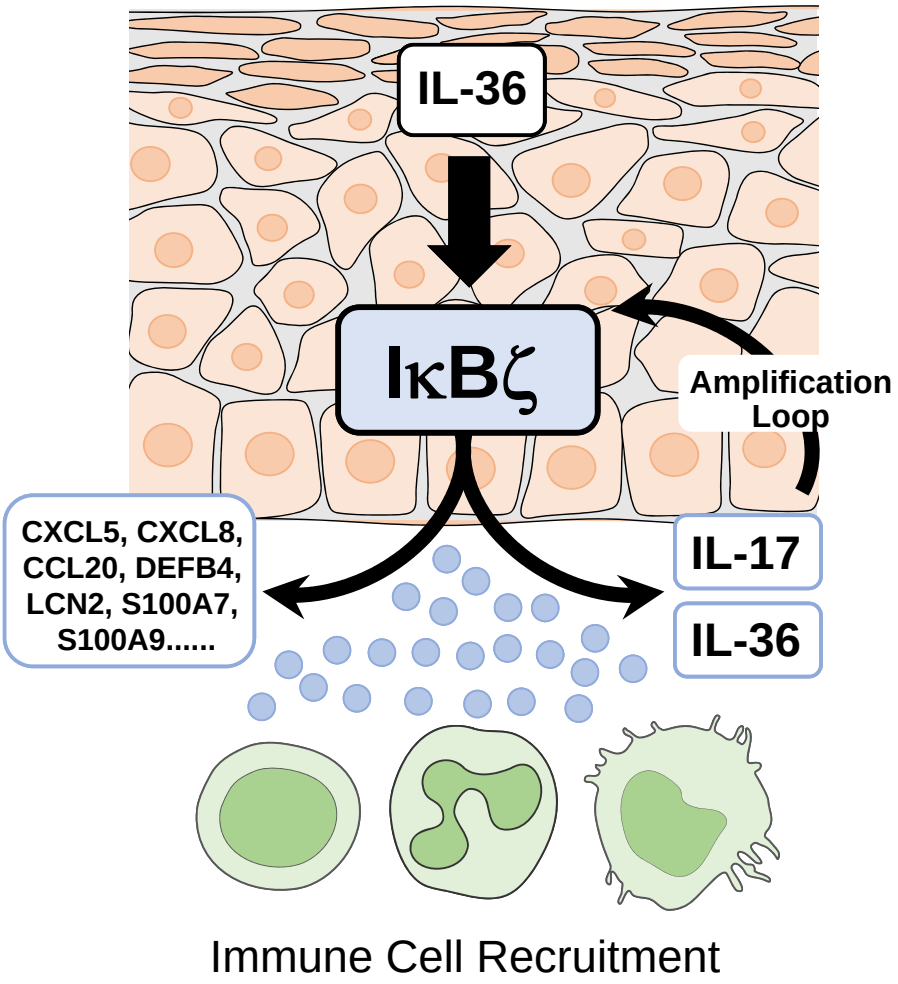

Fig. S6. Simplified model of IL-36-driven IκBζ signaling in keratinocytes. Binding of IL-36 to its receptor triggers the expression of the transcriptional regulator IκBζ, which then transcriptionally upregulates several antimicrobial peptides, cytokines and chemokines involved in the pathogenesis of psoriasis. Among others, induction of IκBζ target genes results in the recruitment and activation of immune cells. Important IκBζ target genes are also IL-17 and IL-36 itself, triggering an amplification loop of proinflammatory IκBζ signaling in keratinocytes.

Table S1. List of genes regulated by *NFKBIZ* knockdown in primary KC after 1.5 h of IL-36α treatment

	Base Mean	log2 fold Change	lfcSE	stat	P value	P value adj.
NTSR1	36.69	3.57	0.47	-7.63	2.26554E-14	2.80042E-11
RMRP	15.62	2.55	0.67	-3.82	0.00013082	0.003760604
DOK7	236.97	2.43	0.35	-6.87	6.54443E-12	4.04476E-09
UBBP4	13.30	2.35	0.60	-3.95	7.91843E-05	0.002581941
MATK	19.32	2.32	0.51	-4.59	4.3557E-06	0.000297611
RAMP1	206.36	2.26	0.35	-6.50	7.95432E-11	3.37984E-08
DUSP9	53.29	2.23	0.41	-5.43	5.74436E-08	9.29835E-06
SYT12	117.45	2.20	0.41	-5.34	9.2756E-08	1.33006E-05
ASCL2	32.82	2.18	0.47	-4.65	3.37294E-06	0.000240115
CRLF1	58.59	2.11	0.38	-5.49	4.07773E-08	7.20064E-06
SPRY4	642.68	2.09	0.22	-9.50	2.00174E-21	9.07253E-18
LYNX1	189.12	2.04	0.40	-5.12	2.99845E-07	3.2616E-05
DUSP2	409.28	2.02	0.35	-5.85	4.97137E-09	1.16544E-06
USH1G	13.45	2.02	0.62	-3.24	0.001212883	0.016508214
KIAA1644	25.47	2.01	0.45	-4.49	7.10439E-06	0.000429326
DEGS2	46.57	1.99	0.46	-4.35	1.38739E-05	0.00072277
PTGES	125.49	1.97	0.34	-5.76	8.25718E-09	1.78211E-06
TMEM105	20.05	1.93	0.46	-4.17	3.09087E-05	0.001334178
CX3CL1	33.79	1.93	0.47	-4.10	4.14642E-05	0.001713643
SNCB	58.08	1.91	0.42	-4.55	5.39648E-06	0.000342878
HAS1	18.97	1.90	0.48	-3.95	7.95946E-05	0.002589111
CPLX1	21.35	1.90	0.48	-3.99	6.55802E-05	0.002306451
STMN3	122.69	1.89	0.37	-5.17	2.33847E-07	2.64968E-05
KRT1	188.81	1.88	0.29	-6.61	3.85818E-11	1.69225E-08
DNLZ	22.01	1.87	0.59	-3.18	0.001486806	0.018753345
GRIA1	19.04	1.87	0.50	-3.73	0.000189181	0.004844251
LRFN1	90.52	1.85	0.38	-4.91	8.97741E-07	7.71716E-05
CITED4	2028.14	1.84	0.30	-6.06	1.36946E-09	4.43346E-07
FOXL1	13.71	1.83	0.54	-3.40	0.000679254	0.011530356
PLLP	142.79	1.79	0.26	-6.85	7.49452E-12	4.43057E-09
PALD1	34.37	1.78	0.40	-4.50	6.93618E-06	0.00042382
CAPN8	90.37	1.75	0.32	-5.44	5.40551E-08	8.96571E-06
GPR153	2211.19	1.75	0.33	-5.33	9.87708E-08	1.39894E-05
SYT8	300.56	1.75	0.30	-5.87	4.30154E-09	1.05144E-06
DCN	19.76	1.74	0.45	-3.85	0.000117377	0.003492291
ENTPD2	328.87	1.74	0.32	-5.53	3.21671E-08	5.91049E-06

SLC22A17	329.90	1.74	0.30	-5.75	9.08664E-09	1.9288E-06
PTGS1	202.11	1.72	0.26	-6.65	2.97177E-11	1.49656E-08
EDN2	26.70	1.71	0.38	-4.49	7.17739E-06	0.000431819
EGFL7	324.81	1.70	0.42	-4.08	4.41959E-05	0.001793826
TNFRSF18	311.45	1.69	0.32	-5.34	9.2929E-08	1.33006E-05
SH3TC1	1053.00	1.69	0.36	-4.65	3.3605E-06	0.000240115
RP11-1055B8.6	15.98	1.67	0.54	-3.11	0.001858448	0.021601366
TP73	23.76	1.67	0.46	-3.61	0.000304315	0.006739047
MROH6	3512.63	1.66	0.33	-5.10	3.34272E-07	3.55086E-05
BGN	16.86	1.66	0.53	-3.11	0.001880921	0.021784395
SLC19A1	1829.84	1.66	0.37	-4.48	7.57219E-06	0.00044571
TH	116.02	1.65	0.33	-4.98	6.23379E-07	5.6133E-05
KLK14	51.87	1.65	0.39	-4.20	2.65412E-05	0.001191025
RP11-1275H24.1	55.10	1.63	0.42	-3.93	8.55968E-05	0.002747145
PTPRU	2427.25	1.63	0.32	-5.07	3.90059E-07	4.05098E-05
NAPRT1	1086.21	1.63	0.31	-5.24	1.57862E-07	2.00602E-05
CDT1	2468.96	1.62	0.32	-4.99	5.94145E-07	5.53328E-05
CPNE5	32.61	1.62	0.36	-4.55	5.3036E-06	0.000338559
ABCA2	528.66	1.62	0.34	-4.77	1.85847E-06	0.000144398
NUDT8	189.96	1.62	0.42	-3.89	0.000102143	0.003156451
GDNF	35.28	1.61	0.34	-4.76	1.94597E-06	0.000150337
FAM132A	82.35	1.61	0.40	-3.99	6.57703E-05	0.002306451
FGFR4	330.38	1.61	0.35	-4.55	5.48997E-06	0.000345589
LINC00173	14.42	1.61	0.59	-2.73	0.00640307	0.046458131
COL5A3	97.34	1.59	0.35	-4.55	5.47311E-06	0.000345589
PLK1	2492.76	1.59	0.27	-5.84	5.31008E-09	1.22375E-06
OLFM2	237.37	1.58	0.33	-4.84	1.27851E-06	0.000105357
EEF1A2	31.73	1.58	0.38	-4.21	2.55856E-05	0.001159625
RP11-770E5.1	17.62	1.58	0.46	-3.44	0.000578136	0.010235564
KCNK5	128.56	1.57	0.28	-5.64	1.73734E-08	3.32713E-06
TONSL	1878.45	1.57	0.34	-4.58	4.57553E-06	0.000303651
WNT7B	1240.12	1.55	0.32	-4.90	9.73165E-07	8.27008E-05
GJC2	76.42	1.55	0.42	-3.67	0.000239484	0.005702741
CTD-2555C10.3	51.20	1.54	0.41	-3.76	0.000172436	0.004535047
GAREML	77.41	1.54	0.30	-5.04	4.63403E-07	4.47349E-05
SLC52A3	439.00	1.53	0.26	-5.88	4.1459E-09	1.04392E-06
HPDL	120.37	1.53	0.29	-5.36	8.16353E-08	1.21613E-05
AC018638.1	21.57	1.52	0.50	-3.07	0.002158634	0.023670122
C15orf39	3127.90	1.52	0.35	-4.37	1.2356E-05	0.000666683
TMEM121	33.87	1.51	0.48	-3.15	0.001652997	0.02019389
PROB1	480.44	1.51	0.33	-4.58	4.60044E-06	0.000303651

PRRT4	127.54	1.50	0.36	-4.12	3.71906E-05	0.001565573
NPAS1	54.44	1.50	0.41	-3.63	0.000286895	0.006501514
GPAA1	6340.25	1.50	0.35	-4.24	2.26669E-05	0.001059113
PROM2	2941.51	1.50	0.32	-4.65	3.28821E-06	0.00023656
C1orf145	18.13	1.50	0.47	-3.18	0.001457413	0.018554718
PLEKHA7	188.14	1.49	0.22	-6.77	1.31768E-11	7.16657E-09
LPHN1	126.92	1.49	0.37	-4.07	4.75998E-05	0.001878553
KCNMA1	121.21	1.49	0.27	-5.47	4.59965E-08	7.81768E-06
LINC00162	35.08	1.48	0.40	-3.69	0.000226536	0.005475789
CTB-102L5.4	34.47	1.47	0.47	-3.15	0.00160817	0.019842369
IRF2BPL	1128.35	1.47	0.29	-5.01	5.44604E-07	5.14235E-05
SLC16A3	3228.38	1.47	0.36	-4.08	4.50465E-05	0.001817499
FASN	96217.62	1.47	0.36	-4.04	5.42499E-05	0.002046291
IGFBP2	5259.48	1.46	0.34	-4.37	1.22969E-05	0.000666137
CBX2	339.33	1.46	0.34	-4.31	1.63281E-05	0.000816227
TAS1R3	76.91	1.46	0.36	-4.10	4.04412E-05	0.001681587
AC079250.1	42.29	1.45	0.39	-3.73	0.000188518	0.004839375
KIF18B	1034.89	1.45	0.24	-5.97	2.4432E-09	6.92087E-07
GALK1	231.14	1.45	0.38	-3.85	0.00012019	0.003544967
CDC42BPG	2591.47	1.45	0.34	-4.25	2.10619E-05	0.000997833
FURIN	11269.18	1.44	0.34	-4.28	1.8625E-05	0.000904443
LRP3	1688.33	1.44	0.36	-4.01	6.11098E-05	0.00222205
MFSD3	1337.78	1.44	0.32	-4.48	7.30959E-06	0.000437835
FLJ27365	1882.10	1.43	0.33	-4.34	1.40193E-05	0.000727079
SH2D2A	301.43	1.43	0.31	-4.60	4.24967E-06	0.000293314
TMEM201	1333.13	1.43	0.37	-3.86	0.00011361	0.003402546
GAS2L1	3357.03	1.42	0.35	-4.09	4.34396E-05	0.00176841
AMN	57.17	1.42	0.40	-3.57	0.000358417	0.0076028
SLC39A4	1011.15	1.42	0.37	-3.83	0.000126202	0.003666611
ZNHIT2	408.48	1.42	0.36	-3.96	7.554E-05	0.002503256
AQP3	2941.08	1.42	0.32	-4.45	8.41513E-06	0.000486896
MMP9	284.79	1.41	0.32	-4.41	1.05104E-05	0.000585699
EFR3B	61.07	1.41	0.29	-4.80	1.57838E-06	0.000124861
N4BP3	1574.65	1.41	0.29	-4.82	1.43298E-06	0.000115291
ICAM1	1169.32	1.41	0.26	-5.48	4.19055E-08	7.30499E-06
RECQL4	1722.72	1.41	0.31	-4.58	4.58649E-06	0.000303651
GCHFR	113.17	1.41	0.37	-3.84	0.000121533	0.003553739
C3	64.73	1.41	0.28	-5.04	4.63898E-07	4.47349E-05
COL18A1	3120.75	1.40	0.33	-4.22	2.47191E-05	0.001127872
TNNI2	23.89	1.40	0.42	-3.34	0.000826532	0.013144283
ARHGAP4	37.37	1.40	0.40	-3.51	0.000452464	0.008864767

TELO2	4341.95	1.40	0.33	-4.19	2.78231E-05	0.001224305
TROAP	553.42	1.40	0.26	-5.36	8.38118E-08	1.22536E-05
MDFI	6269.58	1.40	0.32	-4.34	1.41705E-05	0.000727079
C17orf70	2465.73	1.40	0.35	-4.00	6.23973E-05	0.002238565
ADRA1B	117.18	1.39	0.24	-5.89	3.86772E-09	9.92253E-07
NOTCH3	2944.00	1.39	0.34	-4.05	5.10446E-05	0.001971743
PRR12	2128.98	1.39	0.35	-3.97	7.18753E-05	0.00244527
RP11-509E16.1	36.54	1.39	0.42	-3.34	0.000846042	0.01332845
PDGFB	117.64	1.39	0.30	-4.67	2.95589E-06	0.000216703
BCAM	5055.45	1.39	0.35	-3.96	7.43063E-05	0.002488529
RP11-328M4.2	24.40	1.39	0.37	-3.73	0.000194687	0.00492037
MIDN	3529.69	1.39	0.32	-4.33	1.51615E-05	0.000763523
SLCO4A1	744.48	1.38	0.27	-5.04	4.56923E-07	4.47349E-05
PKMYT1	6033.67	1.38	0.33	-4.13	3.55551E-05	0.00151076
FBXL16	91.25	1.38	0.32	-4.26	2.03352E-05	0.000970165
C1orf233	756.41	1.38	0.36	-3.81	0.000137218	0.00387086
RAVER1	2235.36	1.37	0.37	-3.67	0.000243298	0.005783442
RABL6	5465.28	1.37	0.32	-4.28	1.82986E-05	0.000894986
HPCAL1	1749.61	1.37	0.30	-4.52	6.15698E-06	0.00038402
NME3	779.59	1.37	0.36	-3.85	0.000119222	0.003524046
KCNH3	57.12	1.37	0.37	-3.66	0.000249712	0.005894669
DNASE1L2	101.76	1.37	0.33	-4.08	4.46195E-05	0.00180563
FUOM	535.34	1.37	0.35	-3.87	0.000110039	0.003324876
LINC01023	13.90	1.37	0.49	-2.76	0.005752889	0.04355347
E2F2	110.11	1.36	0.35	-3.92	8.68174E-05	0.002777543
FGFRL1	919.77	1.35	0.31	-4.30	1.69464E-05	0.000844028
GAMT	179.20	1.35	0.38	-3.52	0.000435231	0.008713117
WTIP	959.53	1.35	0.32	-4.24	2.26612E-05	0.001059113
GCAT	389.12	1.35	0.36	-3.74	0.000182912	0.004755364
PDLIM2	2653.01	1.35	0.33	-4.06	4.94549E-05	0.001937864
C16orf59	629.54	1.35	0.34	-3.90	9.58857E-05	0.002990272
RPS6KA4	9670.96	1.34	0.35	-3.87	0.000108537	0.003308931
FAM203A	61.21	1.34	0.35	-3.79	0.000149382	0.004095066
C20orf195	25.04	1.34	0.47	-2.88	0.003981263	0.034283237
RP11-94H18.1	18.24	1.34	0.43	-3.12	0.001833697	0.021530899
TGM3	14.91	1.33	0.49	-2.75	0.005951514	0.044406436
PIDD	958.54	1.33	0.35	-3.77	0.000162192	0.004341182
IGSF9B	119.71	1.32	0.33	-4.02	5.83159E-05	0.002148837
KRT24	13.48	1.32	0.48	-2.77	0.005597304	0.042780518
WDR18	3831.34	1.32	0.35	-3.79	0.000152259	0.004140542
AGRN	39952.14	1.32	0.36	-3.69	0.00022466	0.005454828

RTEL1	57.36	1.32	0.36	-3.63	0.000285977	0.006491527
SCRN2	526.82	1.32	0.30	-4.39	1.13603E-05	0.000617863
DIRAS1	25.22	1.31	0.47	-2.78	0.005478644	0.042293811
PYCRL	1028.07	1.31	0.35	-3.70	0.000211958	0.005259106
ADAM8	9775.55	1.31	0.31	-4.28	1.90483E-05	0.000915193
GPX1	9013.76	1.31	0.35	-3.73	0.000190361	0.004847066
LFNG	1803.78	1.30	0.33	-3.93	8.41492E-05	0.00271132
LAMA5	11199.37	1.30	0.36	-3.57	0.000357171	0.007588206
GPSM1	2890.20	1.30	0.35	-3.70	0.000219024	0.0053532
PIM3	7092.94	1.30	0.32	-4.06	4.89632E-05	0.001924139
CD320	1093.13	1.30	0.36	-3.59	0.000335898	0.007284227
KCNAB2	146.70	1.30	0.31	-4.24	2.28352E-05	0.001063321
POLD1	3651.02	1.30	0.32	-4.03	5.64893E-05	0.002110122
CENPM	436.70	1.30	0.35	-3.75	0.000179517	0.004694911
FCRLB	26.12	1.30	0.47	-2.77	0.005596439	0.042780518
RNF26	2097.26	1.30	0.36	-3.56	0.000375498	0.007854851
H2AFX	5018.73	1.29	0.32	-4.08	4.59253E-05	0.001827923
CAPN15	2199.98	1.29	0.33	-3.88	0.000102903	0.003172729
FSCN1	34967.91	1.28	0.34	-3.75	0.000174741	0.00458678
HR	3930.76	1.28	0.34	-3.76	0.000172075	0.004534317
TMEM238	210.07	1.28	0.34	-3.78	0.000154824	0.004193518
INTS1	11915.94	1.28	0.35	-3.64	0.000272527	0.006306864
PFAS	2113.70	1.28	0.28	-4.48	7.54242E-06	0.00044571
MIR3648	40.25	1.28	0.46	-2.76	0.005848651	0.044016309
SLC4A2	5966.52	1.27	0.36	-3.58	0.00034312	0.007393672
ISYNA1	338.21	1.27	0.33	-3.81	0.000139766	0.003926455
WDR90	2511.18	1.27	0.31	-4.15	3.38966E-05	0.001453919
STX1A	188.68	1.27	0.28	-4.52	6.19671E-06	0.000384733
REEP4	3088.80	1.27	0.33	-3.83	0.000128168	0.003707862
KREMEN2	437.56	1.27	0.32	-3.95	7.85505E-05	0.002578656
GDPD2	24.43	1.27	0.41	-3.10	0.001937903	0.022142576
IMPA2	1886.85	1.27	0.24	-5.38	7.60731E-08	1.16221E-05
UNC93B1	1011.28	1.27	0.32	-3.92	8.99804E-05	0.002845264
PLXNB2	14746.49	1.27	0.31	-4.02	5.7754E-05	0.002137774
PAK6	243.65	1.27	0.35	-3.58	0.000347505	0.007452949
NFKBID	1982.99	1.27	0.32	-4.00	6.46196E-05	0.002288107
TSKU	3249.79	1.26	0.32	-3.94	8.13311E-05	0.002632998
FHOD1	1461.24	1.26	0.30	-4.19	2.80027E-05	0.001228236
PLEC	143550.89	1.26	0.35	-3.62	0.000294712	0.00661254
MMP17	908.43	1.26	0.35	-3.63	0.000285812	0.006491527
TTLL12	9007.03	1.26	0.33	-3.80	0.000142379	0.003975199

RIN1	1375.33	1.25	0.36	-3.45	0.000561586	0.010034017
SRM	8146.16	1.25	0.34	-3.74	0.000187584	0.00483913
LINC00472	20.42	1.25	0.46	-2.74	0.006079827	0.044976826
NUDT16L1	914.77	1.25	0.34	-3.65	0.000266995	0.006226993
MTSS1L	694.87	1.25	0.35	-3.58	0.000345473	0.007432585
DCAF15	1693.72	1.25	0.30	-4.22	2.40036E-05	0.001101457
SLC6A17	46.59	1.25	0.40	-3.08	0.002082431	0.023170877
NRGN	57.27	1.25	0.39	-3.22	0.001275995	0.017089493
MESP2	23.54	1.24	0.46	-2.70	0.006926515	0.048496306
TMEM158	130.00	1.24	0.32	-3.84	0.00012125	0.003553124
FOSL1	13941.72	1.24	0.27	-4.56	5.06496E-06	0.000327944
RELT	1312.93	1.24	0.31	-4.04	5.43148E-05	0.002046291
GNB1L	461.38	1.24	0.35	-3.56	0.00037404	0.007836401
MBLAC1	43.77	1.24	0.33	-3.80	0.000143291	0.003992463
C14orf80	1321.43	1.24	0.34	-3.63	0.000279434	0.006407181
PIGQ	2932.88	1.24	0.37	-3.39	0.000710157	0.011906298
CRISPLD2	128.30	1.24	0.24	-5.05	4.38716E-07	4.41868E-05
GPR3	45.08	1.23	0.33	-3.71	0.000203529	0.00509647
SLC5A5	20.84	1.23	0.43	-2.88	0.003916143	0.034098918
PRSS21	142.03	1.23	0.30	-4.17	3.08373E-05	0.001334178
ASPG	51.03	1.23	0.36	-3.45	0.000564166	0.010053696
FBXW5	5827.71	1.23	0.35	-3.49	0.000477305	0.009080612
C2	25.58	1.23	0.40	-3.05	0.002256431	0.024234356
NPR1	328.31	1.23	0.25	-4.91	9.02426E-07	7.71716E-05
SLC16A5	441.87	1.23	0.31	-3.97	7.22645E-05	0.002450326
EPN1	9428.18	1.23	0.36	-3.44	0.000586778	0.010348154
WNT10A	788.66	1.22	0.26	-4.69	2.75261E-06	0.00020452
EMR2	302.05	1.22	0.18	-6.64	3.22297E-11	1.51113E-08
PIF1	243.31	1.22	0.20	-5.99	2.05776E-09	6.21762E-07
C9orf142	947.16	1.22	0.33	-3.71	0.000208862	0.005191762
RARG	3752.50	1.22	0.31	-3.95	7.86443E-05	0.002578656
INF2	9094.24	1.22	0.34	-3.64	0.000273574	0.006315419
SPRY2	343.56	1.22	0.17	-7.09	1.3528E-12	1.02189E-09
FAM110A	790.49	1.22	0.30	-4.02	5.85485E-05	0.002151577
RP11-21L23.2	41.27	1.22	0.31	-3.88	0.00010579	0.003247022
MFSD2B	325.29	1.22	0.38	-3.21	0.001345697	0.017625853
MPND	178.40	1.22	0.35	-3.44	0.000584384	0.010319309
KLHDC7B	24.69	1.21	0.45	-2.72	0.006493208	0.046862077
CTXN1	284.01	1.21	0.37	-3.24	0.0011925	0.01641136
SAPCD2	236.09	1.21	0.34	-3.52	0.000428185	0.008612481
TMEM180	295.65	1.21	0.33	-3.63	0.00028259	0.006446932

CENPB	5729.18	1.21	0.34	-3.56	0.000373778	0.007836401
CCNF	369.90	1.21	0.27	-4.47	7.91325E-06	0.000461787
PLXNA1	11975.75	1.21	0.31	-3.92	8.89154E-05	0.002818143
CHTF18	2776.72	1.21	0.32	-3.79	0.000151102	0.004126072
SLC6A8	3677.92	1.21	0.34	-3.52	0.000439203	0.008718017
DLX3	218.33	1.21	0.28	-4.31	1.61137E-05	0.000808482
SYTL1	1975.77	1.21	0.30	-4.01	6.02155E-05	0.002206872
TSPAN4	3314.16	1.21	0.33	-3.66	0.000254529	0.005987599
NACC1	4270.71	1.21	0.35	-3.46	0.000550061	0.009880018
FDXR	819.55	1.20	0.34	-3.55	0.000382614	0.007930493
LY6E	11113.91	1.20	0.34	-3.50	0.000465945	0.008986356
TMEM54	192.13	1.20	0.33	-3.68	0.000236449	0.005640787
CDC25B	3436.51	1.20	0.28	-4.33	1.4998E-05	0.000758095
ZNF295-AS1	20.21	1.20	0.44	-2.73	0.00624201	0.045926736
SULT2B1	1498.70	1.20	0.28	-4.25	2.17138E-05	0.001025147
LZTS1	247.60	1.20	0.34	-3.51	0.000452182	0.008864767
SLC25A10	1723.12	1.20	0.36	-3.33	0.000881238	0.01358526
NAT14	542.48	1.20	0.30	-3.95	7.87043E-05	0.002578656
TMEM129	1167.55	1.19	0.31	-3.83	0.000129003	0.003724098
BRAT1	2240.40	1.19	0.34	-3.44	0.000572276	0.010158271
DPP7	2300.92	1.19	0.34	-3.54	0.000405013	0.008243955
BCL9L	9299.58	1.18	0.34	-3.52	0.00043822	0.008718017
ZBTB7B	2370.59	1.18	0.33	-3.59	0.000325255	0.007121569
POLRMTP1	290.54	1.18	0.40	-2.98	0.002858843	0.02800554
DOT1L	2546.66	1.18	0.33	-3.55	0.000389898	0.00803199
ACOT11	204.72	1.18	0.33	-3.55	0.000381463	0.007918697
BCL2L12	1643.39	1.18	0.29	-4.05	5.22739E-05	0.002007819
MMP28	239.03	1.18	0.24	-4.93	8.01708E-07	6.996E-05
DDN	43.77	1.18	0.39	-3.04	0.002404528	0.025188262
CYP1B1-AS1	27.53	1.18	0.38	-3.14	0.001701251	0.020543438
ZNF668	579.01	1.18	0.31	-3.81	0.000140646	0.003943025
SLC25A22	2693.53	1.18	0.34	-3.43	0.00059561	0.010436215
EMC10	386.78	1.18	0.35	-3.32	0.000907026	0.013810567
MNT	2013.89	1.18	0.34	-3.45	0.000559413	0.010008348
TMEM161A	1554.04	1.17	0.34	-3.40	0.000663688	0.011336885
DHRS13	121.14	1.17	0.32	-3.68	0.000234954	0.005624424
NFIC	4031.53	1.17	0.35	-3.35	0.000817746	0.013035047
NDUFS7	1482.17	1.17	0.36	-3.23	0.001224933	0.016589053
ATP5D	3032.23	1.17	0.33	-3.56	0.000366206	0.007731829
TTLL10	214.13	1.17	0.23	-4.98	6.21691E-07	5.6133E-05
TMEM8A	2493.82	1.16	0.34	-3.41	0.000654155	0.011216325

PLXND1	102.71	1.16	0.36	-3.27	0.001086366	0.015375861
ZNF358	252.68	1.16	0.35	-3.37	0.000754833	0.012425503
FOXD2-AS1	55.80	1.16	0.38	-3.06	0.002193656	0.023839395
UNC13D	286.03	1.16	0.40	-2.89	0.003834848	0.033801146
PELP1	3658.21	1.16	0.34	-3.43	0.000600215	0.010489881
EREG	1538.55	1.16	0.22	-5.32	1.0161E-07	1.40979E-05
TBL3	3464.34	1.15	0.35	-3.27	0.001070781	0.015293502
CALM3	3296.49	1.15	0.26	-4.48	7.48667E-06	0.000444525
FAM173A	686.07	1.15	0.33	-3.53	0.000419079	0.008466887
NACC2	1178.86	1.15	0.31	-3.77	0.000162844	0.004350084
PSKH1	662.01	1.15	0.31	-3.73	0.000187914	0.00483913
CNN2	12302.18	1.15	0.33	-3.50	0.000467261	0.008986356
ARHGEF16	955.94	1.15	0.32	-3.57	0.000351208	0.007508458
FBXO46	1182.99	1.15	0.28	-4.04	5.27179E-05	0.002013497
MT2P1	2239.63	1.15	0.27	-4.21	2.57591E-05	0.00116361
EPPK1	8883.83	1.15	0.35	-3.27	0.001066295	0.015261482
C1orf132	53.48	1.15	0.31	-3.69	0.000223139	0.005427575
TCIRG1	2570.29	1.15	0.33	-3.53	0.000420124	0.008475404
MRPS31P2	23.78	1.15	0.40	-2.85	0.004328283	0.03624117
INTS5	1533.46	1.15	0.35	-3.32	0.000904932	0.013807599
EFHD2	4821.89	1.15	0.29	-3.90	9.45193E-05	0.002968082
CARD10	12538.49	1.15	0.33	-3.48	0.000499952	0.009310594
DKFZP761J1410	1237.49	1.15	0.35	-3.30	0.000976658	0.01450839
VPS51	3044.41	1.15	0.33	-3.51	0.000446611	0.008815268
ST6GALNAC4	791.61	1.15	0.37	-3.13	0.001772348	0.021129455
CASKIN2	947.05	1.15	0.35	-3.25	0.001171826	0.016245854
TRMT61A	1714.09	1.15	0.36	-3.20	0.00135727	0.017710947
GNAO1	24.84	1.15	0.41	-2.79	0.005260531	0.041155027
CDHR1	228.93	1.15	0.25	-4.55	5.30121E-06	0.000338559
MT2A	34609.61	1.15	0.27	-4.20	2.68113E-05	0.001199186
COMTD1	1200.86	1.14	0.30	-3.84	0.000121251	0.003553124
SH2D5	6792.14	1.14	0.28	-4.09	4.27068E-05	0.001743797
TMEM109	47.38	1.14	0.37	-3.05	0.002271862	0.024304096
BCAR1	7059.72	1.14	0.33	-3.51	0.000449173	0.008838507
SLC2A4RG	2388.72	1.14	0.33	-3.43	0.00059295	0.010416453
PRODH	200.72	1.14	0.26	-4.36	1.28721E-05	0.000689063
PLA2G4F	832.23	1.14	0.30	-3.76	0.00016776	0.004452725
C2CD4D	31.73	1.14	0.38	-3.00	0.002728715	0.027361611
EFNA3	229.87	1.14	0.33	-3.42	0.000632855	0.01093384
JAG2	5544.67	1.14	0.33	-3.44	0.000575174	0.010196404
HMGA1	25419.87	1.14	0.34	-3.32	0.00091445	0.013855665

TACC3	2981.72	1.13	0.22	-5.27	1.3687E-07	1.78945E-05
ADAM15	13591.22	1.13	0.35	-3.28	0.001021985	0.014830238
SLC25A11	1917.13	1.13	0.32	-3.53	0.000413983	0.00838886
MESDC1	2089.55	1.13	0.28	-4.00	6.44132E-05	0.002287225
TMEM63C	205.57	1.13	0.32	-3.59	0.000337006	0.007296609
POLRMT	2876.10	1.13	0.34	-3.34	0.00082395	0.013118563
FYB	17.80	1.13	0.42	-2.70	0.006863255	0.048223635
CSF1	1501.52	1.13	0.26	-4.34	1.42746E-05	0.000729669
FAM195A	554.06	1.13	0.32	-3.54	0.000399555	0.008157277
LEPREL2	668.88	1.13	0.34	-3.37	0.000760889	0.012510048
MIER2	1206.91	1.13	0.34	-3.35	0.000817466	0.013035047
SF3A2	3907.26	1.13	0.35	-3.24	0.001195644	0.016423036
FBXL18	1375.47	1.13	0.32	-3.47	0.000519056	0.009537305
PPP1R26-AS1	34.87	1.13	0.34	-3.31	0.000932528	0.014052646
MSLN	3178.56	1.13	0.33	-3.42	0.000622658	0.010798827
SREBF1	11755.72	1.13	0.32	-3.50	0.000466607	0.008986356
EPHB6	194.10	1.12	0.38	-2.97	0.003006479	0.028849042
PDDC1	2620.77	1.12	0.30	-3.74	0.0001843	0.004780133
P2RY2	289.17	1.12	0.30	-3.76	0.00017098	0.004522987
HAGHL	511.21	1.12	0.32	-3.48	0.000494722	0.009265476
CCDC85B	6120.98	1.12	0.32	-3.56	0.00037008	0.007797304
PQLC1	4256.82	1.12	0.34	-3.33	0.000868772	0.013500224
HSPBP1	4426.06	1.12	0.33	-3.43	0.000598507	0.010473493
GS1-393G12.12	43.31	1.12	0.37	-3.01	0.002590203	0.026369027
PDLIM7	3714.62	1.12	0.30	-3.77	0.000160882	0.004323151
MYBBP1A	6640.68	1.12	0.32	-3.46	0.000549043	0.009874793
NAB2	1954.12	1.12	0.29	-3.89	9.83776E-05	0.003060961
PHYHIP	134.90	1.12	0.34	-3.26	0.001103067	0.015542387
TNRC18	9129.18	1.12	0.33	-3.36	0.000767287	0.012566419
EXOSC4	636.55	1.12	0.36	-3.07	0.002143543	0.023580707
NECAB3	188.49	1.12	0.33	-3.40	0.000671803	0.011445771
KIAA1875	80.37	1.12	0.33	-3.36	0.000792717	0.012740625
SPHK1	6487.16	1.11	0.32	-3.49	0.000476229	0.009080612
MAFK	659.14	1.11	0.35	-3.15	0.001650963	0.020187177
IFRD2	5528.99	1.11	0.30	-3.71	0.000208407	0.005191762
AGAP3	6981.84	1.11	0.31	-3.56	0.000373948	0.007836401
FAM83H	22302.93	1.11	0.34	-3.26	0.001109241	0.015597054
ZNF865	797.81	1.11	0.31	-3.58	0.000347516	0.007452949
TPRG1	41.60	1.11	0.31	-3.55	0.000379473	0.007914274
PPDPF	6459.78	1.11	0.33	-3.35	0.00081519	0.01302484
ZNF628	501.29	1.11	0.38	-2.94	0.003252789	0.03043921

C1orf86	1716.94	1.11	0.33	-3.33	0.000853183	0.013364898
TTYH3	5900.85	1.11	0.35	-3.12	0.001816749	0.02139627
RHBDF1	1337.58	1.11	0.29	-3.87	0.000106932	0.003267315
MIR429	165.56	1.11	0.32	-3.45	0.000565993	0.010073044
FAM155B	595.11	1.11	0.34	-3.27	0.001083015	0.015375861
IRAK3	56.53	1.10	0.30	-3.64	0.000270825	0.00628396
LLGL1	2596.87	1.10	0.32	-3.47	0.000511825	0.00945555
PCAT6	40.00	1.10	0.39	-2.81	0.005027863	0.039932155
PAQR5	25.84	1.10	0.36	-3.05	0.00232153	0.024660816
FGFR3	2217.87	1.10	0.29	-3.73	0.000191818	0.004875038
EHD1	14554.26	1.10	0.30	-3.72	0.000197978	0.004994262
DGAT1	1640.21	1.10	0.33	-3.33	0.000878068	0.01356715
REXO1	3249.12	1.10	0.35	-3.15	0.001632914	0.020056663
BCL3	2167.42	1.10	0.34	-3.24	0.00118778	0.016379554
TOR4A	1356.01	1.10	0.33	-3.33	0.000872242	0.013538674
BOP1	914.25	1.10	0.33	-3.33	0.000880439	0.01358526
ANO7	37.78	1.10	0.39	-2.80	0.005170873	0.040711269
MAZ	769.32	1.10	0.31	-3.49	0.000479799	0.00909879
RP11-478C19.2	222.05	1.10	0.32	-3.40	0.000668854	0.011410793
PIEZO1	16376.30	1.10	0.33	-3.34	0.000838364	0.013247296
SPPL2B	1421.42	1.09	0.32	-3.43	0.000595051	0.010436215
AURKB	1836.26	1.09	0.25	-4.42	9.78805E-06	0.000552233
COL7A1	25312.35	1.09	0.32	-3.41	0.000641781	0.011066297
MST1R	4253.20	1.09	0.30	-3.69	0.000226272	0.005475789
C1orf159	1403.04	1.09	0.32	-3.41	0.00064215	0.011066297
SECTM1	182.56	1.09	0.33	-3.31	0.00093326	0.014052646
KLF16	1436.81	1.09	0.32	-3.36	0.000787091	0.012719583
MXRA8	320.81	1.09	0.31	-3.53	0.000410814	0.008337063
PPP1R3F	134.69	1.09	0.35	-3.13	0.001737409	0.020795379
ATP13A1	4023.79	1.09	0.33	-3.26	0.001127781	0.015808701
GRWD1	4603.67	1.09	0.34	-3.24	0.001201632	0.01644112
SBNO2	4887.78	1.09	0.32	-3.42	0.000619986	0.010779682
C2orf48	103.98	1.08	0.27	-3.98	6.8751E-05	0.002366601
SPHK2	696.87	1.08	0.37	-2.92	0.003459981	0.03161447
ANGPTL4	367.42	1.08	0.33	-3.25	0.001139777	0.015890257
TGFBR3L	45.45	1.08	0.39	-2.80	0.005059876	0.040116114
CARD14	51.23	1.08	0.31	-3.50	0.000471381	0.009014579
MAPK8IP2	230.07	1.08	0.33	-3.30	0.00098137	0.014551458
RP11-611L7.1	692.21	1.08	0.31	-3.44	0.000588208	0.010359928
PLEKHJ1	1966.51	1.08	0.31	-3.46	0.000541924	0.009798591
CDHR2	57.22	1.08	0.31	-3.52	0.000439146	0.008718017

STAT5A	1472.92	1.08	0.24	-4.43	9.52257E-06	0.000539493
DUS3L	1534.85	1.07	0.31	-3.42	0.000627797	0.010860242
CHCHD10	427.42	1.07	0.27	-3.97	7.0624E-05	0.002418829
FOXK1	2845.90	1.07	0.32	-3.34	0.000846935	0.01332845
RBM38	1224.72	1.07	0.33	-3.29	0.001019701	0.014812904
TMUB1	1648.93	1.07	0.33	-3.22	0.001281995	0.017089493
METRN	1736.04	1.07	0.32	-3.31	0.000937514	0.014073158
ATAD3A	3795.74	1.07	0.32	-3.36	0.00077565	0.012630554
POM121C	1691.66	1.07	0.34	-3.14	0.00170061	0.020543438
RET	117.60	1.07	0.26	-4.07	4.66582E-05	0.001849596
PPAP2C	466.67	1.07	0.35	-3.07	0.002131595	0.023525407
CLUH	17085.03	1.07	0.32	-3.38	0.000721178	0.012046506
ZNF787	1812.98	1.07	0.35	-3.07	0.002112427	0.023389797
UFSP1	33.58	1.07	0.37	-2.86	0.004176185	0.035423326
FBLN2	238.17	1.07	0.30	-3.61	0.0003098	0.006838236
C15orf52	2308.63	1.07	0.21	-4.98	6.41479E-07	5.73828E-05
KIAA1549	284.82	1.06	0.24	-4.40	1.06418E-05	0.0005906
RNASEH2C	387.15	1.06	0.31	-3.49	0.000487566	0.009169339
APRT	2683.25	1.06	0.33	-3.18	0.001477301	0.018673893
PTPN23	3819.87	1.06	0.35	-3.06	0.002247242	0.024183143
PNKP	1789.06	1.06	0.28	-3.78	0.000157581	0.00425125
SLC25A39	8066.04	1.06	0.32	-3.31	0.000938011	0.014073158
CST3	4058.55	1.06	0.27	-3.86	0.000111967	0.003368173
MED16	2091.68	1.06	0.36	-2.97	0.002962883	0.028612441
RP11-465B22.8	1119.09	1.06	0.30	-3.49	0.000490057	0.009203468
C7orf50	3257.85	1.06	0.32	-3.27	0.001086526	0.015375861
PTPRS	928.10	1.06	0.30	-3.55	0.000386977	0.008004449
FAM207BP	33.70	1.06	0.35	-2.98	0.002855121	0.027989243
GIGYF1	2645.31	1.06	0.31	-3.46	0.000538845	0.009779213
LRWD1	1246.36	1.06	0.33	-3.22	0.001279182	0.017089493
NR2F6	1444.93	1.06	0.30	-3.47	0.000517213	0.009516307
SYNGR1	111.23	1.06	0.36	-2.89	0.003794234	0.033598093
TPGS1	272.69	1.06	0.30	-3.50	0.000470441	0.009009271
ARHGEF4	3662.24	1.06	0.24	-4.40	1.09254E-05	0.000599
MT-ND6	36529.48	1.06	0.28	-3.75	0.000179551	0.004694911
FLNC	93.72	1.06	0.34	-3.07	0.002167597	0.023711037
DNM1	119.84	1.05	0.32	-3.28	0.001040037	0.015044024
SORCS2	40.22	1.05	0.36	-2.93	0.003385315	0.031179252
GPC1	9934.83	1.05	0.34	-3.09	0.002025297	0.022758648
RELL2	321.92	1.05	0.31	-3.36	0.000786694	0.012719583
GPR144	36.22	1.05	0.36	-2.89	0.00390999	0.034098918

SLC43A1	128.59	1.05	0.27	-3.95	7.91533E-05	0.002581941
ISOC2	1186.13	1.05	0.33	-3.22	0.001285374	0.017104421
ILVBL	2227.49	1.05	0.34	-3.06	0.002216655	0.024034977
TBX1	92.83	1.05	0.36	-2.93	0.003386906	0.031179252
NINJ1	3040.42	1.05	0.28	-3.82	0.000134146	0.003823852
SIRPB2	34.25	1.05	0.35	-2.99	0.002820388	0.027835316
THEM6	421.31	1.05	0.37	-2.87	0.004099873	0.034906687
PER2	235.79	1.05	0.26	-3.98	6.84185E-05	0.002366601
FANCE	492.62	1.05	0.30	-3.51	0.000440599	0.008732974
DVL1	9114.82	1.05	0.33	-3.19	0.001400847	0.01808862
MT-ND3	22969.29	1.05	0.31	-3.33	0.000865118	0.013489697
PPP1R13L	7732.58	1.04	0.33	-3.20	0.001388635	0.01798684
WDR4	3245.66	1.04	0.27	-3.82	0.000131848	0.003774184
ADAMTSL4	398.75	1.04	0.32	-3.29	0.001001337	0.014655732
CCND1	4598.99	1.04	0.16	-6.40	1.60113E-10	6.59713E-08
ESRRA	2712.01	1.04	0.32	-3.25	0.001134185	0.015833179
SBF1	8431.28	1.04	0.35	-2.99	0.002820995	0.027835316
TMEM79	768.62	1.04	0.32	-3.24	0.001182867	0.016333084
RPUSD1	1953.74	1.04	0.37	-2.78	0.005378559	0.041776627
CYC1	4600.26	1.04	0.27	-3.87	0.000108985	0.003313715
MBD3	3699.81	1.04	0.35	-2.99	0.002781107	0.027642335
ALDH16A1	502.00	1.04	0.37	-2.81	0.004917422	0.039485788
OXLD1	317.07	1.04	0.32	-3.25	0.001152862	0.016044482
PSD4	2859.20	1.04	0.29	-3.61	0.000303131	0.006723774
GIPC1	11654.42	1.03	0.34	-3.03	0.002423959	0.025352749
40057.00	16352.67	1.03	0.31	-3.31	0.000936542	0.014073158
ASPSCR1	874.76	1.03	0.34	-3.06	0.002182058	0.023811751
WDR34	2869.03	1.03	0.33	-3.14	0.001717818	0.020651791
PRR22	131.64	1.03	0.29	-3.57	0.000352591	0.007514392
KLHL26	267.48	1.03	0.33	-3.10	0.001914807	0.022026757
NOC4L	1534.39	1.03	0.35	-2.99	0.002799878	0.027747775
KCTD11	420.33	1.03	0.34	-3.05	0.002260774	0.024261834
RHOT2	4771.50	1.03	0.30	-3.42	0.000623571	0.01080089
CISD3	992.15	1.03	0.32	-3.24	0.001195764	0.016423036
PCNXL3	4860.32	1.03	0.34	-3.01	0.002644579	0.026811754
LRRC45	763.48	1.03	0.32	-3.22	0.001264302	0.017008684
VARS	10713.45	1.03	0.33	-3.07	0.002112197	0.023389797
CTSD	1180.35	1.03	0.34	-3.05	0.002274739	0.024315741
G6PC3	1216.02	1.03	0.34	-3.04	0.002327853	0.024708683
ZDHHC12	2325.25	1.03	0.35	-2.93	0.003383209	0.031179252
SH2D3A	2776.08	1.02	0.26	-3.87	0.000109182	0.003313715

CTD-2228K2.5	67.35	1.02	0.27	-3.85	0.000118466	0.003514569
TM7SF2	870.20	1.02	0.31	-3.30	0.000974377	0.014495193
ENDOG	175.72	1.02	0.35	-2.90	0.003748835	0.033359231
LTBP3	1571.23	1.02	0.32	-3.19	0.001417351	0.018232469
C16orf13	1204.27	1.02	0.33	-3.14	0.001704644	0.020560733
KIF26A	58.65	1.02	0.38	-2.69	0.007120102	0.049464084
DUSP6	602.40	1.02	0.27	-3.72	0.000201177	0.005055857
RP11-54F2.1	213.82	1.02	0.19	-5.42	5.978E-08	9.5627E-06
SIRT6	1393.96	1.02	0.32	-3.16	0.001581123	0.019581242
TMEM38A	104.36	1.02	0.32	-3.19	0.001411108	0.018178666
C20orf27	1964.11	1.02	0.35	-2.88	0.004026182	0.034517023
NCAPH2	2976.95	1.02	0.29	-3.46	0.000535848	0.009740551
EFS	852.73	1.02	0.30	-3.36	0.000790868	0.012738896
PKN3	520.02	1.02	0.29	-3.49	0.000477505	0.009080612
CDH4	1352.87	1.02	0.30	-3.40	0.000685857	0.011598999
PC	3333.94	1.02	0.31	-3.27	0.001086725	0.015375861
BRD4	4559.68	1.02	0.32	-3.16	0.001603292	0.019818149
IMPDH1	4994.38	1.02	0.32	-3.14	0.001673871	0.020361764
PER1	5302.32	1.02	0.35	-2.95	0.003161906	0.029939018
YIF1A	2404.46	1.02	0.34	-3.02	0.002523252	0.026014143
ATP6V0B	4893.20	1.02	0.36	-2.86	0.004255767	0.035834966
RAC3	585.52	1.02	0.36	-2.84	0.004470161	0.037129373
NCLN	10879.70	1.02	0.35	-2.89	0.003852641	0.033840027
UBE2S	1114.82	1.02	0.28	-3.64	0.000277714	0.006400121
CCDC61	401.86	1.02	0.29	-3.47	0.000528961	0.009654066
SULT1A1	165.80	1.02	0.29	-3.55	0.000392242	0.008056373
FOXRED2	555.11	1.02	0.28	-3.57	0.000356003	0.007575227
ARRDC1	3173.95	1.02	0.32	-3.22	0.001281763	0.017089493
CBLC	2056.54	1.01	0.29	-3.46	0.000544338	0.009803122
LAT2	71.13	1.01	0.31	-3.22	0.001271118	0.017061591
ZNF316	1132.30	1.01	0.32	-3.21	0.001341184	0.017585415
MFSD10	7970.37	1.01	0.32	-3.13	0.00177309	0.021129455
LTBR	5083.33	1.01	0.28	-3.57	0.000360655	0.007638353
TRMT2A	1123.20	1.01	0.33	-3.06	0.002231577	0.024098677
B4GALT2	5012.19	1.01	0.33	-3.12	0.001839333	0.021578433
ARHGEF39	68.50	1.01	0.28	-3.61	0.000301518	0.006704671
HOXC11	282.86	1.01	0.23	-4.34	1.40792E-05	0.000727079
ADCK4	807.54	1.01	0.32	-3.15	0.00164014	0.020109099
RAD23A	4718.26	1.01	0.31	-3.29	0.001000817	0.014655732
MEX3A	107.49	1.01	0.29	-3.50	0.000462092	0.008962129
ADCK5	586.51	1.01	0.31	-3.22	0.001264675	0.017008684

ZNF524	341.13	1.01	0.35	-2.88	0.004012855	0.034469661
DCXR	834.38	1.01	0.31	-3.29	0.000998169	0.014655732
RASIP1	675.34	1.01	0.32	-3.12	0.001790454	0.0212431
PGP	820.60	1.01	0.25	-4.08	4.5977E-05	0.001827923
BAK1	2542.84	1.01	0.33	-3.07	0.002125211	0.023510979
AKT1S1	4733.54	1.01	0.33	-3.09	0.001997649	0.022635028
RARA	480.67	1.01	0.32	-3.11	0.001866792	0.021639196
DUSP23	650.19	1.01	0.30	-3.33	0.000866472	0.013490079
C17orf53	532.40	1.01	0.24	-4.12	3.85807E-05	0.001614099
MIR663A	255.94	1.01	0.32	-3.14	0.001688952	0.020467634
AXL	852.90	1.01	0.17	-6.04	1.49893E-09	4.73976E-07
ARFRP1	1872.26	1.01	0.29	-3.42	0.000620761	0.010779682
TIMM17B	1402.80	1.01	0.35	-2.89	0.003896802	0.034051938
WDR24	592.06	1.00	0.33	-3.01	0.002594935	0.026389929
SNAPC4	1998.77	1.00	0.29	-3.45	0.000559083	0.010008348
SEMA4C	557.59	1.00	0.30	-3.38	0.000736496	0.012210955
TMEM175	691.18	1.00	0.30	-3.29	0.000993432	0.014634559
C9orf16	1686.52	1.00	0.33	-3.06	0.002195828	0.023839395
FZR1	2649.62	1.00	0.33	-3.06	0.002228433	0.024098677
RP11-1055B8.7	740.57	1.00	0.35	-2.90	0.003788244	0.033578068
FBXW9	498.76	1.00	0.30	-3.34	0.000850155	0.013363656
RP11-215G15.5	235.10	1.00	0.20	-5.09	3.5582E-07	3.75046E-05
TMEM134	800.21	1.00	0.32	-3.09	0.002021949	0.022758648
PKP3	13159.86	1.00	0.30	-3.29	0.001013192	0.014770654
ZFP36L1	8243.97	1.00	0.25	-4.07	4.7665E-05	0.001878553
NDOR1	1805.92	1.00	0.34	-2.97	0.002978623	0.028682958
GMEB2	1587.34	1.00	0.31	-3.28	0.001043383	0.015076381
ZNF213	746.39	1.00	0.35	-2.87	0.00408169	0.034839129
DRAP1	7103.01	1.00	0.23	-4.33	1.45841E-05	0.000739925
SLC12A4	5020.33	1.00	0.31	-3.28	0.001049434	0.015147718
RP11-1096G20.5	246.66	1.00	0.28	-3.62	0.000293556	0.006597482
COMMD2	435.24	-1.00	0.26	3.84	0.00012252	0.003574915
RP11-2H8.2	35.43	-1.00	0.37	2.70	0.006871068	0.048232271
ARHGEF12	2745.08	-1.01	0.18	5.50	3.88844E-08	6.95672E-06
VLDLR	92.20	-1.01	0.26	3.90	9.49052E-05	0.002969542
PRKRIR	362.13	-1.01	0.26	3.82	0.000134977	0.003831489
MYLIP	97.64	-1.01	0.26	3.82	0.000133327	0.003808513
TNFSF10	247.29	-1.01	0.20	4.92	8.52443E-07	7.38259E-05
AC005224.2	28.82	-1.01	0.36	2.81	0.00498291	0.039753053
CTC-436P18.3	27.08	-1.01	0.36	2.78	0.005383	0.041776627
RP13-631K18.5	36.87	-1.01	0.32	3.12	0.001795383	0.021246149

RFTN1P1	40.55	-1.01	0.32	3.21	0.00134686	0.017625853
AP2B1	3365.29	-1.02	0.20	5.12	3.12266E-07	3.34321E-05
RCBTB1	358.28	-1.02	0.22	4.66	3.20565E-06	0.000233087
ROBO2	70.72	-1.02	0.27	3.85	0.00012054	0.003547569
KRT75	1796.31	-1.02	0.15	6.64	3.09229E-11	1.50164E-08
SLC35B4	248.73	-1.02	0.19	5.26	1.42099E-07	1.82275E-05
OCRL	698.67	-1.02	0.19	5.51	3.64911E-08	6.61559E-06
CTSO	55.38	-1.03	0.35	2.92	0.003462083	0.03161447
ATG4A	64.05	-1.03	0.28	3.66	0.000249422	0.005894669
KRT34	1606.18	-1.03	0.18	5.69	1.28334E-08	2.56611E-06
SLFN5	3131.31	-1.04	0.24	4.26	2.08983E-05	0.000993548
ZNF135	62.19	-1.04	0.33	3.18	0.001469539	0.018632549
SPON1	29.17	-1.04	0.37	2.79	0.005210132	0.040901939
KLF6	16751.19	-1.04	0.16	6.39	1.66308E-10	6.65085E-08
DDX60	1745.46	-1.04	0.31	3.39	0.000701002	0.011796449
RHOQ	33.69	-1.04	0.33	3.20	0.001396257	0.018046484
KDELR3	71.01	-1.04	0.25	4.12	3.79287E-05	0.001591716
TSPYL5	148.08	-1.04	0.25	4.23	2.30956E-05	0.001071778
PIK3CB	563.23	-1.05	0.18	5.91	3.48811E-09	9.12075E-07
YIPF6	487.20	-1.05	0.21	4.97	6.76316E-07	6.01037E-05
RP11-517B11.7	37.17	-1.05	0.38	2.75	0.006035884	0.044773547
SYTL2	46.78	-1.06	0.32	3.29	0.000986963	0.01459073
SNCAIP	40.32	-1.06	0.35	3.01	0.002578651	0.026325829
TAGLN	786.24	-1.07	0.22	4.89	1.01011E-06	8.47805E-05
RASSF6	192.37	-1.08	0.24	4.49	7.01874E-06	0.000426044
KRT15	2745.68	-1.08	0.15	7.35	2.03796E-13	2.13155E-10
TMED2	3722.80	-1.08	0.21	5.23	1.72952E-07	2.09967E-05
C2orf27A	70.51	-1.08	0.28	3.85	0.000116102	0.003461925
PIK3IP1	159.42	-1.09	0.23	4.82	1.41715E-06	0.000114697
RND1	75.76	-1.10	0.25	4.40	1.08094E-05	0.000595043
COG6	258.16	-1.10	0.24	4.67	2.96438E-06	0.000216703
RPS6KL1	37.99	-1.11	0.35	3.18	0.00145262	0.018516646
ZNF165	368.98	-1.11	0.20	5.57	2.5655E-08	4.84488E-06
FAM115A	181.01	-1.11	0.22	4.95	7.49602E-07	6.6184E-05
CENPQ	189.16	-1.12	0.28	4.03	5.62844E-05	0.002108262
LARP6	171.74	-1.12	0.19	5.74	9.50429E-09	1.9288E-06
ANKRD19P	23.58	-1.12	0.39	2.91	0.003622536	0.032533439
RCAN1	2603.32	-1.12	0.18	6.10	1.03261E-09	3.51011E-07
CYP2R1	93.95	-1.12	0.27	4.20	2.71209E-05	0.001203951
LCA5	19.52	-1.12	0.41	2.76	0.005861751	0.044058723
FBXO32	44.10	-1.12	0.31	3.62	0.000295709	0.00662398

TCHH	63.62	-1.12	0.28	3.97	7.27619E-05	0.002461053
ZXDA	109.78	-1.13	0.28	3.98	6.87168E-05	0.002366601
S100A7	119.65	-1.13	0.22	5.20	2.04707E-07	2.39948E-05
RND3	7959.37	-1.13	0.22	5.12	3.03432E-07	3.27442E-05
INA	27.43	-1.13	0.38	3.01	0.002597615	0.026397433
TXNIP	252.13	-1.13	0.25	4.58	4.56995E-06	0.000303651
ZPLD1	36.07	-1.13	0.35	3.23	0.001244177	0.01679948
KCNJ2	68.22	-1.13	0.35	3.21	0.001349603	0.017644757
MGAT4A	41.98	-1.14	0.37	3.08	0.002048242	0.022865311
ASNS	705.06	-1.14	0.22	5.28	1.27181E-07	1.72928E-05
SLC27A6	115.23	-1.14	0.27	4.18	2.9055E-05	0.001270292
NXT2	125.36	-1.15	0.26	4.34	1.4162E-05	0.000727079
CD200	31.00	-1.15	0.36	3.17	0.001536268	0.019216779
EPB41	361.26	-1.15	0.19	6.15	7.55016E-10	2.70157E-07
AC005083.1	24.86	-1.15	0.39	2.93	0.003407772	0.031286616
MAP3K8	627.75	-1.15	0.21	5.41	6.24097E-08	9.75384E-06
APOBEC3G	31.43	-1.16	0.36	3.17	0.001503992	0.018917463
BST2	42.90	-1.16	0.32	3.69	0.000227249	0.005478548
HIST1H2BD	173.66	-1.16	0.20	5.83	5.44439E-09	1.23379E-06
LRRK2	23.77	-1.16	0.42	2.79	0.005230626	0.04099183
BPGM	635.21	-1.17	0.23	5.17	2.38653E-07	2.68179E-05
GALNT5	368.05	-1.17	0.22	5.28	1.29217E-07	1.73956E-05
IL1B	5626.22	-1.17	0.16	7.22	5.29352E-13	4.23388E-10
ERBB2IP	1032.46	-1.18	0.22	5.44	5.40699E-08	8.96571E-06
SNRNP27	114.19	-1.18	0.21	5.48	4.31824E-08	7.4323E-06
MSMO1	4621.80	-1.18	0.24	4.98	6.21501E-07	5.6133E-05
RP11-20B7.1	46.36	-1.19	0.30	3.99	6.50229E-05	0.002296405
FYTTD1	754.82	-1.19	0.26	4.57	4.77388E-06	0.000312629
AC107399.2	21.45	-1.19	0.39	3.06	0.002194606	0.023839395
BEND7	102.89	-1.19	0.24	5.04	4.60455E-07	4.47349E-05
RP11-690G19.3	27.14	-1.19	0.35	3.38	0.000733514	0.012197674
RP11-3L8.3	56.25	-1.20	0.27	4.42	9.99077E-06	0.000559031
ZSCAN31	102.59	-1.20	0.25	4.85	1.21122E-06	0.00010042
RSAD2	192.83	-1.21	0.29	4.23	2.35208E-05	0.001084108
LEPR	128.38	-1.22	0.25	4.84	1.28714E-06	0.000105429
ERO1LB	29.83	-1.23	0.35	3.46	0.000530928	0.009676983
ARL5B	1724.07	-1.23	0.25	4.88	1.05365E-06	8.78928E-05
FAM46A	135.83	-1.23	0.24	5.19	2.12801E-07	2.47303E-05
AC005682.6	20.58	-1.24	0.42	2.97	0.002970335	0.02864372
DISP1	36.85	-1.25	0.40	3.09	0.002013977	0.022721133
STRADB	80.93	-1.25	0.28	4.51	6.63607E-06	0.000408284

SELPLG	36.41	-1.27	0.37	3.45	0.000562561	0.010038252
DNAJB9	219.89	-1.27	0.27	4.74	2.17705E-06	0.000166644
SLC9A2	16.03	-1.27	0.45	2.80	0.005167454	0.040711269
RP11-196G18.22	41.56	-1.27	0.32	3.97	7.19356E-05	0.00244527
HEPHL1	569.61	-1.28	0.22	5.74	9.37452E-09	1.9288E-06
OVCH2	28.82	-1.29	0.37	3.51	0.000446696	0.008815268
BTG4	29.73	-1.29	0.38	3.36	0.000768939	0.012566419
RP11-1020M18.10	109.99	-1.29	0.22	5.87	4.33041E-09	1.05144E-06
PLA2G4C	71.89	-1.29	0.27	4.72	2.37625E-06	0.000180502
ECHDC1	657.12	-1.29	0.22	5.97	2.31761E-09	6.85055E-07
CYFIP2	21.83	-1.30	0.40	3.27	0.001073978	0.015299623
CERKL	25.15	-1.31	0.39	3.38	0.000713863	0.011953695
RAB6B	83.06	-1.31	0.28	4.71	2.4891E-06	0.000188024
RP11-403A21.1	79.28	-1.31	0.27	4.89	1.00606E-06	8.47805E-05
MYO16	331.65	-1.31	0.22	6.06	1.35062E-09	4.43346E-07
DIO2	22.50	-1.32	0.45	2.90	0.003775658	0.033494554
MOXD1	85.44	-1.32	0.26	4.99	5.99805E-07	5.54799E-05
STC2	119.68	-1.32	0.23	5.65	1.60581E-08	3.11918E-06
GPC4	45.74	-1.32	0.30	4.37	1.2644E-05	0.000679529
IL7	66.16	-1.32	0.31	4.24	2.22125E-05	0.001045065
GRIK1	13.80	-1.32	0.49	2.69	0.007148503	0.049586225
PTPRR	15.57	-1.32	0.48	2.75	0.005916566	0.044274511
IMPG1	19.16	-1.33	0.42	3.17	0.001542175	0.019237578
ID4	51.04	-1.33	0.29	4.56	5.05434E-06	0.000327944
SULT1E1	37.89	-1.35	0.35	3.87	0.000109477	0.003315288
ENO2	36.83	-1.35	0.33	4.08	4.5878E-05	0.001827923
APBA1	45.52	-1.35	0.34	4.02	5.70716E-05	0.002126035
FN1	732.37	-1.35	0.19	7.07	1.53616E-12	1.09932E-09
LANCL1	38.30	-1.36	0.39	3.50	0.000457612	0.008927038
IL23A	136.77	-1.38	0.23	5.95	2.70754E-09	7.44259E-07
RP1-93H18.7	16.47	-1.38	0.44	3.13	0.001722921	0.020676574
CCDC115	161.99	-1.39	0.22	6.34	2.31427E-10	8.99061E-08
TMEM217	241.21	-1.39	0.18	7.56	3.93689E-14	4.46083E-11
N4BP2L1	18.71	-1.39	0.42	3.31	0.000947901	0.014194499
HSD11B1	42.67	-1.40	0.31	4.43	9.28077E-06	0.000530213
IL20	265.07	-1.40	0.23	5.97	2.41045E-09	6.92087E-07
RP11-443P15.2	56.88	-1.40	0.33	4.29	1.80294E-05	0.000885001
CCDC126	46.64	-1.40	0.31	4.59	4.49527E-06	0.000303651
RP1-78O14.1	20.49	-1.41	0.41	3.43	0.000603668	0.010536678
CAMK4	16.19	-1.41	0.49	2.88	0.003950799	0.034172405
PLCL2	32.43	-1.41	0.39	3.65	0.000258057	0.006060111

SERINC3	1189.28	-1.41	0.19	7.64	2.14103E-14	2.80042E-11
RP11-439L18.3	15.35	-1.42	0.49	2.89	0.003910237	0.034098918
SOCS3	861.48	-1.43	0.31	4.59	4.48737E-06	0.000303651
CXCL5	283.89	-1.43	0.28	5.16	2.48738E-07	2.77221E-05
ATPAF1	318.40	-1.46	0.20	7.32	2.5558E-13	2.40499E-10
SLC2A10	13.52	-1.46	0.48	3.04	0.002351335	0.02483996
RP11-277P12.20	142.86	-1.46	0.22	6.61	3.73439E-11	1.69225E-08
IGFBP3	871.07	-1.47	0.17	8.44	3.22263E-17	5.47726E-14
RP11-96K19.2	15.89	-1.48	0.54	2.76	0.005763752	0.04358717
VNN3	30.52	-1.50	0.39	3.79	0.000147738	0.004073185
KLHL24	111.36	-1.52	0.25	6.20	5.77507E-10	2.12226E-07
ADORA2BP	24.02	-1.53	0.39	3.96	7.56666E-05	0.002503256
RP1-28O10.1	224.10	-1.54	0.23	6.74	1.57153E-11	8.21852E-09
MIR146A	195.64	-1.54	0.29	5.33	9.99558E-08	1.40113E-05
RRAGD	52.38	-1.54	0.30	5.07	4.04332E-07	4.13361E-05
RP11-568N6.1	29.06	-1.55	0.38	4.05	5.03006E-05	0.001948538
CASP7	286.33	-1.58	0.23	6.97	3.2612E-12	2.21712E-09
FAM171B	67.39	-1.59	0.28	5.74	9.34446E-09	1.9288E-06
CDKL2	19.22	-1.59	0.44	3.60	0.000323486	0.007105713
CADPS2	14.06	-1.61	0.52	3.10	0.001914496	0.022026757
REPS2	29.16	-1.62	0.35	4.57	4.78244E-06	0.000312629
SERPINE3	43.91	-1.64	0.32	5.20	2.03699E-07	2.39948E-05
MSRB3	60.95	-1.65	0.32	5.23	1.69468E-07	2.09408E-05
KB-1460A1.5	17.99	-1.66	0.47	3.50	0.000472202	0.009017595
TEPP	15.98	-1.67	0.46	3.60	0.000319723	0.00703442
TUBA1A	535.97	-1.67	0.18	9.32	1.13575E-20	3.86071E-17
MAP1B	118.14	-1.68	0.23	7.31	2.65315E-13	2.40499E-10
AC104777.2	36.55	-1.68	0.36	4.70	2.5751E-06	0.000193445
SYT14	40.15	-1.72	0.33	5.23	1.70952E-07	2.09408E-05
SOX4	3302.44	-1.72	0.16	11.04	2.49378E-28	3.3908E-24
AC023115.2	14.19	-1.74	0.49	3.57	0.000363481	0.007686239
FZD3	107.90	-1.74	0.24	7.22	5.21551E-13	4.23388E-10
S100A12	22.42	-1.74	0.42	4.20	2.64843E-05	0.001191025
HAS2	15.75	-1.77	0.48	3.73	0.00018957	0.004845076
VIM	471.24	-1.78	0.17	10.51	7.59215E-26	5.16152E-22
NFKBIZ	11511.68	-1.78	0.19	9.23	2.60778E-20	7.09159E-17
KCNJ5	38.35	-1.82	0.35	5.27	1.39448E-07	1.80579E-05
POSTN	29.78	-1.83	0.53	3.47	0.000526519	0.009622418
SPRR2A	433.82	-1.84	0.27	6.80	1.03889E-11	5.88574E-09
BVES	35.85	-1.89	0.36	5.23	1.6806E-07	2.09408E-05
MBD5	562.33	-1.89	0.21	9.06	1.33897E-19	3.03432E-16

LSMEM1	28.35	-1.89	0.45	4.21	2.50722E-05	0.001140155
CXCL6	44.81	-1.90	0.34	5.54	3.02475E-08	5.63391E-06
SPRR3	281.51	-1.92	0.28	6.93	4.32803E-12	2.80229E-09
TLR3	58.90	-1.95	0.31	6.23	4.57619E-10	1.7284E-07
RP11-79H23.3	117.66	-1.96	0.24	8.23	1.92715E-16	2.91149E-13
IL16	141.60	-1.98	0.22	9.02	1.8425E-19	3.57892E-16
UCHL1	25.30	-2.06	0.39	5.24	1.63328E-07	2.05627E-05
SERPINB4	17.44	-2.71	0.52	5.21	1.89325E-07	2.2781E-05
KIAA1683	14.82	-3.01	0.63	4.80	1.58728E-06	0.000124861

Table S2. List of genes regulated by *NFKBIZ* knockdown in primary KC after 24 h of IL-36α treatment

	Base Mean	log2 fold Change	lfcSE	stat	P value	P value adj.
EIF3CL	90.67	4.06	1.13	-3.59	0.000331714	0.008152368
KRT24	31.08	2.91	0.43	-6.75	1.47482E-11	9.70012E-09
CAPN8	61.71	2.09	0.29	-7.25	4.10347E-13	2.983E-10
FAM198B	44.03	1.88	0.31	-5.99	2.03957E-09	5.3152E-07
SLITRK6	45.18	1.75	0.33	-5.33	1.00299E-07	1.57424E-05
STXBP6	13.61	1.73	0.52	-3.29	0.00099468	0.017750032
LIPH	29.41	1.64	0.36	-4.58	4.75827E-06	0.000360893
NTSR1	78.88	1.52	0.25	-6.01	1.90292E-09	5.1979E-07
STAC	26.41	1.44	0.40	-3.59	0.000333048	0.008156136
LINC00887	20.71	1.41	0.41	-3.41	0.000657254	0.013310848
MYH15	30.14	1.36	0.34	-3.97	7.13402E-05	0.002667673
RIC3	117.85	1.36	0.21	-6.38	1.72605E-10	8.13769E-08
DMRTA1	23.41	1.30	0.40	-3.29	0.000992507	0.017734168
DCN	17.44	1.27	0.45	-2.83	0.004682933	0.049665678
SCML2	92.89	1.27	0.24	-5.22	1.74412E-07	2.43331E-05
ITGBL1	28.56	1.27	0.38	-3.33	0.000857423	0.015982091
RP11-298I3.4	17.83	1.24	0.43	-2.88	0.004010271	0.044886435
HSPD1P6	34.86	1.22	0.32	-3.83	0.000128662	0.004094669
PHACTR3	60.59	1.22	0.27	-4.51	6.62191E-06	0.000445448
DIRAS1	33.77	1.16	0.40	-2.91	0.00362251	0.042080834
SDPR	243.29	1.16	0.21	-5.58	2.4665E-08	5.07779E-06
GPR110	497.93	1.15	0.18	-6.43	1.27104E-10	6.5021E-08
SYT8	268.62	1.14	0.21	-5.43	5.61872E-08	9.70073E-06
MAP7D2	48.49	1.12	0.28	-3.97	7.26778E-05	0.002691222
ABCC2	75.47	1.11	0.24	-4.60	4.18993E-06	0.000326957
LINC00589	55.07	1.08	0.28	-3.91	9.18453E-05	0.003187356
SFTA1P	58.81	1.08	0.28	-3.82	0.000130854	0.00414531
PTGS1	511.23	1.07	0.17	-6.19	5.91133E-10	2.04118E-07
CTD-2620I22.1	33.05	1.06	0.36	-2.98	0.002896516	0.035624827
SMOC1	366.80	1.05	0.20	-5.26	1.41323E-07	2.07655E-05
RGS2	307.53	1.04	0.20	-5.24	1.61151E-07	2.31855E-05
PRUNE2	26.42	1.04	0.36	-2.90	0.003700374	0.042733745
SPA17	45.81	1.04	0.29	-3.61	0.000308974	0.007787498
ZNF583	58.68	1.04	0.26	-4.00	6.46924E-05	0.002495898
MYEF2	71.56	1.02	0.25	-4.07	4.72542E-05	0.001977803
ZNF239	91.37	1.02	0.23	-4.41	1.04794E-05	0.000637625
LDHBP2	90.21	1.01	0.24	-4.21	2.59898E-05	0.001277475

AC073254.1	34.29	1.01	0.34	-2.95	0.003227682	0.038665004
PLEKHA7	89.51	1.01	0.25	-3.96	7.50795E-05	0.002750658
LINC00704	101.10	1.01	0.22	-4.48	7.35763E-06	0.000480401
HS3ST2	148.52	1.01	0.22	-4.63	3.69191E-06	0.000298203
SLC16A14	222.42	1.00	0.20	-4.91	8.93763E-07	9.4234E-05
FAM189A2	62.36	-1.00	0.28	3.61	0.000300926	0.007616219
SLIT3	230.67	-1.00	0.22	4.48	7.51757E-06	0.000482943
CFD	43.13	-1.01	0.31	3.30	0.000980138	0.017581391
LY6D	730.05	-1.01	0.16	6.28	3.38131E-10	1.37361E-07
BRSK1	43.25	-1.01	0.31	3.30	0.000973688	0.017511168
HOXC13-AS	55.52	-1.01	0.26	3.84	0.000124073	0.00398533
GYLTL1B	1905.03	-1.01	0.22	4.68	2.87195E-06	0.000241875
HSPG2	11564.52	-1.01	0.27	3.73	0.000187734	0.005368489
POU3F1	92.69	-1.01	0.26	3.84	0.000121601	0.003938646
KCTD11	149.38	-1.01	0.27	3.77	0.000160137	0.004805191
PGLYRP4	148.05	-1.01	0.22	4.70	2.54566E-06	0.000220042
PCOLCE	83.00	-1.01	0.24	4.16	3.2392E-05	0.001511481
TYMP	4581.80	-1.01	0.22	4.52	6.30653E-06	0.000435529
REEP2	76.79	-1.02	0.27	3.78	0.000159338	0.004802299
RP11-178L8.4	76.41	-1.02	0.31	3.30	0.000950581	0.01723022
SDK2	869.43	-1.02	0.24	4.21	2.51133E-05	0.001247714
SMTNL1	26.72	-1.02	0.36	2.85	0.004327679	0.047326918
HELZ2	5813.25	-1.02	0.25	4.17	3.10266E-05	0.001462589
FADS3	1037.55	-1.03	0.19	5.45	5.12252E-08	9.07081E-06
C3	465.87	-1.03	0.16	6.53	6.68566E-11	3.69369E-08
RP11-540O11.1	37.41	-1.03	0.33	3.11	0.001885911	0.026909295
YPEL3	660.07	-1.03	0.20	5.10	3.33169E-07	4.0015E-05
PIK3IP1	498.63	-1.03	0.17	6.15	7.83048E-10	2.35119E-07
CRAT	241.10	-1.04	0.22	4.70	2.549E-06	0.000220042
ADAMTS13	104.37	-1.04	0.24	4.26	2.08188E-05	0.001085092
TAPBPL	180.28	-1.04	0.21	4.93	8.32423E-07	8.84417E-05
COASY	2348.99	-1.04	0.23	4.53	5.87339E-06	0.000411793
ANKRD34A	42.51	-1.04	0.30	3.49	0.000482208	0.010555093
FZD2	82.43	-1.05	0.32	3.33	0.000875477	0.0162528
MTRNR2L10	55.86	-1.05	0.29	3.67	0.000243039	0.006518172
EFNB3	66.44	-1.05	0.26	4.11	3.99571E-05	0.001768869
DMTN	222.27	-1.05	0.26	4.00	6.31471E-05	0.002449964
MT-TY	125.52	-1.05	0.23	4.59	4.36565E-06	0.000338755
CPNE2	431.18	-1.05	0.19	5.41	6.30583E-08	1.04935E-05
RP11-277P12.20	112.18	-1.06	0.23	4.61	3.9345E-06	0.000311937
ENG	106.24	-1.06	0.29	3.68	0.000234302	0.006357919

LGALS9B	181.91	-1.06	0.21	4.99	5.90899E-07	6.63537E-05
SNRNP27	120.27	-1.07	0.21	4.97	6.70389E-07	7.29087E-05
SOCS2-AS1	34.52	-1.07	0.35	3.10	0.001947527	0.027532491
RP11-1212A22.1	57.91	-1.07	0.32	3.36	0.000787142	0.015100013
GPR37	29.64	-1.07	0.35	3.09	0.001989725	0.027928943
C6orf1	1217.75	-1.07	0.23	4.76	1.94035E-06	0.000182314
HAPLN3	266.92	-1.07	0.23	4.70	2.5683E-06	0.000220332
SCN4B	707.59	-1.08	0.17	6.15	7.68511E-10	2.35119E-07
LINC01023	23.73	-1.08	0.37	2.92	0.003497639	0.04097488
BVES	46.92	-1.08	0.30	3.57	0.000355435	0.008582637
FAM171A2	88.86	-1.08	0.34	3.18	0.001468619	0.022740549
RHBDL2	24.91	-1.08	0.38	2.87	0.004165372	0.046210537
SERINC3	1585.24	-1.08	0.16	6.67	2.6143E-11	1.6413E-08
FKBP10	210.72	-1.09	0.25	4.43	9.53804E-06	0.000588122
CORO1A	214.25	-1.09	0.23	4.73	2.2957E-06	0.000207647
NYAP1	89.84	-1.09	0.30	3.65	0.000265543	0.006894125
LGALS7B	931.50	-1.09	0.26	4.17	3.09335E-05	0.001462589
FAM219A	512.66	-1.09	0.24	4.56	5.2364E-06	0.000379077
RAB1B	33.70	-1.09	0.37	2.96	0.003037162	0.036959723
LHX5	28.44	-1.10	0.35	3.13	0.001733432	0.025606591
CRIP2	699.27	-1.10	0.23	4.72	2.36531E-06	0.000210772
RAB6B	86.40	-1.10	0.25	4.38	1.17532E-05	0.000687979
COL5A1	245.29	-1.11	0.25	4.35	1.3793E-05	0.000783986
RHOQ	49.83	-1.11	0.29	3.84	0.000121449	0.003938646
SYDE1	391.62	-1.11	0.25	4.36	1.29345E-05	0.000744382
HOXC4	87.04	-1.11	0.26	4.29	1.80533E-05	0.000977852
ADAMTS4	30.04	-1.11	0.38	2.97	0.003025565	0.03685106
FMNL1	130.10	-1.11	0.25	4.53	5.79198E-06	0.000408157
CCDC115	287.21	-1.11	0.18	6.26	3.95861E-10	1.51879E-07
MARCKSL1	118.24	-1.12	0.30	3.76	0.000171446	0.005049068
TUBA1A	624.18	-1.12	0.18	6.18	6.29244E-10	2.09222E-07
PODNL1	31.93	-1.12	0.36	3.09	0.001986981	0.027918808
LIF	184.44	-1.12	0.25	4.55	5.26953E-06	0.000379077
MAP3K11	1824.36	-1.12	0.24	4.66	3.09117E-06	0.00025566
ACSS1	228.69	-1.12	0.24	4.61	4.04233E-06	0.000317231
SALL4	32.93	-1.12	0.35	3.22	0.001290772	0.020926104
CENPQ	158.67	-1.13	0.21	5.34	9.08296E-08	1.442E-05
ACBD4	285.67	-1.13	0.21	5.39	6.99621E-08	1.13684E-05
PLXND1	91.30	-1.13	0.27	4.25	2.10833E-05	0.001094747
SLC16A8	25.49	-1.14	0.39	2.94	0.003264253	0.038969547
NXPH4	95.49	-1.14	0.30	3.73	0.000189537	0.005397698

FAM214B	1216.79	-1.14	0.22	5.18	2.21473E-07	2.94133E-05
SP6	429.30	-1.15	0.24	4.73	2.26318E-06	0.000207647
SERPING1	400.41	-1.15	0.21	5.54	3.03878E-08	5.91149E-06
SPRED3	43.04	-1.15	0.33	3.50	0.000460265	0.010206017
BLMH	387.27	-1.15	0.17	6.65	2.99076E-11	1.79601E-08
THBS2	802.88	-1.15	0.18	6.36	2.03829E-10	9.08158E-08
CCNJL	26.69	-1.16	0.37	3.11	0.001870603	0.02680162
CTD-2020K17.1	26.53	-1.16	0.36	3.22	0.001270874	0.020748591
SCARB1	2991.83	-1.16	0.23	5.01	5.38841E-07	6.15081E-05
FN1	304.07	-1.16	0.18	6.38	1.76753E-10	8.13769E-08
TMEM132A	3354.91	-1.16	0.23	4.97	6.69016E-07	7.29087E-05
GDPD5	162.98	-1.16	0.26	4.54	5.69741E-06	0.000403552
TMEM191A	68.05	-1.17	0.34	3.48	0.000498525	0.010790008
SYNPO	2585.17	-1.17	0.24	4.88	1.04271E-06	0.000108286
NOTCH4	35.04	-1.17	0.36	3.30	0.000967345	0.017462712
ACE	24.07	-1.18	0.40	2.92	0.003480061	0.040872967
HUNK	27.10	-1.18	0.37	3.19	0.001433596	0.022348565
SV2A	132.35	-1.18	0.25	4.72	2.39885E-06	0.00021239
GPAT2	63.95	-1.19	0.30	3.93	8.63229E-05	0.003065018
IL20	56.19	-1.19	0.32	3.76	0.000166692	0.004956471
FTH1P8	23.31	-1.19	0.39	3.06	0.002214819	0.02984495
SLC17A9	80.11	-1.19	0.25	4.69	2.7174E-06	0.000230262
VWA7	27.89	-1.19	0.37	3.27	0.001079926	0.018668253
APOE	748.01	-1.20	0.22	5.52	3.35329E-08	6.25886E-06
CYP27A1	78.85	-1.20	0.32	3.71	0.000209098	0.005846266
SIPA1	656.02	-1.20	0.23	5.14	2.70849E-07	3.37024E-05
BST2	197.93	-1.20	0.19	6.35	2.18371E-10	9.42544E-08
PPP1R18	4297.35	-1.20	0.23	5.28	1.26839E-07	1.92516E-05
PCSK9	11804.14	-1.21	0.22	5.42	6.06306E-08	1.02993E-05
TMCC2	75.65	-1.21	0.29	4.23	2.38766E-05	0.001199215
SLC39A2	19.35	-1.21	0.41	2.95	0.003220708	0.038614945
POU2F2	1307.38	-1.22	0.19	6.25	4.16135E-10	1.55342E-07
SPNS2	543.97	-1.22	0.23	5.23	1.70651E-07	2.40513E-05
GPR68	577.04	-1.22	0.20	6.03	1.64512E-09	4.73383E-07
MAP1B	410.31	-1.22	0.19	6.48	9.13939E-11	4.85512E-08
CAPS	33.88	-1.22	0.37	3.33	0.000858749	0.015985237
C1R	173.34	-1.22	0.20	6.20	5.65456E-10	2.00258E-07
JDP2	617.13	-1.22	0.18	6.78	1.18876E-11	8.20959E-09
CXCL16	1478.53	-1.23	0.23	5.45	4.93629E-08	8.85455E-06
PLXNA3	1190.72	-1.23	0.22	5.47	4.47546E-08	8.13356E-06
GS1-393G12.12	26.33	-1.24	0.41	3.00	0.002693966	0.034136756

KRT16P2	49.62	-1.24	0.29	4.23	2.30216E-05	0.001169025
CSPG4	501.37	-1.24	0.26	4.72	2.32342E-06	0.000208383
SCAMP5	42.71	-1.25	0.38	3.32	0.000915025	0.016783973
ABCC10	1243.27	-1.25	0.23	5.52	3.3161E-08	6.25886E-06
ACO2	1739.56	-1.25	0.17	7.53	5.18035E-14	5.11078E-11
PAMR1	74.53	-1.26	0.27	4.69	2.71146E-06	0.000230262
FAM195B	32.91	-1.26	0.39	3.25	0.001160528	0.019511564
C6orf15	43.56	-1.26	0.33	3.82	0.000132048	0.004160174
S100A8	8630.75	-1.27	0.22	5.77	7.97492E-09	1.85451E-06
GPR173	31.34	-1.27	0.35	3.58	0.000346392	0.008438046
TXNIP	3456.35	-1.27	0.24	5.29	1.24831E-07	1.91574E-05
HEPHL1	3533.63	-1.27	0.21	6.17	6.80847E-10	2.13724E-07
OSBPL7	212.33	-1.27	0.22	5.72	1.08056E-08	2.40721E-06
ADCY4	34.53	-1.28	0.34	3.74	0.000183712	0.005308437
SEZ6L2	403.34	-1.28	0.25	5.13	2.93584E-07	3.62051E-05
IL23A	73.48	-1.28	0.25	5.16	2.47566E-07	3.14851E-05
FCHO1	211.02	-1.29	0.26	4.96	7.11591E-07	7.67851E-05
ARC	33.63	-1.29	0.36	3.55	0.000380604	0.009007532
KAL1	83.06	-1.29	0.26	4.94	7.9037E-07	8.46247E-05
TSPO	8371.87	-1.29	0.25	5.18	2.18777E-07	2.93374E-05
TNS1	111.45	-1.29	0.30	4.26	2.07814E-05	0.001085092
TUBB3	1857.49	-1.29	0.22	5.84	5.14911E-09	1.24771E-06
PANX2	73.24	-1.30	0.27	4.84	1.32989E-06	0.000133554
RP11-400F19.8	21.40	-1.30	0.45	2.92	0.003516065	0.041155837
SOCS3	157.09	-1.30	0.26	5.03	4.82062E-07	5.54853E-05
AC004463.6	22.13	-1.30	0.41	3.20	0.001362287	0.021577873
CADPS2	17.83	-1.30	0.46	2.84	0.004443628	0.048185798
TMEM92	124.71	-1.31	0.24	5.52	3.33742E-08	6.25886E-06
S100A9	15585.29	-1.33	0.21	6.17	6.69343E-10	2.13724E-07
NKX3-1	20.77	-1.33	0.42	3.16	0.001559432	0.023879019
SLC43A2	569.07	-1.33	0.26	5.17	2.35661E-07	3.07071E-05
LRRC3	171.66	-1.33	0.26	5.07	3.91625E-07	4.62318E-05
SAMD14	18.99	-1.34	0.43	3.11	0.001880611	0.026909295
ZMYND15	46.45	-1.36	0.30	4.48	7.6302E-06	0.000487909
C1QTNF1	1349.56	-1.39	0.22	6.34	2.31811E-10	9.70235E-08
SLC16A11	38.07	-1.39	0.36	3.90	9.44046E-05	0.003243572
SYNGR3	28.03	-1.39	0.39	3.60	0.000313323	0.007868399
CGB7	36.92	-1.40	0.32	4.31	1.64631E-05	0.000902332
GPC4	56.32	-1.40	0.30	4.67	2.94823E-06	0.000246793
TUBB2A	355.53	-1.40	0.19	7.33	2.23646E-13	1.78579E-10
CSF2	39.14	-1.41	0.32	4.37	1.25808E-05	0.000727057

IGFBP6	436.68	-1.42	0.23	6.20	5.552E-10	2.00258E-07
IL36G	383.12	-1.42	0.19	7.37	1.7061E-13	1.47279E-10
ENO2	79.49	-1.43	0.28	5.16	2.44598E-07	3.14851E-05
LGALS7	587.76	-1.43	0.27	5.25	1.48167E-07	2.15419E-05
NACAD	118.79	-1.43	0.26	5.43	5.52136E-08	9.6533E-06
S100A12	54.35	-1.44	0.36	4.00	6.44007E-05	0.002491602
C19orf57	18.77	-1.45	0.46	3.17	0.001531504	0.023608405
S100A7	326.28	-1.45	0.18	7.88	3.29226E-15	4.54727E-12
CORO2B	53.56	-1.45	0.30	4.83	1.38393E-06	0.000135567
AEBP1	212.84	-1.46	0.25	5.96	2.59318E-09	6.63279E-07
APBA1	34.79	-1.46	0.35	4.17	3.08801E-05	0.001462589
PLA2G2F	69.26	-1.47	0.27	5.50	3.75617E-08	6.91736E-06
IL24	170.77	-1.48	0.19	7.67	1.7029E-14	1.96004E-11
PRSS22	410.89	-1.48	0.19	7.68	1.62535E-14	1.96004E-11
UCHL1	35.97	-1.49	0.33	4.50	6.8193E-06	0.000455015
LITAF	2448.79	-1.50	0.14	10.35	4.21026E-25	1.9384E-21
RP13-582O9.5	28.92	-1.50	0.37	4.08	4.55133E-05	0.001934244
CNTNAP1	15.56	-1.50	0.50	3.03	0.002465369	0.031943415
KCND1	80.61	-1.52	0.25	6.00	1.91929E-09	5.1979E-07
SPRR3	227.33	-1.52	0.19	8.23	1.85835E-16	3.20845E-13
LRRC3DN	137.36	-1.54	0.27	5.77	8.0561E-09	1.85451E-06
JAK3	63.63	-1.54	0.30	5.11	3.23868E-07	3.92392E-05
AIM1	3690.16	-1.55	0.15	10.28	9.04763E-25	3.12415E-21
DERL3	126.08	-1.55	0.26	6.02	1.77037E-09	4.99027E-07
PDZK1IP1	566.74	-1.56	0.18	8.60	7.92637E-18	1.82465E-14
ELF3	19.38	-1.57	0.45	3.52	0.000437428	0.00990547
MIR429	16.87	-1.57	0.48	3.25	0.001173527	0.019646978
VNN3	34.10	-1.59	0.35	4.48	7.42522E-06	0.000481489
hsa-mir-1199	26.95	-1.59	0.41	3.88	0.000103197	0.003468021
KAZALD1	15.82	-1.59	0.48	3.35	0.000818648	0.015485891
KCNJ5	195.48	-1.60	0.21	7.65	1.97443E-14	2.09775E-11
DMBT1	32.38	-1.61	0.37	4.33	1.51885E-05	0.000842505
IGFBP4	928.73	-1.62	0.25	6.58	4.58119E-11	2.63647E-08
SLC22A31	38.39	-1.65	0.33	4.99	6.02067E-07	6.70625E-05
SPRR2B	304.78	-1.66	0.20	8.40	4.64465E-17	9.16455E-14
TEPP	62.31	-1.66	0.28	6.00	1.97445E-09	5.24443E-07
CXCL6	31.24	-1.67	0.36	4.59	4.43058E-06	0.000341872
GLI1	29.92	-1.67	0.41	4.07	4.78121E-05	0.001983125
CNTD2	23.15	-1.71	0.43	4.01	6.02711E-05	0.002371695
LCN2	3457.99	-1.72	0.16	10.64	1.94804E-26	1.34532E-22
KRT16P5	79.38	-1.72	0.37	4.62	3.85974E-06	0.000308155

ADAMTS15	29.23	-1.72	0.41	4.24	2.22643E-05	0.001138943
FAM131C	26.24	-1.72	0.40	4.28	1.87246E-05	0.001002417
APH1A	3229.29	-1.79	0.22	8.14	4.06748E-16	6.24222E-13
SPRR2A	1110.16	-1.82	0.20	9.23	2.59764E-20	7.17572E-17
EBF4	21.39	-1.83	0.47	3.91	9.40591E-05	0.003243572
HAS2	17.73	-1.88	0.47	4.04	5.26456E-05	0.002126144
ATP13A2	133.64	-1.90	0.33	5.76	8.20766E-09	1.85843E-06
CHST1	20.40	-1.93	0.48	4.06	4.92054E-05	0.002011045
SERPINB4	27.36	-1.94	0.41	4.73	2.20374E-06	0.000204283
IGFBP3	65.76	-1.99	0.27	7.33	2.32726E-13	1.78579E-10
IL8	89.90	-2.03	0.27	7.45	9.42817E-14	8.68146E-11
C12orf68	31.95	-2.03	0.42	4.82	1.4046E-06	0.000136622
CREB3L1	17.96	-2.31	0.49	4.74	2.11112E-06	0.000197019
CSF3	340.13	-2.49	0.23	10.91	1.04831E-27	1.44793E-23
KM-PA-2	28.98	-3.90	1.30	3.01	0.002654495	0.033822772

Table S3. List of primer sequences for qPCR

Primer	Sequence 5`- 3`	Gene
hgIL36g-F	CTGGAGCCACGATTCAGTCC	*IL36G*
hgIL36G-R	AGGGTCCACACTTGCTGATTC	*IL36G*
hgS100A9-F	GCTGGAACGCAACATAGAGAC	*S100A9*
hgS100A9-R	TGCATTTGTGTCCAGGTCCTC	*S100A9*
hgLCN2-F	AGAGCTACAATGTCACCTCCG	*LCN2*
hgLCN2-R	TTAATGTTGCCCAGCGTGAAC	*LCN2*
hgDEFB4A-F	CCAGCCATCAGCCATGAGGGT	*DEFB4A*
hgDEFB4A-R	GGAGCCCTTTCTGAATCCGCA	*DEFB4A*
hgCXCL8-F	AAGGTGCAGTTTTGCCAAGG	*CXCL8*
hgCXCL8-R	CCCAGTTTTCCTTGGGGTCC	*CXCL8*
hgCCL20-F	TGTCAGTGCTGCTACTCCAC	*CCL20*
hgCCL20-R	GATTTGCGCACACAGACAAC	*CCL20*
hgIL17C-F	CCGGCTTCCCTTACCCTATC	*IL17C*
hgIL17C-R	GGTACTTCCAAGGAGGTTGGG	*IL17C*
hgRPL37a-F	AGATGAAGAGACGAGCTGTGG	*RPL37A*
hgRPL37a-R	CTTTACCGTGACAGCGGAAG	*RPL37A*
hgCXCL5-F	AGCGCGTTGCGTTTGTTTAC	*CXCL5*
hgCXCL5-R	TGGCGAACACTTGCAGATTAC	*CXCL5*
hgNFKBIZ-F	ACACCCACAAACCAACTCTGG	*NFKBIZ*
hgNFKBIZ-R	TGCTGAACACTGGAGGAAGTC	*NFKBIZ*

Table S4. List of primer sequences for generation of luciferase constructs

***NFKBIZ* reporter**	**Primer**	**Sequence 5`- 3`**
w/o STAT3	mutSTAT3-F	GGCGCGCTCTTGCCAGTCCCCAAGAACCA
	mutSTAT3-R	GACTGGCAAGAGCGCGCCCCGCACCCCTC
w/o STAT1/3	mutSTAT1/3-F	ATCCTGTACGGACGCATCCGGAGGAGGGGC
	mutSTAT1/3-R	ATGCGTCCGTACAGGATGAGGCAATGCG
w/o AP1	mutAP1-F	CGCCTCCCTCTGCAGGCCCATCCCTCCAC
	mutAP1-R	AGGGAGGCGGTGGAGGGAACCGGTTGGCC
w/o KLF4	mutKLF4-F	GGTCGGTCGCGCATTGCCTCATCCTGTAC
	mutKLF4-R	GCAATGCGCGACCGACCGGTTGTTTGCCTG
w/o NF-κB	mutNFkB-F	CGCGCGCTGTAAGGGCAGGCAAACAACCGGT
	mutNFkB-R	GCCTGCCCTTACAGCGCGCGGCTTCCAGCCT

References

1. Nemajerova A, et al. (2016) TAp73 is a central transcriptional regulator of airway multiciliogenesis. *Genes Dev* 30(11):1300-1312.
2. Kim D, Langmead B, Salzberg SL (2015) HISAT: a fast spliced aligner with low memory requirements. *Nat Methods* 12(4):357-360.
3. Nair RP, et al. (2009) Genome-wide scan reveals association of psoriasis with IL-23 and NF-kappaB pathways. *Nat Genet* 41(2):199-204.
4. Swindell WR, et al. (2011) Genome-wide expression profiling of five mouse models identifies similarities and differences with human psoriasis. *Plos One* 6(4):e18266
5. Mahil SK, et al. (2017) An analysis of IL-36 signature genes and individuals with IL1RL2 knockout mutations validates IL-36 as a psoriasis therapeutic target. *Sci Transl Med* 9(411).