Supplementary File

Table of contents:

Materials and Methods

Patient characteristics

We included two patients under regular follow-up in our CF outpatient clinic into this study. Both suffered from classical CF-lung phenotype but also from pancreatic insufficiency requiring exocrine enzyme substitution. One patient was post lung transplantation. CFTR genotype is depicted in **Figure 3F** and **G**. The study has been approved by the local ethics committee at Ulm University and the patients gave written consent.

c.1521_1523delCTT (p.F508del) is the most frequent mutation in the Middle European population (70% of CF-associated alleles according to CFTR2 database (http://www.cftr2.org/): The in-frame deletion of phenylalanine at position 508 causes perturbed posttranslational processing and leads to misfolding and retention of the mutant protein in the ER and lack of the protein at the apical membrane (class II).

c.3773dupT (p.L1258F*fs**7), former nomenclature 3905insT (legacy name), is a rare mutation (less than 0.5% of CF-associated alleles but more frequent in the Swiss population (almost 10% of CF-associated alleles) [1]. The mutation leads to frameshift and a premature translational stop codon. The mutant mRNA has been shown to escape nonsense-mediated decay, but absence of expression of the mutant protein could be demonstrated at the apical membrane (class I or II) [1].

c.3276C>A (p.Y1092*) is another rare mutation (less than 0.5% of CF-associated alleles) and has been shown to lead to instable mRNA (class I) [1].

Generation of induced pluripotent stem cell (iPSC) lines from plucked human hair keratinocytes

Keratinocytes grew to 75% confluence on Collagen IV (20 µg/mL) coated 6-well plates and were infected with $5x10^8$ proviral genome copies of hOKSM-dTomato lentivirus [2] in EpiLife medium

supplemented with HKGS (human keratinocyte growth supplement) (both Gibco), 10 µM Rock inhibitor (Y-27632, Abcam) and 8 µg/mL polybrene (Sigma) on two subsequent days. On the third day, keratinocytes were detached from the plates using TrypLE (Gibco) and transferred onto irradiated rat embryonic fibroblast (REF) feeder cells ($3.5x10^5$ cells per well irradiated with 30 Gy). Cells were cultured in hiPSCs medium (Knockout DMEM, 20% knockout serum replacement (KOSR, Gibco), 1% Penicillin/ Streptomycin (Sigma), 100 µM NEAA (Sigma), 2 mM L-Glutamine (Sigma), 100 µM β-mercaptoethanol (Merck Millipore), 50 µg/mL L-Ascorbic acid (A4544, Sigma), 10 ng/mL FGF2 (PeproTech), 10 µM Rock inhibitor) in a 5% CO_2 / 5% O_2 incubator and medium was changed daily. After 7-10 days, small colonies appeared, showing a typical hiPSC like morphology. Around 14 days later, hiPSC colonies had the appropriate size for mechanical picking and passaging onto irradiated REFs for further expansion [3,4].

Culture of human pluripotent stem cells

HUES8 (http://stemcelldistribution.harvard.edu), a standard human embryonic stem cell line, was used as control within this study. Permission to culture and differentiate these cells toward the pancreatic lineage was obtained from the Robert Koch Institute within the "79. Genehmigung nach dem Stammzellgesetz, erteilt am 28.05.2013. Genehmigung erweitert am 24.03.2015". hiPSCs were initially cultured on feeder cells in hiPSC medium as described above. At passage 2 or 3 colonies were mechanically picked, transferred onto Matrigel-coated dishes (BD, 354277) and kept in FTDA medium [5] that contains DMEM/F12-GlutaMax (Invitrogen), 1x Insulin-Transferrin-Selenium-X (ITS-X, Invitrogen), 0.1% HSA (Biological Industries, Israel), 1% Lipid mix (Invitrogen), 1% Pen/Strep, 5 ng/mL FGF2, 0.5 ng/mL TGF-β (PeproTech), 50 nM Dorsomorphin (Sigma), and 5 ng/mL Activin A (PeproTech). hPSCs were cultured in a 5% CO_2/ 5% O_2 incubator and medium was changed daily. For splitting cells, hPSC colonies were incubated with 1 mg/mL Dispase (StemCell Technologies) for 4-7 min at 37°C and subsequently detached using a cell scraper. After centrifugation for 3 min at 1000 rpm, cells were resuspended in FTDA medium supplemented with 10 µM Rock inhibitor and

transferred onto Matrigel-coated dishes. Ahead of differentiation, cells were split into single cells by applying TrypLE (Invitrogen) for 5 min at 37°C and were seeded in FDTA supplemented with 10 µM Rock inhibitor onto Matrigel-coated plates.

Immunocytochemistry

Cells at different time points of differentiation were fixed with 4% paraformaldehyde (PFA) for 20 min and blocked with 5% normal goat or donkey serum (NGS or NDS, Jackson ImmunoResearch) and 0.1% Triton X-100 (Sigma) in PBS for 45 min. Samples were then incubated overnight at 4 °C with the primary antibodies diluted in blocking solution as indicated in **Supplementary Table S2**. After washing with PBS, fluorescence labelling was performed using the appropriate goat or donkey Alexa Fluor 488 and/or Alexa Fluor 568 secondary antibodies (Life Technologies, all diluted 1:500) for 90 min at room temperature. For SSEA4 staining samples were blocked in 5% NGS/PBS for 1 h and antibodies were diluted in 1% BSA (Serva Electrophoresis)/ PBS. Nuclei were stained with 1 µg/mL DAPI (Invitrogen). Images were captured using a BZ-9000 fluorescence microscope (Keyence) or an upright Axio Imager Z1 fluorescence microscope (Zeiss) equipped with a Zeiss CCD camera and analysed using Axiovision software (Zeiss).

Immunohistochemistry

For staining of organoids, samples were either fixed with 4% PFA/ 10 % Sucrose in PBS for 20 min at RT followed by incubation in 25% sucrose solution overnight at 4°C before embedding in Tissue-Tek OCT compound (Sakura) with snap-freezing or fixed overnight at 4°C, embedded in 2% agarose and further processed for paraffin embedding (only applied for CK19/Amy staining). Immunofluorescence staining was carried out on serial sections of 8 µm (cryo) and 4 µm (paraffin) using standard techniques and as detailed above. In brief, cryosections were rehydrated for 30 min with H_2O,

whereas paraffin sections were deparaffinized, rehydrated and subjected to heat induced antigen retrieval in sodium citrate buffer (pH 6).

Blocking as well as primary antibody dilutions (according to **Supplementary Table S2**) were performed in 10% normal goat serum and 0.2% Triton X-100. Following incubation with the secondary antibodies for 1 h, sections were mounted in ProLong Gold antifade reagent with DAPI (Life Technologies). Imaging was performed on an upright Apotome fluorescence microscope (Axio Imager Z1) equipped with a Zeiss CCD camera and Axiovision software was used for analysis. To quantify the relative amount of acinar- or duct-like cells, respectively, amylase and CK19 positive cells were counted in fluorescently labelled sections of at least 3 individual organoids with an estimated amount of > 50 % pancreatic cells.

Flow cytometry

For flow cytometric analysis, cells at the DE-stage were harvested with TrypLE, washed with 2% FCS/ PBS (FACS buffer) and incubated in 10% FCS in PBS for 20 min on ice. After washing, cells were stained with 1 µl of CXCR4-PE antibody for 40 min and 0.5µl of c-Kit-APC antibody (Supplementary Table 2) for additional 15 min in 50 µl FACS buffer on ice. Afterwards, cells were washed, resuspended in FACS buffer, counterstained with DAPI (100 ng/mL) to assess viability and analysed on an LSRII flow cytometer (BD Biosciences).

At the PP stage, cells were dispersed to single cell suspension using TrypLE, washed with PBS and fixed in 4% PFA for 20 min on ice. After washing twice with PBS, cells were blocked in 5% NDS/ 0.1% Triton X-100 in PBS for 30 min on ice. Cells were washed with 2% NDS/ 0.1% Triton X-100 and then incubated with the primary antibodies (anti-PDX1 and anti-NKX6.1 diluted as indicated in **Supplementary Table 2**) in blocking solution overnight at 4°C. Next, cells were washed twice and incubated with donkey-anti-goat Alexa Fluor 488 and donkey-anti-mouse Alexa Fluor 568 (diluted 1:500 in) for 90 min on ice. Finally cells were washed again twice and analysed on an LSRII flow

cytometer (BD Biosciences).

Electron microscopy

Organoids cultured for 12 days in suspension were collected with a cut 200 µL tip into a 15 mL falcon with PBS and spun down at 400 rpm for 4 min. For transmission electron microscopy, organoids were fixed in 0.1 M phosphate buffer pH 7.3, containing 2.5% glutaraldehyde, 1% sucrose and osmicated for 1 h in 2% OsO4. Afterwards they were dehydrated in graded series of ethanol, contrasted in 2% uranyl acetate and embedded in epoxy resin (Sigma) at 60°C. Thin sections of 70-80 nm were cut with a diamond knife on a Reichert ultramicrotome and collected on 300 mesh grids. The sections were contrasted with 0.3% lead citrate for 1 min and analysed on the transmission electron microscope EM 10 (Zeiss) at 80 kV.

Carbonic anhydrase assay

For evaluation of carbonic anhydrase activity we performed a colorimetric assay based on the imidazole-Tris method [6] using phenol red as a pH indicator. Organoids from suspension culture were collected in a microfuge tube, spun down at 800 g for 1 min, washed with PBS and homogenized in lysis buffer (150 mM NaCl, 50 mM Tris-HCl, pH 7.2, 2 mM EDTA, 1% NP40 (#74385, Fluka), supplemented with protease inhibitors) at 4°C. Primary ductal cells isolated from mouse pancreas processed in the same way were included as positive control. To assess CA activity the protein lysate or carbonic anhydrase II from bovine erythrocytes (used to establish the standard curve first, obtained from Sigma) were mixed with incubation buffer (60 mM imidazole, 30 mM Tris base, 1 mM phenol red, 0.1% BSA, pH 9.6), gassed with CO_2 at a constant flow rate, and the time required to reach the end point of the colour change was measured.

Quantitative real-time PCR

RNA was extracted with the GeneJet RNA Purification kit (Thermo Scientific) according to the manufacturer's instructions and eluted in 60 µl RNAse-free H_2O. Subsequently cDNA was synthesized using the iScript cDNA synthesis kit (BioRad). 500 ng cDNA were used as a template for quantitative real-time PCR (qPCR) performed by using SensiMix SYBR kit (Bioline) according to the supplier's instructions in a Rotor Gene qPCR Cycler (Qiagen) or Light Cycler 480 II (Roche). PCR conditions were as follows: denaturation at 95 °C for 10 min, followed by 40 cycles at 95 °C for 15 s, 60 °C for 30 s and 72 °C for 15 s. Internal standards (house-keeping gene) and samples were simultaneously amplified and melting curve analysis was performed to verify the specificity of the PCR amplification products. mRNA levels of the target genes were normalized to the house-keeping gene *HMBS* (hydroxymethylbilane synthase). All primers were obtained from Qiagen (QuantiTect Primer Assays) [7] [8] except for CASP3 (F: TGGTTCATCCAGTCGCTTTG, R: AATTCTGTTGCCACCTTTCG) and XBP1-spliced (F: TGCTGAGTCCGCAGCAGGTG, R: GCTGGCAGGCTCTGGGGAAG) primer pairs that were ordered from Biomers and CYCLIN D1 from Sigma.

Microarray and gene expression data analysis

RNA quality was controlled on the 2100 Bioanalyzer. Quality-approved RNA with a RIN value higher than 9.0 was used for gene expression analysis, which was performed using the SurePrint G3 Human GE 8x60K (Design ID 028004) Microarray Kit. 100 ng of each sample was labelled with the Low Input Quick Amp Labeling Kit according to the manufacturer's instructions. Slides were scanned using a microarray scanner (Agilent Technologies).

The DNA microarray data were pre-processed and normalized by the limma package [9]. Unsupervised hierarchical clustering was performed to validate the pluripotent nature of the established iPSC lines by comparing their expression profiles to published transcriptome data from human embryonic stem cells (H1, GSM1040172; H9, GSM1040173), iPSCs established elsewhere (hiPSC_1, GSM1040179;

hiPSC_2, GSM1040180) and somatic cells including peripheral blood monocytes (PBMN_1, GSM1040233; PBMN_2, GSM1040234), cord blood cells CB_1, GSM104023; CB_2, GSM1040232) and human dermal fibroblasts (HDF, GSM1040229).

Microarray data from control and CF-derived pancreatic organoids were combined with reference gene expression profiles, including pluripotent stem cells (GSE56130, GSE63101), human adult pancreas (GSE72492), acinar or small/large ductal cells (E-MTAB-463), human keratinocytes (GSE63101) and human foreskin/lung fibroblasts (GSE55820), using R package inSilicoMerging. The combined data sets were then subjected to unsupervised hierarchical clustering and heat map analysis to reveal the similarity or dissimilarly between samples. In the heat map analysis, in-house and publicly available gene sets were used. In house acinar and ductal-related gene sets (PSC vs. Acinar, PSC vs. Ductal, PSC vs. Acinar/Ductal, ME vs. Acinar, ME vs. Ductal and ME vs. Acinar/Ductal) were defined using up-regulated genes from PSC (or ME) to acinar and ductal cells, respectively. The public available gene sets (Acinar_Dorrell et al., Ductal_Dorrell et al. and Acinar/Ductal_Dorrell et al.) were derived from results of differentially expressed genes analysis from Dorrell et al [10]. Gene names are given in **Supplementary Table 4**.

For gene set enrichment analysis (GSEA)[11] relevant gene sets were retrieved from the molecular signature database of the GSEA website (http://www.broadinstitute.org/gsea/msigdb/index.jsp). The analysis was performed using the GSEA-P-R program downloaded from the GSEA website.

Analysing RNA-sequencing data

RNA-Seq data (GSE61475 [12] for ES and ME cells and GSE79469 [13] for acinar and ductal cells) were converted to fastq files by SRA Toolkit [14] and subjected to quality control check and preprocessing steps using fastQC [15]. Then alignment to the human genome built 38 (hg38) was done with STAR aligner which can detect sliced transcripts from RNA-seq data. More than 100 million reads per sample were mapped to the genome. We calculated differentially expressed genes for each

comparison individually by comparing ES or ME cells versus acinar or ductal cells. Normalization and differential expression analysis were performed with Cufflinks, which estimates the relative abundances of transcripts based on how many reads support each one, taking into account biases in library preparation protocols [16]. We chose an FDR of 0.01 and a log2 fold change of 2 to detect differentially expressed genes in acinar or ductal differentiation. Gene names are given in **Supplementary Table 4**.

Generation of pancreatic organoids from Nkx6.1-GFP purified PPs

The NKX6.1-GFP HES3 reporter cell line ($NKX6.1^{GFP/w}$) was kindly provided by Prof. Andrew Elefanty (Murdoch Childrens Research Institute, Melbourne, Australia). Differentiation was performed as explained above and outlined in **Figure 1** with the following modifications: basal medium for DE stage (day 0-3) was MCDB131 supplemented with 10 mM glucose, 1.174 g/L sodium bicarbonate, 0.5% FAF-BSA and 2 mM L-Glutamine. From day 3 to 6 cells were treated with 50 ng/mL FGF10 and 0,75 µM Dorsomorphin in RPMI containing 0.4% FCS, 0.1% ITS-X, 2 mM L-Glutamine and 0.5 mM ascorbic acid (based on [17]).

After 12 days of PP differentiation, cells were dissociated into single cell suspension with TrypLE, washed with 2 % FCS/PBS FACS buffer and sorted according to GFP signal intensity using FACS Aria III cell sorter (BD Biosciences). Purified cells were centrifuged and resuspended in day 12 medium supplemented with Rock inhibitors Y-27632 (10 µM) and thiazovivin (0.5 µM, Calbiochem). Further cultivation was performed as detailed for 3D pancreatic organoid culture in suspension.

Measurement of digestive enzyme activity (Amy, Tryp, Ela)

Trypsin and elastase kinetic activity was measured as kinetic over 60 min at 37°C in buffer containing 100mM Tris, 5mM $CaCl_2$ at pH 8.0 by fluorometric assay using fluorochrome substrates, trypsin R110-$(CBZ\text{-}Ile\text{-}Pro\text{-}Arg)_2$ for trypsin activity and R110-$(CBZ\text{-}Ala\text{-}Ala)_2$ for elastase activity, both from

Invitrogen. Amylase was determined by colorimetric assay using Amyl-Kit obtained from Roche-Hitachi as a kinetic over 30 min at 37°C.

Enzyme activity was determined in triplicate cell pellets of pancreatic organoids generated over one passage in suspension culture. Trypsin and elastase activity was calculated as relative fluorescence units (RFU), which represents substrate cleavage/time against total protein content. Amylase activity was calculated against purified enzyme (porcine amylase obtained from Sigma).

CFTR activity

Organoids growing for 6 days in matrigel on a glass chamber slide were incubated with the fluorescent chloride ion indicator MQAE (N-(Ethoxycarbonylmethyl)-6-methoxyquinolinium bromide, 8 mM, from Enzo), 20 µM forskolin and 100 µM IBMX for 4 h at 37°C. Dye loading and CFTR activation was performed in Standard Ringer's solution (composed of 140 mM NaCl, 5 mM KCl, 5 mM HEPES, 1 mM $MgCl_2$, 1.5 mM $CaCl_2$, 5 mM glucose, pH 7.4) to promote intracellular chloride influx and transport into the organoid lumen.

Live images were captured on a Leica TCS SP8-HCS confocal microscope using a HC PL FLUOTAR 10x/0.30 DRY objective. MQAE was excited using the 405 nm laser line and emission was detected from 450-500 nm. Images represent single confocal sections through 3D structures.

mRNA transfection of pancreatic organoids

Generation of modified mRNA was carried out as described before [18] and the modifications used in the present study were 25% s2UTP+25% m5CTP (with 25% incorporation of 2-thiouridine-5'-triphosphate and 5-methylcytidine-5'-triphosphate each).

Organoids growing in suspension culture were first mechanically dissociated and further dispersed using collagenase IV (Invitrogen)/dispase (StemCell Technologies) (1 mg/ml) for 8 min followed by incubation in TrypLE for 4 min at 37°C with occasional trituration. Cells were then centrifuged at 1000 g for 5 min and resuspended in DMEM/F12 supplemented with 1x N2, 0.5x B27 (both from gibco)

and 10 µM ROCK-inhibitor (abcam). Approximately 0.8-1*10^5 cells in 200 µl medium were seeded per well of a 48-well plate (NuclonΔSurface).

Transfection using Lipofectamine® 2000 (Invitrogen) was performed according to the manufacturer's instructions. In brief, 1 µg dsRed- or human CFTR-mRNA and 1.5 µl Lipofectamine reagent were diluted in Opti-MEM medium (gibco), mixed and added to the cells (50 µl per 48-well). After centrifugation of the plate at 400 g for 10 min, the cells were incubated for additional 4 h at 37°C while briefly shaking the plate every hour. Next the cell clusters were spun down in a collection tube (at 1000 g) and resuspended either in FN-medium with ROCK-inhibitor or in matrigel for further suspension- or matrigel-based culture, respectively, as described above.

Forskolin-induced swelling assay was carried out as detailed before on organoids that developed 4 days after dsRed- or CFTR-mRNA transfection. For quantification, 12 organoids out of 3 independent wells showing no obvious signs of shrinkage were analysed using ImageJ.

Transplantation of pancreatic organoids

For xenotransplantation, athymic NMRI-nu/nu mice (strain: RjOrl: NMRI-Foxn1nu /Foxn1nu) from Envigo RMS Spain, S.L. (formerly known as Harlan) were used. Living organoids were shipped to the Instituto de Investigaciones Biomédicas "Alberto Sols" CSIC-UAM, Spain for transplantation. Organoids generated after 12 days in monolayer and 9 days in FN-based suspension culture differentiation were spun down at 400 g for 4 min and repeatedly resuspended in ice-cold BE3 medium to generate smaller pieces by pipetting up/down with a glass Pasteur pipette. After centrifugation at 4 °C (500 rpm, 5 min), the organoid pieces were resuspended in a 1:1 mixture of GFR-Matrigel and BE3 medium to approximately 10^6 cells/40 µl and kept on ice.

All animal experiments were performed in compliance with the institutional guidelines for the welfare of experimental animals approved by the Universidad Autonoma de Madrid Ethics Committee (CEI 60-1057-A068) and La Comunidad de Madrid (PROEX 335/14).

Anaesthesia of the mice was achieved with isoflurane inhalation. After anaesthetic had taken effect,

mice were wiped with ethanol-containing skin antiseptic. A small cutaneous midline incision was performed (0.8 cm) and a small subcutaneous pocket was prepared. An equally small incision (0.8 cm) was made into the peritoneum, the pancreas was mobilized and exposed. Approximately 10^6 organoid cells in matrigel/medium suspension were injected into the corpus of the (WT (HUES8) and CF (CFTR-P1 #11), n=4 each). The pancreas and spleen were then carefully repositioned in the abdomen. The peritoneum was then closed with a single stitch suture using 6-0 Prolene sutures. The skin was closed with surgical staples. During the next 48 h, mice were regularly visited and received Tramadol as analgesic into the drinking water for one week after transplantation.

Organs were harvested 5 weeks after injection. Graft tissue specimens were fixed in 4% phosphate-buffered paraformaldehyde overnight at 4 °C and embedded in paraffin. Immunohistochemical analyses were performed on serial sections of 4 µm using standard techniques. Details on antibodies used are provided in **Supplementary Table S3**. Images were taken with Olympus BX40 microscope.

Supplementary Results

Pancreatic progenitors from human pluripotent stem cells

For commitment to the pancreatic lineage a protocol from Chetty *et al.*[19] was initially implemented as the basis for further optimization and fine-tuning to develop a tailored protocol matching our specific requirements of an exocrine disease modelling platform. Herein, keratinocyte growth factor (KGF, also termed FGF7) was used to pattern the DE into gut tube endoderm for 2 days, followed by retinoic acid, KGF and Activin A treatment and inhibition of Sonic hedgehog (SHH) and bone morphogenetic protein (BMP) signalling with the small molecule compounds SANT1 and LDN193189[20 21] for 4 days to generate pancreatic endoderm (see schematic in **Supplementary Figure S1A**). The SHH antagonist SANT1 binds to Smoothened thus preventing downstream signaling[22]. LDN193189 is an inhibitor of SMAD1/5/8 phosphorylation by BMP type 1 receptors ALK2, 3, and 6[246] but has also been shown to efficiently affect non-SMAD mediated BMP signalling branches (p38, ERK1/2 and Akt)[21].

To validate the applicability of this basic differentiation protocol and also the factors for further titration and optimization experiments, endodermal and pancreatic progenitor cell markers were analysed during the course of differentiation. The combination of the factors listed above progressively induced the expression of *PDX1* and *PTF1A*, essential transcription factors for human pancreas development[23-26], gaining highest levels after 10 days of differentiation as described previously [19] (**Supplementary Figure S1B**). In line with Chetty et al., we observed weak induction of *NKX6.1* by qPCR analysis at d10 giving a first hint for the emergence of pancreatic progenitor cells. However, this marker was not yet detectable in PE cells on protein level as demonstrated by flow cytometric analysis (**Supplementary Figure S1C**). For PDX1 we saw a nice correlation between the qPCR and flow cytometry results showing increasing expression at three consecutive days till the PE stage **(Supplementary Figure S1B,C**). Thereby, at least 60 % PDX1-positive cells resembling

pancreatic epithelium were gained reaching up to 90 % in certain cell lines (**Supplementary Figure S1C**).

Differentiation protocols to direct human PSCs towards exocrine pancreatic cell types remain limited to two studies[27 28]. We tested the following compounds for further evaluation to generate an acinar-/ductal-prone pancreatic progenitor cell: FGF10 is supposed to increase the PDX1-positive progenitor population based on developmental clues from mesenchymal cells inducing proliferation in the pancreatic epithelium[29-31], while nicotinamide (NA) and FGF2 have been previously applied to promote a more mature pancreatic cell fate[32-34]. Indolactam V has been identified in a high-content chemical screen to induce differentiation of human ES cell-derived gut tube endoderm into PDX1-expressing cells[32]. The reason to include this small molecule activator of protein kinase C (PKC) signalling into our testing was the observation that although Chen *et al.* aimed to derive endocrine, insulin-producing cells, instead ILV-treated cells gave rise to a lot of amylase-positive cells indicating an exocrine fate conversion[32].

When differentiation was pursued using FGF10 and ILV from day10 to 14, *NKX6.1* expression became significantly upregulated. Nevertheless, the pancreatic progenitor markers *PTF1A* and also weakly *CPA1* exhibited a decrease in their expression levels from the PE (d10) to the PP (d14) stage (**Supplementary Figure S3E**). This result indicated that the formation of true PPs co-expressing all critical markers was not yet optimal especially with respect to our aim of inducing progenitors with an exocrine fate requiring high levels of *CPA1* and *PTF1A*.

A tailored protocol to generate true pancreatic progenitor cells

So far our efforts have shown that (i) at day 10 of the differentiation true PPs are not yet formed, (ii) in principle the substances are suitable to direct pancreatic differentiation, (iii) we could generate a lot of PDX1-expressing cells but as in previous studies found low abundance of cells co-expressing *PDX1* and *NKX6.1* together with other PP markers. Thus, a stepwise protocol optimization was

performed primarily in HUES8 embryonic stem cells for generating PDX1/NKX6.1-double positive cells. This was assessed by FACS and qPCR analysis particularly at day 14. We determined day 14 as the optimal time point to detect emerging true PPs, based on the observation that *NKX6.1* is induced here and that the day10 cell population still lacks NKX6.1 protein expression (**Figure 1D,E; Supplementary Figure S1B**).

First the intermediate stage from DE to pancreatic endoderm (day4-10) was modified by testing a set of growth factors and small molecules based on previous publications[19 28 32 35] in various combinations while the readout was set to day14 as detailed in **Supplementary Figure S2A**. Interestingly, the variations outlined in **Supplementary Figure S2A** as conditions 2a-e produced the best results exceeding the amount of PPs obtained under the two other conditions (**Supplementary Figure S2A**, conditions 1 and 3). The highest percentage of PDX1/NKX6.1-positive cells at day14 was achieved by omission of KGF and Activin A and addition of the MEK inhibitor PD0325901 (PD) (**Supplementary Figure S2,** condition 2e) from day 6-10 to the conditions used before (**Supplementary Figure S1A**). The inclusion of the small molecule PD was suggested by a study that analysed in detail signalling pathways involved in lineage bifurcation[36] to eliminate hepatic fate induction[36 37].

Despite the fact that condition 3 included a more complex factor combination, different timing for DE patterning[36], and comprised the same factors from day 5-10, this condition delivered around 40% less double-positive cells compared to the best condition (see condition 2e vs 3 in **Supplementary Figure S2B**). This illustrates the impact of early fate determinants on the final outcome and again confirms our choice of staging and patterning. To sum up, retinoic acid, SANT1, LDN and PD were selected as inducing factors for the differentiation step from day6 to 10.

Next, in a separate optimization step, guidance cues for the commitment from PE to the PP stage (day10-14) were precisely titrated as illustrated in **Supplementary Figure S3A** taking into account not only gene expression of PP markers (*PTF1A*, *NKX6.1*) but also of other gut tube patterning markers such as CDX2 and Albumin (*ALB*) to exclude intestinal or hepatic fate conversion based on qPCR

analysis (**Supplementary Figure S3B,C**). Besides increasing the rate of the PP population, the goal on the other hand was to enhance exocrine differentiation propensity by looking for factors that specifically induce an upregulation of *PTF1A* and *CPA1,* both marker genes of progenitors with an acinar fate.

The following factors were included into our testing for this phase:

BMP has been shown to be a mesenchymal factor required for pancreatic epithelial branching and exocrine differentiation in mice[38 39]. We found that treatment of the day 10 PE population with different concentrations of BMP4 could increase the expression of *PTF1A* and induce *NKX6.1.* However, this was accompanied with a strong upregulation of *ALB*, which was not unexpected since BMP-signalling also mediates liver progenitor specification [37] (**Supplementary Figure S3B,C**).

The approach of TGF-β inhibition was inspired by studies in rodents showing that Follistatin, a mesenchyme-derived factor, inhibits TGF-β family signalling to enable exocrine tissue development[40 41]. Using the small molecule SB431542 (SB), an inhibitor of TGF-β type I activin receptor-like kinase receptors ALK4, 5, and 7, more selectively increased the expression level of *PTF1A* in a concentration dependent manner, while *NKX6.1* was also upregulated, though to a similar level at both tested SB-concentrations (**Supplementary Figure S3B**).

Notch signalling is supposed to play divergent roles at various stages during pancreatic cell specification mediating progenitor maintenance while blocking exocrine differentiation[39 42 43]. Hence the effect of inhibiting Notch signalling was tested for the protocol optimization by applying the γ-secretase inhibitor X. This treatment did not increase *PTF1A* expression from day10 to day14 but induced *NKX6.1*. *ALB* was slightly increased compared to the treatment with SB while the *CDX2* expression level remained unchanged (**Supplementary Figure S3B,C**).

Two members of the FGF family were analysed in this optimization step due to the assigned positive effect on progenitor cell expansion [29] and reports on their impact on exocrine cell differentiation from human PSCs[28 44]. FGF7 seemed to be more potent than FGF10 in upregulating both *PTF1A* and

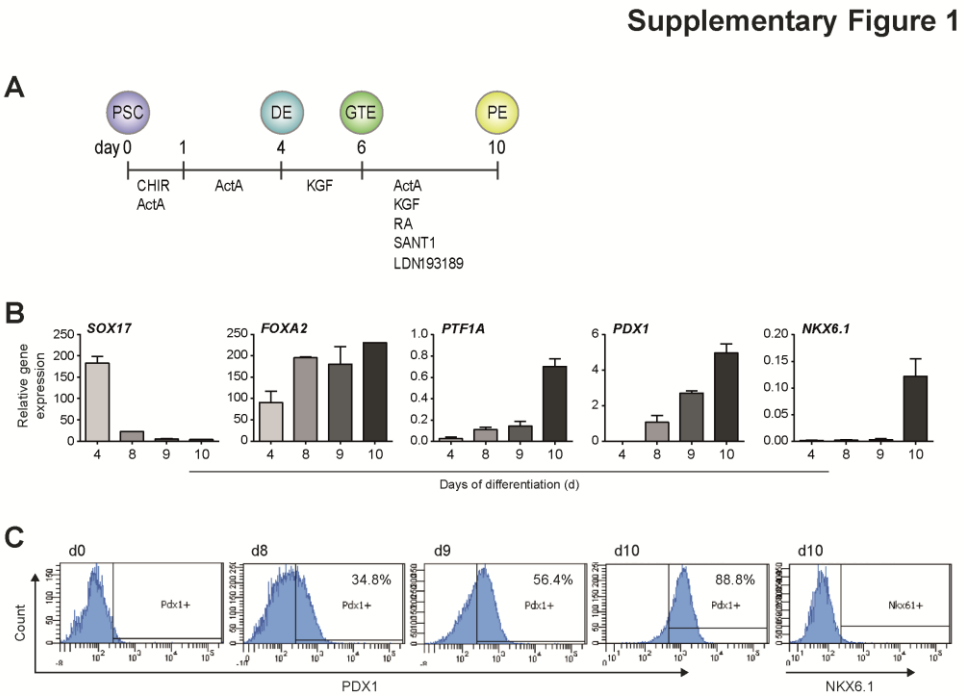
NKX6.1 but it also caused a twofold higher *ALB* expression. On the other hand, in combination with a higher (24mM final) concentration of glucose, FGF10 strongly increased *PTF1A* and *NKX6.1* expression (**Supplementary Figure S3B,C**)**.**

Summarized, the experiments revealed a strong positive effect of TGF-β signalling inhibition selectively on *PTF1A* expression and showed an upregulation of both PP markers, *PTF1A* and *NKX6.1,* by applying FGF10 in high glucose medium and had lowest inductive effect on other lineages such as hepatic or intestinal fate (**Supplementary Figure S3B,C**). The set of factors that proved to be effective during PP induction from PE, including ILV, FGF10, SB and high glucose, was finally combined together with the improved conditions identified before for the differentiation from DE to PE, constituting to the "new" differentiation protocol summarized in **Supplementary Figure 3D** and **Figure 1A**.

As illustrated for *CPA1*, *PTF1A* and *NKX6.1* in **Figure 1C** the optimized conditions led to a strong increase in PP marker gene expression at day14 compared to the Chetty et al. protocol[19 28], which we had used as initial template for optimization (compare **Supplementary Figure 1A**) and significantly raised their level from day10 to day14 (**Supplementary Figure 3E,F**).

Supplementary Figures

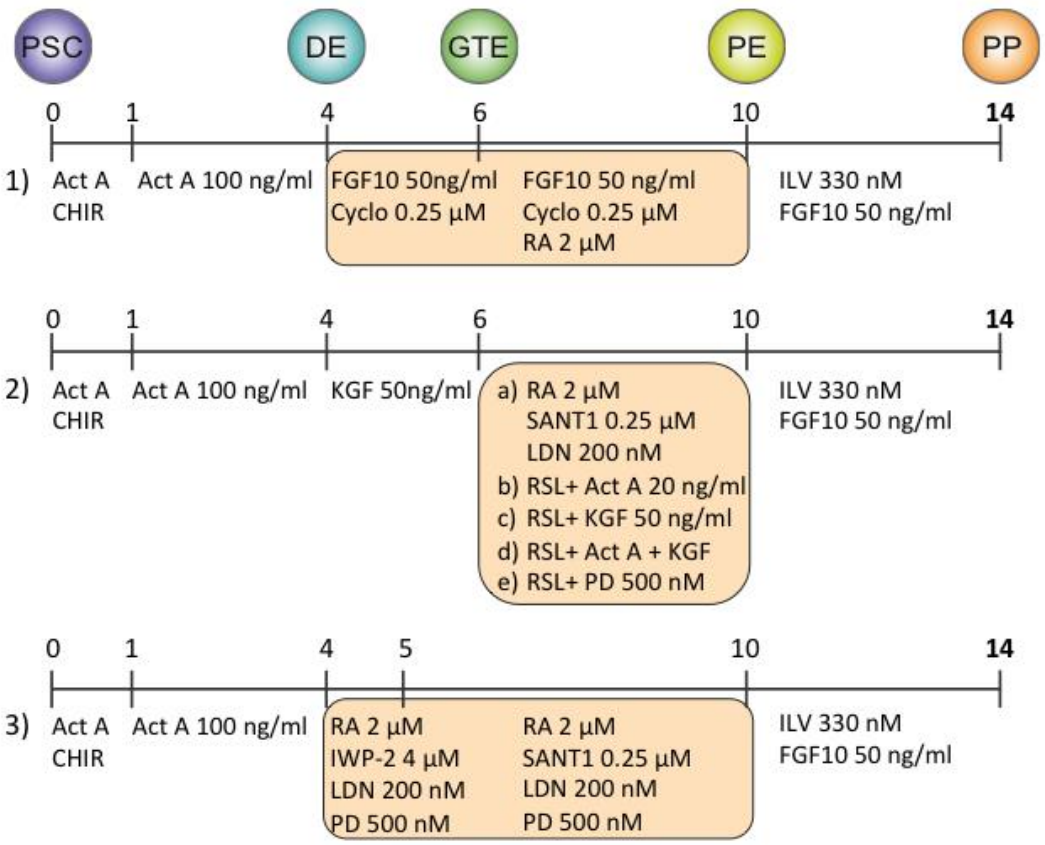
Supplementary Figure S1. Commitment towards PDX1 positive pancreatic endoderm. (**A**) Outline of the *in vitro* differentiation protocol based on Chetty et al. [19 28 45] indicating the growth factors and small molecules applied at each developmental stage. PSC: pluripotent stem cell, DE: definitive endoderm, GTE: gut tube endoderm, PE: pancreatic endoderm, ActA: Activin A, RA: Retinoid acid. (**B**) Increasing expression of pancreas specific transcription factors (*PTF1A*, *PDX1*) at consecutive days from DE to PE stage. The posterior foregut marker *FOXA2* is maintained at high levels while *SOX17* expression rapidly decreases during pancreatic differentiation (d4-10). Slight induction of *NKX6.1* is first detectable by qPCR analysis at d10. mRNA levels measured in biological duplicates normalized to *HMBS* are depicted as mean ±SEM. (**C**) FACS analysis at d8 to d10 confirmed the gradual induction of PDX1 on protein level, but showed no NKX6.1 positive cells at d10 of differentiation. Percentage of PDX1-positive cells is depicted in the FACS plots. Undifferentiated ES cells (d0) were included as negative control. All experiments were performed in HUES8 cells. DE: definitive endoderm, PE: pancreatic endoderm, d: day. Target mRNA expression relative to *HMBS* is depicted as mean ±SEM (n=2).



Supplementary Figure S2. Protocol optimization at day 4-10 during PSC differentiation. (**A**) Schematic overview of the various tested growth factor combinations to generate high yields of NKX6.1/PDX1 double positive pancreatic progenitor cells. Conditions were modified during the transition from the DE to PE stage and judged based on flow cytometric analysis for the PP markers PDX1 and NKX6.1 at day14. (**B**) Tabular overview of FACS-results for HUES8 cells after directed differentiation according to conditions 1, 2a-e and 3 as detailed in (A). (**C**) FACS plots for PP cells generated using the old differentiation protocol (**Supplementary Figure1A** = 2d) or condition 2e involving omission of TGF-β/Nodal- and FGF-activating cytokines and inhibition of MEK/ERK-signalling from d6-10 (2e) which produced the best result. (PSC: pluripotent stem cell, DE: definitive endoderm, GTE: gut tube endoderm, PE: pancreatic endoderm, PP: pancreatic progenitor, ActA: Activin A, CHIR: CHIR99021, Cyclo: KAAD-Cyclopamine (SHH antagonist), RA: Retinoic acid, IWP-2 (Wnt inhibitor), ILV: Indolactam V, LDN: LDN-193189S, PD: PD0325901, RSL: RA + SANT1 + LDN, AK: Activin A + KGF, d: day).

Supplementary Figure 2

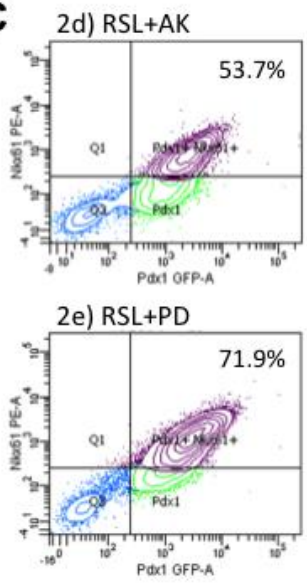
A



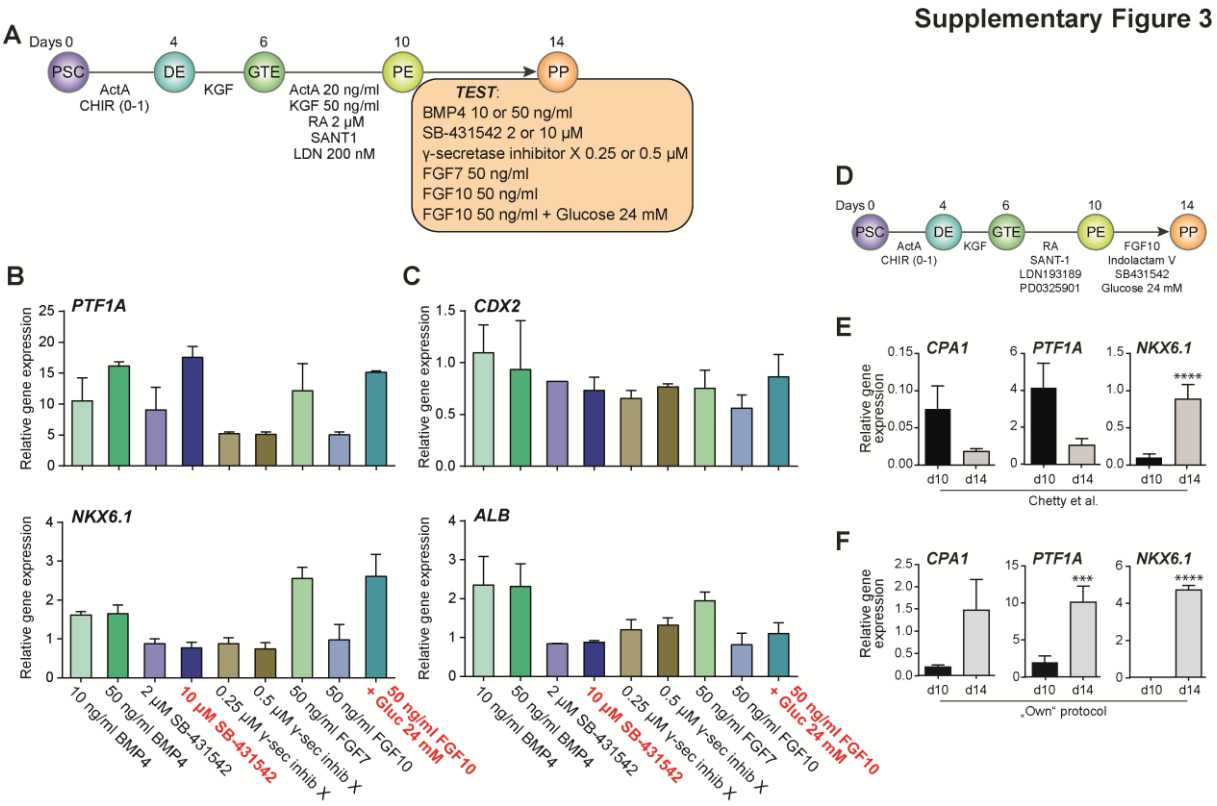
B

Condition	% of positive cells at d14 PDX1/NKX6.1	PDX1 total
1)	19.8	85.4
2a)	57.0	86.5
2b)	52.1	76.2
2c)	51.1	73.7
2d)	53.7	80.8
2e)	71.9	86.4
3)	41.5	73.5

C

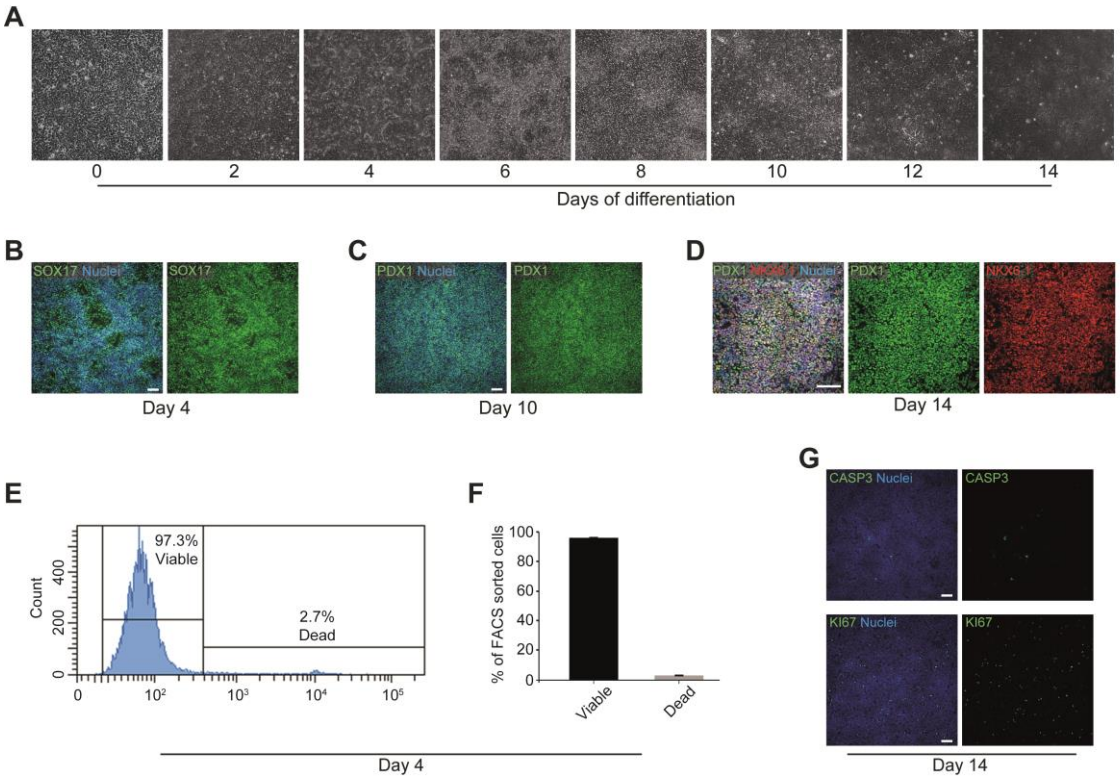


Supplementary Figure S3. Protocol optimization from d10-14 during PSC differentiation. (**A**) Schematic overview of the various growth factors tested during differentiation from the pancreatic endoderm (PE) to the pancreatic progenitor (PP) stage to increase the expression of *PTF1A* and *NKX6.1* at day14. (**B**) Gene expression based on qPCR analysis of the PP markers *PTF1A* and *NKX6.1* as well as (**C**) *CDX2* and *ALB* (Albumin) marking duodenal and hepatic cell specification, respectively, after treatment with the indicated factors according to the protocol depicted in (**A**). Conditions that were further integrated into the "new" PP-protocol as detailed in (**D**) are highlighted in red. Differentiation was performed in duplicates for each condition using HUES8 cells. (**E,F**) Gene expression analysis during pancreatic differentiation revealing a strong increase in PP markers from d10 to d14 when applying our own optimized protocol (**F**) compared to Chetty et al. (protocol as condition 2d in Supplementary Figure 2A) (**E**) (n=3 independent experiments, 2 biol. replicates). mRNA levels are presented as mean ±SEM and were normalized to *HMBS*. Statistical significance was determined by two-tailed *t*-test, ***$P<0.005$, ****$P<0.001$. PSC: pluripotent stem cell, DE: definitive endoderm, GTE: gut tube endoderm, ActA: Activin A, CHIR: CHIR99021, RA: Retinoic acid, LDN: LDN-193189, d: day.



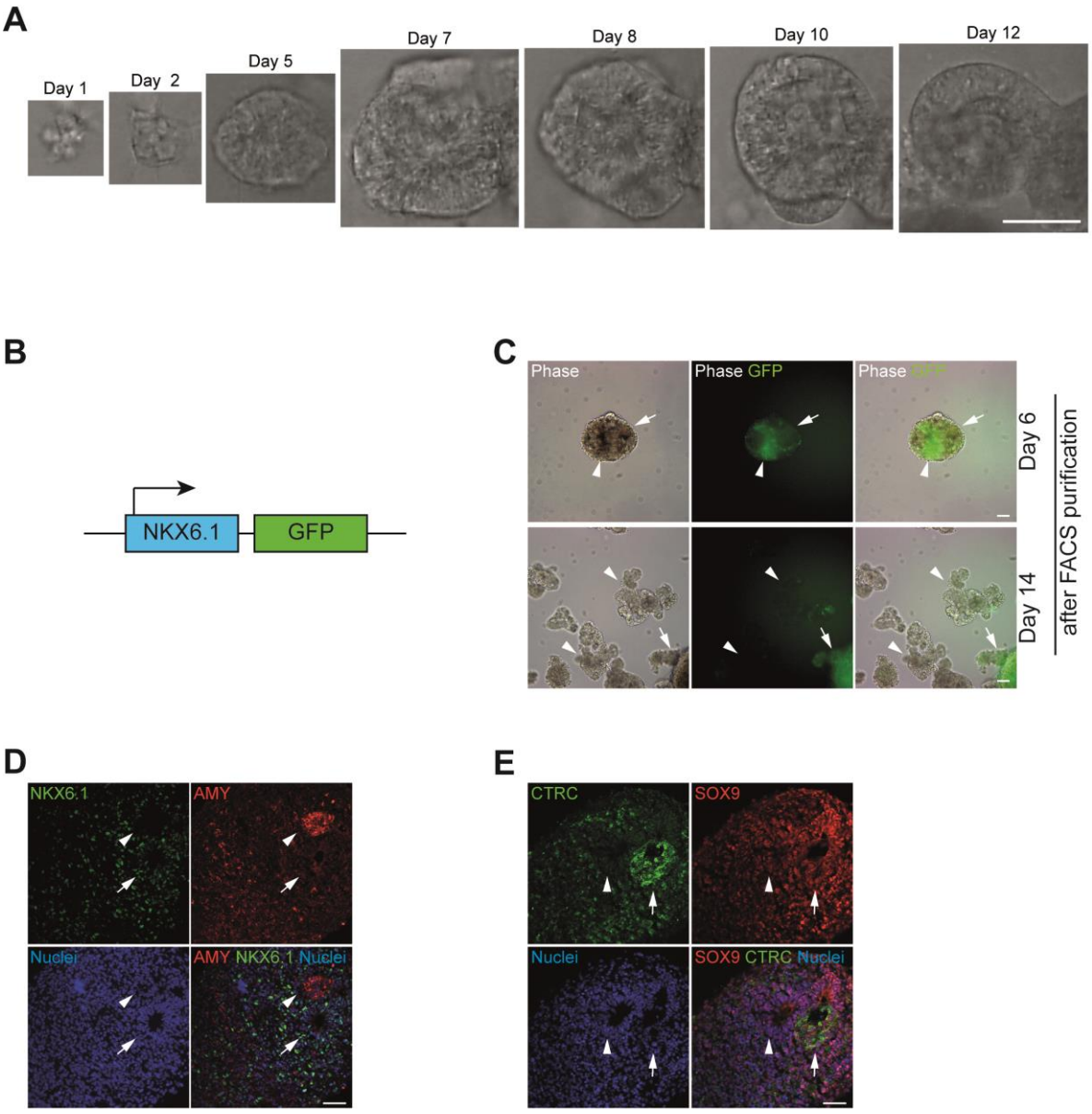
Supplementary Figure S4. No relevant cell death during PP differentiation. (**A-D**) Phase contrast images (**A**) and corresponding immunostaining at key stages (**B-D**) of differentiating hESC cultures over the course of pancreatic progenitor cell formation. (**E,F**) FACS analysis for cell viability at the DE stage based on DAPI staining of dead cells. (**G**) Immunofluorescent staining for cleaved caspase 3 and Ki67 revealing low degree of apoptosis and considerable proliferation at the PP stage. Scale bars: 100 µm.

Supplementary Figure 4

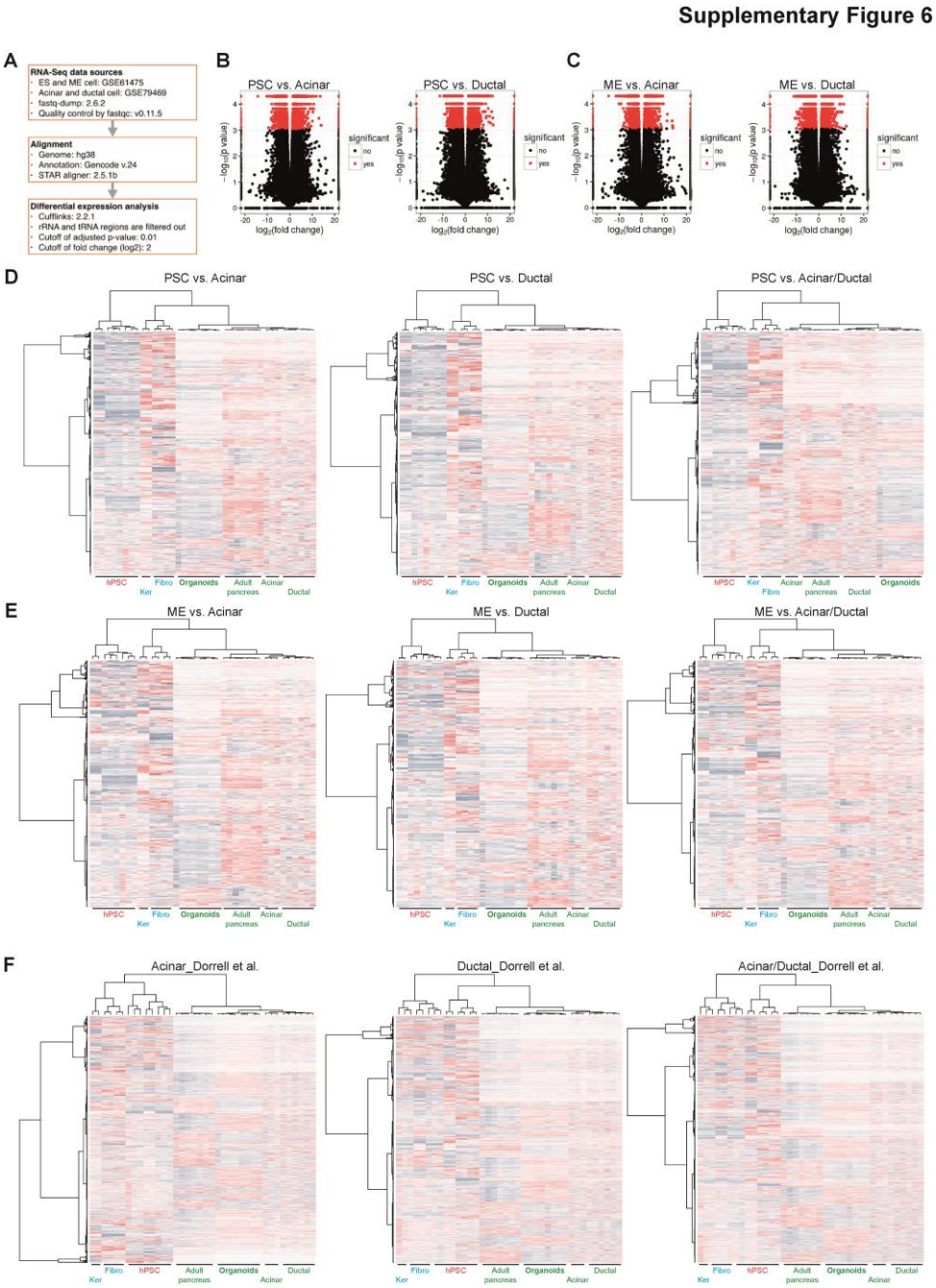


Supplementary Figure S5. (**A**) Phase contrast documentation of a growing pancreatic organoid derived from HUES8 human ESCs in matrigel culture over 12 days following stepwise PP differentiation. (**B**) Schematic of NKX6.1 gene locus in the human NKX6.1-GFP reporter ESC-line that was used to generate organoids shown in (**C-E**). (**C**) Organoids developing out of the NKX6.1-GFP-positive cell population purified by FACS after 12 days of PP differentiation from NKX6.1-GFP ESCs. Arrows and arrowheads point at NKX6.1-negative and positive structures, respectively. Note that GFP signal correlates with dense, compacted cell cluster morphology. (**D,E**) Immunostaining for the indicated markers demonstrating the emergence of pancreatic acinar and ductal lineage cells from sorted NKX6.1-GFP-positive PPs. (**D**) Expression of progenitor cell marker NKX6.1 (arrow) is broadly excluded from amylase (AMY) positive structures (arrowhead). (**E**) SOX9-positive duct-like structures (arrowhead) are mostly negative for chymotrypsin C (CTRC) while residual SOX9 expression can be detected in CTRC-positive acinar-like cells. Scale bars: 50 µm.

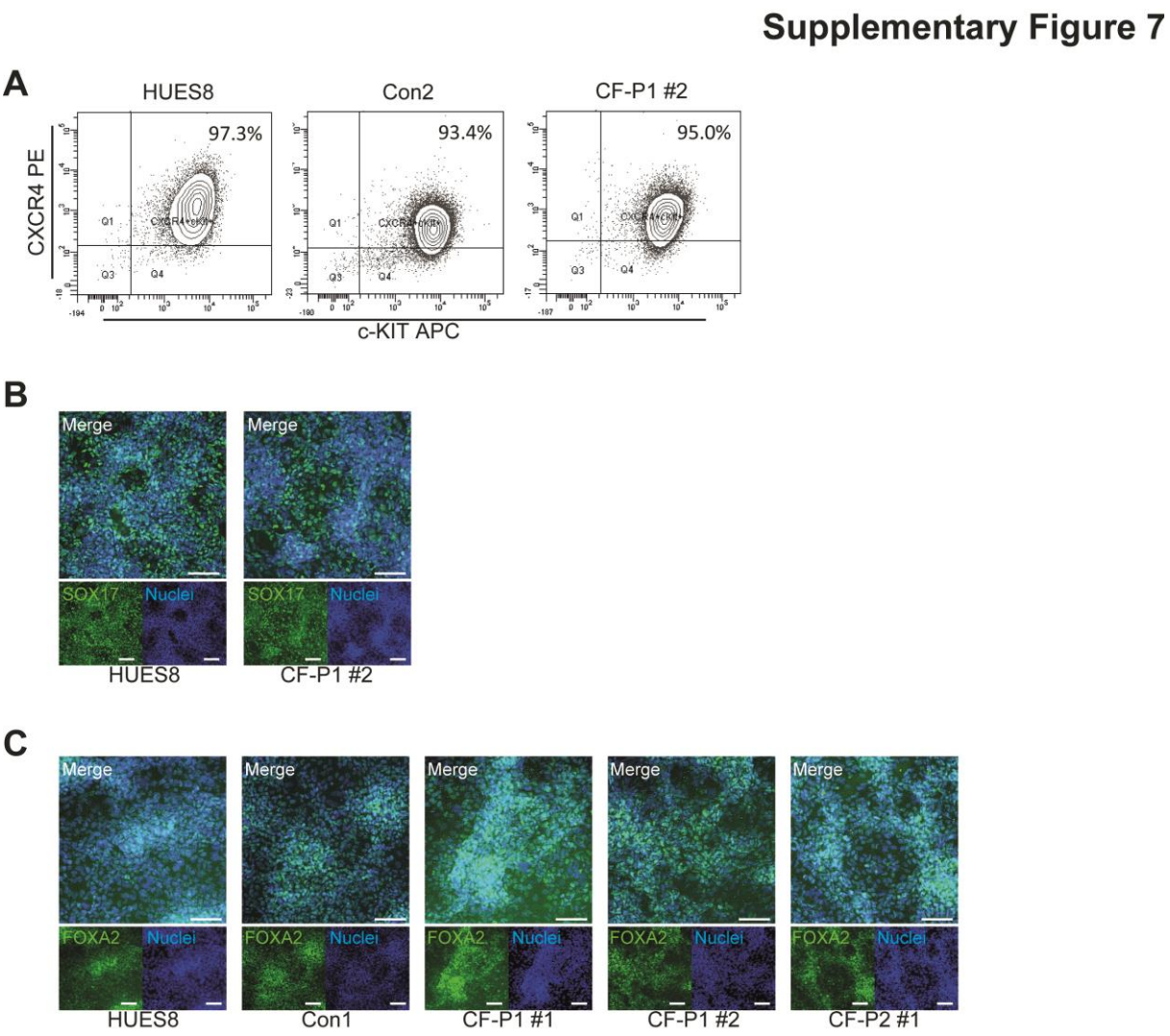
Supplementary Figure 5



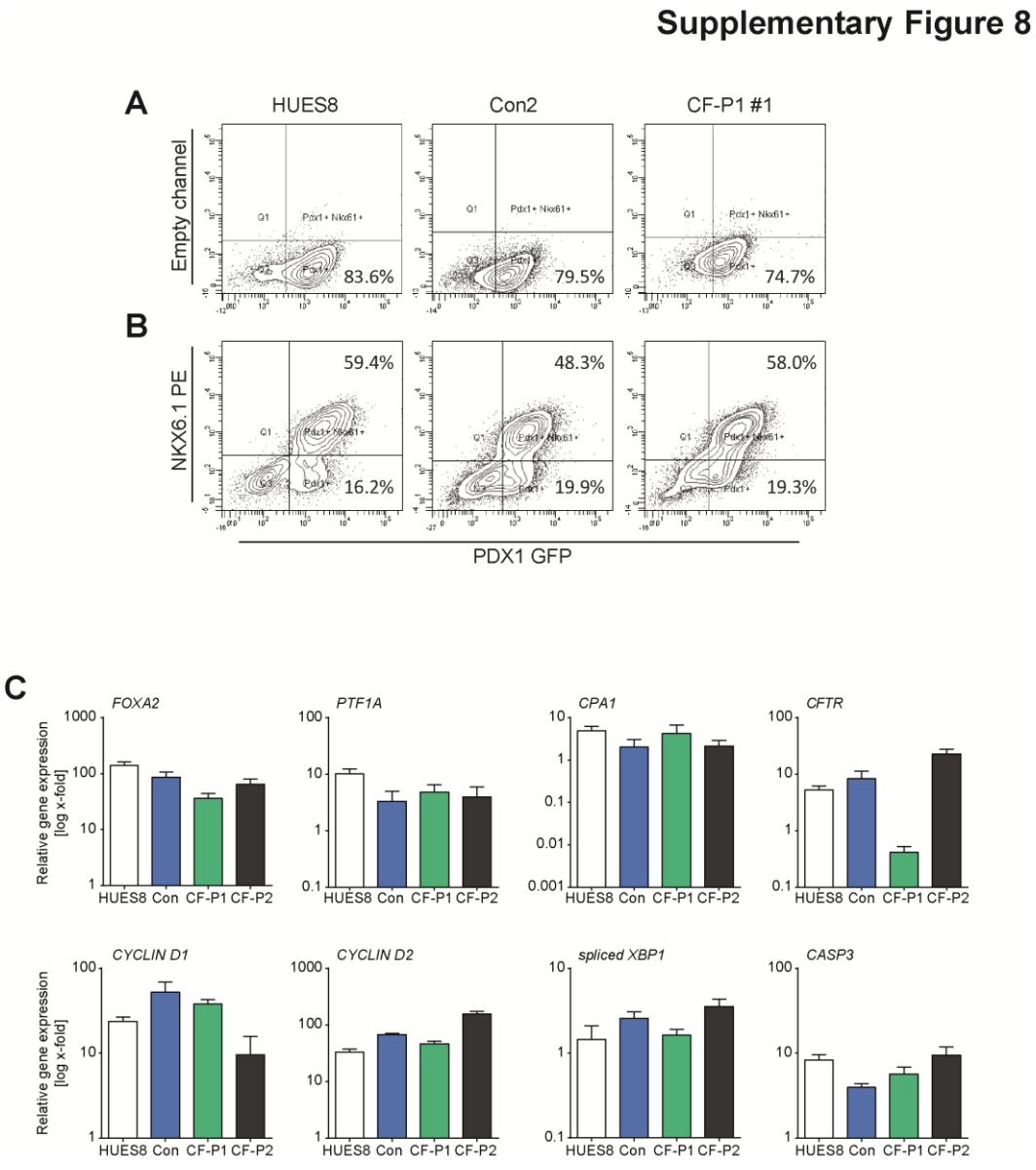
Supplementary Figure S6. (**A**) Bioinformatics pipeline for definition of Acinar and Ductal cells gene sets from RNA-Seq data. (**B,C**) The volcano plots from the differential expression analysis in the comparison between pluripotent stem cells (PSC) and acinar cells (**B**) and between mesodermal (ME) cells and ductal cells (**C**) both from young donors. (**D,E**). The combined dataset (shown in **Figure 2M**) were analysed using in-house generated acinar or ductal-related gene sets (defined as in **A-D**). (**F**) The combined datasets were analysed using public available acinar or ductal-related gene sets derived from Dorrell et al. [10].



Supplementary Figure S7. Differentiation of CF-mutated iPSCs towards definitive endoderm (DE). (**A**) FACS analysis for CXCR4 and c-KIT of the indicated genotypes at day 4 of differentiation (DE). (**B**) Immunostaining for SOX17 at day 4 of differentiation (DE) of the indicated genotypes. (**C**) Immunostaining for FOXA2 at day 4 of differentiation (DE) of the indicated genotypes. Scale bars: 100 µm.

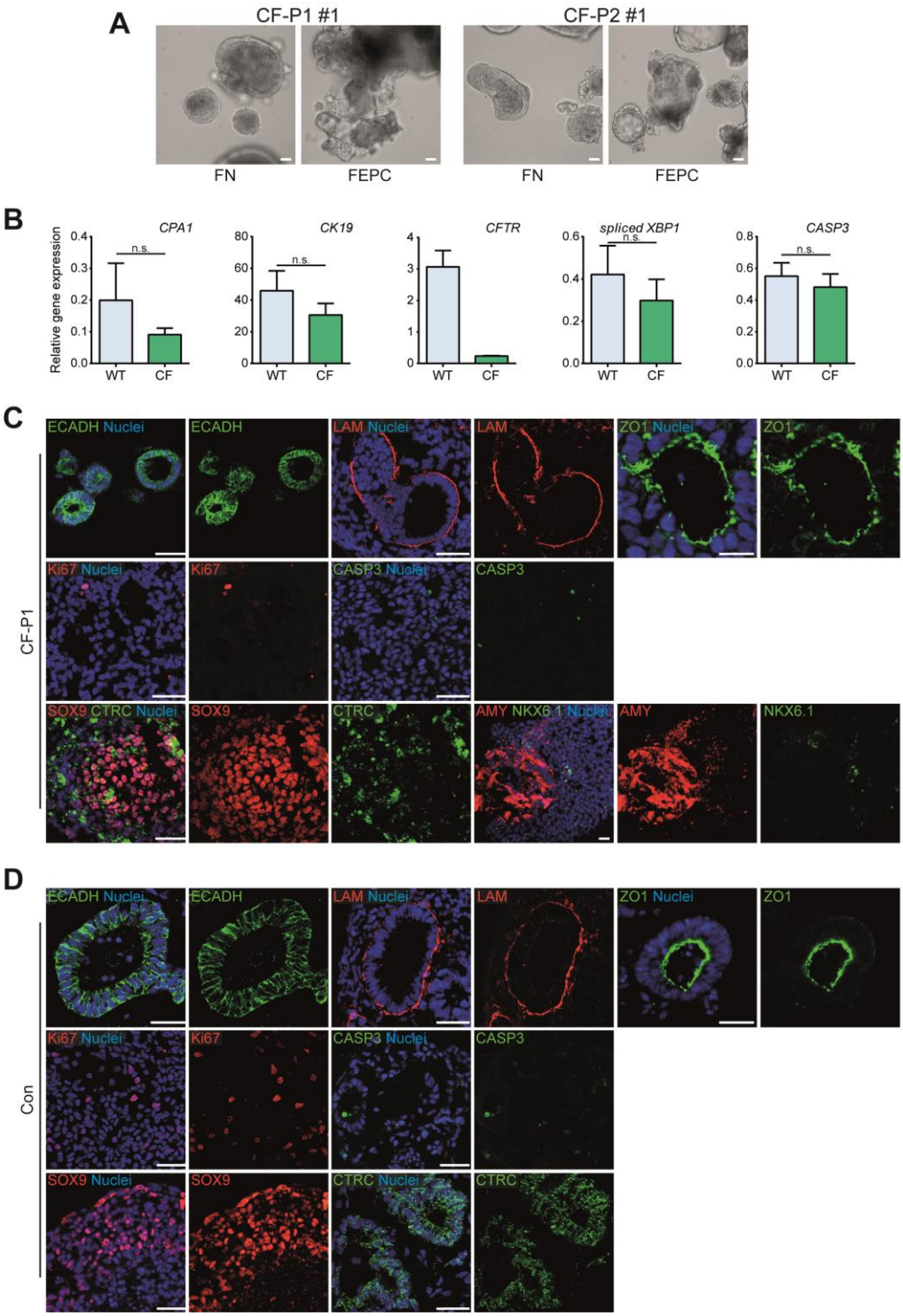


Supplementary Figure S8. Differentiation of CF-mutated iPSCs towards pancreatic endoderm (PE) and –progenitors (PP). (**A**) FACS analysis for PDX1 of the indicated genotypes at day 10 of differentiation (PE). (**B**) FACS analysis for PDX1 and NKX6.1 of the indicated genotypes at day 14 of differentiation (PP). (**C**) mRNA expression of pancreatic progenitor cell, proliferation (CYCLIN D1/D2), ER-stress (XBP1) and apoptosis (CASP3) markers in PPs derived from two wildtype (HUES8, Con) and two CFTR-mutated (CF-P1, -P2) PSC lines. Note that CFTR expression level in CF-P1 is significantly lower as expected based on the present CFTR mutation causing mRNA degradation. Target mRNA expression relative to *HMBS* is depicted as mean ±SEM (n=3) at a log10 scale.



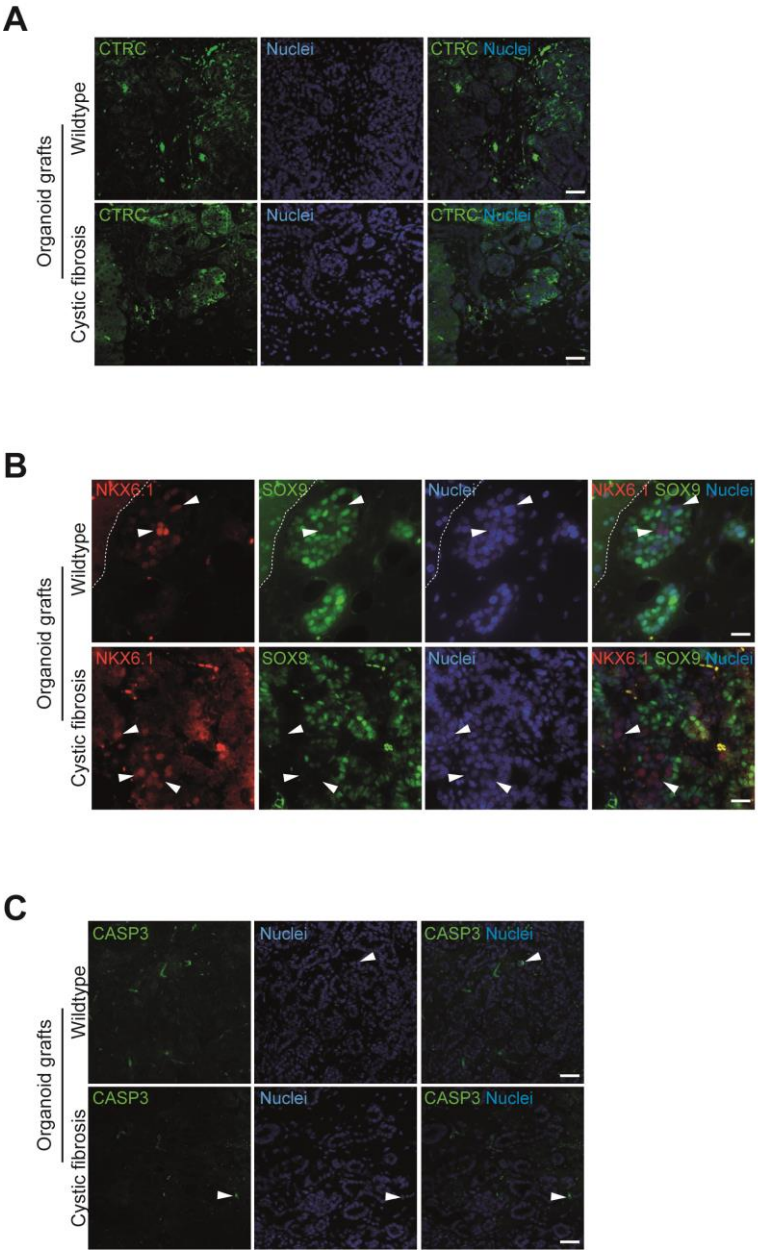
Supplementary Figure S9. (**A**) Morphology of POs from indicated genotypes in the two applied differentiation media (FN and FEPC). Scale bar: 50 µm. (**B**) qPCR analysis of wildtype and CF pancreatic organoid cultures at day 18 of differentiation. Values represent mean mRNA expression relative to *HMBS* of two WT (HUES8, Con) and two CF (CF-P1 #1/#2) PSC lines, respectively, each analysed in duplicates. Strong downregulation of *CFTR* expression in CF-P1 results from mRNA instability due to the premature termination codon. (**C,D**) Immunostaining of pancreatic organoids generated from CF-patient (CF-P1, **C**) and control iPS (Con, **D**) cells for the indicated markers. ECADH: E-cadherin, LAM: laminin-α5, CASP3: cleaved caspase 3, CTRC: chymotrypsin C, AMY: amylase. Scale bars: 20 µm.

Supplementary Figure 9



Supplementary Figure S10 (**A-C**) Immunostainings for the indicated markers of pancreatic grafts retrieved 5 weeks after orthotopic transplantation of WT- and CF-organoids into mouse pancreas. (**A**) Expression of acinar-specific marker chymotrypsin C (CTRC). (**B**) NKX6.1 expression is predominantly found in SOX9-negative cells (arrowheads). (**C**) Apoptotic cells marked by cleaved caspase 3 (CASP3) are only rarely detected (arrowhead). Scale bar: (**A,C**) 40 µm, (**B**) 20 µm.

Supplementary Figure 10



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Supplementary Tables

Supplementary Table 1. Panel of CFTR Correctors and Potentiators tested

ID	Chemical name	Other name	Reference
C3	4-Cyclohexyloxy-2-{1-[4-(4-methoxy-benzensulfonyl)-piperazin-1-yl]-ethyl}-quinazoline	VRT-325	46-48
C4	N-[2-(5-Chloro-2-methoxy-phenylamino)-4'-methyl-[4,5']bithiazolyl-2'-yl]-benzamide	Corr-4a	47-49
C8	N-(2-fluorophenyl)-2-(1H-indol-3-yl)-2-oxoacetamide		47
C17	N-(2-(5-chloro-2-methoxyphenylamino)-4'-methyl-4,5'-bithiazol-2'-yl)pivalamide	15Jf	50 51
C18	1-(benzo[d][1,3]dioxol-5-yl)-N-(5-((2-chlorophenyl)(3-hydroxypyrrolidin-1-yl)methyl)thiazol-2-yl)cyclopropanecarboxamide	VRT-534	48 52
P1	4-Methyl-2-(5-phenyl-1H-pyrazol-3-yl)-phenol	VRT-532	50 53 54
P4	1-(3-chlorophenyl)-5-trifluoromethyl-3-hydrobenzimidazol-2-one	UCCF-853	54 55
P9	3-But-3-ynyl-5-methoxy-1-phenyl-1H-pyrazole-4-carbaldehyde		55

Provided by Cystic Fibrosis Foundation Therapeutics, Inc. (CFFT)

Supplementary Table 2. Antibodies applied for flow cytometry and for immunostainings (on cells and organoid cryo/paraffin sections)

Antigen	Species	Cat. Nr.	Company	Dilution
OCT4	mouse	sc-5279	Santa Cruz	1:200
NANOG	rabbit	3580	Cell Signaling	1:500
SSEA4 (MC813)	mouse	4755	Cell Signaling	1:500
c-KIT-APC (CD117)	mouse	CD11705	Invitrogen	1:100
CXCR4-PE (CD184)	mouse	MHCXR404	Invitrogen	1:50
SOX17	goat	AF1924	R&D, USA	1:500
FOXA2	goat	sc-6554	Santa Cruz	1:500
PDX1	goat	AF2419	R&D	1:500
NKX6.1	mouse	F55A12	Iowa Hybridoma	1:50
SOX9	rabbit	AB5535	Millipore	1:800
Chymotrypsin	mouse	MAB1476	Millipore	1:1000
E-Cadherin	mouse	610182	BD Bioscience	1:1000
α-Amylase	rabbit	A8273	Sigma	1:500
Cytokeratin 19	mouse	Ab7755	abcam	1:2000
CFTR	mouse	MAB1660	R&D	1:100
ZO-1, clone R40.76	rat	MABT11	Millipore	1:50
Laminin-α5	mouse	Ab77175	Abcam	1:100
Cleaved caspase 3	rabbit	9579	Cell Signaling	1:100

Supplementary Table 3. Antibodies applied for IHC and IF of grafts (if divergent from Table 2)

Antigen	Species	Cat. Nr.	Company	Dilution
Human Cytokeratin 8	mouse	345779	BD Bioscience	1:100
α-Amylase	rabbit	A8273	Sigma	1:1000
Cytokeratin 19	mouse	Ab7755	abcam	1:100
Insulin	rabbit	11187	ICN/Cappel	1:200
Human Ki67	mouse	M7240	Dako	1:100
α-smooth muscle actin	rabbit	AB5694	Biozol	1:400
SOX9	rabbit	AB5535	Millipore	1:2000
Carboxypeptidase A1	rabbit	AHP2054	AbD Serotec	1:200
CFTR	rabbit	sc-10747	Santa Cruz	1:100

Supplementary Table 4. List of genes constituting in-house generated or public available acinar or ductal-related gene sets

PSC vs Acinar	PSC vs Ductal	PSC vs Acinar_Ductal	ME vs Acinar	ME vs Ductal	ME vs Acinar_Ductal	Acinar Dorrel et al.	Ductal Dorrell et al.	Acinar_Ductal Dorrel et al.
A1CF	A1CF	A1CF	A1CF	A1CF	A1CF	A1BG	A1BG	A1BG
AAK1	ABCA5	AAK1	AAK1	ABCA5	AAK1	AAK1	A1CF	A1CF
ABCA5	ABCB1	ABCA5	ABCA5	ABCB1	ABCA5	AASDHPPT	AASDH	AAK1
ABCA9	ABHD2	ABCA9	ABCA9	ABHD2	ABCA9	ABCA5	AASDHPPT	AASDH
ABHD1	ABHD4	ABCB1	ABCC9	ABHD4	ABCB1	ABCB1	ABCA5	AASDHPPT
ABHD14B	ABHD5	ABHD1	ABHD14B	ABLIM2	ABCC9	ABCB10	ABCB1	ABCA5
ABHD2	ABI3BP	ABHD14B	ABHD2	ABTB2	ABHD14B	ABCC5	ABCB10	ABCB1
ABHD5	ABL2	ABHD2	ABI3BP	ACSS1	ABHD2	ABCC9	ABCB8	ABCB10
ABI3BP	ABTB2	ABHD4	ABLIM2	ACVR2A	ABHD4	ABCF1	ABCC3	ABCB8
ACBD5	ACBD5	ABHD5	ACCS	ACY3	ABI3BP	ABCG1	ABCC4	ABCC3
ACCS	ACE	ABI3BP	ACOX1	ADAM28	ABLIM2	ABHD10	ABCC5	ABCC4
ACOX1	ACPP	ABL2	ACSS1	ADAMTS16	ABTB2	ABHD13	ABCC9	ABCC5
ACRC	ACRC	ABTB2	ACY3	ADCY5	ACCS	ABHD5	ABCF1	ABCC9
ACSS1	ACSL5	ACBD5	ADAT2	AFF4	ACOX1	ABI2	ABCG1	ABCF1
ADAMTS9	ACSS1	ACCS	ADHFE1	AFTPH	ACSS1	ABI3BP	ABHD1	ABCG1
ADAMTSL4	ACVR2A	ACE	ADPRH	AGR3	ACVR2A	ABLIM2	ABHD10	ABHD1
ADAP2	ADAM28	ACOX1	ADPRHL1	AHI1	ACY3	ABTB1	ABHD12	ABHD10
ADAT2	ADAMTS1	ACPP	AFF4	AIFM2	ADAM28	ACAA2	ABHD13	ABHD12
ADCY4	ADAMTS9	ACRC	AFTPH	AKAP13	ADAMTS16	ACAD10	ABHD14B	ABHD13
ADHFE1	ADCY4	ACSL5	AGR3	ALPK1	ADAT2	ACAD9	ABHD2	ABHD14B
ADPRH	ADCY5	ACSS1	AHI1	ALS2CL	ADCY5	ACADSB	ABHD4	ABHD2
ADPRHL1	ADHFE1	ACVR2A	AKAP13	ANGPTL1	ADHFE1	ACMSD	ABHD5	ABHD4
AFAP1L2	AFF4	ADAM28	ALDH1L2	ANKHD1	ADPRH	ACO1	ABI2	ABHD5
AFF4	AFTPH	ADAMTS1	ALG2	ANKRD13A	ADPRHL1	ACOX1	ABI3BP	ABI2
AFTPH	AGPAT3	ADAMTS9	ALPK1	ANKRD18A	AFF4	ACPP	ABL2	ABI3BP
AGPAT3	AHI1	ADAMTSL4	AMIGO1	ANKRD28	AFTPH	ACRC	ABLIM2	ABL2
AHI1	AHNAK	ADAP2	ANKH	ANKRD36	AGR3	ACSL6	ACAA2	ABLIM2
AHNAK	AKAP13	ADAT2	ANKHD1	ANO9	AHI1	ACSS2	ACAD9	ABTB1
AKAP13	AKT3	ADCY4	ANKRD18A	ANPEP	AIFM2	ACTB	ACADSB	ACAA2
ALDH1L2	ALS2CL	ADCY5	ANKRD22	ANXA11	AKAP13	ACTG2	ACE	ACAD10
ALG2	ANGPTL1	ADHFE1	ANKRD36	AP1G1	ALDH1L2	ACTR2	ACMSD	ACAD9
ALPK1	ANKRD13A	ADPRH	ANKRD37	AP1S3	ALG2	ACTR6	ACO1	ACADSB
ALPK3	ANKRD28	ADPRHL1	ANKRD53	APCDD1	ALPK1	ACTR8	ACOX1	ACE
ALS2CL	ANKRD36	AFAP1L2	ANO9	APOBEC3F	ALS2CL	ACVR2B	ACP6	ACMSD

AMDHD1	ANKRD44	AFF4	ANPEP	APOH	AMIGO1	ACVRL1	ACPP	ACO1
AMIGO1	ANO6	AFTPH	AP1G1	APOOL	ANGPTL1	ACY3	ACRC	ACOX1
ANGEL1	ANO9	AGPAT3	AP1S3	ARFGEF2	ANKH	ADAL	ACSL5	ACP6
ANKH	ANPEP	AHI1	APOH	ARHGAP21	ANKHD1	ADAM22	ACSL6	ACPP
ANKRD18A	ANXA11	AHNAK	APOOL	ARHGAP24	ANKRD13A	ADAMTS12	ACSS1	ACRC
ANKRD36	AP1G1	AKAP13	APPL1	ARHGAP26	ANKRD18A	ADAMTS16	ACSS3	ACSL5
ANKRD37	AP1S3	AKT3	ARFGEF2	ARHGAP27	ANKRD22	ADAMTS18	ACTB	ACSL6
ANKRD44	APCDD1	ALDH1L2	ARHGAP18	ARHGAP30	ANKRD28	ADAMTS2	ACTR2	ACSS1
ANKRD53	APOBEC3F	ALG2	ARHGAP21	ARHGAP5	ANKRD36	ADAMTS5	ACTR6	ACSS2
ANO9	APOH	ALPK1	ARHGAP24	ARHGEF12	ANKRD37	ADAMTS9	ACVR2B	ACSS3
ANPEP	APOL6	ALPK3	ARHGAP26	ARHGEF5	ANKRD53	ADAMTSL1	ACVRL1	ACTB
ANXA11	APOOL	ALS2CL	ARHGAP30	ARID5B	ANO9	ADAMTSL4	ADAL	ACTG2
AP1G1	ARFGEF2	AMDHD1	ARHGAP5	ARNTL2	ANPEP	ADAMTSL5	ADAM22	ACTR2
APOH	ARG1	AMIGO1	ARID4A	ARRDC3	ANXA11	ADARB1	ADAM28	ACTR6
APOL6	ARHGAP18	ANGEL1	ARRDC3	ARSD	AP1G1	ADARB2	ADAM33	ACTR8
APOOL	ARHGAP21	ANGPTL1	ARRDC4	ASB2	AP1S3	ADAT2	ADAMTS1	ACVR2B
APPL1	ARHGAP24	ANKH	ARSD	ASH1L	APCDD1	ADCY1	ADAMTS12	ACVRL1
ARF1	ARHGAP26	ANKRD13A	ASB8	ASPH	APOBEC3F	ADCYAP1	ADAMTS16	ACY3
ARFGEF2	ARHGAP27	ANKRD18A	ASH1L	ATF7IP2	APOH	ADD1	ADAMTS18	ADAL
ARHGAP18	ARHGAP30	ANKRD28	ASPH	ATG2B	APOOL	ADD2	ADAMTS2	ADAM22
ARHGAP21	ARHGAP5	ANKRD36	ATF7IP2	ATP11B	APPL1	ADHFE1	ADAMTS5	ADAM28
ARHGAP24	ARHGEF12	ANKRD37	ATG2B	ATP13A4	ARFGEF2	ADNP	ADAMTS7	ADAM33
ARHGAP26	ARID4A	ANKRD44	ATP11B	ATP2C2	ARHGAP18	ADRBK2	ADAMTS9	ADAMTS1
ARHGAP30	ARID4B	ANKRD53	ATP2A3	ATP5S	ARHGAP21	AEBP2	ADAMTSL1	ADAMTS12
ARHGAP5	ARID5B	ANO6	ATP8B1	ATP8B1	ARHGAP24	AFAP1L1	ADAMTSL4	ADAMTS16
ARHGEF12	ARRDC3	ANO9	ATP9B	ATR	ARHGAP26	AFF4	ADAMTSL5	ADAMTS18
ARID4A	ARSD	ANPEP	ATXN1	ATXN1	ARHGAP27	AFG3L2	ADARB1	ADAMTS2
ARID5B	ASB2	ANXA11	ATXN7	ATXN7	ARHGAP30	AFMID	ADAT2	ADAMTS5
ARMC3	ASB8	AP1G1	B3GALNT2	B3GALT5	ARHGAP5	AFTPH	ADCK5	ADAMTS7
ARRDC3	ASH1L	AP1S3	B3GNT5	B3GNT5	ARHGEF12	AGPAT4	ADCY1	ADAMTS9
ARRDC4	ASPH	APCDD1	B3GNT7	B3GNT7	ARHGEF5	AGPAT5	ADCY5	ADAMTSL1
ARSD	ATAD1	APOBEC3F	BACE1	B4GALT1	ARID4A	AGPAT9	ADCYAP1	ADAMTSL4
ASB8	ATF6	APOH	BACE2	BACE2	ARID5B	AGTRAP	ADD1	ADAMTSL5
ASH1L	ATF7IP2	APOL6	BACH1	BCL2L11	ARNTL2	AHCTF1	ADD2	ADARB1
ASPH	ATG2B	APOOL	BAG1	BCL2L14	ARRDC3	AHI1	ADHFE1	ADARB2
ATAD2B	ATP11A	APPL1	BANF2	BCL2L15	ARRDC4	AHNAK	ADI1	ADAT2
ATF6	ATP11B	ARF1	BATF2	BCL6	ARSD	AHRR	ADNP	ADCK5
ATF7	ATP2C2	ARFGEF2	BCL2L11	BCO2	ASB2	AIFM2	ADPRHL1	ADCY1
ATF7IP2	ATP8B1	ARG1	BCL2L14	BCOR	ASB8	AIG1	ADRBK2	ADCY5

ATG2B	ATXN1	ARHGAP18	BCL2L15	BDP1	ASH1L	AK7	AEBP2	ADCYAP1
ATG7	ATXN7	ARHGAP21	BCL6	BEND7	ASPH	AKAP12	AFAP1L1	ADD1
ATP11B	AVIL	ARHGAP24	BCOR	BEX2	ATF7IP2	AKAP13	AFAP1L2	ADD2
ATP8B1	B2M	ARHGAP26	BDP1	BEX5	ATG2B	AKAP8L	AFF4	ADHFE1
ATXN1	B3GNT5	ARHGAP27	BEND7	BHMT2	ATP11B	AKNA	AFG3L2	ADI1
ATXN7	B4GALT1	ARHGAP30	BEX5	BIRC3	ATP13A4	AKT2	AFTPH	ADNP
AVIL	BACE2	ARHGAP5	BHMT2	BIRC6	ATP2A3	AKT3	AGBL5	ADPRHL1
B2M	BACH2	ARHGEF12	BIRC3	BMPR1B	ATP2C2	AKTIP	AGPAT3	ADRBK2
B3GALNT2	BBS12	ARID4A	BIRC6	BRAF	ATP5S	ALDH1L2	AGPAT4	AEBP2
B3GNT5	BBS5	ARID4B	BRAF	BTBD9	ATP8B1	ALDOA	AGPAT5	AFAP1L1
B4GALT1	BCL2L11	ARID5B	BRI3BP	CACNA1D	ATP9B	ALDOB	AGPAT9	AFAP1L2
BACE1	BCL6	ARMC3	BRSK2	CADPS	ATR	ALG2	AHCTF1	AFF4
BACE2	BCO2	ARRDC3	BTBD9	CALN1	ATXN1	ALKBH5	AHI1	AFG3L2
BACH1	BDP1	ARRDC4	C1RL	CAMSAP1	ATXN7	ALKBH7	AHNAK	AFMID
BAIAP2L1	BEND7	ARSD	C2CD4B	CAPS2	B3GALNT2	ALKBH8	AHRR	AFTPH
BANF2	BHMT2	ASB2	C7	CARD6	B3GALT5	ALPK1	AHSA2	AGBL5
BATF2	BIRC3	ASB8	CA12	CASC4	B3GNT5	ALS2	AIFM3	AGPAT3
BCL2L11	BIRC6	ASH1L	CACNA1D	CASZ1	B3GNT7	ALS2CL	AIG1	AGPAT4
BCL2L14	BIVM	ASPH	CADPS	CCDC125	B4GALT1	AMDHD1	AK3	AGPAT5
BCL2L15	BMP2K	ATAD1	CAMK1D	CCDC146	BACE1	AMN1	AK5	AGPAT9
BCL6	BMPR2	ATAD2B	CANX	CCDC17	BACE2	AMOTL1	AKAP12	AGTRAP
BEND7	BNIP2	ATF6	CARD6	CCDC47	BACH1	ANGPT2	AKAP13	AHCTF1
BET1L	BRAF	ATF7	CASC4	CCDC59	BAG1	ANGPTL1	AKT2	AHI1
BEX5	BSPRY	ATF7IP2	CASZ1	CCDC6	BANF2	ANGPTL4	AKT3	AHNAK
BHMT2	BTBD9	ATG2B	CBLL1	CCDC64B	BATF2	ANGPTL6	AKTIP	AHRR
BIRC3	C1QTNF7	ATG7	CBX4	CCDC84	BCL2L11	ANK1	ALDH18A1	AHSA2
BIRC6	CACNA1D	ATP11A	CCDC112	CCDC93	BCL2L14	ANK3	ALDH1L2	AIFM2
BIVM	CADM1	ATP11B	CCDC125	CCL28	BCL2L15	ANKDD1A	ALDOB	AIFM3
BMPR2	CADPS	ATP2C2	CCDC149	CCNL1	BCL6	ANKFY1	ALG2	AIG1
BRAF	CAMSAP1	ATP8B1	CCDC59	CCNT1	BCO2	ANKH	ALG5	AK3
BRSK2	CAPS2	ATXN1	CCDC6	CCNYL1	BCOR	ANKRD11	ALG9	AK5
BSPRY	CARD6	ATXN7	CCDC64B	CD274	BDP1	ANKRD13A	ALKBH5	AK7
BTBD9	CASC4	AVIL	CCDC84	CD2AP	BEND7	ANKRD17	ALPK3	AKAP12
C1RL	CASZ1	B2M	CCKBR	CD44	BEX2	ANKRD23	ALS2	AKAP13
C7	CBX4	B3GALNT2	CCL28	CD47	BEX5	ANKRD24	ALS2CL	AKAP8L
CA12	CCDC146	B3GNT5	CCND2	CDADC1	BHMT2	ANKRD28	AMACR	AKNA
CAMK1D	CCDC17	B4GALT1	CCNI	CDC42SE2	BIRC3	ANKRD34A	AMDHD1	AKT2
CANX	CCDC50	BACE1	CCNL1	CDC73	BIRC6	ANKRD35	AMIGO1	AKT3
CARD6	CCDC59	BACE2	CCNYL1	CDCP1	BMPR1B	ANKRD37	AMMECR1L	AKTIP

CASC4	CCDC84	BACH1	CD274	CDKL2	BRAF	ANKRD53	AMN1	ALDH18A1
CASZ1	CCDC93	BACH2	CD2AP	CDO1	BRI3BP	ANKS1B	AMOTL1	ALDH1L2
CBX4	CCL28	BAIAP2L1	CD44	CDS1	BRSK2	ANKS6	ANAPC4	ALDOA
CCDC125	CCNL1	BANF2	CDADC1	CEACAM19	BTBD9	ANP32E	ANAPC5	ALDOB
CCDC126	CCNT1	BATF2	CDC37L1	CFLAR	C1RL	ANPEP	ANGEL1	ALG2
CCDC149	CCNYL1	BBS12	CDC42SE2	CFTR	C2CD4B	ANTXR1	ANGPT2	ALG5
CCDC50	CD2AP	BBS5	CDCA7L	CGN	C7	ANTXR2	ANGPTL1	ALG9
CCDC59	CD44	BCL2L11	CDCP1	CHD2	CA12	ANXA1	ANK1	ALKBH5
CCDC6	CD47	BCL2L14	CDS1	CHD6	CACNA1D	ANXA11	ANK3	ALKBH7
CCDC64B	CD59	BCL2L15	CEACAM19	CHD9	CADPS	AP1G1	ANKH	ALKBH8
CCDC84	CD84	BCL6	CFTR	CHDH	CALN1	AP1S2	ANKHD1	ALPK1
CCDC93	CDCP1	BCO2	CGN	CLDN1	CAMK1D	AP4B1	ANKIB1	ALPK3
CCL28	CDKL1	BDP1	CHD2	CLDN23	CAMSAP1	APBB1IP	ANKRD10	ALS2
CCND2	CDKL2	BEND7	CHDH	CLIC5	CANX	APCDD1	ANKRD11	ALS2CL
CCNI	CDKN2B	BET1L	CHRM3	CLIC6	CAPS2	APCDD1L	ANKRD13B	AMACR
CCNL1	CEACAM19	BEX5	CLDN1	CLINT1	CARD6	APEH	ANKRD13C	AMDHD1
CCNYL1	CFL2	BHMT2	CLDN12	CLIP1	CASC4	APH1A	ANKRD17	AMIGO1
CD2AP	CFLAR	BIRC3	CLDN23	CLIP4	CASZ1	APH1B	ANKRD22	AMMECR1L
CD44	CFTR	BIRC6	CLIP1	CLMN	CBLL1	APLP2	ANKRD23	AMN1
CD84	CHD2	BIVM	CLIP4	CMYA5	CBX4	APOBEC3F	ANKRD24	AMOTL1
CDCP1	CHD6	BMP2K	CLMN	CNKSR3	CCDC112	APOH	ANKRD28	ANAPC4
CDKL1	CHD9	BMPR2	CMTM8	CNOT2	CCDC125	APOL4	ANKRD32	ANAPC5
CDKL2	CHM	BNIP2	CMYA5	CNOT6L	CCDC146	AQP4	ANKRD34A	ANGEL1
CEACAM19	CHMP4C	BRAF	CNKSR2	CNTN3	CCDC149	AR	ANKRD35	ANGPT2
CEP120	CLDN1	BRSK2	CNKSR3	COBLL1	CCDC17	ARAF	ANKRD44	ANGPTL1
CFLAR	CLDN23	BSPRY	CNOT6L	COMTD1	CCDC47	ARF1	ANKRD52	ANGPTL4
CFTR	CLEC16A	BTBD9	CNTN3	CPEB2	CCDC59	ARF3	ANKS6	ANGPTL6
CHD2	CLEC2D	C1QTNF7	COBLL1	CPEB3	CCDC6	ARF6	ANPEP	ANK1
CHMP4C	CLIC6	C1RL	COG3	CPEB4	CCDC64B	ARFGAP2	ANTXR1	ANK3
CHRM3	CLINT1	C7	COMTD1	CREB5	CCDC84	ARFGEF2	ANTXR2	ANKDD1A
CITED2	CLIP1	CA12	COQ10A	CREBBP	CCDC93	ARHGAP1	ANXA11	ANKFY1
CLDN1	CLIP4	CACNA1D	CPEB2	CRIM1	CCKBR	ARHGAP18	ANXA6	ANKH
CLIP1	CLK4	CADM1	CPEB3	CRIPAK	CCL28	ARHGAP24	AP1G1	ANKHD1
CLIP4	CLMN	CADPS	CPEB4	CRTC3	CCND2	ARHGAP28	AP1S2	ANKIB1
CLK4	CLRN3	CAMK1D	CREB3L2	CSPP1	CCNI	ARHGEF5	AP3M1	ANKRD10
CLMN	CMYA5	CAMSAP1	CREB5	CTAGE5	CCNL1	ARHGEF7	AP4B1	ANKRD11
CLSTN2	CNKSR3	CANX	CREBBP	CTTNBP2	CCNT1	ARID1B	AP4E1	ANKRD13A
CMTM8	CNOT2	CAPS2	CRTC3	CXCL16	CCNYL1	ARID4B	AP4S1	ANKRD13B
CMYA5	CNOT6L	CARD6	CSMD3	CXCL2	CD274	ARID5B	APBB1IP	ANKRD13C

CNOT6L	CNTN3	CASC4	CTAGE5	CYP3A5	CD2AP	ARIH2	APCDD1	ANKRD17
CNTN3	CNTN4	CASZ1	CUX1	CYP4V2	CD44	ARL13B	APCDD1L	ANKRD22
COBLL1	COBLL1	CBX4	CXCL16	DAB2	CD47	ARL15	APEH	ANKRD23
COG1	COG3	CCDC125	CXCL2	DAZAP2	CDADC1	ARL8A	APH1A	ANKRD24
COG3	COG5	CCDC126	CXXC4	DCDC2	CDC37L1	ARL8B	APLN	ANKRD28
COL12A1	COL12A1	CCDC146	CYP3A5	DCLRE1C	CDC42SE2	ARMC2	APLP2	ANKRD32
COL3A1	COL27A1	CCDC149	CYP4V2	DCP1A	CDC73	ARMC9	APOBEC3F	ANKRD34A
COL4A4	CPEB2	CCDC17	DAZAP2	DDX58	CDCA7L	ARMCX4	APOH	ANKRD35
COMTD1	CPEB3	CCDC50	DCDC2	DDX60L	CDCP1	ARNTL2	APOL4	ANKRD37
CPEB2	CPEB4	CCDC59	DCN	DENND1B	CDKL2	ARRB1	APOL6	ANKRD44
CPEB3	CREB5	CCDC6	DCTN4	DENND2C	CDO1	ARRDC1	APPL1	ANKRD52
CPEB4	CREBBP	CCDC64B	DDX58	DERL1	CDS1	ARRDC3	AQP11	ANKRD53
CRBN	CRIM1	CCDC84	DDX60L	DGKE	CEACAM19	ARRDC4	AQP4	ANKS1B
CREB3L2	CRIPAK	CCDC93	DENND1B	DHRS7	CFLAR	ARSK	AQR	ANKS6
CREB5	CROT	CCL28	DENND2C	DIRAS2	CFTR	ARX	ARF1	ANP32E
CREBBP	CRTC3	CCND2	DERL3	DIRC2	CGN	ASB1	ARF3	ANPEP
CRTC2	CSNK1G1	CCNI	DGCR5	DMGDH	CHD2	ASB4	ARF6	ANTXR1
CRTC3	CSPP1	CCNL1	DGKE	DMXL1	CHD6	ASB5	ARFGEF2	ANTXR2
CSAD	CTTNBP2	CCNT1	DHRS12	DNAH1	CHD9	ASB6	ARGLU1	ANXA1
CSMD3	CUL9	CCNYL1	DIRC2	DNAH11	CHDH	ASB7	ARHGAP1	ANXA11
CST3	CXCL16	CD2AP	DMD	DNAH5	CHRM3	ASB8	ARHGAP21	ANXA6
CTAGE5	CXCL2	CD44	DMGDH	DNAH6	CLDN1	ASCC3	ARHGAP24	AP1G1
CUX1	CYB5D1	CD47	DMKN	DNAH7	CLDN12	ASCL2	ARHGAP26	AP1S2
CXCL16	CYP3A5	CD59	DNAH1	DNAJA4	CLDN23	ASNS	ARHGAP28	AP3M1
CXCL2	DAAM1	CD84	DNAH11	DNAJC22	CLIC5	ASPH	ARHGAP30	AP4B1
CYP3A5	DAB2	CDCP1	DNAH6	DNAJC3	CLIC6	ASPN	ARHGAP5	AP4E1
DAAM1	DAZAP2	CDKL1	DNAH7	DOCK5	CLINT1	ASPRV1	ARHGEF11	AP4S1
DAZAP2	DCDC2	CDKL2	DNAJA4	DSEL	CLIP1	ASRGL1	ARHGEF12	APBB1IP
DCDC2	DCLK2	CDKN2B	DNAJC12	DST	CLIP4	ASXL3	ARHGEF19	APCDD1
DCN	DCP1A	CEACAM19	DNAJC22	DTNA	CLMN	ATAD3A	ARHGEF2	APCDD1L
DCP1A	DDAH1	CEP120	DNAJC3	DTWD2	CMTM8	ATAD3B	ARHGEF5	APEH
DCTN4	DDHD1	CFL2	DNAJC4	DTX3L	CMYA5	ATCAY	ARHGEF7	APH1A
DDAH1	DDX58	CFLAR	DOCK5	DUSP1	CNKSR2	ATF7	ARID1B	APH1B
DDHD1	DDX60L	CFTR	DOCK8	DUSP16	CNKSR3	ATF7IP2	ARID2	APLN
DDX58	DENND1B	CHD2	DPP10	DUSP23	CNOT2	ATG16L2	ARID5B	APLP2
DDX60L	DENND2C	CHD6	DPP6	DYRK1A	CNOT6L	ATG9B	ARL13B	APOBEC3F
DEF6	DENND4C	CHD9	DSEL	ECHDC2	CNTN3	ATMIN	ARL15	APOH
DENND1B	DERL1	CHM	DST	EDN1	COBLL1	ATP11A	ARL6IP6	APOL4
DENND2C	DGKE	CHMP4C	DTNA	EEPD1	COG3	ATP11B	ARL8A	APOL6

DENND4C	DGKH	CHRM3	DTWD2	EFCAB6	COMTD1	ATP2A2	ARL8B	APPL1
DGCR5	DHRS7	CITED2	DTX3L	EGFR	COQ10A	ATP2A3	ARMC10	AQP11
DGKE	DIRAS2	CLDN1	DUSP1	EGLN1	CPEB2	ATP5E	ARMC4	AQP4
DHRS12	DIRC2	CLDN23	DUSP16	EGR1	CPEB3	ATP5G3	ARMCX3	AQR
DHRS7	DLC1	CLEC16A	DUSP23	EGR4	CPEB4	ATP5S	ARMCX4	AR
DIO3OS	DMGDH	CLEC2D	ECHDC2	EHF	CREB3L2	ATP6V0E1	ARNTL2	ARAF
DMD	DNAH1	CLIC6	EDEM3	EIF4E3	CREB5	ATP6V1C1	ARRDC1	ARF1
DMGDH	DNAH10	CLINT1	EFCAB6	ELF3	CREBBP	ATP6V1D	ARRDC3	ARF3
DNAH1	DNAH2	CLIP1	EFHD2	ELK4	CRIM1	ATP6V1G1	ARRDC4	ARF6
DNAH10	DNAH7	CLIP4	EGFR	ELL2	CRIPAK	ATP8B2	ARSI	ARFGAP2
DNAH2	DNAJA4	CLK4	EGLN1	ELOVL7	CRTC3	ATPIF1	ARSK	ARFGEF2
DNAH7	DNAJC22	CLMN	EGR1	EML4	CSMD3	ATXN3	ARX	ARGLU1
DNAJA4	DNAJC27	CLRN3	EHF	ENPP5	CSPP1	AURKAIP1	ASB1	ARHGAP1
DNAJC1	DNAJC3	CLSTN2	EIF2AK3	EPB41L1	CTAGE5	AUTS2	ASB4	ARHGAP18
DNAJC12	DNALI1	CMTM8	EIF4E3	EPB41L4A	CTTNBP2	AVIL	ASB5	ARHGAP21
DNAJC15	DNHD1	CMYA5	ELF3	EPB41L4B	CUX1	B3GALNT1	ASCC3	ARHGAP24
DNAJC21	DOCK5	CNKSR3	ELK4	EPC1	CXCL16	B3GALNT2	ASCL2	ARHGAP26
DNAJC22	DPP7	CNOT2	ELL2	EPC2	CXCL2	B3GALT5	ASNS	ARHGAP28
DNAJC3	DST	CNOT6L	ELOF1	EPHA6	CXXC4	B3GAT2	ASPA	ARHGAP30
DNAJC4	DTNA	CNTN3	ELOVL7	EPN3	CYP3A5	B3GNT7	ASPH	ARHGAP5
DOCK5	DTX3L	CNTN4	EML4	EPS8L2	CYP4V2	B4GALT6	ASPHD2	ARHGEF11
DOCK8	DUSP1	COBLL1	ENPP1	ERAP2	DAB2	BAALC	ASPM	ARHGEF12
DPP6	DUSP16	COG1	ENPP5	ERBB2IP	DAZAP2	BACE1	ASPN	ARHGEF19
DPP7	DUSP18	COG3	ENTPD7	ERBB3	DCDC2	BACH2	ASPRV1	ARHGEF2
DST	DZIP1L	COG5	EPB41L4B	ERBB4	DCLRE1C	BAG2	ASXL3	ARHGEF5
DTNA	EBF1	COL12A1	EPC1	ERC1	DCN	BAG5	ATAD2	ARHGEF7
DTX3L	ECHDC2	COL27A1	EPN3	ERCC6	DCP1A	BAIAP2L1	ATAD2B	ARID1B
DUSP1	EDN1	COL3A1	ERBB3	ERN1	DCTN4	BAIAP2L2	ATAD3B	ARID2
DUSP16	EEA1	COL4A4	ERC1	ERP27	DDX58	BANP	ATCAY	ARID4B
DUSP18	EEPD1	COMTD1	ERCC6	ERRFI1	DDX60L	BASP1	ATF7	ARID5B
DYM	EFCAB6	CPEB2	ERN1	ETS2	DENND1B	BATF2	ATF7IP	ARIH2
ECHDC2	EGFR	CPEB3	ERP27	ETV6	DENND2C	BAZ1B	ATG16L2	ARL13B
EDEM3	EGLN1	CPEB4	ERRFI1	EXOC6	DERL1	BBS1	ATG4D	ARL15
EDN1	EGR1	CRBN	ETS2	EYS	DERL3	BBS12	ATG7	ARL6IP6
EFCAB1	ELF2	CREB3L2	ETV6	F5	DGCR5	BBS2	ATG9B	ARL8A
EFCAB6	ELF3	CREB5	EXD2	FA2H	DGKE	BBS5	ATMIN	ARL8B
EFHD2	ELK4	CREBBP	FA2H	FAM102A	DHRS12	BCAT1	ATP11A	ARMC10
EGFR	ELL2	CRIM1	FAM102A	FAM107B	DHRS7	BCL2L11	ATP11B	ARMC2
EGLN1	ELOVL7	CRIPAK	FAM105A	FAM111A	DIRAS2	BCL2L13	ATP11C	ARMC4

EGR1	EMP1	CROT	FAM107B	FAM122A	DIRC2	BCL2L14	ATP13A4	ARMC9
EIF2A	ENAM	CRTC2	FAM122A	FAM124A	DMD	BCL2L15	ATP2A2	ARMCX3
EIF2AK3	ENPP5	CRTC3	FAM160A1	FAM135A	DMGDH	BCL6B	ATP2A3	ARMCX4
EIF4E3	EPB41L1	CSAD	FAM162A	FAM160A1	DMKN	BCLAF1	ATP5G3	ARNTL2
ELF2	EPB41L4A	CSMD3	FAM3B	FAM3B	DMXL1	BCO2	ATP5S	ARRB1
ELF3	EPC1	CSNK1G1	FAM46C	FAM46A	DNAH1	BCORL1	ATP6V0B	ARRDC1
ELK4	EPC2	CSPP1	FAM63A	FAM46C	DNAH11	BCR	ATP6V0E1	ARRDC3
ELL2	EPN3	CST3	FAM83B	FAM63A	DNAH5	BDP1	ATP6V1C1	ARRDC4
ELOVL7	ERAP2	CTAGE5	FAM83F	FAM81A	DNAH6	BET1L	ATP8B2	ARSI
EML4	ERBB2IP	CTTNBP2	FAM91A1	FAM83B	DNAH7	BEX2	ATP8B3	ARSK
EMP1	ERBB4	CUL9	FBXO2	FAM83F	DNAJA4	BEX5	ATXN1	ARX
EMP2	ERC1	CUX1	FBXO25	FAM91A1	DNAJC12	BHMT2	ATXN3	ASB1
ENAM	ERCC6	CXCL16	FBXO32	FARP2	DNAJC22	BICD1	ATXN7	ASB4
ENPP1	ERN1	CXCL2	FBXO4	FBXO25	DNAJC3	BIVM	ATXN7L1	ASB5
ENTPD7	ERP27	CYB5D1	FBXW7	FBXO32	DNAJC4	BLOC1S2	AUTS2	ASB6
EPB41L4B	ERRFI1	CYP3A5	FER1L5	FBXO4	DOCK5	BMPER	AVIL	ASB7
EPB41L5	ESAM	DAAM1	FGD4	FER	DOCK8	BMPR1A	AXIN2	ASB8
EPC1	ETS1	DAB2	FGF12	FERMT1	DPP10	BMPR2	AZI2	ASCC3
EPN3	ETS2	DAZAP2	FHDC1	FGD4	DPP6	BNIP2	B2M	ASCL2
ERAP2	ETV6	DCDC2	FITM2	FGFR2	DSEL	BPNT1	B3GALNT1	ASNS
ERBB2IP	EXOC6	DCLK2	FKBP11	FMN1	DST	BPTF	B3GALNT2	ASPA
ERBB3	EXT1	DCN	FKBP5	FNIP1	DTNA	BRD7	B3GALT1	ASPH
ERBB4	EYA4	DCP1A	FNDC1	FNIP2	DTWD2	BRI3	B3GALT6	ASPHD2
ERC1	EYS	DCTN4	FNIP2	FOXO3	DTX3L	BRWD3	B3GAT2	ASPM
ERCC6	F5	DDAH1	FOXN2	FOXP1	DUSP1	BTBD10	B3GNT7	ASPN
ERN1	FA2H	DDHD1	FOXO1	FRAS1	DUSP16	BTBD11	B4GALT6	ASPRV1
ERP27	FAM102A	DDX58	FOXO3	FRK	DUSP23	BTBD6	BACE1	ASRGL1
ERRFI1	FAM107B	DDX60L	FOXP1	FRS2	DYRK1A	BTBD7	BACH1	ASXL3
ETS1	FAM110B	DEF6	FOXP2	FSD1L	ECHDC2	BTBD9	BACH2	ATAD2
ETS2	FAM110C	DENND1B	FRK	FUCA1	EDEM3	BTC	BAD	ATAD2B
ETV5	FAM120B	DENND2C	FRMD3	GAB1	EDN1	BTD	BAG1	ATAD3A
ETV6	FAM126B	DENND4C	FSD2	GABPB2	EEPD1	BTF3	BAG2	ATAD3B
EXD2	FAM160A1	DERL1	FUCA1	GABRB3	EFCAB6	BTN2A1	BAG4	ATCAY
FA2H	FAM3B	DGCR5	GABPB2	GAN	EFHD2	BTRC	BAG5	ATF7
FAAH2	FAM46A	DGKE	GALNT5	GATA6	EGFR	BVES	BAIAP2L1	ATF7IP
FAM102A	FAM46C	DGKH	GAN	GATM	EGLN1	C1GALT1	BAIAP2L2	ATF7IP2
FAM107B	FAM63A	DHRS12	GATM	GBP1	EGR1	C1GALT1C1	BANP	ATG16L2
FAM110C	FAM65A	DHRS7	GBP1	GBP3	EGR4	C1RL	BARD1	ATG4D
FAM114A1	FAM73A	DIO3OS	GDAP1	GCLM	EHF	C2CD3	BASP1	ATG7

FAM160A1	FAM83B	DIRAS2	GGT6	GDAP1	EIF2AK3	C7	BAZ1B	ATG9B
FAM160B2	FAM84A	DIRC2	GHRL	GDF15	EIF4E3	CA10	BBS1	ATMIN
FAM3B	FAM91A1	DLC1	GIGYF2	GDNF	ELF3	CA12	BBS2	ATP11A
FAM46A	FANK1	DMD	GIT2	GGT6	ELK4	CA8	BBS5	ATP11B
FAM46C	FARP2	DMGDH	GKAP1	GHRL	ELL2	CABLES1	BCAN	ATP11C
FAM63A	FBXL17	DNAH1	GLIS3	GK5	ELOF1	CABP7	BCAT1	ATP13A4
FAM65A	FBXO25	DNAH10	GLRB	GKAP1	ELOVL7	CACNA1B	BCDIN3D	ATP2A2
FAM73A	FBXO32	DNAH2	GNPTAB	GLIPR1	EML4	CACNA1C	BCL11A	ATP2A3
FAM83B	FBXO38	DNAH7	GOLT1A	GLIS3	ENPP1	CACNA1D	BCL2L1	ATP5E
FAM84A	FBXO4	DNAJA4	GPATCH4	GLRB	ENPP5	CACNA2D1	BCL2L11	ATP5G3
FAM91A1	FER	DNAJC1	GPR146	GOLT1A	ENTPD7	CACNB4	BCL2L12	ATP5S
FANK1	FER1L5	DNAJC12	GPR155	GPATCH2	EPB41L1	CACNG2	BCL2L13	ATP6V0B
FARP2	FGA	DNAJC15	GPR160	GPATCH4	EPB41L4A	CACNG7	BCL2L14	ATP6V0E1
FBXL17	FGD3	DNAJC21	GPRC5A	GPBP1	EPB41L4B	CADM1	BCL6B	ATP6V1C1
FBXO32	FGFR2	DNAJC22	GPRC5B	GPR160	EPC1	CADPS	BCL9L	ATP6V1D
FBXO4	FITM2	DNAJC27	GPRIN3	GPRC5A	EPC2	CALCOCO2	BCLAF1	ATP6V1G1
FBXO6	FKBP15	DNAJC3	GSTO2	GPRC5B	EPHA6	CALCRL	BCO2	ATP8B2
FBXW7	FMN1	DNAJC4	GUCA1C	GPRIN3	EPN3	CALD1	BCOR	ATP8B3
FER	FNIP1	DNALI1	GYLTL1B	GRAMD3	EPS8L2	CALU	BCORL1	ATPIF1
FER1L5	FNIP2	DNHD1	HBP1	GRTP1	ERAP2	CAMK2D	BCR	ATXN1
FGF10	FOSL2	DOCK5	HDLBP	GSG1	ERBB2IP	CAMK2G	BDH2	ATXN3
FGFRL1	FOXA1	DOCK8	HELZ	GSTO2	ERBB3	CAMK2N1	BDP1	ATXN7
FITM2	FOXO3	DPP6	HERC1	GUCY1A2	ERBB4	CAMKK1	BEX2	ATXN7L1
FKBP11	FOXP1	DPP7	HERPUD2	GYLTL1B	ERC1	CAND1	BEX5	AURKAIP1
FKBP15	FRK	DST	HEYL	HBEGF	ERCC6	CAND2	BHMT2	AUTS2
FKBP5	FRMD3	DTNA	HFE	HBP1	ERN1	CAPN1	BID	AVIL
FNDC1	FRMD6	DTX3L	HHLA2	HCFC2	ERP27	CAPN13	BIVM	AXIN2
FNDC3A	FRS2	DUSP1	HIPK2	HDAC9	ERRFI1	CAPRIN1	BMP2K	AZI2
FNIP1	FSD1L	DUSP16	HIPK3	HECTD1	ETS2	CAPS	BMP8B	B2M
FNIP2	FUCA1	DUSP18	HIVEP3	HELZ	ETV6	CAPS2	BMPER	B3GALNT1
FOSL2	GAB1	DYM	HKDC1	HERC1	EXD2	CAPSL	BMPR1A	B3GALNT2
FOXA1	GAB3	DZIP1L	HM13	HHLA2	EXOC6	CARD6	BMPR1B	B3GALT1
FOXK1	GABPB2	EBF1	HNF4G	HIPK2	EYS	CASC4	BMPR2	B3GALT5
FOXO1	GALNT5	ECHDC2	HOOK1	HIPK3	F5	CASD1	BPTF	B3GALT6
FOXO3	GAN	EDEM3	HS6ST3	HIVEP2	FA2H	CASKIN1	BRD7	B3GAT2
FOXP1	GATA6	EDN1	HSPH1	HIVEP3	FAM102A	CASP9	BRD8	B3GNT7
FOXP2	GATAD2B	EEA1	HYI	HKDC1	FAM105A	CASR	BRI3	B4GALT6
FRK	GATM	EEPD1	ICA1	HLA-DOA	FAM107B	CASZ1	BRI3BP	BAALC
FRMD3	GDF15	EFCAB1	IFNAR1	HNF4G	FAM111A	CBFA2T2	BRWD1	BACE1

FSD2	GDNF	EFCAB6	IFRD1	HNRNPU	FAM122A	CBL	BRWD3	BACH1
FUCA1	GFRA3	EFHD2	IGF1	HOOK1	FAM124A	CC2D1B	BTBD11	BACH2
FYTTD1	GHRL	EGFR	IGSF11	HS6ST3	FAM135A	CC2D2A	BTBD7	BAD
GAB1	GIPR	EGLN1	IKZF2	HSPB8	FAM160A1	CC2D2B	BTBD9	BAG1
GABPB2	GK5	EGR1	IKZF5	HSPH1	FAM162A	CCDC108	BTF3	BAG2
GALNT5	GKAP1	EIF2A	IL17RA	ICA1L	FAM3B	CCDC112	BTN2A1	BAG4
GATA4	GLIPR1	EIF2AK3	IL17RB	IFNAR1	FAM46A	CCDC113	BTNL9	BAG5
GATA6	GLIS3	EIF4E3	IL17RE	IFNAR2	FAM46C	CCDC126	BTRC	BAIAP2L1
GATM	GLRB	ELF2	IL20RA	IFRD1	FAM63A	CCDC134	BUB3	BAIAP2L2
GDF15	GLS	ELF3	IL6R	IFT57	FAM81A	CCDC137	BVES	BANP
GHRL	GNG12	ELK4	ILDR1	IGSF11	FAM83B	CCDC14	C1GALT1	BARD1
GIGYF2	GON4L	ELL2	INADL	IGSF5	FAM83F	CCDC151	C1RL	BASP1
GIPR	GPATCH2	ELOVL7	INO80	IKZF2	FAM91A1	CCDC17	C7	BATF2
GIT2	GPR132	EML4	INO80D	IKZF5	FARP2	CCDC23	CA10	BAZ1B
GK5	GPR157	EMP1	INPP4B	IL17RB	FBXO2	CCDC3	CA12	BBS1
GLIS3	GPR39	EMP2	INSR	IL1RL1	FBXO25	CCDC34	CA8	BBS12
GLRB	GPRC5A	ENAM	INTS10	IL20RA	FBXO32	CCDC40	CABLES1	BBS2
GLS	GPRIN3	ENPP1	INTS6	IL6R	FBXO4	CCDC47	CABLES2	BBS5
GNPTAB	GPX2	ENPP5	IQGAP2	ILDR1	FBXW7	CCDC57	CABP7	BCAN
GOLGA3	GRASP	ENTPD7	IRF1	INADL	FER	CCDC6	CABYR	BCAT1
GOLT1A	GSG1	EPB41L1	IRF2BP2	INO80	FER1L5	CCDC80	CACHD1	BCDIN3D
GPHN	GSTM3	EPB41L4A	IRF5	INO80D	FERMT1	CCDC84	CACNA1B	BCL11A
GPR155	GSTO2	EPB41L4B	ITGB4	INPP4B	FGD4	CCDC85A	CACNA1C	BCL2L1
GPR157	GTF2IRD2	EPB41L5	ITGB8	INTS6	FGF12	CCDC88A	CACNA2D1	BCL2L11
GPR160	GTSF1	EPC1	ITGBL1	IQGAP2	FGFR2	CCDC88B	CACNG6	BCL2L12
GPRC5A	GUCY1A2	EPC2	ITPR3	IRAK2	FHDC1	CCDC88C	CACNG7	BCL2L13
GPRIN3	GUCY1A3	EPN3	IYD	IRF1	FITM2	CCDC90B	CACNG8	BCL2L14
GRK4	HBEGF	ERAP2	JAK1	IRF5	FKBP11	CCDC96	CADPS	BCL2L15
GSTM3	HBP1	ERBB2IP	JMJD1C	ITGB4	FKBP5	CCKBR	CALCOCO2	BCL6B
GSTO2	HCFC2	ERBB3	JMY	ITGB8	FMN1	CCND2	CALCRL	BCL9L
GTSF1	HDAC9	ERBB4	JPH1	ITPR1	FNDC1	CCNDBP1	CALU	BCLAF1
GUCA1C	HECA	ERC1	KANK4	ITPR3	FNIP1	CCNG2	CAMK1D	BCO2
GUCY1A2	HECTD1	ERCC6	KBTBD12	IYD	FNIP2	CCNK	CAMK2D	BCOR
GUCY1A3	HELZ	ERN1	KCNAB1	JAG1	FOXN2	CCNL1	CAMK2G	BCORL1
HBEGF	HERC1	ERP27	KCNIP3	JAK1	FOXO1	CCNL2	CAMK2N1	BCR
HBP1	HGD	ERRFI1	KCNJ11	JMJD1C	FOXO3	CD109	CAMKK1	BDH2
HCFC2	HGSNAT	ESAM	KCNJ15	KCNAB1	FOXP1	CD300LG	CAMSAP1	BDP1
HDLBP	HIPK2	ETS1	KCNJ16	KCNJ15	FOXP2	CD36	CAMTA1	BET1L
HEATR5B	HIPK3	ETS2	KCNJ5	KCNJ16	FRAS1	CD44	CAND1	BEX2

HECA	HIVEP2	ETV5	KCNK3	KCTD16	FRK	CD47	CAND2	BEX5
HECTD1	HIVEP3	ETV6	KCTD16	KIAA1109	FRMD3	CD48	CANX	BHMT2
HELZ	HKDC1	EXD2	KIAA0368	KIAA1217	FRS2	CD5	CAPN1	BICD1
HERC1	HMBOX1	EXOC6	KIAA1109	KIAA1324	FSD1L	CD53	CAPN12	BID
HERPUD2	HNF4A	EXT1	KIAA1143	KIAA1328	FSD2	CD59	CAPN13	BIVM
HEYL	HNF4G	EYA4	KIAA1161	KIAA1468	FUCA1	CD84	CAPNS2	BLOC1S2
HFE	HNMT	EYS	KIAA1217	KIAA1522	GAB1	CD8B	CAPRIN1	BMP2K
HGD	HOOK1	F5	KIAA1324	KIAA1671	GABPB2	CD9	CAPS	BMP8B
HGSNAT	HOOK3	FA2H	KIAA1522	KIAA1683	GABRB3	CD99L2	CAPSL	BMPER
HHIP	HSPA1L	FAAH2	KIAA1683	KIAA2022	GALNT5	CDADC1	CARD8	BMPR1A
HIPK2	HSPA5	FAM102A	KIAA2022	KIAA2026	GAN	CDC34	CARHSP1	BMPR1B
HIPK3	HSPB8	FAM107B	KIAA2026	KIF12	GATA6	CDC42	CARS	BMPR2
HIVEP2	HSPH1	FAM110B	KIF12	KIF1B	GATM	CDC42BPA	CASC4	BNIP2
HIVEP3	IAH1	FAM110C	KIF1A	KIF21A	GBP1	CDC42EP3	CASC5	BPNT1
HKDC1	ICA1L	FAM114A1	KIF1B	KIF27	GBP3	CDC42SE1	CASD1	BPTF
HM13	IFNAR1	FAM120B	KIF21A	KIF9	GCLM	CDC42SE2	CASK	BRD7
HMBOX1	IFNAR2	FAM126B	KLF13	KLF2	GDAP1	CDCA7	CASP2	BRD8
HNF4A	IFRD1	FAM160A1	KLF15	KLF3	GDF15	CDCP1	CASP9	BRI3
HNF4G	IFT172	FAM160B2	KLF2	KLF6	GDNF	CDH11	CASZ1	BRI3BP
HOOK1	IFT57	FAM3B	KLF3	KLF7	GGT6	CDH24	CATSPER3	BRWD1
HRASLS5	IGSF11	FAM46A	KLF6	KLF9	GHRL	CDH6	CBFA2T2	BRWD3
HS6ST3	IKZF2	FAM46C	KLF9	KLHL15	GIGYF2	CDK6	CBL	BTBD10
HSPA5	IKZF5	FAM63A	KLHL15	KLHL8	GIT2	CDK9	CBLL1	BTBD11
HSPH1	IL17RA	FAM65A	KLHL28	KRT80	GK5	CDKL2	CBS	BTBD6
HYI	IL17RB	FAM73A	KLHL8	KRTAP4-12	GKAP1	CDO1	CC2D2A	BTBD7
IAH1	IL20RA	FAM83B	KLK12	KRTCAP3	GLIPR1	CDON	CCDC107	BTBD9
ICA1	IL6R	FAM84A	KRT80	LAMA3	GLIS3	CDS2	CCDC108	BTC
IFNAR1	IL6ST	FAM91A1	KSR1	LANCL2	GLRB	CEACAM19	CCDC112	BTD
IFRD1	ILDR1	FANK1	LAMA3	LARP1B	GNPTAB	CECR2	CCDC132	BTF3
IGF1	INADL	FARP2	LANCL2	LARP4	GOLT1A	CENPN	CCDC134	BTN2A1
IKZF5	INHBA	FBXL17	LARP1	LATS1	GPATCH2	CENPT	CCDC148	BTNL9
IL17RA	INO80	FBXO25	LARP1B	LATS2	GPATCH4	CEP152	CCDC149	BTRC
IL17RB	INO80D	FBXO32	LARP4	LCA5L	GPBP1	CEP68	CCDC150	BUB3
IL17RE	INPP4B	FBXO38	LATS1	LCOR	GPR146	CEP70	CCDC151	BVES
IL6R	INTS6	FBXO4	LCA5L	LIMA1	GPR155	CEP97	CCDC3	C1GALT1
IL6ST	IQGAP2	FBXO6	LCOR	LIPH	GPR160	CFC1	CCDC47	C1GALT1C1
ILDR1	IRAK2	FBXW7	LDHD	LMO7	GPRC5A	CFL1	CCDC50	C1RL
IMPAD1	IRF1	FER	LENG8	LMOD2	GPRC5B	CFL2	CCDC57	C2CD3
INADL	IRF2BP2	FER1L5	LGR4	LMTK2	GPRIN3	CFTR	CCDC58	C7

INHBA	ITGA2	FGA	LIPH	LNPEP	GRAMD3	CGGBP1	CCDC64B	CA10
INO80D	ITGB4	FGD3	LMAN1	LNX2	GRTP1	CGN	CCDC66	CA12
INPP4B	ITGB8	FGF10	LMO3	LONRF2	GSG1	CHCHD7	CCDC77	CA8
INSR	ITPR1	FGFR2	LMO7	LPCAT2	GSTO2	CHD1L	CCDC84	CABLES1
INTS10	ITPRIPL2	FGFRL1	LMOD2	LPGAT1	GUCA1C	CHD6	CCDC88A	CABLES2
INTS6	JAG1	FITM2	LMTK2	LPP	GUCY1A2	CHD7	CCDC88C	CABP7
IRAK2	JAK1	FKBP11	LNX2	LRG1	GYLTL1B	CHD9	CCDC90B	CABYR
IRF1	JMJD1C	FKBP15	LONRF2	LRIG3	HBEGF	CHIC1	CCDC96	CACHD1
IRF2BP2	KCNAB1	FKBP5	LPAR3	LRRC37A2	HBP1	CHL1	CCKBR	CACNA1B
ITCH	KCNJ16	FMN1	LPP	LRRC37A3	HCFC2	CHML	CCL28	CACNA1C
ITGA2	KCTD16	FNDC1	LRG1	LRRC55	HDAC9	CHMP4B	CCNB2	CACNA1D
ITGB4	KDM1B	FNDC3A	LRIG1	LRRC7	HDLBP	CHMP4C	CCND2	CACNA2D1
ITGB8	KDM5A	FNIP1	LRIG3	LRRC8E	HECTD1	CHORDC1	CCNDBP1	CACNB4
ITGBL1	KIAA1109	FNIP2	LRRC37A2	LRRFIP2	HELZ	CHPT1	CCNG2	CACNG2
ITPRIPL2	KIAA1217	FOSL2	LRRC7	LRRK2	HERC1	CHRAC1	CCNI	CACNG6
JAK1	KIAA1324	FOXA1	LRRC8E	LSG1	HERPUD2	CHRDL2	CCNK	CACNG7
JMJD1C	KIAA1328	FOXK1	LRRFIP2	LTBR	HEYL	CHRM3	CCNL1	CACNG8
JMY	KIAA1462	FOXO1	LRRK2	LYNX1	HFE	CHST12	CCNL2	CADM1
KALRN	KIAA1468	FOXO3	LTBR	LZTFL1	HHLA2	CHST14	CCNY	CADPS
KANK4	KIAA1671	FOXP1	LYNX1	MACC1	HIPK2	CHST2	CCNYL1	CALCOCO2
KCNAB1	KIAA1683	FOXP2	MACC1	MACF1	HIPK3	CHST9	CCT4	CALCRL
KCNIP3	KIAA2022	FRK	MAGI1	MACROD2	HIVEP2	CHURC1	CD109	CALD1
KCNJ16	KIAA2026	FRMD3	MAGI3	MAGI1	HIVEP3	CIAO1	CD274	CALU
KCNJ3	KIDINS220	FRMD6	MAL2	MAGI3	HKDC1	CIAPIN1	CD300LG	CAMK1D
KCNJ5	KIF12	FRS2	MALAT1	MAL2	HLA-DOA	CISH	CD36	CAMK2D
KCNK3	KIF1B	FSD1L	MANEAL	MANEAL	HM13	CKAP2	CD44	CAMK2G
KCNK6	KIF27	FSD2	MAP6D1	MAP2	HNF4G	CLASP2	CD47	CAMK2N1
KCNMA1	KIF6	FUCA1	MARVELD2	MAP3K2	HNRNPU	CLCN4	CD48	CAMKK1
KCTD16	KLF2	FYTTD1	MARVELD3	MAP3K8	HOOK1	CLDN12	CD5	CAMSAP1
KIAA1109	KLF3	GAB1	MAST4	MAPK4	HS6ST3	CLDN23	CD53	CAMTA1
KIAA1143	KLF6	GAB3	MBNL1	MARVELD2	HSPB8	CLDND1	CD59	CAND1
KIAA1217	KLF7	GABPB2	MBNL3	MARVELD3	HSPH1	CLEC14A	CD8B	CAND2
KIAA1324	KLF9	GALNT5	MBP	MAST4	HYI	CLEC2D	CD99L2	CANX
KIAA1328	KLHDC10	GAN	MCL1	MBNL1	ICA1	CLEC3A	CDADC1	CAPN1
KIAA1671	KLHL15	GATA4	MCOLN3	MBOAT1	ICA1L	CLIC6	CDC14B	CAPN12
KIAA1683	KLHL24	GATA6	MCTP2	MBP	IFNAR1	CLINT1	CDC26	CAPN13
KIAA2022	KLHL5	GATAD2B	MDM4	MCL1	IFNAR2	CLIP1	CDC37L1	CAPNS2
KIAA2026	KLHL8	GATM	ME3	MCOLN3	IFRD1	CLIP3	CDC42	CAPRIN1
KIF12	KREMEN1	GDF15	MED13	MCTP2	IFT57	CLIP4	CDC42BPA	CAPS

KIF1B	KRTAP3-1	GDNF	MED13L	MDM4	IGF1	CLK3	CDC42EP3	CAPS2
KIF27	KRTAP4-12	GFRA3	MEF2D	ME3	IGSF11	CLMN	CDC42SE1	CAPSL
KLB	KSR2	GHRL	MEG3	MED13	IGSF5	CLN8	CDC42SE2	CARD6
KLF13	L3MBTL4	GIGYF2	MFSD4	MED13L	IKZF2	CLPB	CDCA3	CARD8
KLF2	LAMA3	GIPR	MFSD6	MEF2D	IKZF5	CLPX	CDCA7	CARHSP1
KLF3	LAMP2	GIT2	MFSD9	MEG3	IL17RA	CLSTN2	CDCP1	CARS
KLF6	LANCL2	GK5	MGAT4A	MFSD4	IL17RB	CLTC	CDH11	CASC4
KLF7	LARP1B	GKAP1	MGP	MFSD6	IL17RE	CLUAP1	CDH24	CASC5
KLF9	LATS1	GLIPR1	MINA	MGAT4A	IL1RL1	CMIP	CDH6	CASD1
KLHL15	LATS2	GLIS3	MITF	MGLL	IL20RA	CMTM3	CDK6	CASK
KLHL28	LCA5	GLRB	MKNK1	MICAL3	IL6R	CMTM4	CDK9	CASKIN1
KLHL8	LCA5L	GLS	MKNK2	MITF	ILDR1	CMTM6	CDKL1	CASP2
KLK12	LCOR	GNG12	MLLT6	MLLT4	INADL	CMTM8	CDKN2AIPNL	CASP9
KSR1	LEPROT	GNPTAB	MLXIP	MMAA	INO80	CNDP2	CDKN2B	CASR
KSR2	LIMA1	GOLGA3	MLYCD	MPP5	INO80D	CNIH3	CDON	CASZ1
L3MBTL4	LIMCH1	GOLT1A	MMAA	MPP7	INPP4B	CNKSR3	CDS1	CATSPER3
LAMA3	LIPH	GON4L	MPP7	MPZL3	INSR	CNOT6L	CDS2	CBFA2T2
LAMB4	LMAN1	GPATCH2	MPZL3	MR1	INTS10	CNOT7	CEACAM19	CBL
LAMP2	LMBRD1	GPHN	MTBP	MTDH	INTS6	CNRIP1	CECR6	CBLL1
LARP1	LMLN	GPR132	MTDH	MTF1	IQGAP2	CNTN1	CENPK	CBS
LARP1B	LMNA	GPR155	MTHFR	MTHFD2L	IRAK2	CNTN3	CENPN	CC2D1B
LATS1	LMO2	GPR157	MTMR12	MTMR12	IRF1	CNTN4	CENPO	CC2D2A
LCA5L	LMO7	GPR160	MTPAP	MTMR3	IRF2BP2	CNTN5	CEP152	CC2D2B
LCOR	LMTK2	GPR39	MTR	MTMR7	IRF5	CNTNAP3	CEP63	CCDC107
LCP2	LNPEP	GPRC5A	MTUS1	MTPAP	ITGB4	COG2	CEP68	CCDC108
LENG8	LNX1	GPRIN3	MTUS2	MTUS1	ITGB8	COG3	CEP70	CCDC112
LEPROT	LONRF2	GPX2	MUC20	MUC20	ITGBL1	COG6	CFC1	CCDC113
LGR4	LOXL4	GRASP	MXD1	MUC4	ITPR1	COL12A1	CFL1	CCDC126
LIFR	LPCAT2	GRK4	MYADM	MUM1L1	ITPR3	COL1A2	CFLAR	CCDC132
LIMA1	LPGAT1	GSG1	MYH11	MXD1	IYD	COL27A1	CFTR	CCDC134
LIPH	LPP	GSTM3	MYH14	MYADM	JAG1	COL3A1	CGGBP1	CCDC137
LMAN1	LPXN	GSTO2	MYLK2	MYH14	JAK1	COL4A3BP	CGN	CCDC14
LMBRD1	LRIG3	GTF2IRD2	MYO5A	MYO5B	JMJD1C	COMMD2	CHCHD1	CCDC148
LMLN	LRP10	GTSF1	MYO5B	MYO7B	JMY	COMMD7	CHCHD3	CCDC149
LMNA	LRRC37A2	GUCA1C	MYRIP	MYRIP	JPH1	COPS7B	CHCHD7	CCDC150
LMO3	LRRC37A3	GUCY1A2	N4BP2L1	MYSM1	KANK4	COPS8	CHD1L	CCDC151
LMO7	LRRC6	GUCY1A3	NAALADL1	N4BP2L1	KBTBD12	COPZ2	CHD6	CCDC17
LMTK2	LRRC7	HBEGF	NALCN	NALCN	KCNAB1	COQ10A	CHD7	CCDC23
LNPEP	LRRC8E	HBP1	NAPG	NAPG	KCNIP3	COQ2	CHD9	CCDC3

LNX1	LRRFIP1	HCFC2	NCL	NAT8L	KCNJ11	COQ4	CHIC1	CCDC34
LNX2	LRRFIP2	HDAC9	NCOA7	NBEA	KCNJ15	CORO1C	CHID1	CCDC40
LONRF2	LRRK2	HDLBP	NEBL	NCOA7	KCNJ16	CORO2A	CHL1	CCDC47
LPAR3	LTBP3	HEATR5B	NEDD4L	NEDD4L	KCNJ5	COTL1	CHM	CCDC50
LPGAT1	LYPD6B	HECA	NEXN	NEDD9	KCNK3	COX19	CHML	CCDC57
LPP	LZTFL1	HECTD1	NFATC2	NFAT5	KCTD16	COX4I1	CHMP4C	CCDC58
LRGUK	MACC1	HELZ	NFIA	NFATC2	KIAA0368	CP	CHORDC1	CCDC6
LRIG3	MACF1	HERC1	NFIB	NFIA	KIAA1109	CPD	CHRDL2	CCDC64B
LRP10	MAGI1	HERPUD2	NFIC	NFIB	KIAA1143	CPEB3	CHRM3	CCDC66
LRRC37A2	MAGI3	HEYL	NFIX	NFIC	KIAA1161	CPEB4	CHST12	CCDC77
LRRC7	MAL2	HFE	NFKBIA	NFIX	KIAA1217	CPLX1	CHST2	CCDC80
LRRC8E	MAML2	HGD	NFKBIZ	NFKBIA	KIAA1324	CPLX2	CHST9	CCDC84
LRRFIP2	MAP3K1	HGSNAT	NIPAL2	NFKBIZ	KIAA1328	CPLX3	CHURC1	CCDC85A
LRRK2	MAP3K2	HHIP	NKAPL	NIPBL	KIAA1468	CPNE4	CIAO1	CCDC88A
LTBP2	MAP3K8	HIPK2	NLK	NKAPL	KIAA1522	CPNE8	CIAPIN1	CCDC88B
LTBP3	MARVELD2	HIPK3	NLRC5	NLRC5	KIAA1671	CPSF3	CIB4	CCDC88C
LTBR	MAST4	HIVEP2	NMNAT3	NMNAT3	KIAA1683	CPXM2	CINP	CCDC90B
LYNX1	MBD6	HIVEP3	NOB1	NOL10	KIAA2022	CRAMP1L	CIRBP	CCDC96
LYPD6B	MBNL1	HKDC1	NOL10	NOSTRIN	KIAA2026	CRB1	CIRH1A	CCKBR
LZTFL1	MBOAT1	HM13	NOP58	NPC1	KIF12	CRBN	CITED4	CCL28
MACC1	MBP	HMBOX1	NOSTRIN	NPNT	KIF1A	CREB3L4	CKAP2	CCNB2
MAFB	MCOLN3	HNF4A	NPNT	NR1H4	KIF1B	CREB5	CKAP4	CCND2
MAGI3	MCTP2	HNF4G	NR1H4	NR3C1	KIF21A	CREBBP	CKLF	CCNDBP1
MAGIX	MDM4	HNMT	NR3C1	NRG4	KIF27	CREBZF	CLASP2	CCNG2
MAL2	ME3	HOOK1	NRG2	NRSN1	KIF9	CREM	CLCN4	CCNI
MALAT1	MED10	HOOK3	NRG4	NRXN3	KLF13	CRIM1	CLDN1	CCNK
MAP3K8	MED13	HRASLS5	NRIP3	NT5DC3	KLF15	CRIP3	CLDN12	CCNL1
MAPK9	MED13L	HS6ST3	NRSN1	NTN1	KLF2	CRIPAK	CLDN23	CCNL2
MARVELD2	MED23	HSPA1L	NSMAF	NTN4	KLF3	CRTAP	CLDN6	CCNY
MAST4	MEF2A	HSPA5	NT5C1A	NTRK2	KLF6	CRTC2	CLDND1	CCNYL1
MBD6	MEF2D	HSPB8	NT5DC3	NUDT6	KLF7	CSNK1A1	CLEC14A	CCT4
MBNL1	MEG3	HSPH1	NTN4	NUP153	KLF9	CSNK1G3	CLEC7A	CD109
MCEE	MFI2	HYI	NUCB2	NUP214	KLHL15	CSNK2A2	CLIP1	CD274
MCL1	MFSD4	IAH1	NUP214	OAS3	KLHL28	CSPP1	CLIP3	CD300LG
MCOLN3	MFSD6	ICA1	OAF	OCLN	KLHL8	CSTF3	CLIP4	CD36
MCTP2	MGLL	ICA1L	OCLN	OFD1	KLK12	CTAGE5	CLMN	CD44
MDM2	MICAL2	IFNAR1	OFD1	OGFRL1	KRT80	CTHRC1	CLN8	CD47
MDM4	MICAL3	IFNAR2	OGT	ONECUT2	KRTAP4-12	CTNNA3	CLNS1A	CD48
ME3	MICALL2	IFRD1	OLA1	OSBP2	KRTCAP3	CTNNB1	CLOCK	CD5

MED13	MITF	IFT172	ONECUT2	OSMR	KSR1	CTPS2	CLPX	CD53
MED13L	MLLT4	IFT57	OSBP2	OTUD1	LAMA3	CTSC	CLSTN2	CD59
MED23	MLLT6	IGF1	OTUD1	OTUD4	LANCL2	CTSS	CLTC	CD84
MEF2D	MMAA	IGSF11	OTUD4	OTUD7A	LARP1	CTTNBP2	CMIP	CD8B
MEG3	MON2	IKZF2	PACSIN2	PAK3	LARP1B	CTTNBP2NL	CMKLR1	CD9
METTL7A	MPP5	IKZF5	PAK3	PALMD	LARP4	CUL4A	CMTM1	CD99L2
MFSD4	MPP7	IL17RA	PAPD4	PAPD4	LATS1	CUL5	CMTM4	CDADC1
MFSD6	MPZL2	IL17RB	PAPD5	PAPD5	LATS2	CWC15	CMTM7	CDC14B
MFSD9	MPZL3	IL17RE	PARD3B	PAQR5	LCA5L	CXADR	CMTM8	CDC26
MGAT4A	MSRA	IL20RA	PARD6B	PARD3B	LCOR	CXCL17	CNBP	CDC34
MGST3	MTDH	IL6R	PARM1	PARD6B	LDHD	CXCL2	CNDP2	CDC37L1
MICAL2	MTF1	IL6ST	PARP14	PARP14	LENG8	CXXC4	CNIH3	CDC42
MICAL3	MTHFD2L	ILDR1	PARP9	PARP9	LGR4	CXXC5	CNOT2	CDC42BPA
MINA	MTMR3	IMPAD1	PCGF5	PATL1	LIMA1	CYB561D1	CNOT6	CDC42EP3
MITF	MTR	INADL	PCM1	PCGF5	LIPH	CYB5B	CNOT7	CDC42SE1
MKNK1	MTUS1	INHBA	PCMTD1	PCM1	LMAN1	CYB5R4	CNPY3	CDC42SE2
MKNK2	MTUS2	INO80	PDE11A	PCNXL2	LMO3	CYBA	CNPY4	CDCA3
MLLT6	MUC20	INO80D	PDE7B	PDE12	LMO7	CYBB	CNRIP1	CDCA7
MLXIP	MUC4	INPP4B	PDE8A	PDE1C	LMOD2	CYBRD1	CNTLN	CDCP1
MLYCD	MUM1L1	INSR	PDK4	PDE3A	LMTK2	CYCS	CNTN1	CDH11
MMAA	MXD1	INTS10	PDLIM5	PDE7B	LNPEP	CYHR1	CNTN2	CDH24
MON2	MXRA7	INTS6	PDZD8	PDE8A	LNX2	CYP19A1	CNTN4	CDH6
MPP7	MYADM	IQGAP2	PELI2	PDE8B	LONRF2	CYP26B1	CNTN5	CDK6
MPZL2	MYH14	IRAK2	PEX5L	PDGFC	LPAR3	CYP2S1	CNTNAP3	CDK9
MPZL3	MYH7B	IRF1	PGPEP1	PDGFD	LPCAT2	CYP2U1	CNTROB	CDKL1
MS4A1	MYLIP	IRF2BP2	PHACTR1	PDK4	LPGAT1	CYP3A5	COBLL1	CDKL2
MSRA	MYO15B	ITCH	PHACTR4	PDLIM5	LPP	CYP4V2	COG1	CDKN2AIPNL
MTDH	MYO1C	ITGA2	PHC3	PDZD8	LRG1	CYP4X1	COG5	CDKN2B
MTHFR	MYO5B	ITGB4	PHF11	PGBD4	LRIG1	CYYR1	COG6	CDO1
MTMR3	MYSM1	ITGB8	PHKA1	PHACTR4	LRIG3	D2HGDH	COL12A1	CDON
MTR	N4BP2L1	ITGBL1	PHYHD1	PHC3	LRRC37A2	DAAM1	COL1A2	CDS1
MTUS1	NALCN	ITPR1	PHYHIPL	PHF11	LRRC37A3	DAB2	COL20A1	CDS2
MTUS2	NAPG	ITPRIPL2	PIGM	PHF20L1	LRRC55	DAB2IP	COL23A1	CEACAM19
MUC20	NAPSA	JAG1	PIK3AP1	PHLDB2	LRRC7	DACH1	COL27A1	CECR2
MUM1L1	NCOA7	JAK1	PIP5KL1	PIK3AP1	LRRC8E	DACH2	COL3A1	CECR6
MXD1	NEDD4L	JMJD1C	PITRM1	PIP5KL1	LRRFIP2	DACT3	COL4A3BP	CENPK
MXRA7	NEDD9	JMY	PIWIL4	PITRM1	LRRK2	DAPL1	COL8A1	CENPN
MYADM	NEXN	KALRN	PLA2G16	PIWIL4	LSG1	DAZAP2	COMMD1	CENPO
MYH11	NFAT5	KANK4	PLD1	PLCD4	LTBR	DBR1	COMMD6	CENPT

MYH14	NFATC2	KCNAB1	PLEKHA7	PLCG2	LYNX1	DCAKD	COPB1	CEP152
MYLIP	NFIA	KCNIP3	PLEKHH1	PLD1	LZTFL1	DCBLD1	COPB2	CEP63
MYLK2	NFIB	KCNJ16	PLEKHH2	PLEKHA2	MACC1	DCBLD2	COPS8	CEP68
MYO1C	NFIC	KCNJ3	PLK3	PLEKHA7	MACF1	DCLK1	COPZ1	CEP70
MYO5B	NFKBIA	KCNJ5	PLSCR2	PLEKHH1	MACROD2	DCN	COPZ2	CEP97
MYRIP	NFKBIZ	KCNK3	PNPLA7	PLEKHH2	MAGI1	DCP1A	COQ10A	CFC1
MYT1L	NIPAL2	KCNK6	PNPLA8	PLSCR1	MAGI3	DCP1B	COQ2	CFL1
N4BP2L1	NIPBL	KCNMA1	PODN	PMEPA1	MAL2	DCST2	COQ9	CFL2
NALCN	NKTR	KCTD16	POLD3	PNPLA8	MALAT1	DCTN2	CORO2A	CFLAR
NAPG	NLRC5	KDM1B	POLR1D	POLD3	MANEAL	DCTN5	COX15	CFTR
NAPSA	NOSTRIN	KDM5A	POU6F1	POLK	MAP2	DCUN1D1	COX18	CGGBP1
NCOA7	NPC1	KIAA1109	PPARGC1B	POU2F1	MAP3K2	DDR2	COX19	CGN
NEBL	NPC1L1	KIAA1143	PPP1R15B	PPIG	MAP3K8	DDX11	COX4I1	CHCHD1
NEDD4L	NPNT	KIAA1217	PPP1R3C	PPM1H	MAP6D1	DDX19B	COX5A	CHCHD3
NEK6	NPY6R	KIAA1324	PPP1R3E	PPP1R15B	MAPK4	DDX26B	CPD	CHCHD7
NEXN	NR1D2	KIAA1328	PPP1R9A	PPP1R3C	MARVELD2	DDX46	CPEB2	CHD1L
NFAT5	NR1H4	KIAA1462	PPTC7	PPP1R9A	MARVELD3	DDX49	CPEB3	CHD6
NFATC2	NR3C1	KIAA1468	PRKAA2	PPP4R4	MAST4	DDX51	CPEB4	CHD7
NFIA	NRG4	KIAA1671	PRKAB2	PPTC7	MBNL1	DDX54	CPLX1	CHD9
NFIB	NRSN1	KIAA1683	PRLR	PRDM16	MBNL3	DDX55	CPLX2	CHIC1
NFIC	NTN4	KIAA2022	PRODH2	PRKAA1	MBOAT1	DEAF1	CPLX3	CHID1
NFKBIA	NTRK2	KIAA2026	PROM2	PRKAA2	MBP	DEF8	CPNE4	CHL1
NFKBIZ	NUMB	KIDINS220	PROX1	PRKCG	MCL1	DEFB119	CPNE5	CHM
NIPAL2	NUP214	KIF12	PRPS2	PROM2	MCOLN3	DENND1A	CPNE8	CHML
NIPBL	OAF	KIF1B	PRRG4	PROX1	MCTP2	DENND2C	CPSF2	CHMP4B
NLK	OAS3	KIF27	PSD4	PRRG4	MDM4	DENND4C	CPSF3	CHMP4C
NLRC5	OCLN	KIF6	PTER	PSD4	ME3	DFFA	CPSF6	CHORDC1
NMD3	OFD1	KLB	PTP4A1	PTER	MED13	DGKE	CPXM2	CHPT1
NMNAT3	OGFRL1	KLF13	PTPN22	PTP4A1	MED13L	DGKZ	CR1	CHRAC1
NOSTRIN	ONECUT2	KLF2	PTPN3	PTPN2	MEF2D	DGUOK	CRB3	CHRDL2
NOXA1	OSMR	KLF3	PTPRK	PTPN3	MEG3	DHDDS	CREB3L2	CHRM3
NPC1L1	OTUD1	KLF6	PVRL1	PTPRJ	MFSD4	DHRS7	CREB3L3	CHST12
NPM2	OTUD4	KLF7	PVRL4	PTPRK	MFSD6	DHTKD1	CREB3L4	CHST14
NPNT	OVOL1	KLF9	PXMP4	PVR	MFSD9	DHX36	CREB5	CHST2
NR1H4	P2RX7	KLHDC10	PYROXD1	PVRL4	MGAT4A	DHX37	CREM	CHST9
NR3C1	PACS1	KLHL15	RAB11FIP1	PYROXD1	MGLL	DIAPH3	CRIM1	CHURC1
NRG2	PAG1	KLHL24	RAB11FIP4	RAB11FIP1	MGP	DIDO1	CRIP3	CIAO1
NRG4	PAK3	KLHL28	RAB27B	RAB11FIP4	MICAL3	DIP2B	CRTAP	CIAPIN1
NRSN1	PAPD4	KLHL5	RAB3D	RAB21	MINA	DIRAS1	CRTC3	CIB4

NSMAF	PAPD5	KLHL8	RAB3IP	RAB3IP	MITF	DIRAS2	CSDE1	CINP
NT5C1A	PARD3B	KLK12	RAB7A	RAB7A	MKNK1	DIRC2	CSMD2	CIRBP
NT5DC3	PARD6B	KREMEN1	RABGAP1L	RABGAP1L	MKNK2	DIS3L	CSNK1A1	CIRH1A
NTN4	PARP14	KRTAP3-1	RALGAPA1	RALGAPA1	MLLT4	DIS3L2	CSNK1G3	CISH
NTRK2	PARP6	KRTAP4-12	RALGAPA2	RALGAPA2	MLLT6	DISC1	CST3	CITED4
NUCB2	PARP9	KSR1	RALGPS1	RALGPS1	MLXIP	DISP1	CSTF2	CKAP2
NUMB	PARVA	KSR2	RAP1A	RAP1A	MLYCD	DISP2	CSTF3	CKAP4
NUP214	PATL1	L3MBTL4	RAPGEF6	RAPGEF6	MMAA	DKK3	CTAGE5	CKLF
OAF	PCDH17	LAMA3	RASD1	RAPH1	MPP5	DLC1	CTHRC1	CLASP2
OAS2	PCDH9	LAMB4	RASGRP3	RASA2	MPP7	DLG1	CTNNA3	CLCN4
OBFC1	PCGF5	LAMP2	RASL11A	RASAL2	MPZL3	DLG2	CTNNB1	CLDN1
OCLN	PCM1	LANCL2	RASSF9	RASD1	MR1	DLGAP4	CTSC	CLDN12
OFD1	PCNXL2	LARP1	RBM14	RASGRP3	MTBP	DLK1	CTSS	CLDN23
OGFRL1	PDCD6IP	LARP1B	RBM25	RASSF5	MTDH	DMD	CTTNBP2NL	CLDN6
OGT	PDE1C	LATS1	RBM47	RASSF8	MTF1	DNAH1	CUL4A	CLDND1
OSBPL7	PDE3A	LATS2	RBP1	RASSF9	MTHFD2L	DNAH5	CUL5	CLEC14A
OSMR	PDE5A	LCA5	RBPJ	RBBP9	MTHFR	DNAH7	CUX1	CLEC2D
OTUD1	PDE7B	LCA5L	RC3H1	RBM39	MTMR12	DNAJA4	CWC15	CLEC3A
OTUD4	PDE8A	LCOR	RCAN3	RBM47	MTMR3	DNAJC1	CXADR	CLEC7A
OVOL1	PDE8B	LCP2	RCL1	RBP1	MTMR7	DNAJC10	CXCL16	CLIC6
P2RX7	PDGFC	LENG8	RCOR3	RC3H1	MTPAP	DNAJC18	CXCL17	CLINT1
PACS1	PDGFD	LEPROT	REEP6	RCAN3	MTR	DNAJC3	CXCL2	CLIP1
PACSIN2	PDLIM3	LGR4	REG3A	RDH13	MTUS1	DNAJC4	CXXC4	CLIP3
PAG1	PDLIM5	LIFR	REG3G	REG3A	MTUS2	DNAJC5	CYB5B	CLIP4
PAK3	PDZD8	LIMA1	REL	REG3G	MUC20	DNAL1	CYB5D2	CLK3
PAPD4	PELI2	LIMCH1	RELL1	REL	MUC4	DNALI1	CYBB	CLMN
PAPD5	PGBD4	LIPH	REPS2	RELL1	MUM1L1	DNM1L	CYBRD1	CLN8
PARD3B	PHACTR4	LMAN1	REV3L	REPS2	MXD1	DNMT3A	CYCS	CLNS1A
PARD6B	PHC3	LMBRD1	RFFL	RERG	MYADM	DOCK1	CYGB	CLOCK
PARM1	PHF11	LMLN	RGL3	REV3L	MYH11	DOCK4	CYHR1	CLPB
PARP14	PHF20L1	LMNA	RHOB	RFX2	MYH14	DOCK8	CYP2R1	CLPX
PARP9	PHF21A	LMO2	RIMS1	RFX7	MYLK2	DPF3	CYP2U1	CLSTN2
PARVA	PHLDB2	LMO3	RIOK3	RGL3	MYO5A	DPH5	CYP3A5	CLTC
PCDH17	PIK3AP1	LMO7	RIPK1	RHPN2	MYO5B	DPP10	CYP4V2	CLUAP1
PCGF5	PITRM1	LMTK2	RIPK3	RIC8B	MYO7B	DPP3	CYP4X1	CMIP
PCM1	PKHD1	LNPEP	RIPK4	RICTOR	MYRIP	DPP6	CYYR1	CMKLR1
PCMTD1	PLCD4	LNX1	RNF144B	RIOK3	MYSM1	DPP8	D2HGDH	CMTM1
PCP4L1	PLCG2	LNX2	RNF19A	RIPK1	N4BP2L1	DPY19L2	DAAM1	CMTM3
PDE11A	PLCL1	LONRF2	RNF212	RIPK3	NAALADL1	DPY19L4	DAB2	CMTM4

PDE3A	PLD1	LOXL4	RNF217	RIPK4	NALCN	DPYSL3	DAB2IP	CMTM6
PDE4D	PLEKHA2	LPAR3	RNF38	RNF144B	NAPG	DSC3	DACH1	CMTM7
PDE7B	PLEKHA7	LPCAT2	RNPC3	RNF180	NAT8L	DST	DACH2	CMTM8
PDE8A	PLEKHH2	LPGAT1	RORA	RNF19A	NBEA	DSTN	DACT3	CNBP
PDGFC	PLK3	LPP	RPH3AL	RNF207	NCL	DTD1	DAD1	CNDP2
PDLIM3	PLSCR1	LPXN	RPRD2	RNF212	NCOA7	DTNA	DAP3	CNIH3
PDLIM5	PMEPA1	LRGUK	RPS15A	RNF213	NEBL	DTWD1	DBR1	CNKSR3
PDZD8	PNPLA8	LRIG3	RPS25	RNF32	NEDD4L	DTX1	DBT	CNOT2
PELI2	POLK	LRP10	RPS6KB1	RNF38	NEDD9	DTX3	DCAKD	CNOT6
PEX5L	PPARD	LRRC37A2	RRAD	RNPC3	NEXN	DTX3L	DCBLD1	CNOT6L
PGPEP1	PPP1R15B	LRRC37A3	RRBP1	ROPN1L	NFAT5	DUOXA2	DCBLD2	CNOT7
PHC3	PPP1R1B	LRRC6	RSBN1	ROR1	NFATC2	DUSP1	DCDC2	CNPY3
PHF11	PPP1R3C	LRRC7	SAMD12	RORA	NFIA	DUSP18	DCLK1	CNPY4
PHF21A	PPP1R9A	LRRC8E	SAMHD1	RPS6KB1	NFIB	DUSP27	DCLRE1C	CNRIP1
PHKA1	PPP4R1L	LRRFIP1	SATB1	RRAD	NFIC	DUSP4	DCN	CNTLN
PHLDA1	PPP4R4	LRRFIP2	SCAMP2	RRAGC	NFIX	DYNC1LI1	DCP1A	CNTN1
PHYHD1	PPTC7	LRRK2	SCAMP5	RSBN1	NFKBIA	DYNC1LI2	DCP1B	CNTN2
PHYHIPL	PRDM16	LTBP2	SCFD1	RUNDC3B	NFKBIZ	DZIP1L	DCP2	CNTN3
PIK3AP1	PREPL	LTBP3	SCN7A	SAMD12	NIPAL2	EAF1	DCTN4	CNTN4
PIP5KL1	PRKAA1	LTBR	SCN9A	SART3	NIPBL	EBF1	DCTN5	CNTN5
PITPNM2	PRKAA2	LYNX1	SDK1	SATB1	NKAPL	EBF3	DCUN1D1	CNTNAP3
PITRM1	PRKCE	LYPD6B	SEC11C	SCAMP2	NLK	EBP	DDA1	CNTROB
PIWIL2	PRKCH	LZTFL1	SEC16B	SCD5	NLRC5	EBPL	DDI1	COBLL1
PKHD1	PROM2	MACC1	SEC24A	SCN8A	NMNAT3	ECE2	DDR2	COG1
PLA2G4F	PROX1	MACF1	SEC61B	SCN9A	NOB1	EDC3	DDX11	COG2
PLCXD3	PRRG4	MAFB	SEC62	SEC11C	NOL10	EDEM3	DDX17	COG3
PLD1	PSD4	MAGI1	SEC63	SEC24A	NOP58	EDIL3	DDX19B	COG5
PLEKHA7	PSEN1	MAGI3	SEMA4A	SEMA4A	NOSTRIN	EDN1	DDX26B	COG6
PLEKHG3	PTER	MAGIX	SEMA4D	SEMA4D	NPC1	EEA1	DDX31	COL12A1
PLEKHH1	PTP4A1	MAL2	SERINC2	SEMA6A	NPNT	EEF1A1	DDX46	COL1A2
PLEKHH2	PTPN2	MALAT1	SERPINB1	SERINC2	NR1H4	EEF2	DDX49	COL20A1
PLK3	PTPN21	MAML2	SETBP1	SERTAD1	NR3C1	EFCAB6	DEAF1	COL23A1
PLXNA2	PTPN3	MAP3K1	SFMBT1	SETBP1	NRG2	EFCAB7	DEF8	COL27A1
PM20D2	PTPRK	MAP3K2	SFPQ	SETX	NRG4	EFEMP1	DENND1A	COL3A1
PNPLA7	PVR	MAP3K8	SFT2D2	SFMBT1	NRIP3	EFHB	DENND2C	COL4A3BP
PNPLA8	PVRL4	MAPK9	SGK2	SFPQ	NRSN1	EFHC1	DENND4C	COL8A1
POLK	PXK	MARVELD2	SGMS2	SFT2D2	NRXN3	EFHD2	DEPDC7	COMMD1
PPARD	PYGO1	MAST4	SGSM1	SGMS2	NSMAF	EFTUD2	DERL1	COMMD2
PPM1K	PYROXD1	MBD6	SH3RF1	SGSM1	NT5C1A	EGLN2	DERL2	COMMD6

PPP1R15B	RAB11FIP1	MBNL1	SHANK2	SH3BGRL2	NT5DC3	EGLN3	DFFA	COMMD7
PPP1R3C	RAB21	MBOAT1	SIN3A	SH3RF1	NTN1	EGR4	DGKE	COPB1
PPP1R3E	RAB27B	MBP	SIPA1L1	SHANK2	NTN4	EHD3	DGUOK	COPB2
PPP1R9A	RAB3IP	MCEE	SIPA1L3	SHISA2	NTRK2	EHMT1	DHRS13	COPS7B
PPTC7	RAB7A	MCL1	SIX4	SHROOM3	NUCB2	EHMT2	DHTKD1	COPS8
PRDM1	RAI1	MCOLN3	SLAIN1	SIPA1L1	NUDT6	EID2	DHX36	COPZ1
PRDM16	RALGAPA1	MCTP2	SLC11A1	SIPA1L3	NUP153	EID2B	DHX40	COPZ2
PRELP	RALGAPA2	MDM2	SLC12A2	SLAIN1	NUP214	EIF1B	DHX57	COQ10A
PRKAB2	RALGAPB	MDM4	SLC13A3	SLC12A2	OAF	EIF2A	DIAPH3	COQ2
PRKCE	RAP1A	ME3	SLC16A10	SLC15A2	OAS3	EIF2AK2	DIDO1	COQ4
PRKCH	RAPGEF2	MED10	SLC16A7	SLC15A4	OCLN	EIF3B	DIP2A	COQ9
PRLR	RAPGEF6	MED13	SLC1A2	SLC16A10	OFD1	EIF3C	DIP2B	CORO1C
PROM2	RAPH1	MED13L	SLC1A4	SLC16A7	OGFRL1	EIF3D	DIRAS1	CORO2A
PROX1	RASD1	MED23	SLC20A1	SLC16A9	OGT	EIF4E	DIRAS2	COTL1
PRRC1	RASEF	MEF2A	SLC22A23	SLC19A3	OLA1	EIF4E2	DIS3	COX15
PRRG4	RASGRP3	MEF2D	SLC22A5	SLC22A23	ONECUT2	EIF4ENIF1	DIS3L2	COX18
PSD4	RASSF5	MEG3	SLC25A25	SLC22A5	OSBP2	EIF4G2	DISC1	COX19
PTEN	RASSF6	METTL7A	SLC25A27	SLC23A1	OSMR	EIF5A2	DISP2	COX4I1
PTER	RASSF8	MFI2	SLC25A36	SLC25A25	OTUD1	ELAVL1	DKK2	COX5A
PTP4A1	RASSF9	MFSD4	SLC25A45	SLC28A3	OTUD4	ELAVL2	DKK3	CP
PTPN22	RBM39	MFSD6	SLC28A3	SLC30A4	OTUD7A	ELAVL4	DLG1	CPD
PTPN3	RBM47	MFSD9	SLC30A4	SLC37A1	PACSIN2	ELF3	DLG2	CPEB2
PTPRB	RBMS2	MGAT4A	SLC30A8	SLC38A11	PAK3	ELL2	DLGAP4	CPEB3
PTPRK	RBMS3	MGLL	SLC33A1	SLC3A1	PALMD	ELMOD2	DLK1	CPEB4
PURA	RBP1	MGST3	SLC35E1	SLC41A1	PAPD4	ELOF1	DLL1	CPLX1
PVR	RC3H1	MICAL2	SLC35F3	SLC41A2	PAPD5	ELOVL6	DLL3	CPLX2
PVRL4	RCAN3	MICAL3	SLC35F5	SLC44A3	PAQR5	ELP2	DLL4	CPLX3
PXK	RCOR1	MICALL2	SLC37A1	SLC9A7	PARD3B	EMCN	DMD	CPNE4
PXMP4	RCOR3	MINA	SLC38A11	SLCO3A1	PARD6B	EMILIN3	DMGDH	CPNE5
PYROXD1	REG3G	MITF	SLC38A5	SLCO5A1	PARM1	EML4	DMRTA1	CPNE8
RAB11FIP1	REL	MKNK1	SLC39A5	SLMAP	PARP14	EMP1	DMXL1	CPSF2
RAB27B	RELL1	MKNK2	SLC39A8	SMARCA2	PARP9	ENAH	DNAH2	CPSF3
RAB30	RERG	MLLT4	SLC41A1	SMC5	PATL1	ENPP5	DNAH5	CPSF6
RAB3D	REV3L	MLLT6	SLC41A2	SNIP1	PCGF5	ENSA	DNAH7	CPXM2
RAB7A	RFX2	MLXIP	SLC44A3	SNX25	PCM1	ENTPD7	DNAJA4	CR1
RABGAP1L	RGL3	MLYCD	SLC7A2	SNX9	PCMTD1	ENY2	DNAJC10	CRAMP1L
RALGAPA1	RHBDF1	MMAA	SLC9A7	SOAT1	PCNXL2	EPB41	DNAJC12	CRB1
RALGAPA2	RHOB	MON2	SLCO5A1	SON	PDE11A	EPB41L1	DNAJC14	CRB3
RAP1A	RHOBTB3	MPP5	SLFN11	SORBS2	PDE12	EPB41L4B	DNAJC18	CRBN

RAPGEF6	RHOV	MPP7	SLITRK1	SOX6	PDE1C	EPB41L5	DNAJC19	CREB3L2
RASD1	RHPN2	MPZL2	SMARCA2	SP100	PDE3A	EPC2	DNAJC21	CREB3L3
RASEF	RIC8B	MPZL3	SMC5	SP110	PDE7B	EPDR1	DNAL1	CREB3L4
RASGRP3	RICTOR	MS4A1	SMCHD1	SP140L	PDE8A	EPHA1	DNALI1	CREB5
RASIP1	RIN2	MSRA	SNTB1	SP2	PDE8B	EPHA4	DNER	CREBBP
RASSF6	RIOK3	MTDH	SOAT1	SP4	PDGFC	EPSTI1	DNM1L	CREBZF
RASSF9	RIPK3	MTF1	SOCS7	SPAG17	PDGFD	ERBB3	DNMT3A	CREM
RBM39	RIPK4	MTHFD2L	SORBS1	SPATA13	PDK4	ERBB4	DNTTIP1	CRIM1
RBMS3	RNASEL	MTHFR	SORBS2	SPATA5	PDLIM5	ERC1	DOCK1	CRIP3
RBP1	RNF144B	MTMR3	SP100	SPEF2	PDZD8	ERCC4	DOCK11	CRIPAK
RC3H1	RNF149	MTR	SP110	SPG11	PELI2	ERF	DOCK4	CRTAP
RCAN3	RNF180	MTUS1	SP140L	SPINT1	PEX5L	ERG	DOCK7	CRTC2
RCL1	RNF19A	MTUS2	SP2	SPIRE1	PGBD4	ERGIC1	DOCK8	CRTC3
RCOR3	RNF207	MUC20	SP4	SPNS2	PGPEP1	ERGIC2	DOK6	CSDE1
RDX	RNF213	MUC4	SPATA13	SPOPL	PHACTR1	ERH	DOT1L	CSMD2
REG3G	RNF217	MUM1L1	SPATA5	SPRR3	PHACTR4	ERLIN2	DPCR1	CSNK1A1
REG4	RNF32	MXD1	SPEF2	SPSB1	PHC3	ERMN	DPF3	CSNK1G3
REL	RNPC3	MXRA7	SPG11	SPTBN1	PHF11	ERN2	DPH3	CSNK2A2
RELL1	RORA	MYADM	SPINT1	SPTLC3	PHF20L1	ERO1LB	DPH5	CSPP1
REPS2	RORC	MYH11	SPPL2A	SQSTM1	PHKA1	ERRFI1	DPP10	CST3
RERG	RPS6KA3	MYH14	SPRYD4	SRGAP1	PHLDB2	ESAM	DPP3	CSTF2
REV3L	RPS6KB1	MYH7B	SPSB1	SSPN	PHYHD1	ETNK1	DPP6	CSTF3
RGL3	RRAGC	MYLIP	SPTLC3	STAG1	PHYHIPL	ETS1	DPPA2	CTAGE5
RHOB	RSBN1	MYLK2	SQSTM1	STAM2	PIGM	ETS2	DPY19L2	CTHRC1
RHOBTB3	RSPH3	MYO15B	SRGAP1	STARD13	PIK3AP1	ETV6	DPY19L3	CTNNA3
RHOV	RUNX2	MYO1C	SRPRB	STEAP2	PIP5KL1	ETV7	DPY19L4	CTNNB1
RICTOR	S100A10	MYO5B	SSFA2	STK33	PITRM1	EVL	DPYSL3	CTPS2
RILP	S100A6	MYRIP	ST6GALNAC	STOX2	PIWIL4	EVX1	DSC2	CTSC
RIMS1	SAMD12	MYSM1	4	STX11	PLA2G16	EWSR1	DSC3	CTSS
RIN2	SATB1	MYT1L	ST7L	SULT1C2	PLCD4	EXOC2	DSEL	CTTNBP2
RIOK1	SCAMP2	N4BP2L1	STAM2	SYNE1	PLCG2	EXOC3	DST	CTTNBP2NL
RIOK3	SCARB2	NALCN	STARD10	SYNE2	PLD1	EXOC5	DSTN	CUL4A
RIPK3	SCD5	NAPG	STARD13	SYNGR2	PLEKHA2	EXOC6	DTNA	CUL5
RIPK4	SCML1	NAPSA	STAT3	SYNJ2	PLEKHA7	EXOC8	DTNBP1	CUX1
RNF144B	SCN9A	NCOA7	STEAP2	SYT6	PLEKHH1	EXOSC6	DTWD1	CWC15
RNF149	SCNN1G	NEBL	STOX2	SYT8	PLEKHH2	F2RL2	DTX1	CXADR
RNF180	SCYL2	NEDD4L	STX11	TACC1	PLK3	F7	DTX3	CXCL16
RNF19A	SDCCAG8	NEDD9	STXBP5	TAF9B	PLSCR1	FADS2	DTX3L	CXCL17
RNF212	SEC14L2	NEK6	STXBP6	TANC2	PLSCR2	FAF1	DUOXA2	CXCL2

RNF213	SEC24A	NEXN	SUSD4	TANK	PMEPA1	FAHD2A	DUSP1	CXXC4
RNF216	SEMA4A	NFAT5	SYCP2	TASP1	PNPLA7	FAM101B	DUSP27	CXXC5
RNF217	SENP7	NFATC2	SYNE1	TBC1D15	PNPLA8	FAM102A	DYM	CYB561D1
RNF32	SERINC2	NFIA	SYNE2	TBC1D23	PODN	FAM102B	DYNC1H1	CYB5B
RNFT1	SERPINA1	NFIB	SYNGR2	TC2N	POLD3	FAM104A	DYNLRB2	CYB5D2
RNPC3	SERTAD1	NFIC	SYNPO2	TCEA3	POLK	FAM104B	DZIP1L	CYB5R4
RORA	SETBP1	NFKBIA	SYS1	TDRD9	POLR1D	FAM105A	EAF1	CYBA
RORC	SETD7	NFKBIZ	SYT8	TES	POU2F1	FAM109B	EARS2	CYBB
RPH3AL	SETX	NIPAL2	SYTL1	TESC	POU6F1	FAM110A	EBF1	CYBRD1
RPS15A	SFT2D2	NIPBL	TACC1	TET2	PPARGC1B	FAM110B	EBF3	CYCS
RPS25	SGK2	NKTR	TAF4B	THBS1	PPIG	FAM110C	ECE2	CYGB
RPS6KB1	SGMS2	NLK	TAF9B	THRB	PPM1H	FAM114A1	ECHDC2	CYHR1
RRBP1	SH3BGRL2	NLRC5	TASP1	TJP2	PPP1R15B	FAM120AOS	ECT2	CYP19A1
RREB1	SH3RF1	NMD3	TBC1D15	TLK1	PPP1R3C	FAM120C	EDC3	CYP26B1
RSBN1	SH3RF3	NMNAT3	TBC1D23	TLR3	PPP1R3E	FAM131A	EDEM3	CYP2R1
RSPH3	SH3TC1	NOSTRIN	TC2N	TM4SF1	PPP1R9A	FAM131C	EDIL3	CYP2S1
RUNX2	SHANK2	NOXA1	TCEA3	TMC4	PPP4R4	FAM133A	EDN1	CYP2U1
S100A6	SHROOM3	NPC1	TESC	TMC5	PPTC7	FAM135A	EEA1	CYP3A5
SAMHD1	SIPA1L3	NPC1L1	TET2	TMCO4	PRDM16	FAM135B	EEF1A1	CYP4V2
SAR1B	SLAIN2	NPM2	TEX11	TMEM106A	PRKAA1	FAM149B1	EEF2	CYP4X1
SATB1	SLC12A2	NPNT	TGFBRAP1	TMEM107	PRKAA2	FAM20A	EFCAB1	CYYR1
SCAMP2	SLC14A1	NPY6R	THAP2	TMEM127	PRKAB2	FAM26F	EFCAB7	D2HGDH
SCAMP5	SLC15A2	NR1D2	THBS1	TMEM139	PRKCG	FAM60A	EFHB	DAAM1
SCARB2	SLC15A4	NR1H4	THRB	TMEM144	PRLR	FAM65A	EFHC1	DAB2
SCD5	SLC16A7	NR3C1	TIFA	TMEM163	PRODH2	FAM71F1	EFHD2	DAB2IP
SCML1	SLC22A5	NRG2	TIRAP	TMEM171	PROM2	FAM73B	EFNA5	DACH1
SCN7A	SLC23A1	NRG4	TLK1	TMEM184A	PROX1	FAM76A	EFTUD2	DACH2
SCN9A	SLC25A25	NRSN1	TLR3	TMEM217	PRPS2	FAM76B	EGFR	DACT3
SDCCAG8	SLC25A30	NSMAF	TM4SF1	TMEM232	PRRG4	FAM81B	EGLN1	DAD1
SDK1	SLC25A45	NT5C1A	TMBIM4	TMEM27	PSD4	FAM83F	EGLN2	DAP3
SEC16B	SLC2A9	NT5DC3	TMC4	TMEM41A	PTER	FAM84B	EGLN3	DAPL1
SEC24A	SLC30A4	NTN4	TMCO4	TMEM56	PTP4A1	FAM91A1	EGR1	DAZAP2
SEC61A1	SLC35F5	NTRK2	TMED10	TMEM62	PTPN2	FAM98A	EGR4	DBR1
SEC61B	SLC38A11	NUCB2	TMEM106A	TMEM86A	PTPN22	FANCF	EHD3	DBT
SEC62	SLC3A1	NUMB	TMEM127	TMF1	PTPN3	FARP2	EHD4	DCAKD
SEC63	SLC40A1	NUP214	TMEM131	TMPRSS13	PTPRJ	FAT3	EHF	DCBLD1
SEMA4A	SLC41A1	OAF	TMEM144	TMPRSS3	PTPRK	FBRS	EID2	DCBLD2
SEPP1	SLC41A2	OAS2	TMEM163	TNFRSF11	PVR	FBXL16	EID2B	DCDC2
SERINC2	SLC44A3	OAS3	TMEM184A	A	PVRL1	FBXL17	EIF1	DCLK1

SERPINA1	SLC5A9	OBFC1	TMEM220	TNFSF15	PVRL4	FBXL3	EIF1B	DCLRE1C
SERPINB1	SLC7A2	OCLN	TMEM232	TNIP1	PXMP4	FBXO10	EIF2A	DCN
SERPINB6	SLC9A7	OFD1	TMEM41A	TNRC6B	PYROXD1	FBXO15	EIF2AK3	DCP1A
SERTAD1	SLMAP	OGFRL1	TMEM52	TOM1L1	RAB11FIP1	FBXO16	EIF3E	DCP1B
SETBP1	SMARCA2	OGT	TMEM56	TOR1AIP1	RAB11FIP4	FBXO3	EIF3F	DCP2
SETD7	SMC5	ONECUT2	TMEM57	TOR1AIP2	RAB21	FBXO30	EIF3H	DCST2
SFT2D2	SNX25	OSBPL7	TMEM62	TP53INP2	RAB27B	FBXO33	EIF3K	DCTN2
SGK2	SNX9	OSMR	TMEM86A	TPD52	RAB3D	FBXO36	EIF3M	DCTN4
SGMS2	SOAT1	OTUD1	TMF1	TPPP	RAB3IP	FBXO38	EIF4E	DCTN5
SGSM1	SORBS2	OTUD4	TMPRSS13	TRAF1	RAB7A	FBXO5	EIF4E2	DCUN1D1
SH3BP4	SORCS1	OVOL1	TNIP1	TRAF6	RABGAP1L	FBXO6	EIF4E3	DDA1
SH3RF1	SOS1	P2RX7	TNS3	TRIB1	RALGAPA1	FBXO7	EIF4EBP2	DDI1
SH3TC1	SOS2	PACS1	TOM1L1	TRIM38	RALGAPA2	FBXO8	ELAC1	DDR2
SLAIN2	SOX6	PACSIN2	TOR1AIP1	TRIM56	RALGPS1	FBXO9	ELAVL1	DDX11
SLC10A7	SP100	PAG1	TOR1AIP2	TRIM9	RAP1A	FBXW7	ELAVL2	DDX17
SLC12A2	SP110	PAK3	TOX3	TRIO	RAPGEF6	FCHSD1	ELAVL4	DDX19B
SLC16A10	SP140L	PAPD4	TP53INP1	TRIP11	RAPH1	FCRLB	ELF2	DDX26B
SLC16A7	SPAG9	PAPD5	TPD52	TRNP1	RASA2	FDX1L	ELF3	DDX31
SLC1A2	SPATA13	PARD3B	TRIB1	TRPM5	RASAL2	FGD5	ELL2	DDX46
SLC1A4	SPATA5	PARD6B	TRIM2	TSC22D2	RASD1	FGD6	ELMOD2	DDX49
SLC20A1	SPEF2	PARM1	TRIM25	TSGA10	RASGRP3	FGF14	ELOF1	DDX51
SLC22A5	SPG11	PARP14	TRIM36	TTC21A	RASL11A	FGF9	ELOVL6	DDX54
SLC25A25	SPINT1	PARP6	TRIM38	TTC22	RASSF5	FGFBP3	ELOVL7	DDX55
SLC25A27	SPIRE1	PARP9	TRIM50	TTC39C	RASSF8	FGFR1	ELP2	DEAF1
SLC25A36	SPNS2	PARVA	TRIM56	TTLL7	RASSF9	FGFR1OP2	ELP3	DEF8
SLC25A45	SPNS3	PATL1	TRIM7	TTN	RBBP9	FGFR2	EMCN	DEFB119
SLC26A7	SPOPL	PCDH17	TRIP11	TULP4	RBM14	FGGY	EMILIN2	DENND1A
SLC2A13	SPRR3	PCDH9	TRPM6	TXNDC11	RBM25	FIGN	EMILIN3	DENND2C
SLC2A9	SPSB1	PCGF5	TSC22D2	UBN2	RBM39	FILIP1	EML4	DENND4C
SLC30A2	SPTBN1	PCM1	TSPAN33	UBR3	RBM47	FKBP11	EMP1	DEPDC7
SLC30A4	SPTLC3	PCMTD1	TSTD1	UBXN2B	RBP1	FKBP15	EMP2	DERL1
SLC33A1	SQSTM1	PCNXL2	TTC17	UCA1	RBPJ	FKBP5	ENAH	DERL2
SLC35D2	SRGAP1	PCP4L1	TTC21A	UFM1	RC3H1	FKBP7	ENAM	DFFA
SLC35E1	SSFA2	PDCD6IP	TTC22	UGCG	RCAN3	FLCN	ENPP1	DGKE
SLC35F5	SSH2	PDE11A	TTC27	UGT8	RCL1	FLI1	ENTPD7	DGKZ
SLC38A11	SSPN	PDE1C	TTC39C	UHMK1	RCOR3	FLRT3	EP400	DGUOK
SLC39A5	ST3GAL1	PDE3A	TTLL11	ULK4	RDH13	FLT1	EPB41L1	DHDDS
SLC39A8	STAM2	PDE4D	TTLL7	UNC13D	REEP6	FLVCR1	EPB41L2	DHRS13
SLC40A1	STARD13	PDE5A	TTN	USP16	REG3A	FLYWCH2	EPB41L4A	DHRS7

SLC41A1	STK17B	PDE7B	TTYH2	USP2	REG3G	FMN1	EPB41L4B	DHTKD1
SLC41A2	STK31	PDE8A	TULP4	USP24	REL	FMN2	EPC1	DHX36
SLC44A3	STK32A	PDE8B	TWISTNB	USP3	RELL1	FMNL3	EPC2	DHX37
SLC46A1	STX3	PDGFC	TXNDC11	USP31	REPS2	FNDC3A	EPDR1	DHX40
SLC7A2	STX4	PDGFD	U2AF1	USP34	RERG	FNDC7	EPHA1	DHX57
SLITRK1	STXBP5	PDLIM3	UBE2D3	USP36	REV3L	FNIP1	EPHA10	DIAPH3
SMAP2	SUSD1	PDLIM5	UBE4B	USP38	RFFL	FNTA	EPHA4	DIDO1
SMARCA2	SV2B	PDZD8	UBIAD1	USP43	RFX2	FOLR2	EPSTI1	DIP2A
SMC5	SVEP1	PELI2	UBN2	USP47	RFX7	FOXA3	ERAP2	DIP2B
SMCHD1	SYK	PEX5L	UBXN2B	USP9X	RGL3	FOXK2	ERBB2	DIRAS1
SNTB1	SYNE1	PGBD4	UFM1	VAV3	RHOB	FOXN3	ERBB3	DIRAS2
SNX14	SYNE2	PGPEP1	UGCG	VEPH1	RHPN2	FOXO1	ERBB4	DIRC2
SOAT1	SYNGR2	PHACTR4	UGT8	VGLL3	RIC8B	FOXP2	ERC1	DIS3
SORBS1	SYNJ1	PHC3	ULBP2	VIL1	RICTOR	FOXP3	ERCC4	DIS3L
SORBS2	SYNJ2	PHF11	ULK4	VPS13B	RIMS1	FOXP4	ERF	DIS3L2
SOX6	SYNPO	PHF20L1	UNC13D	VPS13C	RIOK3	FOXQ1	ERG	DISC1
SP100	SYTL4	PHF21A	USP16	WAC	RIPK1	FOXRED2	ERGIC1	DISP1
SP110	TACC1	PHKA1	USP2	WDFY3	RIPK3	FPR3	ERGIC2	DISP2
SP2	TACSTD2	PHLDA1	USP3	WDR44	RIPK4	FRAS1	ERICH1	DKK2
SPACA3	TAF1	PHLDB2	USP30	WDR66	RNF144B	FRMD4A	ERLIN2	DKK3
SPAG9	TAF9B	PHYHD1	USP31	WDR7	RNF180	FRMPD4	ERMN	DLC1
SPATA13	TANC1	PHYHIPL	USP34	WDR72	RNF19A	FRZB	ERN1	DLG1
SPEF2	TANC2	PIK3AP1	USP36	WFDC3	RNF207	FST	ERO1LB	DLG2
SPG11	TANK	PIP5KL1	USP38	WHAMM	RNF212	FSTL1	ERP27	DLGAP4
SPIRE1	TAPT1	PITPNM2	USP43	WNK2	RNF213	FSTL5	ERRFI1	DLK1
SPPL2A	TASP1	PITRM1	USP47	WNT4	RNF217	FUCA1	ESAM	DLL1
SPSB1	TBC1D15	PIWIL2	USP9X	WWC1	RNF32	FUK	ESCO1	DLL3
SPTBN1	TBC1D23	PKHD1	UTRN	XDH	RNF38	FUNDC1	ESD	DLL4
SPTLC3	TBC1D8B	PLA2G4F	VCPIP1	XRN1	RNPC3	FUT10	ESRRB	DMD
SQSTM1	TC2N	PLCD4	VGLL3	YTHDC1	ROPN1L	FXR1	ETNK1	DMGDH
SRGAP1	TCEA3	PLCG2	VIL1	ZBED3	ROR1	FXYD5	ETS1	DMRTA1
SRPRB	TES	PLCL1	VPS13A	ZBTB10	RORA	FZD1	ETS2	DMXL1
SSFA2	TET2	PLCXD3	VPS13C	ZBTB20	RPH3AL	FZD3	ETV5	DNAH1
SSH2	TFCP2L1	PLD1	WDFY2	ZBTB43	RPRD2	GAB3	EVC	DNAH2
SSPN	TGFB2	PLEKHA2	WDR44	ZBTB44	RPS15A	GABBR1	EVL	DNAH5
SSR1	THBS1	PLEKHA7	WDR7	ZC3H12C	RPS25	GABPA	EWSR1	DNAH7
SSTR1	THSD4	PLEKHG3	WHAMM	ZCCHC2	RPS6KB1	GABPB2	EXOC3	DNAJA4
ST3GAL1	THSD7A	PLEKHH1	WNK2	ZCCHC6	RRAD	GABRB3	EXOC4	DNAJC1
ST6GALNAC	TLR3	PLEKHH2	WNT9A	ZDHHC14	RRAGC	GAD2	EXOC5	DNAJC10

4	TM4SF1	PLK3	WWC1	ZFHX3	RRBP1	GADD45GIP1	EXOC6	DNAJC12
ST7L	TM4SF18	PLSCR1	XAF1	ZFP28	RSBN1	GALNT10	EXOC8	DNAJC14
STAM2	TMC4	PLXNA2	XBP1	ZFP3	RUNDC3B	GALNT12	EXOSC6	DNAJC18
STARD10	TMC5	PM20D2	XRN1	ZFX	SAMD12	GALNT13	EXT1	DNAJC19
STARD13	TMCC3	PMEPA1	YTHDC1	ZMAT1	SAMHD1	GALNT9	EYA3	DNAJC21
STIM2	TMCO4	PNPLA7	ZBED3	ZMYM5	SART3	GALT	F2RL2	DNAJC3
STK17B	TMEM106A	PNPLA8	ZBTB10	ZNF10	SATB1	GAPVD1	F5	DNAJC4
STK31	TMEM107	POLK	ZBTB20	ZNF100	SCAMP2	GATA4	F7	DNAJC5
STK32A	TMEM117	PPARD	ZBTB43	ZNF148	SCAMP5	GATC	FAAH2	DNAL1
STXBP5	TMEM127	PPM1K	ZC3H12C	ZNF207	SCD5	GATM	FADS2	DNALI1
STXBP6	TMEM131	PPP1R15B	ZCCHC2	ZNF25	SCFD1	GBA2	FAF1	DNER
SUSD1	TMEM136	PPP1R1B	ZCCHC6	ZNF350	SCN7A	GBP1	FAM101B	DNM1L
SUSD2	TMEM144	PPP1R3C	ZCCHC7	ZNF394	SCN8A	GBP2	FAM102A	DNMT3A
SUSD4	TMEM156	PPP1R3E	ZDHHC9	ZNF395	SCN9A	GCC2	FAM102B	DNTTIP1
SV2B	TMEM163	PPP1R9A	ZFAND2A	ZNF398	SDK1	GCLM	FAM104A	DOCK1
SVEP1	TMEM171	PPP4R1L	ZFHX3	ZNF407	SEC11C	GCNT1	FAM105A	DOCK11
SYCP2	TMEM184A	PPP4R4	ZFP3	ZNF430	SEC16B	GDA	FAM110C	DOCK4
SYNE1	TMEM217	PPTC7	ZFYVE28	ZNF431	SEC24A	GDAP1	FAM114A1	DOCK7
SYNE2	TMEM27	PRDM1	ZMAT1	ZNF439	SEC61B	GDE1	FAM118B	DOCK8
SYNGR2	TMEM30B	PRDM16	ZMYM6	ZNF44	SEC62	GDNF	FAM120C	DOK6
SYNPO	TMEM39A	PRELP	ZNF10	ZNF471	SEC63	GEMIN5	FAM122A	DOT1L
SYS1	TMEM41A	PREPL	ZNF207	ZNF483	SEMA4A	GFM2	FAM126B	DPCR1
SYTL1	TMEM45B	PRKAA1	ZNF350	ZNF493	SEMA4D	GFPT1	FAM129B	DPF3
SYTL4	TMEM50B	PRKAA2	ZNF385B	ZNF506	SEMA6A	GGCX	FAM131A	DPH3
TACC1	TMEM56	PRKAB2	ZNF395	ZNF562	SERINC2	GGNBP2	FAM131C	DPH5
TACSTD2	TMEM59	PRKCE	ZNF407	ZNF585B	SERPINB1	GGT6	FAM133A	DPP10
TADA2B	TMEM62	PRKCH	ZNF430	ZNF595	SERTAD1	GGT7	FAM135A	DPP3
TAF1	TMEM86A	PRLR	ZNF431	ZNF600	SETBP1	GHDC	FAM135B	DPP6
TAF9B	TMEM88	PROM2	ZNF44	ZNF652	SETX	GHRL	FAM150B	DPP8
TANC1	TMEM9B	PROX1	ZNF483	ZNF701	SFMBT1	GIGYF2	FAM19A4	DPPA2
TANC2	TMF1	PRRC1	ZNF493	ZNF708	SFPQ	GIMAP1	FAM19A5	DPY19L2
TANK	TMPRSS13	PRRG4	ZNF506	ZNF717	SFT2D2	GIMAP8	FAM20A	DPY19L3
TASP1	TMPRSS2	PSD4	ZNF595	ZNF721	SGK2	GIPC2	FAM3C	DPY19L4
TBC1D15	TMTC2	PSEN1	ZNF600	ZNF75A	SGMS2	GIPR	FAM46C	DPYSL3
TBC1D23	TNFRSF11	PTEN	ZNF652	ZNF789	SGSM1	GIT2	FAM58A	DSC2
TC2N	A	PTER	ZNF655	ZNF800	SH3BGRL2	GJB2	FAM60A	DSC3
TCEA3	TNFSF15	PTP4A1	ZNF681	ZNF827	SH3RF1	GJC1	FAM63A	DSEL
TEP1	TNIP1	PTPN2	ZNF704	ZNF844	SHANK2	GJD3	FAM65A	DST
TES	TOM1L1	PTPN21	ZNF708	ZNF91	SHISA2	GK5	FAM71E1	DSTN

TESC	TOM1L2	PTPN22	ZNF710	ZNFX1	SHROOM3	GKAP1	FAM73A	DTD1
TET2	TOR1AIP1	PTPN3	ZNF717	ZSWIM1	SIN3A	GLCCI1	FAM76B	DTNA
TFCP2L1	TOR1AIP2	PTPRB	ZNF800	ZSWIM6	SIPA1L1	GLIS3	FAM81A	DTNBP1
TGFBR3	TPM1	PTPRK	ZNF844	ZXDA	SIPA1L3	GLS	FAM81B	DTWD1
THAP2	TRAF1	PURA	ZXDA		SIX4	GLT1D1	FAM83B	DTX1
THBS1	TRAF3IP3	PVR			SLAIN1	GLT8D2	FAM84A	DTX3
THRB	TRAF6	PVRL4			SLC11A1	GLTSCR2	FAM84B	DTX3L
TIFA	TRIB1	PXK			SLC12A2	GLUL	FAM92A1	DUOXA2
TIRAP	TRIM38	PXMP4			SLC13A3	GM2A	FAM98A	DUSP1
TLR3	TRIM4	PYGO1			SLC15A2	GMCL1	FAM98C	DUSP18
TM4SF1	TRIM47	PYROXD1			SLC15A4	GMDS	FANCA	DUSP27
TMBIM4	TRIM56	RAB11FIP1			SLC16A10	GMIP	FANCD2	DUSP4
TMC4	TRIM9	RAB21			SLC16A7	GNA12	FANCF	DYM
TMCO4	TRIO	RAB27B			SLC16A9	GNA13	FARP1	DYNC1H1
TMED10	TRIP11	RAB30			SLC19A3	GNAI1	FARSB	DYNC1LI1
TMED2	TRIP12	RAB3D			SLC1A2	GNAO1	FASTKD2	DYNC1LI2
TMED5	TSC22D2	RAB3IP			SLC1A4	GNAS	FAU	DYNLRB2
TMED6	TSHZ1	RAB7A			SLC20A1	GNB4	FBLIM1	DZIP1L
TMEM106A	TSHZ2	RABGAP1L			SLC22A23	GNG11	FBN1	EAF1
TMEM117	TTC21A	RAI1			SLC22A5	GNG2	FBXL16	EARS2
TMEM127	TTC32	RALGAPA1			SLC23A1	GNG7	FBXL19	EBF1
TMEM131	TTC39C	RALGAPA2			SLC25A25	GNG8	FBXL20	EBF3
TMEM144	TTLL7	RALGAPB			SLC25A27	GNL1	FBXL4	EBP
TMEM163	TTN	RAP1A			SLC25A36	GNPDA2	FBXO10	EBPL
TMEM181	TULP4	RAPGEF2			SLC25A45	GNPTAB	FBXO15	ECE2
TMEM184A	TXNDC11	RAPGEF6			SLC28A3	GOLGA3	FBXO16	ECHDC2
TMEM25	UBE2U	RAPH1			SLC30A4	GOLT1B	FBXO18	ECT2
TMEM30B	UBR3	RASD1			SLC30A8	GON4L	FBXO2	EDC3
TMEM39A	UCA1	RASEF			SLC33A1	GOPC	FBXO22	EDEM3
TMEM41A	UFM1	RASGRP3			SLC35E1	GOSR2	FBXO3	EDIL3
TMEM50B	UGCG	RASIP1			SLC35F3	GPBP1	FBXO30	EDN1
TMEM52	UHMK1	RASSF5			SLC35F5	GPC6	FBXO31	EEA1
TMEM56	ULK4	RASSF6			SLC37A1	GPM6A	FBXO33	EEF1A1
TMEM57	USP16	RASSF8			SLC38A11	GPR126	FBXO36	EEF2
TMEM59	USP2	RASSF9			SLC38A5	GPR155	FBXO38	EFCAB1
TMEM62	USP24	RBM39			SLC39A5	GPR158	FBXO7	EFCAB6
TMEM86A	USP3	RBM47			SLC39A8	GPR160	FBXO8	EFCAB7
TMEM9B	USP30	RBMS2			SLC3A1	GPR180	FBXO9	EFEMP1
TMF1	USP31	RBMS3			SLC41A1	GPR26	FBXW7	EFHB

TMPRSS13	USP34	RBP1			SLC41A2	GPR39	FBXW8	EFHC1
TMPRSS2	USP36	RC3H1			SLC44A3	GPR55	FCAMR	EFHD2
TNFSF14	USP38	RCAN3			SLC7A2	GPR68	FCHSD1	EFNA5
TNIP1	USP43	RCL1			SLC9A7	GPR98	FCRLB	EFTUD2
TNS3	USP47	RCOR1			SLCO3A1	GPRC5A	FDX1L	EGFR
TOM1L1	USP53	RCOR3			SLCO5A1	GPRIN1	FECH	EGLN1
TOM1L2	UTRN	RDX			SLFN11	GPRIN3	FEM1A	EGLN2
TOR1AIP1	VAV3	REG3G			SLITRK1	GPSM1	FER	EGLN3
TOR1AIP2	VEPH1	REG4			SLMAP	GRAMD1A	FERMT1	EGR1
TP53INP1	VGLL3	REL			SMARCA2	GRAMD3	FGA	EGR4
TPM1	VPS13C	RELL1			SMC5	GRASP	FGD3	EHD3
TRAF3IP3	VPS37A	REPS2			SMCHD1	GRIA2	FGD5	EHD4
TRAF6	VPS41	RERG			SNIP1	GRIA3	FGD6	EHF
TRIB1	WAC	REV3L			SNTB1	GRIA4	FGF10	EHMT1
TRIM25	WDFY3	RFX2			SNX25	GRID1	FGF12	EHMT2
TRIM38	WDR19	RGL3			SNX9	GRIK3	FGF14	EID2
TRIM4	WDR26	RHBDF1			SOAT1	GRIN2A	FGF18	EID2B
TRIM47	WDR44	RHOB			SOCS7	GRIN2B	FGF19	EIF1
TRIM56	WDR7	RHOBTB3			SON	GRIN3A	FGF9	EIF1B
TRIP11	WDR72	RHOV			SORBS1	GRPEL2	FGFBP3	EIF2A
TRPM6	WHAMM	RHPN2			SORBS2	GSN	FGFR1	EIF2AK2
TSC22D2	WNK2	RIC8B			SOX6	GSTA4	FGFR1OP2	EIF2AK3
TSHZ1	WWC1	RICTOR			SP100	GSTM3	FGFR2	EIF3B
TSHZ2	XDH	RILP			SP110	GSTT1	FGGY	EIF3C
TTC17	XRN1	RIMS1			SP140L	GTF2A1	FHDC1	EIF3D
TTC21A	XRRA1	RIN2			SP2	GTF2H3	FIGN	EIF3E
TTC39C	YPEL2	RIOK1			SP4	GTF2IRD2	FILIP1	EIF3F
TTC7B	YPEL5	RIOK3			SPAG17	GTF3C4	FKBP11	EIF3H
TTLL11	YTHDC1	RIPK3			SPATA13	GTF3C5	FKBP5	EIF3K
TTLL7	ZBTB10	RIPK4			SPATA5	GTPBP1	FKBP7	EIF3M
TTN	ZBTB20	RNASEL			SPEF2	GTPBP2	FKRP	EIF4E
TTYH2	ZBTB38	RNF144B			SPG11	GTPBP8	FLCN	EIF4E2
TULP4	ZBTB41	RNF149			SPINT1	GUCY1A3	FLI1	EIF4E3
TWF1	ZBTB43	RNF180			SPIRE1	GUF1	FLT1	EIF4EBP2
TXNDC11	ZC3H12C	RNF19A			SPNS2	GUK1	FLVCR1	EIF4ENIF1
UBE2D3	ZCCHC2	RNF207			SPOPL	H2AFJ	FLYWCH2	EIF4G2
UBE2H	ZCCHC6	RNF212			SPPL2A	H6PD	FMN1	EIF5A2
UBE2J1	ZDHHC1	RNF213			SPRR3	HAPLN4	FMN2	ELAC1
UBE2U	ZFHX3	RNF216			SPRYD4	HARBI1	FNBP1	ELAVL1

UBR3	ZFP28	RNF217			SPSB1	HAVCR2	FNDC3A	ELAVL2
UFM1	ZFP3	RNF32			SPTBN1	HBS1L	FNIP1	ELAVL4
UGCG	ZFX	RNFT1			SPTLC3	HCFC2	FNIP2	ELF2
UGT8	ZFYVE16	RNPC3			SQSTM1	HCN3	FNTA	ELF3
UHMK1	ZHX1	RORA			SRGAP1	HDAC4	FOLR2	ELL2
ULK4	ZMAT1	RORC			SRPRB	HDAC5	FOXA1	ELMOD2
USP16	ZMYM5	RPH3AL			SSFA2	HDAC8	FOXA3	ELOF1
USP2	ZMYM6	RPS15A			SSPN	HDAC9	FOXK1	ELOVL6
USP24	ZMYND15	RPS25			ST6GALNAC	HDDC3	FOXN3	ELOVL7
USP3	ZNF124	RPS6KA3			4	HDHD2	FOXO1	ELP2
USP30	ZNF148	RPS6KB1			ST7L	HDLBP	FOXP1	ELP3
USP31	ZNF175	RRAGC			STAG1	HEATR5A	FOXP2	EMCN
USP34	ZNF19	RRBP1			STAM2	HECA	FOXP4	EMILIN2
USP36	ZNF25	RREB1			STARD10	HECTD1	FOXQ1	EMILIN3
USP38	ZNF264	RSBN1			STARD13	HECTD2	FOXR1	EML4
USP43	ZNF350	RSPH3			STAT3	HECW2	FOXRED2	EMP1
USP47	ZNF394	RUNX2			STEAP2	HERC1	FPR3	EMP2
USP53	ZNF395	S100A10			STK33	HERPUD2	FRMD4A	ENAH
UTRN	ZNF407	S100A6			STOX2	HEXA	FRMD6	ENAM
VAPA	ZNF430	SAMD12			STX11	HFE	FRMPD4	ENPP1
VIL1	ZNF436	SAMHD1			STXBP5	HGS	FRS2	ENPP5
VPS13C	ZNF44	SAR1B			STXBP6	HGSNAT	FRZB	ENSA
VPS36	ZNF471	SATB1			SULT1C2	HHLA2	FSTL1	ENTPD7
VPS53	ZNF506	SCAMP2			SUSD4	HIAT1	FSTL5	ENY2
WDFY2	ZNF540	SCAMP5			SYCP2	HIF3A	FUBP3	EP400
WDR13	ZNF555	SCARB2			SYNE1	HIGD1A	FUCA1	EPB41
WDR31	ZNF585B	SCD5			SYNE2	HINT1	FUNDC1	EPB41L1
WDR44	ZNF596	SCML1			SYNGR2	HIPK2	FXR1	EPB41L2
WDR7	ZNF641	SCN7A			SYNJ2	HIST1H2BC	FXYD5	EPB41L4A
WHAMM	ZNF644	SCN9A			SYNPO2	HIST1H3E	FZD3	EPB41L4B
WHSC1L1	ZNF652	SCNN1G			SYS1	HIST3H2A	FZD4	EPB41L5
WNT9A	ZNF655	SCYL2			SYT6	HIVEP2	GAB1	EPC1
WWC1	ZNF701	SDCCAG8			SYT8	HIVEP3	GABBR1	EPC2
XBP1	ZNF704	SDK1			SYTL1	HKDC1	GABRB3	EPDR1
XKR4	ZNF75A	SEC14L2			TACC1	HLA-DOA	GAD2	EPHA1
XPNPEP1	ZNF800	SEC16B			TAF4B	HLA-DPB1	GADD45GIP1	EPHA10
XRN1	ZNF83	SEC24A			TAF9B	HMGB1	GALM	EPHA4
YIPF5	ZNF844	SEC61A1			TANC2	HMGB2	GALNT10	EPSTI1
YPEL2	ZNF91	SEC61B			TANK	HMGB3	GALNT13	ERAP2

YPEL5	ZSWIM6	SEC62			TASP1	HMGCLL1	GALNT7	ERBB2
YTHDC1	ZXDA	SEC63			TBC1D15	HN1	GALNT9	ERBB3
ZBTB10		SEMA4A			TBC1D23	HNF4A	GALP	ERBB4
ZBTB20		SENP7			TC2N	HNF4G	GAPVD1	ERC1
ZBTB4		SEPP1			TCEA3	HNRNPA0	GART	ERCC4
ZBTB41		SERINC2			TDRD9	HNRNPC	GAS2L3	ERF
ZBTB43		SERPINA1			TES	HNRNPD	GATM	ERG
ZC3H12C		SERPINB1			TESC	HNRNPM	GBA2	ERGIC1
ZCCHC2		SERPINB6			TET2	HNRNPR	GBP1	ERGIC2
ZCCHC6		SERTAD1			TEX11	HOMER1	GBP2	ERH
ZCCHC7		SETBP1			TGFBRAP1	HORMAD2	GBP3	ERICH1
ZDHHC1		SETD7			THAP2	HOXA13	GBP4	ERLIN2
ZDHHC2		SETX			THBS1	HOXA3	GCNT1	ERMN
ZDHHC9		SFT2D2			THRB	HOXA7	GDA	ERN1
ZFAND2A		SGK2			TIFA	HOXB3	GDAP1	ERN2
ZFHX3		SGMS2			TIRAP	HP1BP3	GDE1	ERO1LB
ZFP3		SGSM1			TJP2	HPS1	GDI2	ERP27
ZFYVE28		SH3BGRL2			TLK1	HPS3	GEMIN6	ERRFI1
ZHX1		SH3BP4			TLR3	HRASLS5	GFI1B	ESAM
ZMAT1		SH3RF1			TM4SF1	HRK	GFM2	ESCO1
ZMYM6		SH3RF3			TMBIM4	HS2ST1	GFPT1	ESD
ZMYND15		SH3TC1			TMC4	HS3ST3B1	GGCX	ESRRB
ZNF10		SHANK2			TMC5	HS3ST4	GGT1	ETNK1
ZNF25		SHROOM3			TMCO4	HS6ST1	GGT6	ETS1
ZNF331		SIPA1L3			TMED10	HS6ST2	GGT7	ETS2
ZNF350		SLAIN2			TMEM106A	HS6ST3	GHDC	ETV5
ZNF385B		SLC10A7			TMEM107	HSDL1	GHRL	ETV6
ZNF395		SLC12A2			TMEM127	HSPA12B	GIGYF2	ETV7
ZNF430		SLC14A1			TMEM131	HSPA1L	GIMAP1	EVC
ZNF44		SLC15A2			TMEM139	HSPA5	GIMAP2	EVL
ZNF493		SLC15A4			TMEM144	HSPA9	GIMAP8	EVX1
ZNF506		SLC16A10			TMEM163	HSPB6	GIPC3	EWSR1
ZNF540		SLC16A7			TMEM171	HSPH1	GIPR	EXOC2
ZNF555		SLC1A2			TMEM184A	HTATIP2	GIT2	EXOC3
ZNF595		SLC1A4			TMEM217	HTRA3	GJB2	EXOC4
ZNF596		SLC20A1			TMEM220	HYI	GK5	EXOC5
ZNF641		SLC22A5			TMEM232	ICA1	GLCCI1	EXOC6
ZNF652		SLC23A1			TMEM27	ICA1L	GLI2	EXOC8
ZNF655		SLC25A25			TMEM41A	ICOSLG	GLI3	EXOSC6

ZNF704		SLC25A27			TMEM52	ID4	GLIPR1	EXT1
ZNF710		SLC25A30			TMEM56	IDH3A	GLS	EYA3
ZNF800		SLC25A36			TMEM57	IER3IP1	GLT1D1	F2RL2
ZNF844		SLC25A45			TMEM62	IFNAR1	GLT8D2	F5
ZNF91		SLC26A7			TMEM86A	IFT172	GLTSCR2	F7
ZXDA		SLC2A13			TMF1	IFT52	GMCL1	FAAH2
		SLC2A9			TMPRSS13	IFT80	GNA12	FADS2
		SLC30A2			TMPRSS3	IFT81	GNA13	FAF1
		SLC30A4			TNFRSF11A	IGF1	GNAI1	FAHD2A
		SLC33A1			TNFSF15	IGF1R	GNAO1	FAM101B
		SLC35D2			TNIP1	IGFBPL1	GNAS	FAM102A
		SLC35E1			TNRC6B	IGSF11	GNB4	FAM102B
		SLC35F5			TNS3	IGSF21	GNG11	FAM104A
		SLC38A11			TOM1L1	IGSF9	GNG12	FAM104B
		SLC39A5			TOR1AIP1	IKZF2	GNG2	FAM105A
		SLC39A8			TOR1AIP2	IKZF4	GNG7	FAM109B
		SLC3A1			TOX3	IL17D	GNGT2	FAM110A
		SLC40A1			TP53INP1	IL17RB	GNL3	FAM110B
		SLC41A1			TP53INP2	IL17RC	GNPDA2	FAM110C
		SLC41A2			TPD52	IL17RD	GNPTAB	FAM114A1
		SLC44A3			TPPP	IL1RL1	GOLGA2	FAM118B
		SLC46A1			TRAF1	IL20RA	GOLGA3	FAM120AOS
		SLC5A9			TRAF6	IL20RB	GOLIM4	FAM120C
		SLC7A2			TRIB1	IL6R	GOLT1A	FAM122A
		SLC9A7			TRIM2	IL6ST	GOLT1B	FAM126B
		SLITRK1			TRIM25	ILDR1	GON4L	FAM129B
		SLMAP			TRIM36	IMMP1L	GOPC	FAM131A
		SMAP2			TRIM38	IMPAD1	GOSR2	FAM131C
		SMARCA2			TRIM50	INADL	GPAM	FAM133A
		SMC5			TRIM56	ING5	GPATCH4	FAM135A
		SMCHD1			TRIM7	INHBA	GPBP1	FAM135B
		SNTB1			TRIM9	INPP5F	GPC6	FAM149B1
		SNX14			TRIO	INSM2	GPD2	FAM150B
		SNX25			TRIP11	INSR	GPHN	FAM19A4
		SNX9			TRNP1	INTS2	GPM6A	FAM19A5
		SOAT1			TRPM5	INTS4	GPR110	FAM20A
		SORBS1			TRPM6	INTS6	GPR126	FAM26F
		SORBS2			TSC22D2	INTU	GPR155	FAM3C
		SORCS1			TSGA10	IPO5	GPR158	FAM46C

		SOS1			TSPAN33	IPPK	GPR160	FAM58A
		SOS2			TSTD1	IQGAP2	GPR176	FAM60A
		SOX6			TTC17	IQSEC2	GPR180	FAM63A
		SP100			TTC21A	IRAK1BP1	GPR26	FAM65A
		SP110			TTC22	IRAK2	GPR55	FAM71E1
		SP140L			TTC27	IREB2	GPR68	FAM71F1
		SP2			TTC39C	IRF1	GPR98	FAM73A
		SPACA3			TTLL11	IRF2BP2	GPRC5B	FAM73B
		SPAG9			TTLL7	IRX2	GPRIN1	FAM76A
		SPATA13			TTN	IRX3	GPRIN3	FAM76B
		SPATA5			TTYH2	ISY1	GPSM1	FAM81A
		SPEF2			TULP4	ISYNA1	GPSM2	FAM81B
		SPG11			TWISTNB	ITCH	GPT2	FAM83B
		SPINT1			TXNDC11	ITFG3	GPX2	FAM83F
		SPIRE1			U2AF1	ITGA1	GRAMD3	FAM84A
		SPNS2			UBE2D3	ITGA2	GRASP	FAM84B
		SPNS3			UBE4B	ITGB2	GRB2	FAM91A1
		SPOPL			UBIAD1	ITGB8	GRIA2	FAM92A1
		SPPL2A			UBN2	ITGBL1	GRIA3	FAM98A
		SPRR3			UBR3	ITPR1	GRIA4	FAM98C
		SPSB1			UBXN2B	ITSN1	GRID1	FANCA
		SPTBN1			UCA1	JAKMIP1	GRIK3	FANCD2
		SPTLC3			UFM1	JAM2	GRIN2A	FANCF
		SQSTM1			UGCG	JAM3	GRIN3A	FARP1
		SRGAP1			UGT8	JARID2	GRIPAP1	FARP2
		SRPRB			UHMK1	JAZF1	GRPEL2	FARSB
		SSFA2			ULBP2	JDP2	GSK3B	FASTKD2
		SSH2			ULK4	JMJD1C	GSN	FAT3
		SSPN			UNC13D	JMJD4	GSTA4	FAU
		SSR1			USP16	JPH3	GSTCD	FBLIM1
		SSTR1			USP2	JUND	GSTM3	FBN1
		ST3GAL1			USP24	KALRN	GSTO2	FBRS
		ST6GALNAC 4			USP3	KANK1	GSTT1	FBXL16
					USP30	KANK4	GTDC1	FBXL17
		ST7L			USP31	KATNAL1	GTF2A1	FBXL19
		STAM2			USP34	KATNAL2	GTF2H3	FBXL20
		STARD10			USP36	KBTBD3	GTF2H5	FBXL3
		STARD13			USP38	KCMF1	GTF3C6	FBXL4
		STIM2			USP43	KCNA1	GTPBP1	FBXO10

		STK17B			USP47	KCNAB1	GTPBP2	FBXO15
		STK31			USP9X	KCNB1	GTSE1	FBXO16
		STK32A			UTRN	KCNC1	GUCA1B	FBXO18
		STX3			VAV3	KCNC2	GUCA1C	FBXO2
		STX4			VCPIP1	KCNC3	GUCY1A2	FBXO22
		STXBP5			VEPH1	KCNH7	GUCY1A3	FBXO3
		STXBP6			VGLL3	KCNJ15	GUK1	FBXO30
		SUSD1			VIL1	KCNJ16	GULP1	FBXO31
		SUSD2			VPS13A	KCNJ3	GZF1	FBXO33
		SUSD4			VPS13B	KCNJ6	H2AFV	FBXO36
		SV2B			VPS13C	KCNK10	H6PD	FBXO38
		SVEP1			WAC	KCNK17	HACE1	FBXO5
		SYCP2			WDFY2	KCNK3	HAP1	FBXO6
		SYK			WDFY3	KCNK4	HAPLN4	FBXO7
		SYNE1			WDR44	KCNK6	HAS3	FBXO8
		SYNE2			WDR66	KCNMA1	HAVCR2	FBXO9
		SYNGR2			WDR7	KCNMB2	HAX1	FBXW7
		SYNJ1			WDR72	KCNMB4	HBEGF	FBXW8
		SYNJ2			WFDC3	KCNQ5	HBP1	FCAMR
		SYNPO			WHAMM	KCNRG	HCFC1	FCHSD1
		SYS1			WNK2	KCTD1	HCFC2	FCRLB
		SYTL1			WNT4	KCTD10	HCN3	FDX1L
		SYTL4			WNT9A	KCTD11	HDAC4	FECH
		TACC1			WWC1	KCTD16	HDAC5	FEM1A
		TACSTD2			XAF1	KCTD6	HDAC7	FER
		TADA2B			XBP1	KDSR	HDAC8	FERMT1
		TAF1			XDH	KHDRBS1	HDAC9	FGA
		TAF9B			XRN1	KHSRP	HDDC3	FGD3
		TANC1			YTHDC1	KIAA0232	HDHD2	FGD5
		TANC2			ZBED3	KIAA0319L	HDLBP	FGD6
		TANK			ZBTB10	KIAA0368	HEATR5A	FGF10
		TAPT1			ZBTB20	KIAA0907	HEATR5B	FGF12
		TASP1			ZBTB43	KIAA1211	HECTD1	FGF14
		TBC1D15			ZBTB44	KIAA1217	HECTD2	FGF18
		TBC1D23			ZC3H12C	KIAA1244	HECW2	FGF19
		TBC1D8B			ZCCHC2	KIAA1257	HERC1	FGF9
		TC2N			ZCCHC6	KIAA1324	HERC4	FGFBP3
		TCEA3			ZCCHC7	KIAA1324L	HERPUD2	FGFR1
		TEP1			ZDHHC14	KIAA1377	HEXA	FGFR1OP2

		TES			ZDHHC9	KIAA1407	HEXIM2	FGFR2
		TESC			ZFAND2A	KIAA1429	HEY2	FGGY
		TET2			ZFHX3	KIAA1462	HEYL	FHDC1
		TFCP2L1			ZFP28	KIAA1468	HFE	FIGN
		TGFB2			ZFP3	KIAA1549	HGD	FILIP1
		TGFBR3			ZFX	KIAA1586	HGSNAT	FKBP11
		THAP2			ZFYVE28	KIAA1683	HHIP	FKBP15
		THBS1			ZMAT1	KIAA1715	HIAT1	FKBP5
		THRB			ZMYM5	KIAA1919	HIATL1	FKBP7
		THSD4			ZMYM6	KIAA1958	HIC1	FKRP
		THSD7A			ZNF10	KIAA2013	HIF3A	FLCN
		TIFA			ZNF100	KIAA2018	HIGD1A	FLI1
		TIRAP			ZNF148	KIAA2022	HIP1	FLRT3
		TLR3			ZNF207	KIDINS220	HIPK2	FLT1
		TM4SF1			ZNF25	KIF19	HIPK3	FLVCR1
		TM4SF18			ZNF350	KIF1A	HIST1H2BC	FLYWCH2
		TMBIM4			ZNF385B	KIF1B	HIST1H3E	FMN1
		TMC4			ZNF394	KIF21A	HIST1H4H	FMN2
		TMC5			ZNF395	KIF26B	HKDC1	FMNL3
		TMCC3			ZNF398	KIF3A	HLA-DPB1	FNBP1
		TMCO4			ZNF407	KIF3B	HLA-DPB2	FNDC3A
		TMED10			ZNF430	KIF5A	HM13	FNDC7
		TMED2			ZNF431	KIF9	HMGB1	FNIP1
		TMED5			ZNF439	KIFC2	HMGCLL1	FNIP2
		TMED6			ZNF44	KIN	HMGCS2	FNTA
		TMEM106A			ZNF471	KIRREL3	HMX2	FOLR2
		TMEM107			ZNF483	KLC1	HN1	FOXA1
		TMEM117			ZNF493	KLC3	HNF4A	FOXA3
		TMEM127			ZNF506	KLF12	HNF4G	FOXK1
		TMEM131			ZNF562	KLF13	HNMT	FOXK2
		TMEM136			ZNF585B	KLF15	HNRNPD	FOXN3
		TMEM144			ZNF595	KLF3	HNRNPK	FOXO1
		TMEM156			ZNF600	KLF6	HOMER1	FOXP1
		TMEM163			ZNF652	KLF8	HOOK1	FOXP2
		TMEM171			ZNF655	KLF9	HOOK3	FOXP3
		TMEM181			ZNF681	KLHDC8A	HOXA13	FOXP4
		TMEM184A			ZNF701	KLHDC9	HOXA3	FOXQ1
		TMEM217			ZNF704	KLHL1	HOXA7	FOXR1
		TMEM25			ZNF708	KLHL12	HOXB13	FOXRED2

		TMEM27			ZNF710	KLHL13	HOXB3	FPR3
		TMEM30B			ZNF717	KLHL15	HP1BP3	FRAS1
		TMEM39A			ZNF721	KLHL24	HPS1	FRMD4A
		TMEM41A			ZNF75A	KLHL28	HRK	FRMD6
		TMEM45B			ZNF789	KLHL29	HS2ST1	FRMPD4
		TMEM50B			ZNF800	KLHL5	HS3ST3B1	FRS2
		TMEM52			ZNF827	KLHL6	HS3ST4	FRZB
		TMEM56			ZNF844	KLHL7	HS6ST1	FST
		TMEM57			ZNF91	KLHL9	HS6ST2	FSTL1
		TMEM59			ZNFX1	KLK12	HS6ST3	FSTL5
		TMEM62			ZSWIM1	KLRG2	HSD17B14	FUBP3
		TMEM86A			ZSWIM6	KNDC1	HSD3B1	FUCA1
		TMEM88			ZXDA	KPNA4	HSDL1	FUK
		TMEM9B				KRBA1	HSF5	FUNDC1
		TMF1				KRIT1	HSPA12B	FUT10
		TMPRSS13				KRT19	HSPA1L	FXR1
		TMPRSS2				KRT80	HSPA5	FXYD5
		TMTC2				KRTAP3-2	HSPB6	FZD1
		TNFRSF11A				KRTAP4-1	HSPB8	FZD3
		TNFSF14				KSR1	HSPD1	FZD4
		TNFSF15				KSR2	HSPH1	GAB1
		TNIP1				L3MBTL2	HTATIP2	GAB3
		TNS3				L3MBTL3	HTRA3	GABBR1
		TOM1L1				L3MBTL4	HYI	GABPA
		TOM1L2				LAMA1	ICA1	GABPB2
		TOR1AIP1				LAMP2	ICA1L	GABRB3
		TOR1AIP2				LARP6	ID4	GAD2
		TP53INP1				LAYN	IDH1	GADD45GIP1
		TPM1				LCA5	IER3IP1	GALM
		TRAF1				LCA5L	IFIT2	GALNT10
		TRAF3IP3				LCORL	IFIT3	GALNT12
		TRAF6				LCP2	IFNGR1	GALNT13
		TRIB1				LDB2	IFRD1	GALNT7
		TRIM25				LDLRAD3	IFT80	GALNT9
		TRIM38				LDOC1L	IGF1	GALP
		TRIM4				LELP1	IGF1R	GALT
		TRIM47				LENG1	IGF2BP2	GAPVD1
		TRIM56				LENG8	IGFBPL1	GART
		TRIM9				LFNG	IGSF10	GAS2L3

		TRIO				LHFP	IGSF21	GATA4
		TRIP11				LHFPL4	IGSF9	GATC
		TRIP12				LIFR	IK	GATM
		TRPM6				LIG4	IKZF2	GBA2
		TSC22D2				LIMCH1	IKZF4	GBP1
		TSHZ1				LIN52	IKZF5	GBP2
		TSHZ2				LIN54	IL17D	GBP3
		TTC17				LIN7B	IL17RA	GBP4
		TTC21A				LINGO1	IL17RB	GCC2
		TTC32				LINGO2	IL17RD	GCLM
		TTC39C				LIPH	IL17RE	GCNT1
		TTC7B				LIX1L	IL18BP	GDA
		TTLL11				LMBR1	IL1RL1	GDAP1
		TTLL7				LMBRD1	IL20RA	GDE1
		TTN				LMBRD2	IL6R	GDI2
		TTYH2				LMCD1	IL6ST	GDNF
		TULP4				LMLN	IMMP1L	GEMIN5
		TWF1				LMO2	IMPAD1	GEMIN6
		TXNDC11				LMO3	INADL	GFI1B
		UBE2D3				LMO4	ING3	GFM2
		UBE2H				LMO7	ING5	GFPT1
		UBE2J1				LMOD2	INHBA	GGCX
		UBE2U				LNPEP	INPP5F	GGNBP2
		UBR3				LNX1	INSM2	GGT1
		UCA1				LONRF1	INTS10	GGT6
		UFM1				LONRF2	INTS2	GGT7
		UGCG				LOXL4	INTS6	GHDC
		UGT8				LPAR3	INTS9	GHRL
		UHMK1				LPAR5	IPO5	GIGYF2
		ULK4				LPGAT1	IPO9	GIMAP1
		USP16				LPP	IPPK	GIMAP2
		USP2				LRCH3	IQCH	GIMAP8
		USP24				LRFN2	IQGAP2	GIPC2
		USP3				LRFN5	IRF1	GIPC3
		USP30				LRG1	IRX2	GIPR
		USP31				LRP10	IRX3	GIT2
		USP34				LRP11	ITCH	GJB2
		USP36				LRPAP1	ITGA1	GJC1
		USP38				LRRC16A	ITGA2	GJD3

		USP43				LRRC28	ITGB2	GK5
		USP47				LRRC34	ITGB4	GKAP1
		USP53				LRRC37A2	ITGB8	GLCCI1
		UTRN				LRRC56	ITGBL1	GLI2
		VAPA				LRRC6	ITLN1	GLI3
		VAV3				LRRC8A	ITPR1	GLIPR1
		VEPH1				LRRC8E	JAG1	GLIS3
		VGLL3				LRRCC1	JAGN1	GLS
		VIL1				LRRFIP1	JAKMIP1	GLT1D1
		VPS13C				LRRFIP2	JAKMIP3	GLT8D2
		VPS36				LRRIQ1	JAM2	GLTSCR2
		VPS37A				LRRK2	JAM3	GLUL
		VPS41				LRRTM1	JARID2	GM2A
		VPS53				LSAMP	JAZF1	GMCL1
		WAC				LSM10	JDP2	GMDS
		WDFY2				LTB4R	JMJD1C	GMIP
		WDFY3				LTBP2	JMY	GNA12
		WDR13				LUC7L	JPH1	GNA13
		WDR19				LUM	JPH3	GNAI1
		WDR26				LY6K	JUND	GNAO1
		WDR31				LYAR	KAAG1	GNAS
		WDR44				LYPD5	KAL1	GNB4
		WDR7				LYRM4	KALRN	GNG11
		WDR72				LYRM7	KANK1	GNG12
		WHAMM				LYSMD1	KANK4	GNG2
		WHSC1L1				LYSMD2	KATNAL1	GNG7
		WNK2				LYSMD3	KATNAL2	GNG8
		WNT9A				LYSMD4	KBTBD3	GNGT2
		WWC1				LZIC	KBTBD6	GNL1
		XBP1				LZTS2	KBTBD7	GNL3
		XDH				MACF1	KCMF1	GNPDA2
		XKR4				MACROD2	KCNA1	GNPTAB
		XPNPEP1				MAFB	KCNB1	GOLGA2
		XRN1				MAFG	KCNC2	GOLGA3
		XRRA1				MAGI2	KCNC4	GOLIM4
		YIPF5				MAGI3	KCNH3	GOLT1A
		YPEL2				MAGT1	KCNIP2	GOLT1B
		YPEL5				MAL2	KCNJ3	GON4L
		YTHDC1				MAMDC2	KCNJ6	GOPC

		ZBTB10				MAMDC4	KCNK10	GOSR2
		ZBTB20				MAML2	KCNK17	GPAM
		ZBTB38				MAN2C1	KCNK3	GPATCH4
		ZBTB4				MANBAL	KCNK6	GPBP1
		ZBTB41				MANEA	KCNMA1	GPC6
		ZBTB43				MANEAL	KCNMB2	GPD2
		ZC3H12C				MAP1B	KCNMB4	GPHN
		ZCCHC2				MAP1LC3A	KCNQ4	GPM6A
		ZCCHC6				MAP2	KCNQ5	GPR110
		ZCCHC7				MAP2K7	KCNRG	GPR126
		ZDHHC1				MAP3K1	KCTD11	GPR155
		ZDHHC2				MAP3K13	KCTD16	GPR158
		ZDHHC9				MAP3K15	KCTD18	GPR160
		ZFAND2A				MAP3K2	KCTD20	GPR176
		ZFHX3				MAP3K3	KCTD6	GPR180
		ZFP28				MAP3K8	KHSRP	GPR26
		ZFP3				MAP4	KIAA0232	GPR39
		ZFX				MAP4K4	KIAA0319L	GPR55
		ZFYVE16				MAP6	KIAA0907	GPR68
		ZFYVE28				MAP7D2	KIAA1147	GPR98
		ZHX1				MAP9	KIAA1161	GPRC5A
		ZMAT1				MAPK1	KIAA1211	GPRC5B
		ZMYM5				MAPK15	KIAA1217	GPRIN1
		ZMYM6				MAPK1IP1L	KIAA1244	GPRIN3
		ZMYND15				MAPK4	KIAA1257	GPSM1
		ZNF10				MAPK6	KIAA1324	GPSM2
		ZNF124				MAPRE3	KIAA1377	GPT2
		ZNF148				MAPT	KIAA1429	GPX2
		ZNF175				MARK1	KIAA1462	GRAMD1A
		ZNF19				MARK3	KIAA1522	GRAMD3
		ZNF25				MARS2	KIAA1524	GRASP
		ZNF264				MARVELD3	KIAA1683	GRB2
		ZNF331				MAST4	KIAA1715	GRIA2
		ZNF350				MASTL	KIAA1841	GRIA3
		ZNF385B				MAT2B	KIAA1919	GRIA4
		ZNF394				MATR3	KIAA1958	GRID1
		ZNF395				MBD1	KIAA2013	GRIK3
		ZNF407				MBD6	KIAA2018	GRIN2A
		ZNF430				MBNL1	KIAA2022	GRIN2B

		ZNF436				MBOAT1	KIDINS220	GRIN3A
		ZNF44				MBOAT2	KIF16B	GRIPAP1
		ZNF471				MBP	KIF19	GRPEL2
		ZNF493				MCC	KIF1A	GSK3B
		ZNF506				MCF2L	KIF1B	GSN
		ZNF540				MCM10	KIF21A	GSTA4
		ZNF555				MCTP1	KIF3A	GSTCD
		ZNF585B				MDGA1	KIF3B	GSTM3
		ZNF595				MDH1B	KIF5A	GSTO2
		ZNF596				MDM2	KIFC2	GSTT1
		ZNF641				ME3	KIN	GTDC1
		ZNF644				MED10	KIRREL2	GTF2A1
		ZNF652				MED19	KIRREL3	GTF2H3
		ZNF655				MED28	KLB	GTF2H5
		ZNF701				MED31	KLC1	GTF2IRD2
		ZNF704				MED4	KLC4	GTF3C4
		ZNF710				MEF2A	KLF12	GTF3C5
		ZNF75A				MEF2D	KLF13	GTF3C6
		ZNF800				MEG3	KLF15	GTPBP1
		ZNF83				MEIS3	KLF3	GTPBP2
		ZNF844				METAP2	KLF6	GTPBP8
		ZNF91				METTL7A	KLF8	GTSE1
		ZSWIM6				METTL9	KLHDC8A	GUCA1B
		ZXDA				MEX3B	KLHDC9	GUCA1C
						MEX3C	KLHL1	GUCY1A2
						MFHAS1	KLHL12	GUCY1A3
						MGA	KLHL15	GUF1
						MGAT3	KLHL23	GUK1
						MGAT5B	KLHL24	GULP1
						MGEA5	KLHL29	GZF1
						MGP	KLHL5	H2AFJ
						MGST1	KLHL7	H2AFV
						MIB1	KLHL8	H6PD
						MICAL2	KLHL9	HACE1
						MICALL2	KLRG2	HAP1
						MIDN	KNDC1	HAPLN4
						MIER1	KPNA4	HARBI1
						MINA	KRCC1	HAS3
						MITF	KRIT1	HAVCR2

						MKKS	KRT19	HAX1
						MKNK2	KRT73	HBEGF
						MKX	KRT80	HBP1
						MLKL	KRTAP3-2	HBS1L
						MLLT1	KRTAP4-1	HCFC1
						MLLT4	KRTCAP2	HCFC2
						MLLT6	KSR2	HCN3
						MMAA	L3MBTL3	HDAC4
						MMD	L3MBTL4	HDAC5
						MMD2	LACTB2	HDAC7
						MNT	LAMA1	HDAC8
						MOGAT3	LAMA3	HDAC9
						MON1B	LAMB4	HDDC3
						MON2	LANCL2	HDHD2
						MORC2	LARP1	HDLBP
						MORF4L1	LARP4	HEATR5A
						MORF4L2	LARP6	HEATR5B
						MORN3	LATS1	HECA
						MOXD1	LATS2	HECTD1
						MPHOSPH8	LCA5L	HECTD2
						MPP5	LCN12	HECW2
						MPP7	LCOR	HERC1
						MPZL1	LCORL	HERC4
						MPZL2	LCP2	HERPUD2
						MPZL3	LDOC1L	HEXA
						MR1	LELP1	HEXIM2
						MRAS	LENG8	HEY2
						MRE11A	LEPROT	HEYL
						MREG	LFNG	HFE
						MRPL2	LGR6	HGD
						MRPL27	LHFP	HGS
						MRPL30	LHFPL4	HGSNAT
						MRPL32	LIFR	HHIP
						MRPL37	LIMCH1	HHLA2
						MRPL43	LIN37	HIAT1
						MRPL44	LIN52	HIATL1
						MRPL54	LIN7B	HIC1
						MRPS23	LIN9	HIF3A
						MRPS26	LINGO1	HIGD1A

						MRTO4	LINGO2	HINT1
						MRVI1	LIPH	HIP1
						MS4A6A	LIX1L	HIPK2
						MSI2	LMAN1	HIPK3
						MSN	LMBRD1	HIST1H2BC
						MSRB2	LMBRD2	HIST1H3E
						MSX1	LMLN	HIST1H4H
						MTA3	LMNA	HIST3H2A
						MTAP	LMO2	HIVEP2
						MTBP	LMO3	HIVEP3
						MTCH2	LMO4	HKDC1
						MTDH	LMO7	HLA-DOA
						MTF1	LNPEP	HLA-DPB1
						MTHFD2L	LNX1	HLA-DPB2
						MTHFR	LNX2	HM13
						MTL5	LOH12CR1	HMGB1
						MTMR14	LONRF1	HMGB2
						MTMR3	LONRF2	HMGB3
						MTMR7	LOXL2	HMGCLL1
						MTMR9	LOXL3	HMGCS2
						MTPN	LOXL4	HMX2
						MTR	LPAR3	HN1
						MTRF1L	LPAR5	HNF4A
						MTUS1	LPCAT2	HNF4G
						MUC12	LPP	HNMT
						MUC15	LRCH1	HNRNPA0
						MUC20	LRCH2	HNRNPC
						MUM1	LRCH3	HNRNPD
						MUSK	LRFN2	HNRNPK
						MVK	LRFN4	HNRNPM
						MXD1	LRFN5	HNRNPR
						MXRA7	LRG1	HOMER1
						MYADM	LRGUK	HOOK1
						MYBL1	LRIG1	HOOK3
						MYCN	LRP10	HORMAD2
						MYEF2	LRP11	HOXA13
						MYH11	LRP3	HOXA3
						MYLIP	LRPAP1	HOXA7
						MYLK	LRRC16A	HOXB13

						MYNN MYO10 MYO19 MYO1C MYO1G MYO9A MYPN MYT1L N4BP2 N4BP2L2 N6AMT2 NAAA NAB1 NADSYN1 NAF1 NAGS NAIF1 NAIP NAMPT NANOS1 NAP1L5 NAPEPLD NAPG NARF NARS NAT14 NAT8L NAV2 NBEA NBN NBPF3 NCAM1 NCOA5 NCOA7 NCOR1 NCOR2 NDFIP1 NDFIP2 NDNL2	LRRC2 LRRC28 LRRC34 LRRC37A2 LRRC4 LRRC8A LRRC8B LRRC8E LRRFIP1 LRRFIP2 LRRK2 LRRN1 LRRTM1 LSAMP LSG1 LSM11 LSM14B LTB4R LTBP2 LTBP3 LTBR LUC7L LUC7L2 LUM LYPD5 LYPD6 LYPLAL1 LYRM4 LYRM5 LYRM7 LYSMD1 LYSMD2 LYSMD3 LYSMD4 LZIC MACF1 MAD2L1 MAEL MAFB	HOXB3 HP1BP3 HPS1 HPS3 HRASLS5 HRK HS2ST1 HS3ST3B1 HS3ST4 HS6ST1 HS6ST2 HS6ST3 HSD17B14 HSD3B1 HSDL1 HSF5 HSPA12B HSPA1L HSPA5 HSPA9 HSPB6 HSPB8 HSPD1 HSPH1 HTATIP2 HTRA3 HYI ICA1 ICA1L ICOSLG ID4 IDH1 IDH3A IER3IP1 IFIT2 IFIT3 IFNAR1 IFNGR1 IFRD1

						NDUFA10	MAFG	IFT172
						NDUFA2	MAGI1	IFT52
						NDUFB4	MAGI2	IFT80
						NDUFB9	MAGI3	IFT81
						NDUFS1	MAGOHB	IGF1
						NEBL	MAGT1	IGF1R
						NECAB1	MALAT1	IGF2BP2
						NEDD4L	MAMDC4	IGFBPL1
						NEFM	MAN2A1	IGSF10
						NEGR1	MANEA	IGSF11
						NEIL2	MANEAL	IGSF21
						NEK10	MAP1B	IGSF9
						NEK9	MAP1LC3A	IK
						NEO1	MAP2	IKZF2
						NEU3	MAP3K15	IKZF4
						NEU4	MAP3K2	IKZF5
						NEXN	MAP3K3	IL17D
						NFASC	MAP3K6	IL17RA
						NFAT5	MAP4	IL17RB
						NFATC2	MAP4K4	IL17RC
						NFATC3	MAP6	IL17RD
						NFIB	MAP6D1	IL17RE
						NFIC	MAP7D2	IL18BP
						NFIX	MAP7D3	IL1RL1
						NFKBIA	MAP9	IL20RA
						NFKBIB	MAPK1	IL20RB
						NFKBIZ	MAPK1IP1L	IL6R
						NFRKB	MAPK4	IL6ST
						NFYC	MAPK8	ILDR1
						NGEF	MAPK8IP3	IMMP1L
						NHLRC2	MAPRE3	IMPAD1
						NHLRC3	MAPT	INADL
						NIN	MARCKS	ING3
						NIPA1	MARK1	ING5
						NISCH	MARK3	INHBA
						NKD1	MARS2	INPP5F
						NKIRAS1	MARVELD2	INSM2
						NKTR	MAST4	INSR
						NLGN1	MBD1	INTS10

						NLGN2	MBD6	INTS2
						NLK	MBNL1	INTS4
						NLRC3	MBNL3	INTS6
						NME7	MBOAT1	INTS9
						NMNAT1	MBOAT2	INTU
						NMNAT3	MBP	IPO5
						NMRAL1	MBTD1	IPO9
						NMUR2	MCC	IPPK
						NNMT	MCEE	IQCH
						NOB1	MCF2L	IQGAP2
						NOL10	MCL1	IQSEC2
						NOL4	MCM10	IRAK1BP1
						NOS1	MCOLN2	IRAK2
						NOTCH4	MCOLN3	IREB2
						NOVA1	MCTP1	IRF1
						NOX4	MCTP2	IRF2BP2
						NOXO1	MCTS1	IRX2
						NPAS3	MDGA1	IRX3
						NPC1L1	MDM4	ISY1
						NPEPL1	ME3	ISYNA1
						NPFFR2	MED1	ITCH
						NPHP1	MED10	ITFG3
						NPHP3	MED11	ITGA1
						NPM1	MED13L	ITGA2
						NPNT	MED17	ITGB2
						NQO2	MED23	ITGB4
						NR1D2	MED28	ITGB8
						NR2F2	MED29	ITGBL1
						NR3C1	MED31	ITLN1
						NRAP	MEF2A	ITPR1
						NRG4	MEF2D	ITSN1
						NRM	MEG3	JAG1
						NRP2	MEI1	JAGN1
						NRSN1	METAP2	JAKMIP1
						NRXN1	METTL3	JAKMIP3
						NSFL1C	METTL4	JAM2
						NSMAF	METTL7A	JAM3
						NSUN4	METTL7B	JARID2
						NT5C1A	METTL9	JAZF1

						NT5DC1	MEX3B	JDP2
						NT5DC3	MEX3D	JMJD1C
						NT5E	MFHAS1	JMJD4
						NTN1	MFI2	JMY
						NTRK2	MFSD11	JPH1
						NUCB2	MFSD4	JPH3
						NUCKS1	MFSD9	JUND
						NUDT16	MGA	KAAG1
						NUDT21	MGAT3	KAL1
						NUDT4	MGAT4A	KALRN
						NUDT6	MGAT4C	KANK1
						NUDT7	MGAT5B	KANK4
						NUFIP2	MGEA5	KATNAL1
						NUMBL	MGP	KATNAL2
						NUP153	MGST1	KBTBD3
						NUP43	MIB1	KBTBD6
						NUP50	MICAL2	KBTBD7
						NUP62	MICAL3	KCMF1
						NUP93	MIER1	KCNA1
						NUPL1	MIPOL1	KCNAB1
						NUS1	MITD1	KCNB1
						OAF	MITF	KCNC1
						OAS2	MKKS	KCNC2
						OBFC1	MKLN1	KCNC3
						OBP2A	MKNK2	KCNC4
						OBSCN	MKX	KCNH3
						OBSL1	MLLT10	KCNH7
						OCIAD2	MLLT4	KCNIP2
						ODF2	MLXIP	KCNJ15
						ODF2L	MLYCD	KCNJ16
						OGFRL1	MMAB	KCNJ3
						OGT	MMD2	KCNJ6
						OLA1	MMP15	KCNK10
						OLFM2	MMP16	KCNK17
						OMA1	MNT	KCNK3
						OPA3	MON1B	KCNK4
						ORAI1	MON2	KCNK6
						ORAOV1	MORC2	KCNMA1
						OSBPL10	MORF4L1	KCNMB2

						OSBPL7	MORF4L2	KCNMB4
						OSBPL8	MOXD1	KCNQ4
						OSGEPL1	MPHOSPH8	KCNQ5
						OSMR	MPHOSPH9	KCNRG
						OSTM1	MPI	KCTD1
						OTUD4	MPP5	KCTD10
						OTUD6B	MPPED1	KCTD11
						OTUD7B	MPZL1	KCTD16
						OVOL1	MPZL2	KCTD18
						OXCT2	MRAS	KCTD20
						OXR1	MREG	KCTD6
						P2RX7	MRO	KDSR
						P2RY8	MRPL2	KHDRBS1
						P4HA1	MRPL27	KHSRP
						P4HA3	MRPL30	KIAA0232
						PACS1	MRPL45	KIAA0319L
						PACSIN1	MRPL50	KIAA0368
						PACSIN2	MRPS10	KIAA0907
						PAIP2	MRPS23	KIAA1147
						PALMD	MRPS25	KIAA1161
						PAPD5	MRPS30	KIAA1211
						PAPLN	MRPS6	KIAA1217
						PAPOLA	MRVI1	KIAA1244
						PAPOLG	MS4A1	KIAA1257
						PAPPA	MS4A4A	KIAA1324
						PAPPA2	MS4A6A	KIAA1324L
						PAQR8	MSI2	KIAA1377
						PARD3B	MSN	KIAA1407
						PARP8	MSRB2	KIAA1429
						PARP9	MSX1	KIAA1462
						PARS2	MTA3	KIAA1468
						PARVA	MTAP	KIAA1522
						PARVB	MTBP	KIAA1524
						PATL1	MTCH2	KIAA1549
						PAWR	MTCP1	KIAA1586
						PAX6	MTDH	KIAA1683
						PBRM1	MTF1	KIAA1715
						PBX4	MTFMT	KIAA1841
						PCBP2	MTHFD2	KIAA1919

						PCDH10	MTHFR	KIAA1958
						PCDH17	MTHFSD	KIAA2013
						PCDH7	MTL5	KIAA2018
						PCDHB14	MTMR12	KIAA2022
						PCDHB16	MTMR3	KIDINS220
						PCDHB2	MTMR6	KIF16B
						PCDHB4	MTMR7	KIF19
						PCDHB6	MTMR9	KIF1A
						PCDHB7	MTO1	KIF1B
						PCF11	MTR	KIF21A
						PCGF3	MTRF1L	KIF26B
						PCGF5	MUC12	KIF3A
						PCM1	MUC17	KIF3B
						PCMTD2	MUC20	KIF5A
						PCNP	MUC4	KIF9
						PCNT	MUM1	KIFC2
						PCNX	MVK	KIN
						PCNXL2	MXD1	KIRREL2
						PCSK6	MXRA7	KIRREL3
						PCSK9	MYBL1	KLB
						PCYOX1	MYCN	KLC1
						PDCD2	MYEF2	KLC3
						PDCD5	MYEOV2	KLC4
						PDCD6IP	MYH11	KLF12
						PDCD7	MYH14	KLF13
						PDDC1	MYL9	KLF15
						PDE1A	MYLIP	KLF3
						PDE3A	MYLK	KLF6
						PDE4D	MYO10	KLF8
						PDE8A	MYO1C	KLF9
						PDE8B	MYO1G	KLHDC8A
						PDK1	MYO5A	KLHDC9
						PDK3	MYO9A	KLHL1
						PDK4	MYPN	KLHL12
						PDLIM5	MYRIP	KLHL13
						PDPN	MYT1L	KLHL15
						PDS5B	N4BP2L1	KLHL23
						PDXDC1	N4BP2L2	KLHL24
						PDXK	NAB1	KLHL28

						PDZD2	NADSYN1	KLHL29
						PDZD4	NAGS	KLHL5
						PELI3	NAIF1	KLHL6
						PERP	NAIP	KLHL7
						PEX13	NAMPT	KLHL8
						PEX26	NANOS1	KLHL9
						PEX5L	NANP	KLK12
						PFKFB2	NAP1L5	KLRG2
						PGBD1	NAPEPLD	KNDC1
						PGK1	NAPG	KPNA4
						PGLS	NARF	KRBA1
						PGM2L1	NARS	KRCC1
						PGM5	NAT14	KRIT1
						PGPEP1	NAT8L	KRT19
						PGR	NAV1	KRT73
						PHACTR2	NAV2	KRT80
						PHACTR4	NBEA	KRTAP3-2
						PHC2	NBN	KRTAP4-1
						PHF10	NBPF3	KRTCAP2
						PHF11	NCDN	KSR1
						PHF20	NCOA5	KSR2
						PHF20L1	NCOA7	L3MBTL2
						PHF21A	NCOR2	L3MBTL3
						PHF5A	NCSTN	L3MBTL4
						PHF6	NDFIP1	LACTB2
						PHF8	NDFIP2	LAMA1
						PHLDA2	NDNL2	LAMA3
						PHLDB2	NDUFA10	LAMB4
						PHLDB3	NDUFA11	LAMP2
						PHPT1	NDUFA2	LANCL2
						PHYHD1	NDUFAF2	LARP1
						PHYHIPL	NDUFB4	LARP4
						PIF1	NDUFV3	LARP6
						PIGK	NEBL	LATS1
						PIGL	NECAB1	LATS2
						PIGS	NECAP2	LAYN
						PINX1	NEDD1	LCA5
						PITPNC1	NEDD9	LCA5L
						PKD1L2	NEFM	LCN12

						PKIA	NEGR1	LCOR
						PKIB	NEIL2	LCORL
						PKP4	NEK10	LCP2
						PLAA	NEK9	LDB2
						PLCD4	NETO2	LDLRAD3
						PLCXD1	NEU3	LDOC1L
						PLCXD3	NEXN	LELP1
						PLD1	NF2	LENG1
						PLD4	NFASC	LENG8
						PLEKHA3	NFAT5	LEPROT
						PLEKHA5	NFATC2	LFNG
						PLEKHA6	NFATC2IP	LGR6
						PLEKHA7	NFE2L3	LHFP
						PLEKHB2	NFIB	LHFPL4
						PLEKHF2	NFIX	LIFR
						PLEKHG1	NFKBIA	LIG4
						PLEKHG2	NFKBIB	LIMCH1
						PLEKHH2	NFKBIZ	LIN37
						PLEKHH3	NFYB	LIN52
						PLSCR1	NHLRC2	LIN54
						PLXDC2	NHLRC3	LIN7B
						PLXNA2	NHP2L1	LIN9
						PLXNA4	NIPA1	LINGO1
						PLXNC1	NIPSNAP3A	LINGO2
						PM20D1	NIPSNAP3B	LIPH
						PMCHL1	NISCH	LIX1L
						PMEPA1	NKAPL	LMAN1
						PNMA3	NKIRAS1	LMBR1
						PNPLA5	NLGN1	LMBRD1
						PNPLA7	NLK	LMBRD2
						PNPLA8	NLRC3	LMCD1
						PNPT1	NLRP2	LMLN
						PODN	NLRP7	LMNA
						POGK	NMD3	LMO2
						POLB	NME7	LMO3
						POLD3	NMNAT3	LMO4
						POLE4	NMUR2	LMO7
						POLR1D	NNMT	LMOD2
						POLR1E	NOD1	LNPEP

						POLR2J2	NOL10	LNX1
						POLR2J4	NOL4	LNX2
						POLR3G	NOL6	LOH12CR1
						POLR3GL	NOM1	LONRF1
						POMT2	NOS1	LONRF2
						POU2F1	NOSTRIN	LOXL2
						PPAPDC1B	NOTCH4	LOXL3
						PPAPDC2	NOVA1	LOXL4
						PPAPDC3	NPAS3	LPAR3
						PPARA	NPC1L1	LPAR5
						PPARD	NPEPL1	LPCAT2
						PPIA	NPFFR2	LPGAT1
						PPIE	NPM1	LPP
						PPIL2	NPM2	LRCH1
						PPM1A	NQO2	LRCH2
						PPM1D	NR1H4	LRCH3
						PPM1E	NR2F2	LRFN2
						PPM1H	NR3C1	LRFN4
						PPM1K	NRAP	LRFN5
						PPM1L	NRD1	LRG1
						PPOX	NRG2	LRGUK
						PPP1CB	NRG4	LRIG1
						PPP1R14C	NRIP3	LRP10
						PPP1R16A	NRM	LRP11
						PPP1R1A	NRP2	LRP3
						PPP1R2	NRXN1	LRPAP1
						PPP1R3C	NRXN3	LRRC16A
						PPP1R3E	NSD1	LRRC2
						PPP1R3F	NSUN4	LRRC28
						PPP1R9A	NSUN7	LRRC34
						PPP1R9B	NT5C1A	LRRC37A2
						PPP2CA	NT5DC1	LRRC4
						PPP2R2D	NT5DC3	LRRC56
						PPP4R2	NT5E	LRRC6
						PPP6C	NTN1	LRRC8A
						PPTC7	NTN4	LRRC8B
						PQLC1	NTRK2	LRRC8E
						PRCP	NTRK3	LRRCC1
						PRDM1	NUCB2	LRRFIP1

						PRDM11	NUCKS1	LRRFIP2
						PRELID1	NUDT10	LRRIQ1
						PRELID2	NUDT21	LRRK2
						PREPL	NUDT4	LRRN1
						PREX1	NUDT7	LRRTM1
						PRICKLE2	NUF2	LSAMP
						PRKAA1	NUFIP2	LSG1
						PRKAB2	NUMA1	LSM10
						PRKACB	NUMBL	LSM11
						PRKAG3	NUP37	LSM14B
						PRKAR1A	NUP93	LTB4R
						PRKAR2A	NUS1	LTBP2
						PRKCE	OAF	LTBP3
						PRKCH	OAS3	LTBR
						PRKD2	OAZ1	LUC7L
						PRKD3	OBFC1	LUC7L2
						PRKG1	OBP2A	LUM
						PRKRA	OBSCN	LY6K
						PRLHR	OCLN	LYAR
						PRLR	ODF2	LYPD5
						PRMT2	OGFRL1	LYPD6
						PRMT6	OGN	LYPLAL1
						PROX1	OGT	LYRM4
						PRPF38A	OLFM2	LYRM5
						PRPF38B	OMA1	LYRM7
						PRPF8	ONECUT2	LYSMD1
						PRR12	OPN3	LYSMD2
						PRR15	OR51E1	LYSMD3
						PRRC1	OR51E2	LYSMD4
						PRRX1	ORAI1	LZIC
						PRSS23	ORAI2	LZTS2
						PRSS27	ORAOV1	MACF1
						PRTFDC1	ORMDL1	MACROD2
						PSD2	ORMDL3	MAD2L1
						PSEN1	OSBPL10	MAEL
						PSMA8	OSBPL11	MAFB
						PSMC2	OSBPL6	MAFG
						PSMF1	OSBPL8	MAGI1
						PSPH	OSGEPL1	MAGI2

						PTCD3	OSMR	MAGI3
						PTCHD1	OSTM1	MAGOHB
						PTEN	OTOP2	MAGT1
						PTGER1	OTUB2	MAL2
						PTGS1	OTUD1	MALAT1
						PTK2	OTUD4	MAMDC2
						PTPLAD1	OTUD6B	MAMDC4
						PTPMT1	OXCT2	MAML2
						PTPN1	OXR1	MAN2A1
						PTPN13	P2RY8	MAN2C1
						PTPN14	P4HA3	MANBAL
						PTPN2	PABPC1L	MANEA
						PTPN21	PACS1	MANEAL
						PTPN3	PACSIN1	MAP1B
						PTPRB	PAG1	MAP1LC3A
						PTPRE	PAIP2	MAP2
						PTPRJ	PAK1	MAP2K7
						PTPRK	PAK3	MAP3K1
						PUM2	PANX1	MAP3K13
						PURB	PAPD4	MAP3K15
						PUS10	PAPLN	MAP3K2
						PVR	PAPOLA	MAP3K3
						PVRL2	PAPOLG	MAP3K6
						PVRL4	PAPPA2	MAP3K8
						PXK	PAQR5	MAP4
						PYGO1	PAQR8	MAP4K4
						PYGO2	PARD3B	MAP6
						QDPR	PARP14	MAP6D1
						QKI	PARP9	MAP7D2
						QRSL1	PARS2	MAP7D3
						QSER1	PARVB	MAP9
						RAB10	PARVG	MAPK1
						RAB11FIP1	PATL1	MAPK15
						RAB12	PAWR	MAPK1IP1L
						RAB18	PAX6	MAPK4
						RAB1A	PBRM1	MAPK6
						RAB21	PCBP2	MAPK8
						RAB27A	PCCA	MAPK8IP3
						RAB27B	PCDH10	MAPRE3

						RAB28	PCDH17	MAPT
						RAB2B	PCDH7	MARCKS
						RAB30	PCDH9	MARK1
						RAB32	PCDHAC2	MARK3
						RAB39B	PCDHB13	MARS2
						RAB3B	PCDHB14	MARVELD2
						RAB3C	PCDHB15	MARVELD3
						RAB3D	PCDHB16	MAST4
						RAB3IP	PCDHB2	MASTL
						RAB40B	PCDHB4	MAT2B
						RAB5A	PCDHB5	MATR3
						RAB7A	PCDHB6	MBD1
						RAB8B	PCDHB7	MBD6
						RAB9B	PCDHB9	MBNL1
						RABEP1	PCDHGC5	MBNL3
						RABGAP1L	PCF11	MBOAT1
						RAD23B	PCGF3	MBOAT2
						RAD52	PCGF5	MBP
						RAI1	PCMTD1	MBTD1
						RALGPS1	PCMTD2	MCC
						RANBP9	PCNP	MCEE
						RANGRF	PCNT	MCF2L
						RAP1A	PCNX	MCL1
						RAP2A	PCSK9	MCM10
						RAPGEF2	PCYT1B	MCOLN2
						RAPGEF6	PDCD2L	MCOLN3
						RAPH1	PDCD6IP	MCTP1
						RASA2	PDCD7	MCTP2
						RASA3	PDE1A	MCTS1
						RASAL1	PDE1C	MDGA1
						RASD1	PDE4A	MDH1B
						RASEF	PDE4D	MDM2
						RASGEF1A	PDE5A	MDM4
						RASGRP3	PDE7A	ME3
						RASIP1	PDE8A	MED1
						RASL11A	PDE8B	MED10
						RASSF4	PDE9A	MED11
						RASSF5	PDGFC	MED13L
						RASSF6	PDGFD	MED17

						RASSF8	PDIA3	MED19
						RAVER2	PDIK1L	MED23
						RBBP6	PDK1	MED28
						RBBP9	PDK3	MED29
						RBM11	PDK4	MED31
						RBM12B	PDLIM3	MED4
						RBM14	PDLIM5	MEF2A
						RBM17	PDPR	MEF2D
						RBM18	PDS5B	MEG3
						RBM41	PDXDC1	MEI1
						RBM47	PDXK	MEIS3
						RBM8A	PDZD2	METAP2
						RBMS1	PDZD8	METTL3
						RBMS2	PEBP4	METTL4
						RBPJ	PECR	METTL7A
						RC3H2	PELI3	METTL7B
						RCAN3	PENK	METTL9
						RCBTB1	PERP	MEX3B
						RCC2	PEX26	MEX3C
						RCOR1	PEX5L	MEX3D
						RCOR3	PFKFB1	MFHAS1
						REC8	PFKFB2	MFI2
						REG3G	PFKP	MFSD11
						REG4	PGAP1	MFSD4
						RELL1	PGBD4	MFSD9
						RELT	PGK1	MGA
						REPIN1	PGLS	MGAT3
						REPS1	PGM2L1	MGAT4A
						REPS2	PGR	MGAT4C
						RERG	PHACTR1	MGAT5B
						REV3L	PHACTR2	MGEA5
						RFESD	PHACTR4	MGP
						RFT1	PHC3	MGST1
						RFTN2	PHF13	MIB1
						RFX1	PHF14	MICAL2
						RFX2	PHF20	MICAL3
						RFX4	PHF20L1	MICALL2
						RFXAP	PHF21A	MIDN
						RGMA	PHF6	MIER1

						RGMB	PHKA1	MINA
						RGS16	PHLDA1	MIPOL1
						RGS22	PHLDB2	MITD1
						RGS5	PHLDB3	MITF
						RGS7BP	PHPT1	MKKS
						RHBDD2	PHTF1	MKLN1
						RHEB	PHYHIPL	MKNK2
						RHOA	PID1	MKX
						RHOB	PIGG	MLKL
						RHOC	PIGK	MLLT1
						RHOJ	PIGN	MLLT10
						RHOT1	PIGR	MLLT4
						RHOV	PIGS	MLLT6
						RIMBP2	PIK3AP1	MLXIP
						RIMS2	PITPNC1	MLYCD
						RIMS4	PITPNM2	MMAA
						RIN2	PITRM1	MMAB
						RIOK1	PIWIL4	MMD
						RIPK4	PKHD1	MMD2
						RIT1	PKIA	MMP15
						RNASEH1	PKIB	MMP16
						RNASEL	PLA2G12A	MNT
						RNF130	PLAA	MOGAT3
						RNF14	PLCG2	MON1B
						RNF145	PLCXD1	MON2
						RNF146	PLCXD3	MORC2
						RNF150	PLD1	MORF4L1
						RNF157	PLEKHA1	MORF4L2
						RNF169	PLEKHA5	MORN3
						RNF180	PLEKHA6	MOXD1
						RNF182	PLEKHA7	MPHOSPH8
						RNF185	PLEKHB1	MPHOSPH9
						RNF19A	PLEKHB2	MPI
						RNF213	PLEKHF2	MPP5
						RNF214	PLEKHG2	MPP7
						RNF215	PLEKHG4	MPPED1
						RNF219	PLEKHH1	MPZL1
						RNF24	PLEKHH3	MPZL2
						RNF38	PLSCR1	MPZL3

						RNPC3	PLSCR2	MR1
						RNPS1	PLXNA2	MRAS
						ROBO2	PLXNA4	MRE11A
						ROCK1	PLXNC1	MREG
						ROR1	PM20D1	MRO
						RORB	PMCHL1	MRPL2
						RPA1	PMEPA1	MRPL27
						RPAIN	PML	MRPL30
						RPGRIP1L	PNMA3	MRPL32
						RPL10A	PNPLA7	MRPL37
						RPL14	PNPLA8	MRPL43
						RPL15	PNPT1	MRPL44
						RPL18	PODN	MRPL45
						RPL19	POLD3	MRPL50
						RPL22L1	POLE4	MRPL54
						RPL27	POLH	MRPS10
						RPL32P3	POLI	MRPS23
						RPL34	POLR1D	MRPS25
						RPL35	POLR2J2	MRPS26
						RPL36A	POLR2J4	MRPS30
						RPL6	POLR3E	MRPS6
						RPL7	POLR3GL	MRTO4
						RPL9	POMT2	MRVI1
						RPS10	POU2F1	MS4A1
						RPS14	POU2F2	MS4A4A
						RPS15A	PPAPDC1B	MS4A6A
						RPS19	PPAPDC3	MSI2
						RPS19BP1	PPARA	MSN
						RPS25	PPARD	MSRB2
						RPS27	PPHLN1	MSX1
						RPS5	PPIA	MTA3
						RPS6	PPIL2	MTAP
						RPS6KA3	PPIL3	MTBP
						RPS6KA6	PPM1A	MTCH2
						RPS6KL1	PPM1E	MTCP1
						RPS7	PPM1H	MTDH
						RPUSD3	PPM1K	MTF1
						RPUSD4	PPM1L	MTFMT
						RRBP1	PPME1	MTHFD2

						RRM2B	PPP1R12C	MTHFD2L
						RSBN1	PPP1R14A	MTHFR
						RSPH1	PPP1R14C	MTHFSD
						RSPO1	PPP1R16A	MTL5
						RSRC1	PPP1R16B	MTMR12
						RTBDN	PPP1R1A	MTMR14
						RTN3	PPP1R1B	MTMR3
						RUFY3	PPP1R1C	MTMR6
						RUNDC1	PPP1R3B	MTMR7
						RUNX1T1	PPP1R3C	MTMR9
						RWDD2A	PPP1R3E	MTO1
						RYBP	PPP1R3F	MTPN
						S100A10	PPP1R9A	MTR
						S100PBP	PPP1R9B	MTRF1L
						S1PR5	PPP2R2A	MTUS1
						SALL1	PPP2R2D	MUC12
						SALL4	PPP2R3C	MUC15
						SAMD1	PPP4R2	MUC17
						SAMD12	PPP6C	MUC20
						SAMD13	PQLC1	MUC4
						SAMD3	PRDM1	MUM1
						SAMD5	PRDM11	MUSK
						SAMM50	PRDM16	MVK
						SAP30BP	PREPL	MXD1
						SARDH	PREX1	MXRA7
						SART1	PRICKLE1	MYADM
						SASH1	PRICKLE2	MYBL1
						SAV1	PRKAB2	MYCN
						SBF2	PRKACB	MYEF2
						SCAF1	PRKAG2	MYEOV2
						SCAMP4	PRKAR1A	MYH11
						SCAMP5	PRKCE	MYH14
						SCAND1	PRKCH	MYL9
						SCARB1	PRKD3	MYLIP
						SCARB2	PRKRA	MYLK
						SCD5	PRLR	MYNN
						SCFD1	PRMT2	MYO10
						SCGB3A1	PRNT	MYO19
						SCN2B	PRODH2	MYO1C

						SCN4B	PROK2	MYO1G
						SCN8A	PROM2	MYO5A
						SCN9A	PRPF38A	MYO9A
						SCOC	PRPF40A	MYPN
						SCRG1	PRPF8	MYRIP
						SCRN2	PRPS2	MYT1L
						SCRT1	PRR12	N4BP2
						SCUBE3	PRRC1	N4BP2L1
						SDAD1	PRRX1	N4BP2L2
						SDCCAG3	PRUNE	N6AMT2
						SDF4	PSAT1	NAAA
						SDK1	PSEN1	NAB1
						SEC11C	PSMA5	NADSYN1
						SEC22A	PSMB2	NAF1
						SEC22C	PSPC1	NAGS
						SEC24A	PSPH	NAIF1
						SEC61A2	PTBP1	NAIP
						SEC61B	PTEN	NAMPT
						SEC62	PTER	NANOS1
						SECISBP2	PTGER1	NANP
						SEH1L	PTGFRN	NAP1L5
						SEMA3A	PTGS1	NAPEPLD
						SEMA4D	PTK2	NAPG
						SEMA5A	PTP4A1	NARF
						SEMA6A	PTPLAD1	NARS
						SEMA6D	PTPN1	NAT14
						SENP1	PTPN13	NAT8L
						SENP2	PTPN14	NAV1
						SENP7	PTPN2	NAV2
						SEPN1	PTPN21	NBEA
						SEPP1	PTPN23	NBN
						SERINC2	PTPN3	NBPF3
						SERP2	PTPN4	NCAM1
						SERPINA1	PTPRB	NCDN
						SERPINB6	PTPRE	NCOA5
						SERPINB9	PTPRJ	NCOA7
						SERPINE2	PTPRS	NCOR1
						SESN2	PUM2	NCOR2
						SESN3	PUS10	NCSTN

						SETBP1	PUS7L	NDFIP1
						SETD4	PVRL1	NDFIP2
						SETD5	PVRL2	NDNL2
						SETD7	PVRL4	NDUFA10
						SETD8	PWWP2A	NDUFA11
						SETX	PXK	NDUFA2
						SEZ6L	PYDC1	NDUFAF2
						SEZ6L2	PYGB	NDUFB4
						SF3A1	PYGO1	NDUFB9
						SFMBT2	PYGO2	NDUFS1
						SFPQ	PYROXD1	NDUFV3
						SFRP1	QDPR	NEBL
						SFRP2	QKI	NECAB1
						SFT2D1	QSOX1	NECAP2
						SFXN1	QSOX2	NEDD1
						SFXN4	RAB10	NEDD4L
						SFXN5	RAB11FIP1	NEDD9
						SGCB	RAB11FIP3	NEFM
						SGIP1	RAB11FIP4	NEGR1
						SGK2	RAB12	NEIL2
						SGOL1	RAB18	NEK10
						SGPP2	RAB21	NEK9
						SGSM1	RAB23	NEO1
						SGTB	RAB24	NETO2
						SH2D5	RAB27A	NEU3
						SH3BGRL2	RAB28	NEU4
						SH3GLB2	RAB2B	NEXN
						SH3KBP1	RAB32	NF2
						SH3PXD2A	RAB37	NFASC
						SH3PXD2B	RAB39B	NFAT5
						SHANK2	RAB3B	NFATC2
						SHC4	RAB3C	NFATC2IP
						SHISA2	RAB3D	NFATC3
						SHISA5	RAB3GAP1	NFE2L3
						SHROOM3	RAB3IP	NFIB
						SIN3A	RAB5A	NFIC
						SIPA1L1	RAB6B	NFIX
						SIPA1L2	RAB9B	NFKBIA
						SIPA1L3	RABEP1	NFKBIB

						SIRT6	RABGAP1L	NFKBIZ
						SKI	RABL3	NFRKB
						SLAIN1	RAD23B	NFYB
						SLAIN2	RAD50	NFYC
						SLAMF7	RAD52	NGEF
						SLC10A7	RADIL	NHLRC2
						SLC11A1	RAI1	NHLRC3
						SLC11A2	RALA	NHP2L1
						SLC12A3	RALBP1	NIN
						SLC14A1	RALGPS1	NIPA1
						SLC15A4	RALGPS2	NIPSNAP3A
						SLC16A10	RANBP2	NIPSNAP3B
						SLC16A6	RANBP9	NISCH
						SLC16A7	RANGRF	NKAPL
						SLC16A9	RAP1GDS1	NKD1
						SLC17A5	RAP2A	NKIRAS1
						SLC1A2	RAP2B	NKTR
						SLC1A4	RAPGEF6	NLGN1
						SLC20A1	RAPH1	NLGN2
						SLC22A15	RARS2	NLK
						SLC22A23	RASA2	NLRC3
						SLC22A5	RASAL1	NLRP2
						SLC23A3	RASAL2	NLRP7
						SLC25A2	RASD1	NMD3
						SLC25A23	RASEF	NME7
						SLC25A26	RASGEF1A	NMNAT1
						SLC25A28	RASIP1	NMNAT3
						SLC25A29	RASL11B	NMRAL1
						SLC25A33	RASSF4	NMUR2
						SLC25A37	RASSF5	NNMT
						SLC25A39	RASSF8	NOB1
						SLC25A40	RASSF9	NOD1
						SLC25A45	RAVER2	NOL10
						SLC25A46	RBAK	NOL4
						SLC26A11	RBBP6	NOL6
						SLC26A9	RBBP9	NOM1
						SLC27A1	RBM11	NOS1
						SLC2A12	RBM12B	NOSTRIN
						SLC2A13	RBM14	NOTCH4

						SLC2A4RG	RBM18	NOVA1
						SLC2A8	RBM25	NOX4
						SLC30A2	RBM27	NOXO1
						SLC30A8	RBM5	NPAS3
						SLC30A9	RBMS1	NPC1L1
						SLC31A1	RBMS2	NPEPL1
						SLC33A1	RBMS3	NPFFR2
						SLC35B4	RBP7	NPHP1
						SLC35E1	RBPJ	NPHP3
						SLC35F1	RBPMS	NPM1
						SLC35F3	RC3H1	NPM2
						SLC36A4	RC3H2	NPNT
						SLC37A3	RCAN3	NQO2
						SLC38A10	RCBTB1	NR1D2
						SLC38A11	RCC2	NR1H4
						SLC38A5	RCL1	NR2F2
						SLC38A7	RCOR1	NR3C1
						SLC39A10	RCOR3	NRAP
						SLC39A13	RDH10	NRD1
						SLC39A3	RDH11	NRG2
						SLC41A1	REG3A	NRG4
						SLC43A2	REG3G	NRIP3
						SLC44A5	REG4	NRM
						SLC45A3	REL	NRP2
						SLC4A8	RELL1	NRSN1
						SLC5A1	RELT	NRXN1
						SLC6A13	REPIN1	NRXN3
						SLC6A17	REPS1	NSD1
						SLC6A19	REPS2	NSFL1C
						SLC6A20	RERG	NSMAF
						SLC6A4	REV1	NSUN4
						SLC6A6	REXO2	NSUN7
						SLC7A14	RFFL	NT5C1A
						SLC7A2	RFT1	NT5DC1
						SLC8A1	RFTN2	NT5DC3
						SLC9A1	RFX1	NT5E
						SLC9A9	RFX2	NTN1
						SLCO3A1	RFX4	NTN4
						SLCO5A1	RFXAP	NTRK2

						SLITRK2	RGL3	NTRK3
						SLITRK6	RGMA	NUCB2
						SLU7	RGMB	NUCKS1
						SMAD1	RGS12	NUDT10
						SMAD9	RGS16	NUDT16
						SMAP2	RGS22	NUDT21
						SMARCA2	RGS5	NUDT4
						SMARCB1	RGS7BP	NUDT6
						SMARCD3	RHBDD2	NUDT7
						SMARCE1	RHBDF1	NUF2
						SMC5	RHEB	NUFIP2
						SMCHD1	RHOA	NUMA1
						SMEK1	RHOB	NUMBL
						SMNDC1	RHOF	NUP153
						SMOC2	RHOT1	NUP37
						SMPD3	RHOU	NUP43
						SMU1	RHOV	NUP50
						SMUG1	RHPN1	NUP62
						SMYD4	RHPN2	NUP93
						SNAP29	RIBC1	NUPL1
						SNAPC3	RICTOR	NUS1
						SNCA	RILP	OAF
						SNRPA1	RIMBP2	OAS2
						SNRPN	RIMS2	OAS3
						SNTB1	RIMS4	OAZ1
						SNX12	RIOK1	OBFC1
						SNX16	RIOK2	OBP2A
						SNX2	RIPK3	OBSCN
						SNX21	RIPK4	OBSL1
						SNX22	RIT1	OCIAD2
						SNX29	RNASEL	OCLN
						SNX3	RNASET2	ODF2
						SNX32	RNF126	ODF2L
						SNX33	RNF130	OGFRL1
						SNX5	RNF135	OGN
						SNX9	RNF14	OGT
						SOAT1	RNF141	OLA1
						SOBP	RNF145	OLFM2
						SOCS2	RNF146	OMA1

						SOCS4	RNF149	ONECUT2
						SOCS6	RNF150	OPA3
						SOCS7	RNF166	OPN3
						SON	RNF185	OR51E1
						SORBS1	RNF19A	OR51E2
						SORCS1	RNF212	ORAI1
						SORD	RNF213	ORAI2
						SORL1	RNF214	ORAOV1
						SORT1	RNF219	ORMDL1
						SOS1	RNF38	ORMDL3
						SOS2	RNPS1	OSBPL10
						SOST	ROBO2	OSBPL11
						SOX17	ROCK1	OSBPL6
						SOX5	ROR1	OSBPL7
						SOX6	RORB	OSBPL8
						SOX7	RP9	OSGEPL1
						SOX8	RP9P	OSMR
						SP100	RPA1	OSTM1
						SP110	RPAIN	OTOP2
						SP2	RPE	OTUB2
						SP3	RPH3AL	OTUD1
						SP5	RPL10A	OTUD4
						SPAG16	RPL18	OTUD6B
						SPAG9	RPL24	OTUD7B
						SPATA17	RPL32P3	OVOL1
						SPATA18	RPL34	OXCT2
						SPATA5	RPL35A	OXR1
						SPATA7	RPL37	P2RX7
						SPCS2	RPL7	P2RY8
						SPG20	RPL9	P4HA1
						SPIN1	RPP25	P4HA3
						SPIN4	RPS10	PABPC1L
						SPIRE1	RPS14	PACS1
						SPIRE2	RPS23	PACSIN1
						SPNS1	RPS24	PACSIN2
						SPNS2	RPS25	PAG1
						SPNS3	RPS29	PAIP2
						SPON1	RPS5	PAK1
						SPOPL	RPS6KA3	PAK3

						SPRY1 SPRYD3 SPSB1 SPTBN4 SPTLC2 SPTLC3 SRA1 SRD5A2 SREBF2 SRP68 SRPK2 SRRD SSBP2 SSFA2 SSPN SSR1 SSR3 SSTR1 SSTR2 SSU72 ST3GAL2 ST3GAL3 ST6GALNAC3 ST6GALNAC5 ST6GALNAC6 ST8SIA2 ST8SIA3 ST8SIA4 STAC2 STAMBP STAMBPL1 STARD13 STARD3NL STARD4 STARD7 STARD9	RPS6KA6 RPS6KB1 RPUSD1 RPUSD4 RRAD RRBP1 RRM2B RRP1 RSAD2 RSBN1 RSPH1 RSPH3 RSPO1 RSPO3 RSPRY1 RSRC1 RSU1 RTBDN RTKN2 RTN3 RTN4RL1 RTTN RUFY1 RUFY2 RUFY3 RUNDC1 RUNX1T1 S100A10 S100A16 S100A6 S100PBP S1PR2 S1PR5 SAE1 SALL1 SAMD12 SAMD13 SAMD3 SAMD5	PALMD PANX1 PAPD4 PAPD5 PAPLN PAPOLA PAPOLG PAPPA PAPPA2 PAQR5 PAQR8 PARD3B PARP14 PARP8 PARP9 PARS2 PARVA PARVB PARVG PATL1 PAWR PAX6 PBRM1 PBX4 PCBP2 PCCA PCDH10 PCDH17 PCDH7 PCDH9 PCDHAC2 PCDHB13 PCDHB14 PCDHB15 PCDHB16 PCDHB2 PCDHB4 PCDHB5 PCDHB6

						STAT3	SAMHD1	PCDHB7
						STAU2	SAMM50	PCDHB9
						STEAP2	SAP30BP	PCDHGC5
						STEAP4	SAR1B	PCF11
						STK11	SARM1	PCGF3
						STK11IP	SART3	PCGF5
						STK19	SASH1	PCM1
						STK31	SAV1	PCMTD1
						STK33	SCAF1	PCMTD2
						STK35	SCAMP2	PCNP
						STK40	SCAMP5	PCNT
						STMN3	SCAND1	PCNX
						STON1	SCARB1	PCNXL2
						STT3B	SCARF2	PCSK6
						STUB1	SCD5	PCSK9
						STX3	SCFD1	PCYOX1
						STX4	SCFD2	PCYT1B
						STXBP5	SCGB3A2	PDCD2
						STXBP5L	SCN11A	PDCD2L
						STXBP6	SCN2B	PDCD5
						STYXL1	SCN4B	PDCD6IP
						SUCLG1	SCN7A	PDCD7
						SUFU	SCN8A	PDDC1
						SULF2	SCNN1G	PDE1A
						SUPT16H	SCO1	PDE1C
						SURF4	SCOC	PDE3A
						SUSD1	SCRG1	PDE4A
						SUSD4	SCRN2	PDE4D
						SUV420H2	SCRN3	PDE5A
						SV2B	SCYL2	PDE7A
						SVEP1	SCYL3	PDE8A
						SVIP	SDAD1	PDE8B
						SVOP	SDHC	PDE9A
						SYCE1	SDK1	PDGFC
						SYCP2	SEC11C	PDGFD
						SYNCRIP	SEC14L1	PDIA3
						SYNE1	SEC14L2	PDIK1L
						SYNE2	SEC14L4	PDK1
						SYNGAP1	SEC16B	PDK3

						SYNGR2	SEC22C	PDK4
						SYNJ1	SEC24A	PDLIM3
						SYNJ2	SEC61B	PDLIM5
						SYNPO2	SEC62	PDPN
						SYNPR	SEC63	PDPR
						SYS1	SEH1L	PDS5B
						SYT11	SEMA3A	PDXDC1
						SYT12	SEMA4F	PDXK
						SYT13	SEMA5A	PDZD2
						SYT16	SEMA6A	PDZD4
						SYT17	SEMA6D	PDZD8
						SYT4	SENP1	PEBP4
						SYT7	SENP7	PECR
						TACC1	SENP8	PELI3
						TAF13	SEPN1	PENK
						TAF15	SEPSECS	PERP
						TAF4B	SERINC2	PEX13
						TAF9B	SERP2	PEX26
						TAGLN	SERPINA1	PEX5L
						TANC2	SERPINB1	PFKFB1
						TAP2	SERPINB9	PFKFB2
						TAPT1	SERPINE2	PFKP
						TARDBP	SERTAD1	PGAP1
						TAS2R5	SERTAD4	PGBD1
						TASP1	SESN2	PGBD4
						TATDN1	SETD4	PGK1
						TBC1D1	SETD5	PGLS
						TBC1D22B	SETD7	PGM2L1
						TBC1D24	SETD8	PGM5
						TBC1D25	SETDB2	PGPEP1
						TBC1D2B	SETX	PGR
						TBC1D7	SEZ6L	PHACTR1
						TBC1D8B	SEZ6L2	PHACTR2
						TBCD	SF3A1	PHACTR4
						TBL1XR1	SFMBT2	PHC2
						TBRG1	SFPQ	PHC3
						TBX15	SFRP2	PHF10
						TBX3	SFXN5	PHF11
						TC2N	SGCD	PHF13

						TCEA2	SGIP1	PHF14
						TCEAL7	SGK2	PHF20
						TCEAL8	SGOL1	PHF20L1
						TCERG1L	SGOL2	PHF21A
						TCF4	SGPP2	PHF5A
						TCFL5	SGSM1	PHF6
						TCOF1	SGTB	PHF8
						TCP10L	SH2D5	PHKA1
						TCTEX1D2	SH3BP4	PHLDA1
						TCTN2	SH3KBP1	PHLDA2
						TDRD9	SH3PXD2A	PHLDB2
						TEAD1	SH3PXD2B	PHLDB3
						TEAD2	SH3RF1	PHPT1
						TEF	SHANK2	PHTF1
						TEP1	SHF	PHYHD1
						TES	SHMT1	PHYHIPL
						TESC	SHPRH	PID1
						TET1	SIAE	PIF1
						TET2	SIN3A	PIGG
						TEX11	SIPA1L1	PIGK
						TEX264	SIPA1L3	PIGL
						TFB1M	SIRPG	PIGN
						TFDP1	SIRT5	PIGR
						TFG	SIX3	PIGS
						TGDS	SIX4	PIK3AP1
						TGFBRAP1	SKAP2	PINX1
						TGIF1	SKI	PITPNC1
						THAP2	SKIL	PITPNM2
						THAP6	SLAIN1	PITRM1
						THBD	SLAIN2	PIWIL4
						THNSL1	SLC10A4	PKD1L2
						THOC2	SLC10A7	PKHD1
						THRAP3	SLC12A2	PKIA
						THSD4	SLC12A4	PKIB
						THSD7A	SLC12A6	PKP4
						TIFA	SLC12A9	PLA2G12A
						TIGD7	SLC13A2	PLAA
						TIMP2	SLC14A1	PLCD4
						TJP2	SLC16A10	PLCG2

						TK2	SLC16A6	PLCXD1
						TKT	SLC16A7	PLCXD3
						TLE3	SLC16A9	PLD1
						TLN2	SLC17A5	PLD4
						TLR3	SLC1A2	PLEKHA1
						TM4SF18	SLC1A4	PLEKHA3
						TM7SF3	SLC20A1	PLEKHA5
						TMBIM4	SLC22A15	PLEKHA6
						TMC5	SLC22A23	PLEKHA7
						TMC8	SLC23A3	PLEKHB1
						TMCC1	SLC25A15	PLEKHB2
						TMCC3	SLC25A2	PLEKHF2
						TMCO3	SLC25A25	PLEKHG1
						TMCO4	SLC25A27	PLEKHG2
						TMED2	SLC25A28	PLEKHG4
						TMED4	SLC25A29	PLEKHH1
						TMED5	SLC25A35	PLEKHH2
						TMED8	SLC25A36	PLEKHH3
						TMEM101	SLC25A37	PLSCR1
						TMEM102	SLC25A40	PLSCR2
						TMEM106B	SLC25A42	PLXDC2
						TMEM106C	SLC25A46	PLXNA2
						TMEM107	SLC26A11	PLXNA4
						TMEM108	SLC26A8	PLXNC1
						TMEM121	SLC28A3	PM20D1
						TMEM130	SLC2A11	PMCHL1
						TMEM131	SLC2A12	PMEPA1
						TMEM132A	SLC2A13	PML
						TMEM132B	SLC2A4RG	PNMA3
						TMEM132D	SLC2A5	PNPLA5
						TMEM138	SLC2A8	PNPLA7
						TMEM139	SLC30A2	PNPLA8
						TMEM143	SLC30A4	PNPT1
						TMEM154	SLC30A5	PODN
						TMEM163	SLC30A8	POGK
						TMEM171	SLC30A9	POLB
						TMEM176B	SLC33A1	POLD3
						TMEM185A	SLC35A4	POLE4
						TMEM196	SLC35B4	POLH

						TMEM200A	SLC35C2	POLI
						TMEM204	SLC35E1	POLR1D
						TMEM25	SLC35F3	POLR1E
						TMEM27	SLC35F5	POLR2J2
						TMEM30B	SLC36A4	POLR2J4
						TMEM33	SLC37A1	POLR3E
						TMEM38A	SLC37A3	POLR3G
						TMEM38B	SLC38A10	POLR3GL
						TMEM39A	SLC38A11	POMT2
						TMEM42	SLC38A5	POU2F1
						TMEM44	SLC38A7	POU2F2
						TMEM52	SLC38A9	PPAPDC1B
						TMEM55A	SLC39A13	PPAPDC2
						TMEM55B	SLC39A8	PPAPDC3
						TMEM57	SLC41A1	PPARA
						TMEM59	SLC41A3	PPARD
						TMEM61	SLC43A2	PPHLN1
						TMEM64	SLC44A1	PPIA
						TMEM65	SLC44A2	PPIE
						TMEM68	SLC44A5	PPIL2
						TMEM69	SLC45A3	PPIL3
						TMEM9	SLC46A1	PPM1A
						TMEM92	SLC47A2	PPM1D
						TMEM98	SLC4A8	PPM1E
						TMEM9B	SLC5A1	PPM1H
						TMLHE	SLC6A13	PPM1K
						TMOD2	SLC6A17	PPM1L
						TMPRSS13	SLC6A19	PPME1
						TMPRSS3	SLC6A20	PPOX
						TMPRSS6	SLC6A4	PPP1CB
						TMTC1	SLC6A6	PPP1R12C
						TNFAIP8	SLC7A14	PPP1R14A
						TNFRSF10D	SLC7A2	PPP1R14C
						TNFRSF11A	SLC7A6OS	PPP1R16A
						TNFRSF19	SLC8A1	PPP1R16B
						TNFSF14	SLC9A9	PPP1R1A
						TNIK	SLCO5A1	PPP1R1B
						TNIP1	SLFN11	PPP1R1C
						TNKS1BP1	SLFN5	PPP1R2

						TNPO1	SLITRK2	PPP1R3B
						TNRC18	SLITRK6	PPP1R3C
						TNRC6A	SLMAP	PPP1R3E
						TNRC6B	SLU7	PPP1R3F
						TNRC6C	SMAD1	PPP1R9A
						TNS3	SMAD5	PPP1R9B
						TOLLIP	SMAD9	PPP2CA
						TOM1L1	SMAP2	PPP2R2A
						TOM1L2	SMARCA2	PPP2R2D
						TOMM22	SMARCB1	PPP2R3C
						TOMM40L	SMARCE1	PPP4R2
						TOP1MT	SMC1A	PPP6C
						TOR3A	SMCHD1	PPTC7
						TOX2	SMEK1	PQLC1
						TOX3	SMEK2	PRCP
						TP53INP1	SMG7	PRDM1
						TP53INP2	SMNDC1	PRDM11
						TP73	SMOC1	PRDM16
						TPD52	SMOC2	PRELID1
						TPK1	SMPD3	PRELID2
						TPM1	SMU1	PREPL
						TPM2	SMYD4	PREX1
						TPM3	SNCA	PRICKLE1
						TRA2A	SNIP1	PRICKLE2
						TRAF1	SNRPA1	PRKAA1
						TRAF3IP1	SNRPN	PRKAB2
						TRAK1	SNTB1	PRKACB
						TRAM1L1	SNX12	PRKAG2
						TRERF1	SNX13	PRKAG3
						TRIB1	SNX16	PRKAR1A
						TRIM11	SNX18	PRKAR2A
						TRIM2	SNX2	PRKCE
						TRIM32	SNX21	PRKCH
						TRIM4	SNX22	PRKD2
						TRIM47	SNX25	PRKD3
						TRIM5	SNX29	PRKG1
						TRIM50	SNX3	PRKRA
						TRIM55	SNX32	PRLHR
						TRIM6	SNX33	PRLR

						TRIM8	SNX5	PRMT2
						TRIM9	SNX9	PRMT6
						TRIOBP	SOAT1	PRNT
						TRIP12	SOBP	PRODH2
						TRMT5	SOCS2	PROK2
						TRPC4	SOCS3	PROM2
						TRPM3	SOCS4	PROX1
						TRPM6	SON	PRPF38A
						TRPS1	SORBS1	PRPF38B
						TRUB1	SORBS2	PRPF40A
						TSC22D2	SORL1	PRPF8
						TSEN54	SORT1	PRPS2
						TSHZ1	SOS1	PRR12
						TSHZ2	SOST	PRR15
						TSHZ3	SOX17	PRRC1
						TSPAN12	SOX5	PRRX1
						TSPAN2	SOX6	PRSS23
						TSPAN3	SP1	PRSS27
						TSPAN33	SP100	PRTFDC1
						TSPAN5	SP3	PRUNE
						TSPYL6	SP4	PSAT1
						TSR1	SP5	PSD2
						TTBK2	SPAG16	PSEN1
						TTC17	SPAG7	PSMA5
						TTC23	SPAG9	PSMA8
						TTC26	SPATA12	PSMB2
						TTC33	SPATA13	PSMC2
						TTC5	SPATA18	PSMF1
						TTC7A	SPATA19	PSPC1
						TTC8	SPATA6	PSPH
						TTC9C	SPATA7	PTBP1
						TTLL11	SPCS2	PTCD3
						TTLL7	SPCS3	PTCHD1
						TTYH2	SPDYA	PTEN
						TUB	SPG11	PTER
						TUBB1	SPG20	PTGER1
						TUBE1	SPG7	PTGFRN
						TUFM	SPIN1	PTGS1
						TUG1	SPIN4	PTK2

						TULP4	SPINT1	PTP4A1
						TUSC1	SPIRE1	PTPLAD1
						TUSC3	SPIRE2	PTPMT1
						TWISTNB	SPNS3	PTPN1
						TWSG1	SPOCD1	PTPN13
						TXNDC11	SPON1	PTPN14
						TXNDC12	SPOP	PTPN2
						TXNL4B	SPOPL	PTPN21
						U2AF1	SPRED1	PTPN23
						UACA	SPRY1	PTPN3
						UBA5	SPRY3	PTPN4
						UBAC2	SPSB1	PTPRB
						UBASH3B	SPTAN1	PTPRE
						UBE2B	SPTBN1	PTPRJ
						UBE2D3	SPTBN4	PTPRK
						UBE2G1	SPTLC2	PTPRS
						UBE2J2	SPTLC3	PUM2
						UBE2K	SRD5A3	PURB
						UBE2Q2	SRGAP1	PUS10
						UBE2T	SRMS	PUS7L
						UBE2W	SRPK2	PVR
						UBE2Z	SRPRB	PVRL1
						UBE3C	SRXN1	PVRL2
						UBFD1	SSBP2	PVRL4
						UBQLN1	SSFA2	PWWP2A
						UBQLN2	SSR1	PXK
						UBR1	SSR3	PYDC1
						UBR3	SSTR1	PYGB
						UBTF	SSTR2	PYGO1
						UCKL1	ST3GAL1	PYGO2
						UEVLD	ST3GAL2	PYROXD1
						UGT1A6	ST6GAL2	QDPR
						UHMK1	ST6GALNAC	QKI
						UHRF2	5	QRSL1
						ULK4	ST8SIA2	QSER1
						UNC119B	ST8SIA3	QSOX1
						UNC13A	ST8SIA4	QSOX2
						UNC45B	STAG1	RAB10
						UNC5B	STAMBPL1	RAB11FIP1

						UNC5C	STARD3NL	RAB11FIP3
						UNC5D	STARD7	RAB11FIP4
						UPRT	STARD9	RAB12
						URM1	STAT3	RAB18
						USP16	STAU2	RAB1A
						USP2	STEAP2	RAB21
						USP22	STIM2	RAB23
						USP3	STK11IP	RAB24
						USP30	STK17B	RAB27A
						USP32	STK35	RAB27B
						USP34	STK4	RAB28
						USP35	STK40	RAB2B
						USP37	STMN3	RAB30
						USP38	STON1	RAB32
						USP40	STON2	RAB37
						USP47	STRBP	RAB39B
						USP48	STRN	RAB3B
						USP7	STT3B	RAB3C
						USP9Y	STX4	RAB3D
						UTP11L	STX6	RAB3GAP1
						UTP15	STXBP5L	RAB3IP
						UTP6	STXBP6	RAB40B
						UTRN	SUCLG1	RAB5A
						UXS1	SULF2	RAB6B
						VANGL1	SULT1C2	RAB7A
						VAPA	SUPT16H	RAB8B
						VASH1	SURF4	RAB9B
						VASN	SURF6	RABEP1
						VAV2	SUSD1	RABGAP1L
						VAV3	SUSD4	RABL3
						VCPIP1	SVEP1	RAD23B
						VGLL2	SVIP	RAD50
						VIL1	SVOP	RAD52
						VPS13A	SYCE1	RADIL
						VPS13B	SYCP3	RAI1
						VPS13C	SYK	RALA
						VPS26B	SYNCRIP	RALBP1
						VPS35	SYNE1	RALGPS1
						VPS37A	SYNE2	RALGPS2

						VPS41	SYNGAP1	RANBP2
						VPS8	SYNJ1	RANBP9
						VSTM2A	SYNJ2	RANGRF
						VTA1	SYNPO	RAP1A
						VTI1A	SYNPO2	RAP1GDS1
						VWCE	SYNPR	RAP2A
						WAC	SYS1	RAP2B
						WASF2	SYT11	RAPGEF2
						WBP11	SYT12	RAPGEF6
						WBSCR16	SYT13	RAPH1
						WDFY2	SYT16	RARS2
						WDFY3	SYT17	RASA2
						WDR1	SYT4	RASA3
						WDR13	SYT6	RASAL1
						WDR19	SYT7	RASAL2
						WDR24	SYT8	RASD1
						WDR26	SYTL5	RASEF
						WDR27	TACC1	RASGEF1A
						WDR35	TACSTD2	RASGRP3
						WDR37	TAF1	RASIP1
						WDR54	TAF13	RASL11A
						WDR55	TAF15	RASL11B
						WDR6	TAF3	RASSF4
						WDR60	TAF9B	RASSF5
						WDR63	TAGLN	RASSF6
						WDR66	TANC1	RASSF8
						WDR7	TANC2	RASSF9
						WDR72	TARDBP	RAVER2
						WDR75	TARS	RBAK
						WDR78	TARSL2	RBBP6
						WDR90	TAS2R14	RBBP9
						WFIKKN2	TASP1	RBM11
						WHSC1	TBC1D1	RBM12B
						WHSC1L1	TBC1D14	RBM14
						WIBG	TBC1D15	RBM17
						WIPF1	TBC1D20	RBM18
						WIPI2	TBC1D22B	RBM25
						WISP1	TBC1D23	RBM27
						WNK1	TBC1D24	RBM41

						WNK2	TBC1D25	RBM47
						WNK3	TBC1D2B	RBM5
						WNK4	TBC1D7	RBM8A
						WNT2B	TBC1D8B	RBMS1
						WNT4	TBCD	RBMS2
						WWC2	TBL1XR1	RBMS3
						WWC3	TBRG1	RBP7
						WWOX	TBX3	RBPJ
						XAF1	TCEA2	RBPMS
						XBP1	TCEA3	RC3H1
						XG	TCEAL7	RC3H2
						XIAP	TCEAL8	RCAN3
						XKR6	TCERG1L	RCBTB1
						XPNPEP1	TCF12	RCC2
						XPNPEP3	TCF19	RCL1
						XPO4	TCF3	RCOR1
						XPO5	TCF4	RCOR3
						XRCC6BP1	TCF7L2	RDH10
						XRN1	TCFL5	RDH11
						XRN2	TCHP	REC8
						XYLT1	TCP10L	REG3A
						YAP1	TCP11L1	REG3G
						YARS	TCTE3	REG4
						YIPF5	TDRD10	REL
						YME1L1	TDRD9	RELL1
						YOD1	TEAD1	RELT
						YPEL1	TEAD2	REPIN1
						YPEL2	TEF	REPS1
						YPEL5	TEP1	REPS2
						YRDC	TES	RERG
						YTHDC1	TET2	REV1
						YTHDF2	TEX11	REV3L
						YWHAG	TEX264	REXO2
						YY1	TFCP2	RFESD
						ZBED3	TFCP2L1	RFFL
						ZBED5	TFDP1	RFT1
						ZBP1	TFRC	RFTN2
						ZBTB37	TGDS	RFX1
						ZBTB38	TGFB2	RFX2

						ZBTB4	TGFBR3	RFX4
						ZBTB41	TGIF1	RFXAP
						ZBTB44	THAP2	RGL3
						ZBTB46	THAP5	RGMA
						ZBTB47	THAP6	RGMB
						ZBTB7A	THBD	RGS12
						ZC3H12C	THEM4	RGS16
						ZC3H13	THOC2	RGS22
						ZC3H18	THRAP3	RGS5
						ZC3H3	THRB	RGS7BP
						ZC3H4	THSD4	RHBDD2
						ZC3H6	THSD7A	RHBDF1
						ZC3H8	TIAL1	RHEB
						ZC3HAV1	TIAM2	RHOA
						ZC3HAV1L	TIFA	RHOB
						ZCCHC2	TIGD4	RHOC
						ZCCHC7	TINAG	RHOF
						ZCCHC8	TIPRL	RHOJ
						ZCWPW1	TJP2	RHOT1
						ZDBF2	TLE3	RHOU
						ZDHHC11	TLK1	RHOV
						ZDHHC14	TLK2	RHPN1
						ZDHHC2	TLR8	RHPN2
						ZDHHC20	TM7SF3	RIBC1
						ZDHHC24	TM9SF3	RICTOR
						ZEB2	TMC5	RILP
						ZFAND2A	TMCC1	RIMBP2
						ZFAND2B	TMCC3	RIMS2
						ZFAND3	TMCO2	RIMS4
						ZFAND5	TMCO3	RIN2
						ZFAND6	TMCO4	RIOK1
						ZFAT	TMED10	RIOK2
						ZFHX2	TMED2	RIPK3
						ZFP14	TMED3	RIPK4
						ZFP28	TMED4	RIT1
						ZFP64	TMED5	RNASEH1
						ZFY	TMED6	RNASEL
						ZFYVE1	TMED8	RNASET2
						ZFYVE27	TMEM106B	RNF126

						ZFYVE28	TMEM106C	RNF130
						ZHX1	TMEM107	RNF135
						ZKSCAN1	TMEM108	RNF14
						ZKSCAN2	TMEM121	RNF141
						ZMAT1	TMEM125	RNF145
						ZMAT2	TMEM127	RNF146
						ZMAT3	TMEM130	RNF149
						ZMIZ1	TMEM131	RNF150
						ZMIZ2	TMEM132B	RNF157
						ZNF10	TMEM132D	RNF166
						ZNF12	TMEM134	RNF169
						ZNF124	TMEM139	RNF180
						ZNF182	TMEM143	RNF182
						ZNF2	TMEM144	RNF185
						ZNF213	TMEM154	RNF19A
						ZNF219	TMEM173	RNF212
						ZNF224	TMEM176B	RNF213
						ZNF225	TMEM18	RNF214
						ZNF226	TMEM181	RNF215
						ZNF229	TMEM185A	RNF219
						ZNF233	TMEM192	RNF24
						ZNF24	TMEM196	RNF38
						ZNF25	TMEM198	RNPC3
						ZNF251	TMEM200A	RNPS1
						ZNF254	TMEM204	ROBO2
						ZNF264	TMEM209	ROCK1
						ZNF274	TMEM30A	ROR1
						ZNF275	TMEM30B	RORB
						ZNF280B	TMEM33	RP9
						ZNF283	TMEM38B	RP9P
						ZNF284	TMEM39A	RPA1
						ZNF286A	TMEM42	RPAIN
						ZNF3	TMEM44	RPE
						ZNF302	TMEM54	RPGRIP1L
						ZNF317	TMEM59	RPH3AL
						ZNF326	TMEM60	RPL10A
						ZNF331	TMEM61	RPL14
						ZNF333	TMEM64	RPL15
						ZNF346	TMEM65	RPL18

						ZNF350	TMEM68	RPL19
						ZNF362	TMEM86B	RPL22L1
						ZNF385D	TMEM9	RPL24
						ZNF418	TMEM99	RPL27
						ZNF439	TMOD2	RPL32P3
						ZNF445	TMPO	RPL34
						ZNF462	TMPRSS13	RPL35
						ZNF469	TMPRSS3	RPL35A
						ZNF471	TMTC1	RPL36A
						ZNF488	TNFAIP8L3	RPL37
						ZNF490	TNFRSF10A	RPL6
						ZNF493	TNFRSF10D	RPL7
						ZNF496	TNFRSF11A	RPL9
						ZNF497	TNIP1	RPP25
						ZNF506	TNPO1	RPS10
						ZNF507	TNRC18	RPS14
						ZNF511	TNRC6A	RPS15A
						ZNF518A	TNRC6B	RPS19
						ZNF518B	TNRC6C	RPS19BP1
						ZNF521	TNS3	RPS23
						ZNF527	TNS4	RPS24
						ZNF529	TOB2	RPS25
						ZNF540	TOLLIP	RPS27
						ZNF543	TOM1L1	RPS29
						ZNF544	TOM1L2	RPS5
						ZNF554	TOR3A	RPS6
						ZNF555	TOX3	RPS6KA3
						ZNF558	TOX4	RPS6KA6
						ZNF585A	TP73	RPS6KB1
						ZNF587	TPBG	RPS6KL1
						ZNF592	TPD52	RPS7
						ZNF594	TPK1	RPUSD1
						ZNF596	TPM1	RPUSD3
						ZNF600	TPM2	RPUSD4
						ZNF606	TPM3	RRAD
						ZNF618	TPMT	RRBP1
						ZNF622	TPRG1L	RRM2B
						ZNF624	TRA2A	RRP1
						ZNF628	TRAF3IP3	RSAD2

						ZNF639	TRAF6	RSBN1
						ZNF644	TRAFD1	RSPH1
						ZNF652	TRAK1	RSPH3
						ZNF655	TRAPPC6B	RSPO1
						ZNF664	TRERF1	RSPO3
						ZNF668	TRIB1	RSPRY1
						ZNF670	TRIM11	RSRC1
						ZNF682	TRIM14	RSU1
						ZNF691	TRIM2	RTBDN
						ZNF701	TRIM32	RTKN2
						ZNF703	TRIM36	RTN3
						ZNF704	TRIM4	RTN4RL1
						ZNF706	TRIM47	RTTN
						ZNF708	TRIM55	RUFY1
						ZNF711	TRIM62	RUFY2
						ZNF746	TRIM63	RUFY3
						ZNF75A	TRIM7	RUNDC1
						ZNF765	TRIM9	RUNX1T1
						ZNF770	TRIO	RWDD2A
						ZNF771	TRIOBP	RYBP
						ZNF776	TRIP11	S100A10
						ZNF777	TRMT5	S100A16
						ZNF780B	TRPC4	S100A6
						ZNF786	TRPM3	S100PBP
						ZNF8	TRPM6	S1PR2
						ZNF81	TRPM8	S1PR5
						ZNF823	TRPS1	SAE1
						ZNF829	TRPV2	SALL1
						ZNF83	TRUB1	SALL4
						ZNFX1	TSC22D2	SAMD1
						ZNRD1	TSEN2	SAMD12
						ZNRF1	TSEN54	SAMD13
						ZNRF3	TSGA10	SAMD3
						ZP1	TSHZ1	SAMD5
						ZRANB1	TSHZ3	SAMHD1
						ZRANB2	TSNARE1	SAMM50
						ZRANB3	TSPAN12	SAP30BP
						ZSCAN18	TSPAN14	SAR1B
						ZSCAN2	TSPAN2	SARDH

						ZSWIM5 ZXDA ZXDC ZYG11B ZZZ3	TSPAN33 TSPAN5 TSPYL6 TSR1 TTC12 TTC17 TTC23 TTC27 TTC30B TTC33 TTC7B TTC8 TTLL2 TTLL7 TTN TTTY13 TTYH3 TUB TUBB1 TUBE1 TULP4 TUSC5 TWF1 TWSG1 TXNDC11 TXNDC15 TXNL4B U2AF1 UACA UBA5 UBE2B UBE2D3 UBE2E2 UBE2G1 UBE2G2 UBE2H UBE2J2 UBE2K UBE2Q1	SARM1 SART1 SART3 SASH1 SAV1 SBF2 SCAF1 SCAMP2 SCAMP4 SCAMP5 SCAND1 SCARB1 SCARB2 SCARF2 SCD5 SCFD1 SCFD2 SCGB3A1 SCGB3A2 SCN11A SCN2B SCN4B SCN7A SCN8A SCN9A SCNN1G SCO1 SCOC SCRG1 SCRN2 SCRN3 SCRT1 SCUBE3 SCYL2 SCYL3 SDAD1 SDCCAG3 SDF4 SDHC

							UBE2W UBE3C UBE4B UBFD1 UBQLN1 UBQLN2 UBR1 UBR3 UBR4 UBTD2 UBTF UCA1 UEVLD UGCG UGT1A6 UGT8 UHMK1 UHRF2 ULK3 ULK4 UNC119B UNC13A UNC5B UNC5C UNC5CL UNC5D UNK UPRT USHBP1 USMG5 USP13 USP14 USP16 USP2 USP21 USP22 USP24 USP30 USP31	SDK1 SEC11C SEC14L1 SEC14L2 SEC14L4 SEC16B SEC22A SEC22C SEC24A SEC61A2 SEC61B SEC62 SEC63 SECISBP2 SEH1L SEMA3A SEMA4D SEMA4F SEMA5A SEMA6A SEMA6D SENP1 SENP2 SENP7 SENP8 SEPN1 SEPP1 SEPSECS SERINC2 SERP2 SERPINA1 SERPINB1 SERPINB6 SERPINB9 SERPINE2 SERTAD1 SERTAD4 SESN2 SESN3

							USP32 USP34 USP35 USP47 USP48 USP7 UTP11L UTRN VANGL1 VARS2 VASH1 VAV2 VAV3 VCPIP1 VEPH1 VGLL2 VGLL3 VIL1 VPS13A VPS13B VPS13C VPS18 VPS26B VPS29 VPS33A VPS37A VPS41 VSIG2 VSTM2A VSX1 VTA1 VTI1A VTI1B VWCE WAC WASF2 WBSCR16 WDFY2 WDFY3	SETBP1 SETD4 SETD5 SETD7 SETD8 SETDB2 SETX SEZ6L SEZ6L2 SF3A1 SFMBT2 SFPQ SFRP1 SFRP2 SFT2D1 SFXN1 SFXN4 SFXN5 SGCB SGCD SGIP1 SGK2 SGOL1 SGOL2 SGPP2 SGSM1 SGTB SH2D5 SH3BGRL2 SH3BP4 SH3GLB2 SH3KBP1 SH3PXD2A SH3PXD2B SH3RF1 SHANK2 SHC4 SHF SHISA2

							WDR1 WDR20 WDR35 WDR36 WDR37 WDR41 WDR44 WDR55 WDR6 WDR63 WDR66 WDR7 WDR72 WDR74 WDR89 WDR91 WFDC10A WFIKKN2 WHSC1 WHSC1L1 WIBG WIPF1 WIPF2 WISP1 WNK1 WNK2 WNK3 WNK4 WNT10A WNT4 WNT7B WNT9A WTAP WWC1 WWC2 WWC3 WWOX XAF1 XBP1	SHISA5 SHMT1 SHPRH SHROOM3 SIAE SIN3A SIPA1L1 SIPA1L2 SIPA1L3 SIRPG SIRT5 SIRT6 SIX3 SIX4 SKAP2 SKI SKIL SLAIN1 SLAIN2 SLAMF7 SLC10A4 SLC10A7 SLC11A1 SLC11A2 SLC12A2 SLC12A3 SLC12A4 SLC12A6 SLC12A9 SLC13A2 SLC14A1 SLC15A4 SLC16A10 SLC16A6 SLC16A7 SLC16A9 SLC17A5 SLC1A2 SLC1A4

							XDH	SLC20A1
							XG	SLC22A15
							XKR4	SLC22A23
							XKR6	SLC22A5
							XPNPEP1	SLC23A3
							XPNPEP3	SLC25A15
							XPO4	SLC25A2
							XPOT	SLC25A23
							XPR1	SLC25A25
							XRCC6BP1	SLC25A26
							XRN1	SLC25A27
							XRN2	SLC25A28
							XYLT1	SLC25A29
							YAP1	SLC25A33
							YIPF4	SLC25A35
							YIPF5	SLC25A36
							YPEL1	SLC25A37
							YPEL2	SLC25A39
							YPEL3	SLC25A40
							YRDC	SLC25A42
							YWHAG	SLC25A45
							YWHAH	SLC25A46
							YY1	SLC26A11
							ZBED3	SLC26A8
							ZBED5	SLC26A9
							ZBP1	SLC27A1
							ZBTB11	SLC28A3
							ZBTB2	SLC2A11
							ZBTB37	SLC2A12
							ZBTB38	SLC2A13
							ZBTB4	SLC2A4RG
							ZBTB41	SLC2A5
							ZBTB43	SLC2A8
							ZBTB46	SLC30A2
							ZBTB7A	SLC30A4
							ZBTB7B	SLC30A5
							ZBTB9	SLC30A8
							ZC3H12C	SLC30A9
							ZC3H13	SLC31A1

							ZC3H14 ZC3H18 ZC3H4 ZC3H6 ZC3H8 ZC3HAV1 ZC3HAV1L ZC3HC1 ZCCHC17 ZCCHC6 ZCCHC7 ZCWPW1 ZDBF2 ZDHHC11 ZDHHC13 ZDHHC14 ZDHHC20 ZDHHC21 ZDHHC23 ZDHHC24 ZDHHC5 ZDHHC9 ZEB2 ZFAND2A ZFAND2B ZFAND5 ZFHX2 ZFP14 ZFP64 ZFP90 ZFX ZFY ZFYVE16 ZFYVE27 ZFYVE28 ZHX1 ZIC4 ZKSCAN1 ZKSCAN2	SLC33A1 SLC35A4 SLC35B4 SLC35C2 SLC35E1 SLC35F1 SLC35F3 SLC35F5 SLC36A4 SLC37A1 SLC37A3 SLC38A10 SLC38A11 SLC38A5 SLC38A7 SLC38A9 SLC39A10 SLC39A13 SLC39A3 SLC39A8 SLC41A1 SLC41A3 SLC43A2 SLC44A1 SLC44A2 SLC44A5 SLC45A3 SLC46A1 SLC47A2 SLC4A8 SLC5A1 SLC6A13 SLC6A17 SLC6A19 SLC6A20 SLC6A4 SLC6A6 SLC7A14 SLC7A2

							ZMAT2 ZMAT3 ZMIZ1 ZMYM2 ZMYM6 ZNF10 ZNF146 ZNF148 ZNF160 ZNF175 ZNF18 ZNF180 ZNF182 ZNF197 ZNF2 ZNF207 ZNF224 ZNF226 ZNF24 ZNF25 ZNF253 ZNF264 ZNF268 ZNF274 ZNF275 ZNF276 ZNF280B ZNF284 ZNF286A ZNF30 ZNF300 ZNF302 ZNF326 ZNF331 ZNF333 ZNF33A ZNF343 ZNF345 ZNF347	SLC7A6OS SLC8A1 SLC9A1 SLC9A9 SLCO3A1 SLCO5A1 SLFN11 SLFN5 SLITRK2 SLITRK6 SLMAP SLU7 SMAD1 SMAD5 SMAD9 SMAP2 SMARCA2 SMARCB1 SMARCD3 SMARCE1 SMC1A SMC5 SMCHD1 SMEK1 SMEK2 SMG7 SMNDC1 SMOC1 SMOC2 SMPD3 SMU1 SMUG1 SMYD4 SNAP29 SNAPC3 SNCA SNIP1 SNRPA1 SNRPN

							ZNF385D	SNTB1
							ZNF395	SNX12
							ZNF397	SNX13
							ZNF398	SNX16
							ZNF418	SNX18
							ZNF425	SNX2
							ZNF436	SNX21
							ZNF438	SNX22
							ZNF439	SNX25
							ZNF445	SNX29
							ZNF462	SNX3
							ZNF490	SNX32
							ZNF493	SNX33
							ZNF497	SNX5
							ZNF502	SNX9
							ZNF503	SOAT1
							ZNF506	SOBP
							ZNF507	SOCS2
							ZNF514	SOCS3
							ZNF518B	SOCS4
							ZNF521	SOCS6
							ZNF527	SOCS7
							ZNF529	SON
							ZNF530	SORBS1
							ZNF543	SORBS2
							ZNF544	SORCS1
							ZNF551	SORD
							ZNF554	SORL1
							ZNF555	SORT1
							ZNF557	SOS1
							ZNF566	SOS2
							ZNF585A	SOST
							ZNF587	SOX17
							ZNF597	SOX5
							ZNF598	SOX6
							ZNF600	SOX7
							ZNF605	SOX8
							ZNF618	SP1
							ZNF628	SP100

							ZNF641 ZNF649 ZNF652 ZNF653 ZNF655 ZNF664 ZNF668 ZNF681 ZNF682 ZNF684 ZNF688 ZNF7 ZNF700 ZNF701 ZNF703 ZNF704 ZNF706 ZNF708 ZNF71 ZNF710 ZNF711 ZNF721 ZNF738 ZNF746 ZNF75A ZNF765 ZNF766 ZNF770 ZNF776 ZNF777 ZNF786 ZNF791 ZNF823 ZNRF1 ZNRF3 ZP1 ZRANB1 ZRANB2 ZRANB3	SP110 SP2 SP3 SP4 SP5 SPAG16 SPAG7 SPAG9 SPATA12 SPATA13 SPATA17 SPATA18 SPATA19 SPATA5 SPATA6 SPATA7 SPCS2 SPCS3 SPDYA SPG11 SPG20 SPG7 SPIN1 SPIN4 SPINT1 SPIRE1 SPIRE2 SPNS1 SPNS2 SPNS3 SPOCD1 SPON1 SPOP SPOPL SPRED1 SPRY1 SPRY3 SPRYD3 SPSB1

							ZSCAN18 ZSCAN2 ZSWIM1 ZSWIM5 ZUFSP ZWILCH ZXDA ZYG11B ZZZ3	SPTAN1 SPTBN1 SPTBN4 SPTLC2 SPTLC3 SRA1 SRD5A2 SRD5A3 SREBF2 SRGAP1 SRMS SRP68 SRPK2 SRPRB SRRD SRXN1 SSBP2 SSFA2 SSPN SSR1 SSR3 SSTR1 SSTR2 SSU72 ST3GAL1 ST3GAL2 ST3GAL3 ST6GAL2 ST6GALNAC3 ST6GALNAC5 ST6GALNAC6 ST8SIA2 ST8SIA3 ST8SIA4 STAC2 STAG1

								STAMBP STAMBPL1 STARD13 STARD3NL STARD4 STARD7 STARD9 STAT3 STAU2 STEAP2 STEAP4 STIM2 STK11 STK11IP STK17B STK19 STK31 STK33 STK35 STK4 STK40 STMN3 STON1 STON2 STRBP STRN STT3B STUB1 STX3 STX4 STX6 STXBP5 STXBP5L STXBP6 STYXL1 SUCLG1 SUFU SULF2 SULT1C2

								SUPT16H SURF4 SURF6 SUSD1 SUSD4 SUV420H2 SV2B SVEP1 SVIP SVOP SYCE1 SYCP2 SYCP3 SYK SYNCRIP SYNE1 SYNE2 SYNGAP1 SYNGR2 SYNJ1 SYNJ2 SYNPO SYNPO2 SYNPR SYS1 SYT11 SYT12 SYT13 SYT16 SYT17 SYT4 SYT6 SYT7 SYT8 SYTL5 TACC1 TACSTD2 TAF1 TAF13

								TAF15 TAF3 TAF4B TAF9B TAGLN TANC1 TANC2 TAP2 TAPT1 TARDBP TARS TARSL2 TAS2R14 TAS2R5 TASP1 TATDN1 TBC1D1 TBC1D14 TBC1D15 TBC1D20 TBC1D22B TBC1D23 TBC1D24 TBC1D25 TBC1D2B TBC1D7 TBC1D8B TBCD TBL1XR1 TBRG1 TBX15 TBX3 TC2N TCEA2 TCEA3 TCEAL7 TCEAL8 TCERG1L TCF12

								TCF19 TCF3 TCF4 TCF7L2 TCFL5 TCHP TCOF1 TCP10L TCP11L1 TCTE3 TCTEX1D2 TCTN2 TDRD10 TDRD9 TEAD1 TEAD2 TEF TEP1 TES TESC TET1 TET2 TEX11 TEX264 TFB1M TFCP2 TFCP2L1 TFDP1 TFG TFRC TGDS TGFB2 TGFBR3 TGFBRAP1 TGIF1 THAP2 THAP5 THAP6 THBD

								THEM4 THNSL1 THOC2 THRAP3 THRB THSD4 THSD7A TIAL1 TIAM2 TIFA TIGD4 TIGD7 TIMP2 TINAG TIPRL TJP2 TK2 TKT TLE3 TLK1 TLK2 TLN2 TLR3 TLR8 TM4SF18 TM7SF3 TM9SF3 TMBIM4 TMC5 TMC8 TMCC1 TMCC3 TMCO2 TMCO3 TMCO4 TMED10 TMED2 TMED3 TMED4

								TMED5 TMED6 TMED8 TMEM101 TMEM102 TMEM106B TMEM106C TMEM107 TMEM108 TMEM121 TMEM125 TMEM127 TMEM130 TMEM131 TMEM132A TMEM132B TMEM132D TMEM134 TMEM138 TMEM139 TMEM143 TMEM144 TMEM154 TMEM163 TMEM171 TMEM173 TMEM176B TMEM18 TMEM181 TMEM185A TMEM192 TMEM196 TMEM198 TMEM200A TMEM204 TMEM209 TMEM25 TMEM27 TMEM30A

								TMEM30B TMEM33 TMEM38A TMEM38B TMEM39A TMEM42 TMEM44 TMEM52 TMEM54 TMEM55A TMEM55B TMEM57 TMEM59 TMEM60 TMEM61 TMEM64 TMEM65 TMEM68 TMEM69 TMEM86B TMEM9 TMEM92 TMEM98 TMEM99 TMEM9B TMLHE TMOD2 TMPO TMPRSS13 TMPRSS3 TMPRSS6 TMTC1 TNFAIP8 TNFAIP8L3 TNFRSF10A TNFRSF10D TNFRSF11A TNFRSF19 TNFSF14

								TNIK TNIP1 TNKS1BP1 TNPO1 TNRC18 TNRC6A TNRC6B TNRC6C TNS3 TNS4 TOB2 TOLLIP TOM1L1 TOM1L2 TOMM22 TOMM40L TOP1MT TOR3A TOX2 TOX3 TOX4 TP53INP1 TP53INP2 TP73 TPBG TPD52 TPK1 TPM1 TPM2 TPM3 TPMT TPRG1L TRA2A TRAF1 TRAF3IP1 TRAF3IP3 TRAF6 TRAFD1 TRAK1

								TRAM1L1 TRAPPC6B TRERF1 TRIB1 TRIM11 TRIM14 TRIM2 TRIM32 TRIM36 TRIM4 TRIM47 TRIM5 TRIM50 TRIM55 TRIM6 TRIM62 TRIM63 TRIM7 TRIM8 TRIM9 TRIO TRIOBP TRIP11 TRIP12 TRMT5 TRPC4 TRPM3 TRPM6 TRPM8 TRPS1 TRPV2 TRUB1 TSC22D2 TSEN2 TSEN54 TSGA10 TSHZ1 TSHZ2 TSHZ3

								TSNARE1 TSPAN12 TSPAN14 TSPAN2 TSPAN3 TSPAN33 TSPAN5 TSPYL6 TSR1 TTBK2 TTC12 TTC17 TTC23 TTC26 TTC27 TTC30B TTC33 TTC5 TTC7A TTC7B TTC8 TTC9C TTLL11 TTLL2 TTLL7 TTN TTTY13 TTYH2 TTYH3 TUB TUBB1 TUBE1 TUFM TUG1 TULP4 TUSC1 TUSC3 TUSC5 TWF1

								TWISTNB TWSG1 TXNDC11 TXNDC12 TXNDC15 TXNL4B U2AF1 UACA UBA5 UBAC2 UBASH3B UBE2B UBE2D3 UBE2E2 UBE2G1 UBE2G2 UBE2H UBE2J2 UBE2K UBE2Q1 UBE2Q2 UBE2T UBE2W UBE2Z UBE3C UBE4B UBFD1 UBQLN1 UBQLN2 UBR1 UBR3 UBR4 UBTD2 UBTF UCA1 UCKL1 UEVLD UGCG UGT1A6

								UGT8 UHMK1 UHRF2 ULK3 ULK4 UNC119B UNC13A UNC45B UNC5B UNC5C UNC5CL UNC5D UNK UPRT URM1 USHBP1 USMG5 USP13 USP14 USP16 USP2 USP21 USP22 USP24 USP3 USP30 USP31 USP32 USP34 USP35 USP37 USP38 USP40 USP47 USP48 USP7 USP9Y UTP11L UTP15

								UTP6 UTRN UXS1 VANGL1 VAPA VARS2 VASH1 VASN VAV2 VAV3 VCPIP1 VEPH1 VGLL2 VGLL3 VIL1 VPS13A VPS13B VPS13C VPS18 VPS26B VPS29 VPS33A VPS35 VPS37A VPS41 VPS8 VSIG2 VSTM2A VSX1 VTA1 VTI1A VTI1B VWCE WAC WASF2 WBP11 WBSCR16 WDFY2 WDFY3

								WDR1 WDR13 WDR19 WDR20 WDR24 WDR26 WDR27 WDR35 WDR36 WDR37 WDR41 WDR44 WDR54 WDR55 WDR6 WDR60 WDR63 WDR66 WDR7 WDR72 WDR74 WDR75 WDR78 WDR89 WDR90 WDR91 WFDC10A WFIKKN2 WHSC1 WHSC1L1 WIBG WIPF1 WIPF2 WIPI2 WISP1 WNK1 WNK2 WNK3 WNK4

								WNT10A WNT2B WNT4 WNT7B WNT9A WTAP WWC1 WWC2 WWC3 WWOX XAF1 XBP1 XDH XG XIAP XKR4 XKR6 XPNPEP1 XPNPEP3 XPO4 XPO5 XPOT XPR1 XRCC6BP1 XRN1 XRN2 XYLT1 YAP1 YARS YIPF4 YIPF5 YME1L1 YOD1 YPEL1 YPEL2 YPEL3 YPEL5 YRDC YTHDC1

								YTHDF2 YWHAG YWHAH YY1 ZBED3 ZBED5 ZBP1 ZBTB11 ZBTB2 ZBTB37 ZBTB38 ZBTB4 ZBTB41 ZBTB43 ZBTB44 ZBTB46 ZBTB47 ZBTB7A ZBTB7B ZBTB9 ZC3H12C ZC3H13 ZC3H14 ZC3H18 ZC3H3 ZC3H4 ZC3H6 ZC3H8 ZC3HAV1 ZC3HAV1L ZC3HC1 ZCCHC17 ZCCHC2 ZCCHC6 ZCCHC7 ZCCHC8 ZCWPW1 ZDBF2 ZDHHC11

								ZDHHC13 ZDHHC14 ZDHHC2 ZDHHC20 ZDHHC21 ZDHHC23 ZDHHC24 ZDHHC5 ZDHHC9 ZEB2 ZFAND2A ZFAND2B ZFAND3 ZFAND5 ZFAND6 ZFAT ZFHX2 ZFP14 ZFP28 ZFP64 ZFP90 ZFX ZFY ZFYVE1 ZFYVE16 ZFYVE27 ZFYVE28 ZHX1 ZIC4 ZKSCAN1 ZKSCAN2 ZMAT1 ZMAT2 ZMAT3 ZMIZ1 ZMIZ2 ZMYM2 ZMYM6 ZNF10

								ZNF12 ZNF124 ZNF146 ZNF148 ZNF160 ZNF175 ZNF18 ZNF180 ZNF182 ZNF197 ZNF2 ZNF207 ZNF213 ZNF219 ZNF224 ZNF225 ZNF226 ZNF229 ZNF233 ZNF24 ZNF25 ZNF251 ZNF253 ZNF254 ZNF264 ZNF268 ZNF274 ZNF275 ZNF276 ZNF280B ZNF283 ZNF284 ZNF286A ZNF3 ZNF30 ZNF300 ZNF302 ZNF317 ZNF326

								ZNF331 ZNF333 ZNF33A ZNF343 ZNF345 ZNF346 ZNF347 ZNF350 ZNF362 ZNF385D ZNF395 ZNF397 ZNF398 ZNF418 ZNF425 ZNF436 ZNF438 ZNF439 ZNF445 ZNF462 ZNF469 ZNF471 ZNF488 ZNF490 ZNF493 ZNF496 ZNF497 ZNF502 ZNF503 ZNF506 ZNF507 ZNF511 ZNF514 ZNF518A ZNF518B ZNF521 ZNF527 ZNF529 ZNF530

								ZNF540 ZNF543 ZNF544 ZNF551 ZNF554 ZNF555 ZNF557 ZNF558 ZNF566 ZNF585A ZNF587 ZNF592 ZNF594 ZNF596 ZNF597 ZNF598 ZNF600 ZNF605 ZNF606 ZNF618 ZNF622 ZNF624 ZNF628 ZNF639 ZNF641 ZNF644 ZNF649 ZNF652 ZNF653 ZNF655 ZNF664 ZNF668 ZNF670 ZNF681 ZNF682 ZNF684 ZNF688 ZNF691 ZNF7

								ZNF700 ZNF701 ZNF703 ZNF704 ZNF706 ZNF708 ZNF71 ZNF710 ZNF711 ZNF721 ZNF738 ZNF746 ZNF75A ZNF765 ZNF766 ZNF770 ZNF771 ZNF776 ZNF777 ZNF780B ZNF786 ZNF791 ZNF8 ZNF81 ZNF823 ZNF829 ZNF83 ZNFX1 ZNRD1 ZNRF1 ZNRF3 ZP1 ZRANB1 ZRANB2 ZRANB3 ZSCAN18 ZSCAN2 ZSWIM1 ZSWIM5

								ZUFSP ZWILCH ZXDA ZXDC ZYG11B ZZZ3

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