

Supplementary Table 1 Immune related gens(IRGs) from the MsigDB (<https://www.gsea-msigdb.org/gsea/msigdb>).

Gene sets name	Gene
GOBP REGULATION OF IMMUNE RESPONSE	<p>A2M, ABL1, ACOD1, ADA, ADAM8, ADAR, ADCY7, ADGRE2, ADORA2B, AGER, AHR, AIM2, AKIRIN2, ALOX15, ALPK1, AMBP, ANKRD17, ANXA1, AP1G1, AP3B1, APCS, APLF, APOE, APPL1, APPL2, ARG1, ARG2, ARID5A, ARRB2, ATAD5, AZGP1, B2M, BAG6, BANF1, BANK1, BAX, BCAR1, BCL10, BCL2, BCL6, BCR, BIRC2, BIRC3, BLK, BLNK, BMX, BPIFB1, BTK, BTLA, BTN1A1, BTN2A1, BTN2A2, BTN2A3P, BTN3A1, BTN3A2, BTN3A3, BTNL10, BTNL2, BTNL3, BTNL8, BTNL9, C12orf4, C17orf99, C1QA, C1QB, C1QBP, C1QC, C1R, C1RL, C1S, C2, C3, C3AR1, C4A, C4B, C4BPA, C4BPB, C5, C5AR1, C5AR2, C6, C7, C8A, C8B, C8G, C9, CACNB3, CACTIN, CADM1, CARD11, CARD9, CASP6, CASP8, CAV1, CBLB, CCL19, CCL5, CCR2, CCR7, CD14, CD160, CD177, CD19, CD1A, CD1B, CD1C, CD1D, CD1E, CD200, CD200R1, CD22, CD226, CD24, CD247, CD274, CD276, CD28, CD300A, CD300LF, CD33, CD36, CD38, CD4, CD40, CD46, CD47, CD48, CD55, CD59, CD5L, CD74, CD79A, CD79B, CD80, CD81, CD84, CD86, CD8A, CD8B, CD8B2, CD96, CDC37, CEACAM1, CFB, CFD, CFH, CFHR1, CFHR5, CFI, CFP, CGAS, CLC, CLCF1, CLEC12B, CLEC4D, CLEC4E, CLEC4G, CLEC6A, CLEC7A, CLNK, CLPB, CLU, CMKLR1, CMTM3, CNOT7, CNR1, COCH, COL3A1, COLEC10, COLEC11, COLEC12, CR1, CR1L, CR2, CREBBP, CRK, CRKL, CRP, CRTAM, CSK, CTLA4, CTSG, CTSH, CTSS, CXCL13, CYBA, CYLD, CYRIB, DAB2IP, DCST1, DDX3X, DDX58, DDX60, DENND1B, DGKZ, DHX58, DHX9, DNASE2, DRD2, DUSP10, DUSP22, DUSP3, ECM1, EIF2AK4, EIF2B1, EIF2B2, EIF2B3, EIF2B4, EIF2B5, ELANE, ELF1, ENPP3, ENTPD7, EP300, EPG5, EPHB2, ERAP1, ERBIN, EREG, ERMAP, ESR1, EXOSC3, EXOSC6, EZR, F2RL1, FADD, FAM3A, FBXO38, FCER1A, FCER1G, FCER2, FCGR1A, FCGR1B, FCGR2A, FCGR2B, FCGR2C, FCGR3A, FCGR3B, FCHO1, FCN1, FCN2, FCN3, FCRL3, FCRLB, FER, FES, FFAR2, FGL1, FGL2, FGR, FKBP1A, FLOT1, FLOT2, FOXF1, FOXFJ1, FOXP1, FOXP3, FPR1, FPR2, FPR3, FURIN, FUT7, FYB1, FYB2, FYN, FZD5, GAB2, GATA1, GATA2, GATA3, GATA6, GBP1, GBP5, GCSAM, GCSAML, GFER, GFI1, GPATCH3, GPLD1, GPR108, GPR151, GPR31, GPR32, GPR32P1, GPR33, GPS2, GPX1, GRAMD4, GRN, HAVCR2, HCK, HCST, HEXIM1, HFE, HHLA2, HLA-A, HLA-B, HLA-DMB, HLA-DPB1, HLA-DQB1, HLA-DRA, HLA-DRB1, HLA-DRB3, HLA-E, HLA-F, HLA-G, HLA-H, HLX, HMCES, HMGB1, HMGB2, HMOX1, HMSD, HPX, HRAS, HRG, HSP90AA1, HSP90AB1, HSPA1A, HSPA1B, HSPD1, ICOSLG, IDO1, IFI16, IFI35, IFIH1, IFNA2, IFNB1, IFNG, IFNK, IFNL1, IFNL2, IFNL3, IFNL4, IGHA1, IGHA2, IGHD, IGHE, IGHG1, IGHG2, IGHG3, IGHG4, IGHM, IGHV1-18, IGHV1-24, IGHV1-3, IGHV1-45, IGHV1-58, IGHV1-69, IGHV1-69-2, IGHV1-69D, IGHV1OR15-1, IGHV2-26, IGHV2-5, IGHV2-70, IGHV2-70D, IGHV3-11, IGHV3-13, IGHV3-15, IGHV3-16, IGHV3-20, IGHV3-21, IGHV3-23, IGHV3-30, IGHV3-33, IGHV3-35, IGHV3-38, IGHV3-43, IGHV3-48, IGHV3-49, IGHV3-53, IGHV3-64, IGHV3-64D, IGHV3-66, IGHV3-7, IGHV3-72, IGHV3-73, IGHV3-74, IGHV4-28, IGHV4-31, IGHV4-34, IGHV4-39, IGHV4-4, IGHV4-59, IGHV4-61, IGHV5-10-1, IGHV5-51, IGHV6-1, IGHV7-4-1, IGHV7-81, IGKC, IGLC1, IGLC2, IGLC3, IGLC6, IGLC7, IGLL1,</p>

Gene sets name	Gene
	IGLL5, IKBKB, IKBKE, IKBKG, IL10, IL12A, IL12B, IL12RB1, IL13, IL13RA2, IL15, IL17A, IL17F, IL18, IL18R1, IL1B, IL1R1, IL1RL1, IL2, IL20RB, IL21, IL23A, IL23R, IL27, IL27RA, IL4, IL4I1, IL4R, IL6, IL6ST, IL7R, INAVA, INPP5D, INS, IRAK1, IRAK2, IRAK3, IRAK4, IRF1, IRF3, IRF4, IRF7, IRGM, ISG15, ITCH, ITGAM, ITGB2, ITK, JAK3, KARS1, KCNN4, KHDRBS1, KIR2DL1, KIR2DL4, KIR2DS2, KIT, KLHL6, KLK3, KLK5, KLK7, KLRC1, KLRC2, KLRC3, KLRC4, KLRC4-KLRK1, KLRD1, KLRK1, KMT5B, KMT5C, KRT1, LACC1, LAG3, LAMP1, LAPTM5, LAT2, LAX1, LBP, LCK, LCP2, LEP, LGALS3, LGALS9, LGR4, LILRA2, LILRA4, LILRB1, LILRB2, LILRB4, LIME1, LIMK1, LOXL3, LPXN, LRP8, LRRC14, LRRC19, LSM14A, LTA, LTF, LY96, LYAR, LYN, MAD2L2, MALT1, MAP2K4, MAP2K6, MAP2K7, MAP3K1, MAP3K7, MAPK1, MAPK10, MAPK14, MAPK8, MAPK9, MAPKAP2, MAPKAP3, MASP1, MASP2, MATR3, MAVS, MBL2, MED1, MEF2C, METTL3, MFAP4, MFHAS1, MICA, MICB, MIR105-1, MIR136, MIR140, MIR146A, MIR17, MIR181B1, MIR18A, MIR19A, MIR19B1, MIR21, MIR34A, MIR520B, MIR520E, MIR6869, MIR708, MKRN2, MLH1, MMP12, MNDA, MOG, MR1, MS4A1, MS4A2, MSH2, MUL1, MYB, MYD88, MYO1G, N4BP1, NCF1, NCKAP1L, NCR1, NCR3, NCR3LG1, NDFIP1, NECTIN2, NFAM1, NFATC2, NFE2L2, NFKBIA, NFKBID, NFKBIL1, NFKBIZ, NINJ1, NLRC3, NLRC4, NLRC5, NLRP10, NLRP2B, NLRP3, NLRP6, NLRX1, NMI, NOD1, NOD2, NONO, NOP53, NPLOC4, NPY, NPY5R, NR1D1, NR1H2, NR1H3, NR1H4, NR4A3, NSD2, OAS1, OAS3, OASL, OTOP1, OTUD4, OTULIN, P2RX7, PAK1, PAK2, PAK3, PARK7, PARP14, PARP3, PARP9, PAWR, PAXIP1, PCK1, PDCD1, PDE4B, PDE4D, PDPK1, PELI1, PGC, PGLYRP1, PGLYRP2, PHB, PHB2, PHPT1, PIANP, PIGR, PIK3AP1, PIK3CA, PIK3CD, PIK3R6, PJA2, PKN1, PLA2G1B, PLA2G2D, PLA2G3, PLA2G4A, PLA2G5, PLA2G6, PLCG1, PLCG2, PLCL2, PLD2, PLEKHA1, PLK2, PLPP4, PLSCR1, POLR3B, POLR3C, POLR3D, POLR3F, POLR3G, PPARG, PPP2R3C, PPP3CB, PQBP1, PRAM1, PRKCB, PRKCD, PRKCE, PRKCH, PRKCQ, PRKCZ, PRKD2, PRKDC, PRNP, PSEN1, PSG9, PSMA1, PSMB4, PSPC1, PTAFR, PTK2, PTPN1, PTPN11, PTPN2, PTPN22, PTPN6, PTPRC, PTPRD, PTPRJ, PTPRS, PUM1, PUM2, PVR, PVRIG, PYCARD, PYHIN1, RAB11FIP2, RAB29, RAB7B, RABGEF1, RAC2, RAET1E, RAET1G, RARA, RASGRP1, RBCK1, RBM14, RC3H1, RC3H2, REG3G, RELA, RFTN1, RGCC, RHBDF2, RIF1, RIOK3, RIPK2, RIPK3, RNF125, RNF135, RNF185, RNF31, RPS19, RPS3, RPS6KA3, RSAD2, RTN4, S100A14, SAMHD1, SAMSN1, SARM1, SASH3, SCARA3, SCIMP, SEC14L1, SELENOS, SERPINB4, SERPINB9, SERPING1, SFPQ, SH2B2, SH2D1A, SH2D1B, SHLD1, SHLD2, SHLD3, SIN3A, SIRT1, SKAP1, SLA2, SLAMF1, SLAMF6, SLAMF8, SLC11A1, SLC15A2, SLC15A3, SLC15A4, SLC22A13, SLC39A10, SLC46A2, SMAD3, SMAD7, SMPDL3B, SNX4, SOCS1, SOCS5, SOS1, SPG21, SPHK2, SPI1, SPINK5, SPN, SPNS2, SPPL2A, SPPL2B, SPPL3, SRC, STAP1, STAT2, STAT5B, STAT6, STING1, STK11, STOML2, STX4, STX7, STXBP1, STXBP2, SUPT6H, SUSD4, SYK, TAPBP, TAPBPL, TASL, TBK1, TBX21, TEC, TESPA1, TFRC, TGFB1, TGFB2, THEMIS, THEMIS2, THOC1, THY1, TICAM1, TICAM2, TIFA, TIRAP, TKFC, TLR1, TLR10, TLR2, TLR3, TLR4, TLR5, TLR6, TLR7, TLR8, TLR9, TNF, TNFAIP3,

Gene sets name	Gene
IMMUNE SYSTEM PROCESS	<p>TNFRSF14, TNFRSF1B, TNFRSF21, TNFSF13, TNFSF13B, TNFSF4, TNIP1, TNIP2, TNIP3, TOMM70, TP53BP1, TRAF2, TRAF3, TRAF6, TRAFD1, TRAT1, TRBC1, TRBC2, TRDC, TREM2, TREML4, TREX1, TRIL, TRIM15, TRIM21, TRIM25, TRIM27, TRIM41, TRIM5, TRIM56, TRIM6, TRIM62, TRPM4, TSPAN6, TTLL12, TXK, TYRO3, TYROBP, UBASH3A, UBE2K, UBE2N, UBQLN1, UFD1, UNC13D, UNC93B1, USP15, USP17L2, USP18, USP27X, USP29, VAMP7, VAMP8, VAV1, VAV2, VAV3, VSIG4, VSIR, VTCN1, WAS, WDFY1, WNK1, WNT5A, XBP1, XCL1, XIAP, XRCC5, XRCC6, YES1, YTHDF2, YTHDF3, ZAP70, ZBP1, ZBTB1, ZBTB7B, ZC3H12A, ZCCHC3, ZDHHC5, ZNFX1, ZP3, ZP4</p> <p>ACIN1, ACKR2, ACKR4, ACVR1B, ACVR2A, ADGRE5, AIM2, AIMP1, AKT1, ALAS2, ANXA11, APLN, APOA1, APOA2, APOA4, APOBEC3F, APOBEC3G, AQP9, ARHGDI1, ATP6V0A2, AZU1, BCAR1, BCL10, BCL2, BLNK, BNIP3, BNIP3L, BST1, BST2, C1QBP, C2, C5AR1, CADM1, CALCA, CARTPT, CCL18, CCL19, CCL2, CCL20, CCL21, CCL22, CCL23, CCL24, CCL25, CCL26, CCL27, CCL4, CCL5, CCR1, CCR2, CCR4, CCR5, CCR6, CCR8, CCR9, CD164, CD1D, CD2, CD22, CD24, CD274, CD276, CD28, CD34, CD3D, CD3E, CD4, CD40LG, CD47, CD7, CD74, CD79A, CD79B, CD83, CD86, CD96, CDC42, CDK6, CEACAM8, CEBPB, CEBPG, CFHR1, CHST4, CHUK, CIITA, CKLF, CLEC7A, CMKLR1, CNIH1, CNR2, COLEC12, CRHR1, CRTAM, CSF1, CST7, CTLA4, CTSC, CTSE, CTSG, CTSS, CTSW, CX3CL1, CXCL12, CXCL13, CXCL8, CXCR2, CXCR4, DCSTAMP, DEFA1, DEFB1, DEFB103A, DEFB118, DEFB127, DEFB4A, DMBT1, DOCK2, DPP4, DPP8, DYRK3, EBI3, ELF4, ELP1, ERAP2, EREG, ETS1, FCAR, FCGR1A, FCGR2B, FCGR3A, FCGR3B, FCGRT, FCN1, FCN2, FOXO3, FOXP3, FTH1, FYB1, FYN, GBP2, GEM, GLMN, GPI, GPR183, GPR65, GTPBP1, GZMA, HAMP, HCLS1, HDAC4, HDAC5, HDAC7, HDAC9, HELLS, HLA-DRB3, HRH2, ICOSLG, IFI16, IFI6, IFITM2, IFITM3, IFNK, IFNL1, IFNLR1, IGSF6, IK, IKBKG, IL10, IL10RB, IL12A, IL12B, IL15, IL16, IL17A, IL17B, IL18, IL18BP, IL1R2, IL2, IL21, IL27, IL27RA, IL2RA, IL2RG, IL31RA, IL32, IL4, IL4R, IL6, IL6R, IL6ST, IL7, IL7R, INHA, INHBA, INS, IRAG2, IRF8, ITGB2, JAG2, KAT6A, KAT8, KIR2DL1, KIR2DL3, KIRREL3, KMT2A, KRT1, LAT, LAT2, LAX1, LCK, LCP2, LDB1, LIG1, LIG3, LILRB2, LST1, LTB4R, LTF, LY75, LY86, LYN, MADCAM1, MAFB, MAL, MALT1, MAP3K7, MAP4K1, MAP4K2, MBL2, MBP, MIA3, MLF1, MMP9, MNX1, MR1, MS4A1, MS4A2, MYH9, NCF4, NCK1, NCK2, NCOA6, NCR1, NFAM1, NFIL3, NHEJ1, NLRC3, NOTCH2, NOTCH4, OPRD1, OPRK1, PAX5, PDCD1, PF4, POU2AF1, POU2F2, PRELID1, PREX1, PRG3, PRKRA, PRL, PSMB10, PTAFR, PTGDR2, PTGER4, PTPRC, PYDC1, RAB3D, RAG1, RASGRP4, RFX1, RGS1, RPS19, RSAD2, RUNX1, S1PR4, SAA1, SART1, SCG2, SCIN, SECTM1, SEMA3C, SEMA4D, SEMA7A, SFTPD, SIRPG, SIT1, SKAP1, SLA2, SNRK, SOCS5, SOD1, SP2, SPACA3, SPI1, SPINK5, ST6GAL1, SYK, TFAZZIN, TAPBP, TARBP2, TBX1, TCF12, TCF7, TENM1, TGFB1, TGFB2, THY1, TLR4, TLR7, TLR8, TNFAIP1, TNFRSF14, TNFRSF4, TNFSF13, TPD52, TRAF2, TRAF6, TRAT1, TREM1, TREM2, TRIM22, UBE2N, VIPR1, VTN, WAS, XBP1, YTHDF2, ZAP70, ZBTB16, ZEB1,</p>

Gene sets name	Gene
GOBP IMMUNE RESPONSE	<p>ZNF675</p> <p>A2M, ABL1, ACKR2, ACKR3, ACKR4, ACOD1, ACTG1, ACTR2, ACTR3, ADA, ADAM15, ADAM17, ADAM8, ADAMDEC1, ADAMTS13, ADAR, ADARB1, ADCY7, ADGRB1, ADGRE1, ADGRE2, ADGRE5, ADORA2B, AGER, AHR, AICDA, AIF1, AIM2, AIRE, AKAP1, AKAP8, AKIRIN2, ALCAM, ALOX15, ALOX5, ALPK1, AMBP, ANG, ANGPT1, ANKHD1, ANKRD17, ANXA1, ANXA3, AP1G1, AP3B1, APBB1IP, APCS, APLF, APLN, APOA1, APOA2, APOA4, APOBEC3A, APOBEC3B, APOBEC3C, APOBEC3D, APOBEC3F, APOBEC3G, APOBEC3H, APOE, APOL1, APP, APPL1, APPL2, AQP4, ARG1, ARG2, ARHGEF2, ARID5A, ARL8B, ARRB2, ASS1, ATAD3A, ATAD5, ATG5, ATP6V0A2, ATP7A, AXL, AZGP1, AZU1, B2M, BACH2, BAG6, BANF1, BANK1, BATF, BAX, BCAR1, BCL10, BCL2, BCL3, BCL6, BCL6B, BCR, BIRC2, BIRC3, BLK, BLNK, BMP6, BMPR1A, BMX, BPI, BPIFA1, BPIFB1, BPIFB3, BST1, BST2, BTK, BTLA, BTN1A1, BTN2A1, BTN2A2, BTN2A3P, BTN3A1, BTN3A2, BTN3A3, BTNL10, BTNL2, BTNL3, BTNL8, BTNL9, C12orf4, C17orf99, C1QA, C1QB, C1QBP, C1QC, C1R, C1RL, C1S, C2, C3, C3AR1, C4A, C4B, C4BPA, C4BPB, C5, C5AR1, C5AR2, C6, C7, C8A, C8B, C8G, C9, CACNB3, CACTIN, CADM1, CALCOCO2, CAMK4, CAMP, CARD11, CARD8, CARD9, CASP1, CASP4, CASP6, CASP8, CAV1, CBL, CBLB, CCDC92, CCL1, CCL11, CCL13, CCL14, CCL15, CCL16, CCL17, CCL18, CCL19, CCL2, CCL20, CCL21, CCL22, CCL23, CCL24, CCL25, CCL26, CCL27, CCL28, CCL3, CCL3L1, CCL3L3, CCL4, CCL5, CCL7, CCL8, CCR1, CCR10, CCR2, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR9, CCRL2, CD14, CD160, CD164, CD177, CD180, CD19, CD1A, CD1B, CD1C, CD1D, CD1E, CD200, CD200R1, CD209, CD22, CD226, CD24, CD244, CD247, CD27, CD274, CD276, CD28, CD300A, CD300LF, CD33, CD36, CD38, CD4, CD40, CD40LG, CD46, CD47, CD48, CD55, CD58, CD59, CD5L, CD6, CD68, CD7, CD70, CD74, CD79A, CD79B, CD80, CD81, CD83, CD84, CD86, CD8A, CD8B, CD8B2, CD96, CDC37, CDC42, CDC42EP2, CDC42EP4, CDH17, CEACAM1, CEACAM8, CEBPB, CEBPG, CERT1, CFB, CFD, CFH, CFHR1, CFHR5, CFI, CFP, CGAS, CH25H, CHGA, CHID1, CHIT1, CHST4, CHUK, CIITA, CITED1, CLC, CLCF1, CLDN1, CLEC10A, CLEC12B, CLEC2A, CLEC4A, CLEC4C, CLEC4D, CLEC4E, CLEC4G, CLEC4M, CLEC5A, CLEC6A, CLEC7A, CLNK, CLPB, CLU, CMKLR1, CMTM3, CNIH1, CNOT7, CNPY3, CNR1, CNR2, COCH, COL3A1, COLEC10, COLEC11, COLEC12, CORO1A, CPLX2, CR1, CR1L, CR2, CRACR2A, CRCP, CREBBP, CRHR1, CRIP1, CRISP3, CRK, CRKL, CRP, CRTAM, CSF1, CSF1R, CSF2, CSF2RB, CSF3, CSK, CST7, CST9, CST9L, CST9LP1, CTLA4, CTSC, CTSG, CTSH, CTSK, CTSL, CTSS, CTSV, CTSW, CUEDC2, CX3CL1, CX3CR1, CXCL1, CXCL10, CXCL11, CXCL12, CXCL13, CXCL14, CXCL16, CXCL2, CXCL3, CXCL5, CXCL6, CXCL8, CXCL9, CXCR1, CXCR2, CXCR3, CXCR4, CXCR5, CXCR6, CYBA, CYBB, CYBC1, CYLD, CYP11B1, CYP27B1, CYRIB, CYSLTR1, CYSLTR2, DAB2IP, DAPK1, DAPK3, DBNL, DCLRE1C, DCST1, DDX1, DDX21, DDX3X, DDX58, DDX60, DEFA1, DEFA1B, DEFA3, DEFA4, DEFA5, DEFA6, DEFB1, DEFB104A, DEFB104B, DEFB105A, DEFB105B, DEFB106A, DEFB106B,</p>

Gene sets name	Gene
	DEFB107A, DEFB107B, DEFB108A, DEFB108B, DEFB110, DEFB112, DEFB113, DEFB114, DEFB115, DEFB116, DEFB118, DEFB119, DEFB121, DEFB123, DEFB124, DEFB125, DEFB126, DEFB127, DEFB128, DEFB131A, DEFB131B, DEFB132, DEFB133, DEFB134, DEFB135, DEFB4A, DENND1B, DGKZ, DHX36, DHX58, DHX9, DLL1, DMBT1, DNASE1, DNASE1L3, DNASE2, DOCK10, DOCK11, DOCK2, DPP8, DRD2, DTX3L, DUSP10, DUSP22, DUSP3, DYSF, EBI3, ECM1, ECSIT, EDA, EDN1, EIF2AK2, EIF2AK4, EIF2B1, EIF2B2, EIF2B3, EIF2B4, EIF2B5, ELANE, ELF1, ELF4, EMP2, ENDOU, ENPP1, ENPP2, ENPP3, ENTPD7, EOMES, EP300, EPG5, EPHB2, EPRS1, ERAP1, ERAP2, ERBIN, ERCC1, EREG, ERMAP, ESR1, ETS1, EXO1, EXOSC3, EXOSC6, EXOSC9, EXT1, EZR, F12, F2, F2RL1, FADD, FAM3A, FAS, FASLG, FBXO38, FBXO9, FCAMR, FCAR, FCER1A, FCER1G, FCER2, FCGR1A, FCGR1B, FCGR2A, FCGR2B, FCGR2C, FCGR3A, FCGR3B, FCGRT, FCHO1, FCN1, FCN2, FCN3, FCRL3, FCRL4, FCRLB, FER, FER1L5, FES, FFAR2, FFAR3, FGA, FGB, FGL1, FGL2, FGR, FKBP1A, FLNB, FLOT1, FLOT2, FOXF1, FOXJ1, FOXP1, FOXP3, FPR1, FPR2, FPR3, FRK, FTH1, FURIN, FUT7, FYB1, FYB2, FYN, FZD5, G3BP1, G3BP2, GAB2, GALP, GAPDH, GAPT, GATA1, GATA2, GATA3, GATA6, GBF1, GBP1, GBP2, GBP3, GBP4, GBP5, GBP6, GBP7, GCH1, GCSAM, GCSAML, GEM, GFER, GFI1, GNL1, GNLY, GP2, GPATCH3, GPER1, GPI, GPLD1, GPR108, GPR151, GPR183, GPR31, GPR32, GPR32P1, GPR33, GPR65, GPRC5B, GPS2, GPX1, GRAMD4, GRN, GSDMD, GSN, GTPBP1, GZMA, GZMB, GZMM, H2BC10, H2BC11, H2BC12, H2BC21, H2BC4, H2BC6, H2BC7, H2BC8, H2BS1, HAMP, HAVCR2, HCK, HCST, HERC5, HEXIM1, HFE, HHLA2, HK1, HLA-A, HLA-B, HLA-C, HLA-DMA, HLA-DMB, HLA-DOA, HLA-DOB, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQA2, HLA-DQB1, HLA-DQB2, HLA-DRA, HLA-DRB1, HLA-DRB3, HLA-DRB4, HLA-DRB5, HLA-E, HLA-F, HLA-G, HLA-H, HLX, HMCES, HMGB1, HMGB2, HMGB3, HMGN2, HMHB1, HMOX1, HMSD, HPRT1, HPX, HRAS, HRG, HRH2, HSP90AA1, HSP90AB1, HSPA1A, HSPA1B, HSPD1, ICAM1, ICOS, ICOSLG, IDO1, IFI16, IFI27, IFI35, IFI44, IFI44L, IFI6, IFIH1, IFIT1, IFIT1B, IFIT2, IFIT3, IFIT5, IFITM1, IFITM2, IFITM3, IFNA1, IFNA10, IFNA13, IFNA14, IFNA16, IFNA17, IFNA2, IFNA21, IFNA4, IFNA5, IFNA6, IFNA7, IFNA8, IFNAR1, IFNAR2, IFNB1, IFNE, IFNG, IFNK, IFNL1, IFNL2, IFNL3, IFNL4, IFNLR1, IFNW1, IGF1R, IGHA1, IGHA2, IGHD, IGHD1-1, IGHE, IGHG1, IGHG2, IGHG3, IGHG4, IGHJ1, IGHM, IGHV1-18, IGHV1-24, IGHV1-3, IGHV1-45, IGHV1-58, IGHV1-69, IGHV1-69-2, IGHV1-69D, IGHV1OR15-1, IGHV2-26, IGHV2-5, IGHV2-70, IGHV2-70D, IGHV3-11, IGHV3-13, IGHV3-15, IGHV3-16, IGHV3-20, IGHV3-21, IGHV3-23, IGHV3-30, IGHV3-33, IGHV3-35, IGHV3-38, IGHV3-43, IGHV3-48, IGHV3-49, IGHV3-53, IGHV3-64, IGHV3-64D, IGHV3-66, IGHV3-7, IGHV3-72, IGHV3-73, IGHV3-74, IGHV4-28, IGHV4-31, IGHV4-34, IGHV4-39, IGHV4-4, IGHV4-59, IGHV4-61, IGHV5-10-1, IGHV5-51, IGHV6-1, IGHV7-4-1, IGHV7-81, IGHV8-51-1, IGKC, IGKJ1, IGKV1-12, IGKV1-13, IGKV1-16, IGKV1-17, IGKV1-27, IGKV1-37, IGKV1-39, IGKV1-5, IGKV1-6, IGKV1-8, IGKV1-9, IGKV1D-12, IGKV1D-13, IGKV1D-17, IGKV1D-33, IGKV1D-37, IGKV1D-39, IGKV1D-42, IGKV1D-43, IGKV1D-8, IGKV2-24, IGKV2-28, IGKV2-29, IGKV2-30,

Gene sets name	Gene
	IGKV2-40, IGKV2D-24, IGKV2D-26, IGKV2D-28, IGKV2D-29, IGKV2D-30, IGKV3-15, IGKV3-20, IGKV3-7, IGKV3D-11, IGKV3D-15, IGKV3D-20, IGKV3D-7, IGKV4-1, IGKV5-2, IGKV6-21, IGKV6D-21, IGKV6D-41, IGLC1, IGLC2, IGLC3, IGLC6, IGLC7, IGLJ1, IGLL1, IGLL5, IGLV1-36, IGLV1-40, IGLV1-44, IGLV1-47, IGLV1-50, IGLV1-51, IGLV10-54, IGLV11-55, IGLV2-11, IGLV2-14, IGLV2-18, IGLV2-23, IGLV2-33, IGLV2-8, IGLV3-1, IGLV3-10, IGLV3-12, IGLV3-16, IGLV3-19, IGLV3-21, IGLV3-22, IGLV3-25, IGLV3-27, IGLV3-32, IGLV3-9, IGLV4-3, IGLV4-60, IGLV4-69, IGLV5-37, IGLV5-45, IGLV5-48, IGLV5-52, IGLV6-57, IGLV7-43, IGLV7-46, IGLV8-61, IGLV9-49, IGSF6, IKBKB, IKBKE, IKBKG, IL10, IL10RB, IL12A, IL12B, IL12RB1, IL13, IL13RA2, IL15, IL16, IL17A, IL17B, IL17F, IL17RA, IL18, IL18BP, IL18R1, IL18RAP, IL19, IL1A, IL1B, IL1F10, IL1R1, IL1R2, IL1RAP, IL1RL1, IL1RL2, IL1RN, IL2, IL20RB, IL21, IL21R, IL23A, IL23R, IL25, IL27, IL27RA, IL2RA, IL2RG, IL3, IL31RA, IL32, IL34, IL36A, IL36B, IL36G, IL36RN, IL37, IL4, IL4I1, IL4R, IL5, IL5RA, IL6, IL6R, IL6ST, IL7, IL7R, IL9, IL9R, ILRUN, INAVA, INPP5D, INS, IPO7, IRAK1, IRAK1BP1, IRAK2, IRAK3, IRAK4, IRF1, IRF3, IRF4, IRF5, IRF7, IRF8, IRGM, ISG15, ISG20, ITCH, ITFG2, ITGAD, ITGAL, ITGAM, ITGB2, ITGB6, ITGB8, ITK, ITM2A, JAG1, JAK1, JAK2, JAK3, JAM3, JCHAIN, KAAG1, KARS1, KCNN4, KDM5D, KHDRBS1, KIF5B, KIR2DL1, KIR2DL3, KIR2DL4, KIR2DS1, KIR2DS2, KIR2DS5, KIR3DL1, KIR3DS1, KIT, KLHL6, KLK3, KLK5, KLK7, KLRC1, KLRC2, KLRC3, KLRC4, KLRC4-KLRK1, KLRD1, KLRF2, KLRG1, KLRK1, KMT5B, KMT5C, KRT1, KRT16, KRT6A, KYNU, LACC1, LAG3, LAIR1, LAMP1, LAMP3, LAPTM5, LAT, LAT2, LAX1, LBP, LCK, LCN2, LCP1, LCP2, LEAP2, LEF1, LEP, LFNG, LGALS1, LGALS3, LGALS9, LGR4, LIF, LIG4, LILRA1, LILRA2, LILRA3, LILRA4, LILRA5, LILRA6, LILRB1, LILRB2, LILRB3, LILRB4, LILRB5, LIME1, LIMK1, LOXL3, LPXN, LRP1, LRP8, LRRC14, LRRC19, LSM14A, LST1, LTA, LTB, LTB4R, LTBR, LTF, LY75, LY86, LY9, LY96, LYAR, LYN, LYST, LYZ, MAD2L2, MADCAM1, MALT1, MAP2K4, MAP2K6, MAP2K7, MAP3K1, MAP3K14, MAP3K5, MAP3K7, MAP4K2, MAPK1, MAPK10, MAPK14, MAPK8, MAPK9, MAPKAPK2, MAPKAPK3, MARCHF1, MARCHF2, MARCHF8, MARCO, MASP1, MASP2, MATR3, MAVS, MBL2, MBP, MCOLN1, MCOLN2, MDK, MED1, MEF2C, MEFV, METTL3, MFAP4, MFHAS1, MFNG, MICA, MICB, MID2, MIF, MILR1, MIR105-1, MIR136, MIR140, MIR146A, MIR17, MIR181B1, MIR18A, MIR19A, MIR19B1, MIR21, MIR34A, MIR520B, MIR520E, MIR6869, MIR708, MKRN2, MLH1, MMP12, MNDA, MOG, MPEG1, MR1, MRC1, MRGPRX2, MS4A1, MS4A2, MSH2, MSH6, MSRB1, MST1R, MTOR, MUC7, MUL1, MX1, MX2, MYB, MYC, MYD88, MYLPF, MYO1C, MYO1G, N4BP1, NAIP, NBN, NCF1, NCF2, NCKAP1L, NCR1, NCR3, NCR3LG1, NDFIP1, NECTIN1, NECTIN2, NFAM1, NFATC2, NFE2L2, NFIL3, NFILZ, NFKB2, NFKBIA, NFKBID, NFKBIL1, NFKBIZ, NINJ1, NKG7, NKX2-3, NLRC3, NLRC4, NLRC5, NLRP1, NLRP10, NLRP2, NLRP2B, NLRP3, NLRP6, NLRP9, NLRX1, NMI, NOD1, NOD2, NONO, NOP53, NOS2, NOTCH1, NOTCH2, NPLOC4, NPY, NPY5R, NR1D1, NR1H2, NR1H3, NR1H4, NR4A3, NRROS, NSD2, NUB1, OAS1, OAS2, OAS3, OASL, OPRD1, OPRK1, OPRM1, OPTN, ORAI1, OSM, OTOP1, OTUB1, OTUD4, OTUD7B, OTULIN, P2RX7, PADI4, PAG1, PAK1, PAK2,

Gene sets name	Gene
	PAK3, PARK7, PARP14, PARP3, PARP9, PAWR, PAX5, PAXIP1, PCBP2, PCK1, PDCD1, PDCD1LG2, PDE12, PDE4B, PDE4D, PDPK1, PELI1, PF4, PF4V1, PGC, PGLYRP1, PGLYRP2, PGLYRP3, PGLYRP4, PHB, PHB2, PHPT1, PI3, PIANP, PIGR, PIK3AP1, PIK3CA, PIK3CD, PIK3CG, PIK3R6, PJA2, PKHD1L1, PKN1, PLA2G1B, PLA2G2D, PLA2G2F, PLA2G3, PLA2G4A, PLA2G5, PLA2G6, PLCG1, PLCG2, PLCL2, PLD2, PLD4, PLEC, PLEKHA1, PLEKHM2, PLK2, PLPP4, PLSCR1, PML, PNMA1, PNP, POLR3A, POLR3B, POLR3C, POLR3D, POLR3E, POLR3F, POLR3G, POLR3H, POLR3K, POU2AF1, POU2F2, PPARG, PPBP, PPP1R14B, PPP2R3C, PPP3CB, PPP6C, PQBP1, PRAM1, PRDM1, PRDX1, PRELID1, PRF1, PRG2, PRG3, PRG4, PRKCB, PRKCD, PRKCE, PRKCH, PRKCQ, PRKCZ, PRKD1, PRKD2, PRKDC, PRKRA, PRNP, PRR7, PRSS2, PRSS3, PRTN3, PSEN1, PSG9, PSMA1, PSMB10, PSMB4, PSPC1, PSTPIP1, PTAFR, PTGDR, PTGDR2, PTGDS, PTGER4, PTK2, PTK2B, PTK6, PTPN1, PTPN11, PTPN2, PTPN22, PTPN6, PTPRC, PTPRD, PTPRJ, PTPRS, PTX3, PUM1, PUM2, PVR, PVRIG, PXDN, PYCARD, PYDC1, PYDC2, PYHIN1, RAB11FIP2, RAB17, RAB20, RAB27A, RAB29, RAB43, RAB7B, RABGEF1, RAC2, RAET1E, RAET1G, RAET1L, RAG1, RAG2, RAP1GAP, RAP1GAP2, RAPGEF3, RAPGEF4, RARA, RARRES2, RASGRP1, RBCK1, RBM14, RBPJ, RC3H1, RC3H2, REG1A, REG1B, REG3A, REG3G, REL, RELA, RELB, RFTN1, RFX1, RGCC, RGS1, RHBDF2, RIF1, RIOK3, RIPK2, RIPK3, RNASE2, RNASE3, RNASE6, RNASE7, RNASE8, RNASET2, RNF125, RNF135, RNF166, RNF168, RNF185, RNF187, RNF19B, RNF31, RNF39, RNF8, ROMO1, RORA, RORC, RPL13A, RPL30, RPL39, RPS19, RPS3, RPS6, RPS6KA3, RPS6KB1, RSAD2, RTN4, S100A12, S100A13, S100A14, S100A7, S100A8, S100A9, S1PR4, SAMHD1, SAMSN1, SARM1, SASH3, SBNO2, SCAP, SCARA3, SCART1, SCIMP, SCNN1B, SDHAF4, SEC14L1, SECTM1, SELENOS, SEMA3C, SEMA4A, SEMA4D, SEMA7A, SEMG1, SEMG2, SENP7, SERINC3, SERINC5, SERPINB4, SERPINB9, SERPING1, SETD2, SFPQ, SFTPD, SH2B2, SH2D1A, SH2D1B, SHFL, SHLD1, SHLD2, SHLD3, SHMT2, SIGLEC10, SIN3A, SIPA1, SIRPA, SIRT1, SIRT2, SIT1, SKAP1, SKP2, SLA, SLA2, SLAMF1, SLAMF6, SLAMF7, SLAMF8, SLAMF9, SLC11A1, SLC15A2, SLC15A3, SLC15A4, SLC22A13, SLC26A6, SLC30A8, SLC39A10, SLC46A2, SLC7A5, SLPI, SMAD3, SMAD6, SMAD7, SMPD1, SMPDL3B, SNAP23, SNCA, SNX4, SNX6, SOCS1, SOCS5, SOS1, SP100, SP2, SPAG11A, SPAG11B, SPG21, SPHK2, SPI1, SPINK5, SPN, SPNS2, SPON2, SPPL2A, SPPL2B, SPPL3, SRC, SRMS, SRPK1, SRPK2, SSC5D, ST3GAL1, ST6GAL1, STAP1, STAT1, STAT2, STAT3, STAT5B, STAT6, STING1, STK11, STMP1, STOML2, STX4, STX7, STX8, STXBP1, STXBP2, STXBP3, STXBP4, STYK1, SUCNR1, SUPT6H, SUSD4, SWAP70, SYK, SYNCRIP, TAP1, TAP2, TAPBP, TAPBPL, TARM1, TASL, TBK1, TBX21, TCF12, TCF7, TCIM, TCIRG1, TDGF1, TEC, TENM1, TESPA1, TF, TFE3, TFEB, TFRC, TGFB1, TGFB2, TGFB3, TGFB3, TGFB3, THBS1, THEMIS, THEMIS2, THOC1, THY1, TICAM1, TICAM2, TIFA, TIRAP, TKFC, TLR1, TLR10, TLR2, TLR3, TLR4, TLR5, TLR6, TLR7, TLR8, TLR9, TMEM106A, TMEM98, TMIGD2, TNF, TNFAIP1, TNFAIP3, TNFAIP8L2, TNFRSF11A, TNFRSF13B, TNFRSF13C, TNFRSF14, TNFRSF17,

Gene sets name	Gene
GOBP REGULATION OF IMMUNE SYSTEM PROCESS	<p>TNFRSF1B, TNFRSF21, TNFRSF4, TNFSF10, TNFSF11, TNFSF12, TNFSF13, TNFSF13B, TNFSF14, TNFSF15, TNFSF18, TNFSF4, TNFSF8, TNFSF9, TNIP1, TNIP2, TNIP3, TNK1, TNK2, TOLLIP, TOMM70, TP53, TP53BP1, TRAF2, TRAF3, TRAF3IP2, TRAF4, TRAF6, TRAFD1, TRAJ3, TRAJ31, TRAJ42, TRAT1, TRAV1-1, TRAV1-2, TRAV10, TRAV12-1, TRAV12-2, TRAV12-3, TRAV13-1, TRAV13-2, TRAV14DV4, TRAV16, TRAV17, TRAV18, TRAV19, TRAV2, TRAV20, TRAV21, TRAV22, TRAV23DV6, TRAV24, TRAV25, TRAV26-1, TRAV26-2, TRAV27, TRAV29DV5, TRAV3, TRAV30, TRAV34, TRAV35, TRAV36DV7, TRAV38-1, TRAV38-2DV8, TRAV39, TRAV4, TRAV40, TRAV41, TRAV5, TRAV6, TRAV7, TRAV8-1, TRAV8-2, TRAV8-3, TRAV8-4, TRAV8-6, TRAV9-1, TRAV9-2, TRBC1, TRBC2, TRBD1, TRBJ1-1, TRBJ1-2, TRBJ1-3, TRBJ1-4, TRBJ1-5, TRBJ1-6, TRBJ2-1, TRBJ2-2, TRBJ2-3, TRBJ2-4, TRBJ2-5, TRBJ2-6, TRBJ2-7, TRBV10-1, TRBV10-2, TRBV10-3, TRBV11-1, TRBV11-2, TRBV11-3, TRBV12-3, TRBV12-4, TRBV12-5, TRBV13, TRBV14, TRBV16, TRBV17, TRBV18, TRBV19, TRBV2, TRBV20-1, TRBV23-1, TRBV24-1, TRBV25-1, TRBV27, TRBV28, TRBV29-1, TRBV3-1, TRBV30, TRBV4-1, TRBV4-2, TRBV5-1, TRBV5-3, TRBV5-4, TRBV5-5, TRBV5-6, TRBV5-7, TRBV6-1, TRBV6-4, TRBV6-5, TRBV6-6, TRBV6-7, TRBV6-8, TRBV7-1, TRBV7-2, TRBV7-3, TRBV7-4, TRBV7-6, TRBV7-7, TRBV7-9, TRBV9, TRDC, TRDD1, TRDJ1, TRDV1, TRDV2, TRDV3, TREM1, TREM2, TREML1, TREML4, TRESX1, TRGC2, TRGJ2, TRGV1, TRGV10, TRGV11, TRGV2, TRGV3, TRGV4, TRGV5, TRGV8, TRGV9, TRIL, TRIM10, TRIM11, TRIM13, TRIM14, TRIM15, TRIM17, TRIM21, TRIM22, TRIM23, TRIM25, TRIM26, TRIM27, TRIM28, TRIM29, TRIM31, TRIM32, TRIM34, TRIM35, TRIM38, TRIM39, TRIM4, TRIM40, TRIM41, TRIM43, TRIM43B, TRIM48, TRIM49, TRIM49B, TRIM49C, TRIM49D1, TRIM49D2, TRIM5, TRIM51, TRIM56, TRIM58, TRIM59, TRIM6, TRIM60, TRIM61, TRIM62, TRIM64, TRIM64B, TRIM64C, TRIM68, TRIM75P, TRIM77, TRIM8, TRIML1, TRIML2, TRPM4, TSC1, TSPAN6, TTC4, TTLL1, TTLL12, TUBB, TUBB4B, TXK, TYK2, TYRO3, TYROBP, UBASH3A, UBD, UBE2K, UBE2N, UBQLN1, UFD1, ULBP1, ULBP2, ULBP3, UNC13D, UNC93B1, UNG, USP14, USP15, USP17L2, USP18, USP27X, USP29, VAMP2, VAMP3, VAMP7, VAMP8, VAV1, VAV2, VAV3, VIM, VNN1, VPREB1, VPREB3, VPS26B, VSIG4, VSIR, VTCN1, VTN, WAS, WDFY1, WFDC10A, WFDC10B, WFDC11, WFDC12, WFDC13, WFDC2, WFDC3, WFDC5, WFDC9, WNK1, WNT5A, WRNIP1, XBP1, XCL1, XCL2, XCR1, XIAP, XRCC5, XRCC6, YES1, YTHDF2, YTHDF3, ZAP70, ZBP1, ZBTB1, ZBTB7B, ZC3H12A, ZC3HAV1, ZCCHC3, ZDHHC1, ZDHHC11, ZDHHC5, ZFPM1, ZNF683, ZNFX1, ZP3, ZP4, ZYX</p> <p>ADA, MIR708, BTNL10, KIR2DS2, CD24, C17orf99, PARP3, IGLL5, MICA, KLRC4-KLRK1, MICOS10-NBL1, DNM1L, NR1H3, TSPAN32, PQBP1, ADAM8, IFNL4, RASGRP1, EBI3, CHST4, RNF41, ADAM10, CDK6, FLOT1, TRIB1, CD96, LRRC17, MIR6869, CDKN1A, FSTL3, IGHV2-70D, IGHV1-69D, IGHV3-64D, LILRB2, ADAR TNIP1, SIRPB1, TLR6, BTN3A3, BTN2A2, NOD1, PIAS3, SPON2, RBM14, VAV3, HAX1, GPNMB, MAD2L2, MERTK, PIBF1, CREB3, CEBPA, CEBPB, CIB1, OLFM4, CXCL13, COLEC10, SH2B2,</p>

Gene sets name	Gene
	<p> HEXIM1, RBCK1, POLR3F, POLR3G, POLR3C, KHDRBS1, CD226, TNFSF13B, FUT9 MASP2, CTSC, TOB2, PLK2, HSPH1, FAXDC2, CCL27, LILRB1, ARID5A, HCST, FGL2, MALT1, LYVE1, TRAFD1, BTNL3, SPINK5, LILRB4, LILRB3, LILRA2, RIPK3, EMILIN1, BTN3A2, BTN3A1, BTN2A1, CD160, CDC37, KAT7, GLMN, HHLA2, CORO1A, IRAK3, DUSP10, PADI2, SHLD3, USP18, IL17F, TREX1, ADCY7, CD300A, PARK7, VSIG4, PHB2, CHRN2, NLRP3, TIRAP, ERMAP, PGLYRP2, MYSM1, SLAMF6, CGAS, FCRL3, GBP5, TNFRSF13C, FAM210B, CLNK, SH2D1B, CLC, TRIM6, EXOSC6, PIK3AP1, CLU, LRRK2, CLPTM1, SLC15A4, H4-16, SPPL3, CCR1, LEO1, CCR6, CCR7, CMTM3, CMKLR1, ZBP2, SPACA3, SPNS2, TMIGD2, CNR1, CNR2, FCRLB, COL3A1, OCSTAMP, ANKRD54, REG3G, TMEM178A, CD200R1, MAP3K8, OTOP1, SLC9B2, IL31RA, PPARGC1B, ADORA1, GPR151, ADORA2A, RAET1E, ADORA2B, CR1, CR1L, CR2, CREB1, CREBBP, CRK, CRKL, CRP, ZBTB46, SIRPA, MAPK14, CSF1, CSF1R, CSF3, CSF3R, CSK, LACC1, LRFN5, IL34, CD300LF, PIK3R6, TICAM1, GCSAML, RC3H1, DCST1, IL23R, CTLA4, PYHIN1, SHLD1, CTNNA1, NFAM1, CTSG, CTSH, BTLA, CTSS, CX3CR1, DAB2IP, CYBA, BTNL9, CYLD, MOSPD2, CYP19A1, CLECL1, CD55, ZFP1, DENND1B, AP1G1, DDT, DDX1, DDX3X, DHX9, CFD, COCH, TMEM64, DHX36, NLRP6, ZNF675, DHPS, DLG1, AGER, DNASE1, DNASE1L3, DNASE2, DPP4, DRD2, JAG1, TSC22D3, DUSP1, DUSP3, GPR183, ECM1, EDN1, EDN2, EDN3, EFN1, EFN2, EFN3, AHR, EGR3, PLPP4, PIANP, ANO6, EIF2B1, NLRC3, AIF1, ELANE, ELF1, FYB2, A2M, APLF, UNC13D, TIGIT, EP300, EPHB2, EPO, ERBB2, EREG, AKT1, ESR1, ESRRA, ETS1, EVI2B, F2RL1, F7, FANCA, FANCD2, PTK2B, FBN1, FCER1A, MS4A2, FCER1G, FCER2, FCGR1A, FCGR1B, FCGR2A, FCGR2B, ADGRF5, FCGR3A, FCGR3B, FCN1, FCN2, MTURN, FER, FES, FGF10, FGL1, FGR, VEGFD, FKBP1A, IKZF3, RAB11FIP2, ZBTB1, KLRK1, FOXF1, PAXIP1, ACIN1, FOXJ1, SWAP70, FOXO3, SARM1, LRCH1, FCHO1, GRAMD4, TLL1, RFTN1, RCOR1, FLOT2, SYT11, PLCL2, PLCB1, PHLPP1, TMEM131L, ICOSLG, FN1, PUM2, SIRT1, ABCB10, TNFRSF13B, SCRIB, CLCF1, FOS, RBFOX2, LILRA4, FPR1, FPR2, DDX58, FPR3, DAPK2, MKRN2, LY96, SLC7A11, CADM1, SHPK, BRD1, DEFB124, ALOX15, IL27, MTOR, FSHB, ABL1, FUT4, FUT7, FYB1, FYN, YTHDF3, XRCC6, GABPA, BCL6B, ZNF683, GCSAM, FBXO7, RHBDD3, KLK5, PRKD2, AMBP, NCR3, ZDHHC5, IL4I1, SAMHD1, SIN3A, TKFC, L3MBTL1, ANKRD17, APPL1, LSM14A, LRRC32, PTPN22, GAS6, STAP1, GATA1, GATA2, GATA3, CLEC4E, BLOC1S6, GATA6, PLA2G2D, GBP1, KAT2A, GREM1, MSTN, GFER, GFI1, HAVCR1, GGT1, GGT3P, LAT, FOXP1, PRELID1, IL36B, C5AR2, SIT1, TNFRSF21, SMPDL3B, RABGEF1, STK39, GLI2, GLI3, GPI, GPLD1, IFNL2, IFNL3, IFNL1, CCDC88B, CXCR3, IGHV7-81, IGHV6-1, IGHV5-10-1, IGHV5-51 IGHV4-61, IGHV4-59, IGHV4-39, IGHV4-34, IGHV4-31 ANGPT1, IGHV4-28, IGHV4-4, MILR1, IGHV3-74, IGHV3-73, GPR18, IGHV3-72, TMEM102, IGHV3-66, IGHV3-64, LGALS9B, IGHV3-53, IGHV3-49, IGHV3-48, IGHV3-43, IGHV3-38, HMSD, IGHV3-35, IGHV3-33, CXCL17, IGHV3-30, IGHV3-23, IGHV3-21, IGHV3-20, Tafa3, IGHV3-16, IGHV3-15, IGHV3-13, IGHV3-11 IGHV3-7, IGHV2-70, IGHV2-26, IGHV2-5, IGHV1-69-2, </p>

Gene sets name	Gene
	IGHV1-69, IGHV1-58, IGHV1-45, IGHV1-24, IGHV1-18 IGHV1-3, DLL1, GPER1, TRDC, GPR31, GPR32, GPR32P1, GPR33, TREML4, TRBC2, TRBC1, NLRP2B, FFAR3, FFAR2, GPS2, GPX1, IGLC7, TMEM176B, GRN, RGCC, PHPT1, DROSHA, PYCARD, TBK1, CD274, BLNK, ICOS, CNOT7, GPR171, UBQLN1, NOP53, TBX21, SH3KBP1, ANXA1, HCK, HCLS1, NCKAP1L, CFH, HFE, CFHR1, ADGRE2, CD209, HIF1A, UBE2K, STOML2, HK1, HLA-A, HLA-B, HLA-DMA, HLA-DMB, HLA-DOA, HLA-DOB, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQA2, HLA-DQB1, HLA-DQB2, HLA-DRA, HLA-DRB1, HLA-DRB3, HLA-DRB4, HLA-DRB5, HLA-E, HLA-F, HLA-G, HLA-H, MR1, HLX, HMGB1, HMGB2, HMGB3, HMOX1, HOXA5, HOXA7, HOXA9, HOXB8, APCS, AIRE, HPX, HRAS, HRG, PRMT1, HES1, BIRC2, HSF1, BIRC3, HSPA1A, HSPA1B, XIAP, HSPA9, HSP90AA1, HSP90AB1, HSPD1, APOA1, APOA2, ICAM1, NLRP10, CLEC4D, RAB7B, HCAR2, CLEC4G, ID2, STING1, CFI, IFI16, IFI35, IFNA2, IFNB1, IRGM, IFNG, APOD, IGF1, APOE, IGF2, IGFBP2, IGHA1, IGHA2, IGHD, IGHE, IGHG1, IGHG2, IGHG3, IGHG4, IGHM, APP, IGKC, RAET1G, TICAM2, IGLC1, IGLC2, IGLC3, KLK3, IGLC6, IGLL1, IHH, IKBKB, IL1A, IL1B, IL1R1, IL2, IL2RA, IL4, IL4R, IL5, IL6, IL6R, IL6ST, IL7, IL7R, CXCL8, IL10, IL12A, IL12B, IL12RB1, IL13, IL13RA2, AQP3, IL15, IL15RA, IL17A, IL18, IDO1, INHA, INHBA, CXCL10, INS, INPP5D, IRAK1, IRAK2, IRF1, IRF3, IRF4, IRF7, ITGA2, ITGA4, ITGAM, ITGB2, EIF6, ITK, ITPKB, JAK2, JAK3, JUND, KARS1, NCR3LG1, TBC1D10C, MIA3, USP17L2, KCNN4, KIR2DL1, KIR2DL4, KIT, KLRC1, KLRC2, KLRC3, KLRD1, ARG1, ARG2, KRT1, RHOA, THEMIS, ILDR2, C10orf99, CLEC12B, IGHV1OR15-1, SCIMP, BLOC1S3, USP27X, LAG3, RHOG, LAMP1, LBP, LCK, LCP2, LDLR, LEP, LGALS1, LGALS3, LGALS9, LIF, LIMK1, RHOH, MYO18A, LMO1, LOX, PLPP6, LTA, ARNT, LTF, LYN, SH2D1A, MIR105-1, MIR125A, MIR125B1, MIR128-1, MIR130A, MIR136, MIR140, MIR142, MIR145, MIR146A, MIR17, MIR18A, MIR181B1, MIR181C, MIR185, MIR19A, MIR19B1, MIR21, MIR221, MIR222, MIR223, MIR24-1, MIR27A, MIR30B, MIR34A, MIR17HG, SMAD3, ARRB2, SMAD7, MBL2, CD46, DNAJB9, MDK, MEF2C, MEIS1, MEIS2, MAP3K1, MFAP4, KITLG, CD99, MICB, MIF, MITF, MLH1, MMP8, MMP12, MMP14, MNDA, MOG, CD200, MPL, MPP1, EIF2AK4, RHEX, NRARP, TARM1, MSH2, MSN, MYB, MYC, MYD88, NBL1, NCK1, ATM, NF1, NFATC2, NFE2L2, NFKBIA, NFKBIL1, NINJ1, NONO, NOS2, CNOT4, NPY, NOTCH2, CCN3, PNP, NPY5R, ROR2, OAS1, OAS3, ORM1, ORM2, P2RX4, P2RX7, FURIN, PLA2G3, SERPINE1, PAK1, IL20, PAK2, PAK3, PAWR, TRAT1, FOXP3, EXOSC3, ZBTB7B, PCK1, GAL, KMT5B, IRAK4, ZNF580, LEF1, CLDN18, MZB1, C1RL, TLR7, CD320, SLC15A3, TLR8, SPG21, PDCD1, PDE4B, SCARA3, PDE4D, YTHDF2, IL23A, CYRIB, KLF13, ENPP3, PDPK1, GPRC5B, CD244, ERAP1, PF4, CFP, PGC, PGF, PHB, SERPINB9, PIGR, PIK3CA, PIK3CB, PIK3CD, PIK3R1, PIP, PLA2G1B, PLA2G2A, PLA2G4A, PLA2G5, IL17D, UBASH3A, PLCG1, PLCG2, PLD2, PLSCR1, IL20RB, TLR9, TREM2, SIAE, SASH3, SHLD2, RC3H2, POU4F1, POU4F2, PAF1, PARP14, PPARG, P4HTM, MED1, BTN2A3P, OTUD4, TRPM4, LAX1, YTHDF1, LIME1, RNF125, TESC, PPP2R3C, BANK1, SUS4, RNF31, TAPBPL, AKIRIN2, PRMT6, RIF1, APPL2, TRIM62, PSPC1, FBXW7, PPP3CB, TMEM176A,

Gene sets name	Gene
	<p>LGR4, SIRPG, H4C15, SMPD3, DDX60, AMBRA1, LYAR, NPLOC4, POLR3B, PRKAR1A, INAVA, PRKCA, PRKCB, PCID2, AXL, PRKCD, PRKCE, PAG1, SELENOS, PRKCH, PKN1, PRKCQ, PRKCZ, PRKDC, ERBIN, MAPK1, MAPK3, MAPK8, MAPK11, MAPK9, MAPK10, MAP2K6, MAP2K7, PRNP, BTNL2, CRTAM, AZGP1, METTL3, LGMN, CCL28, MASP1, KLK7, CYP26B1, PSEN1, B2M, PSG9, PSMA1, IFNK, SLAMF8, GPR137, SPHK2, TCIM, PSMB4, GPR108, SPPL2B, DUSP22, HMCES, CTNNBIP1, TWSG1, ENTPD7, PITHD1, C12orf4, CAMK1D, CD177, RTN4, PELI1, ZNFX1, ZMIZ1, SLC39A10, BAD, PTAFR, IGHV7-4-1 PTGER4, S100A14, MIR520E, MIR520B, PTK2, MAVS, MTUS1, WDFY1, SH3RF1, PTN, USP29, GPAM, PTPN1, PTPN2, EPG5, PTPN6, PTPN11, HAMP, ZP4, SLC46A2, PTPRC, PTPRD, PTPRJ, PTPRS, BAX, PURB, PVR, NECTIN2, NLRC4, JAM2, CACTIN, SELENOK, RAC1, RAC2, RAG1, RAG2, IL21, RARA, RARG, RARRES2, RB1, PLEKHA1, TRPV4, RBP4, BCL2, RELA, TRIM27, FAM3A, BCL6, SMAP1, RORA, BCR, RPS3, RPS6KA3, RPS19, BDKRB1, S100A7, CFB, SERPINB4, BGLAP, CEACAM1, CCL1, CCL2, CCL3, CCL4, CCL5, CCL7, CCL8, CCL19, CCL20, CCL21, CCL24, CCL25, CXCL6, XCL1, CX3CL1, SDC4, CXCL12, PRDM1, GPATCH3, ZNF335, GPSM3, SEC14L1, BLK, MYO1G, SELE, SELP, SAMSN1, CRLF2, VSIR, NOD2, IFIH1, MAP2K4, CARD9, SFPQ, SFRP1, NFKBIZ, SFTPD, CLEC7A, PLA2G2F, SHH, PRSS56, RBM15, P2RY12, ST3GAL4, MARCHF7, LRRC19, RASAL3, SLAMF1, WNK1, BMP4, BMP5, NCF1, LGALS7B, SLC7A1, LGALS9C, SLC11A1, SLC15A2, BMX, POLR3D, SNCA, SOD1, SOS1, SOS2, SOX4, SOX9, SOX11, SOX12, SPI1, SPN, SPTA1, BPI, SRC, TRIM21, ZFP36L1, STAT1, STAT2, STAT3, STAT5B, STAT6, ZFP36L2, STK10, STK11, STX4, STXBP1, STXBP2, BST1, SUPT6H, BST2, VAMP7, XCL2, SYK, ADAM17, TACR1, MAP3K7, TAL1, TAPBP, TCF7, ZEB1, BTK, BTN1A1, TCTA, PRDX2, TEC, TMBIM6, TFE3, TFRC, TGFB1, TGFB2, TGFB3, TGFB2, THBS1, THBS4, THPO, THY1, KLF10, C1QBP, TLR1, TLR2, TLR3, TLR4, SERPING1, TLR5, TSPAN6, GPR137B, C1QA, TNF, TNFAIP3, C1QB, TNFAIP6, TNFRSF1B, C1QC, C1R, TP53BP1, C1S, C2, C3, TRAF2, TRAF3, TRAF6, C3AR1, C4A, C4B, C4BPA, C4BPB, C5, C5AR1, GGT2, C6, TNFSF4, CCR2, TNFRSF4, TXK, TYK2, C7, TYRO3, ACOD1, TYROBP, C8A, C8B, C8G, UBE2N, C9, UFD1, SCGB1A1, NR1H2, VAV1, VAV2, VCAM1, VEGFA, VEGFB, VEGFC, EZR, WAS, LAT2, NSD2, WNT5A, XBP1, XG, XRCC5, YES1, ZAP70, ZFP36, ZNF16, ZBTB16, TRIM25, ZP3, LRP8, LAPTM5, CACNB3, FZD5, MAPKAPK3, COLEC11, CUEDC2, PVRI, DHX58, MMP28, TNIP2, BAG6, LST1, PLA2G7, NKAP, CDC73, MUL1, TNFAIP8L2, AKIRIN1, RHBDF2, NLRX1, VTCN1, RIN3, BTNL8, ATAD5, TNIP3, SLC8B1, NR4A3, ZC3H12A, ALPK1, TASL, PDGFD, WDR61, PDCD1LG2, CD276, NDFIP1, ZBP1, COLEC12, CALR, GPR68, CAMK4, SLC7A5, CFHR5, DCSTAMP, FBXO38, CLPB, UNC93B1, DOCK8, MADCAM1, TLR10, TRIM56, H4C9, KLRC4, GF1B, PLVAP, H4C1, CASP3, H4C4, H4C6, H4C12, H4C11, H4C3, H4C8, H4C2, PARP9, H4C5, H4C13, CD99L2, H4C14, JAM3, ITCH, MAD1L1, CASP6, PLA2G6, PLA2G10, CASP8, PRAM1, NLRC5, STX7, SLA2, RNF135, PRXL2A, NCK2, CARD11, CUL4A, ZC3H8, FOXN1, TTBK1, LOXL3, KMT5C, NFKBID, SEMA7A, ADTRP, HAVCR2, SPPL2A,</p>

Gene sets name	Gene
IMMUNE SYSTEM PROCESS	<p>UBASH3B, IKBKG, DGKZ, CST7, TRIM5, ZCCHC3, AP3B1, FCN3, SCIN, TSLP, CAV1, TNFSF11, RUNX1, SKAP1, OASL, RUNX3, CBF3, SOCS1, PDE5A, IRS2, VAMP8, CBLB, SNX4, RIPK1, TNFSF14, TNFSF13, TNFSF9, TNFRSF14, RIPK2, FADD, RIOK3, TNFRSF18, IL1RL2, IL18R1, BANF1, CD84, LDB1, VNN1, SPHK1, EIF2B4, EIF2B3, EIF2B2, EIF2B5, BCL10, RAB29, AP3D1, WASL, WNT3A, KLHL6, TRIM15, PGLYRP1, TNFSF18, OTULIN, DCAF15, MCU, IL33, CD1A, SART1, DNAJA3, TRIM41, ACVR1B, CD1B, FCGR2C, CD1C, NMI, CD1D, CD1E, CD2, RNF185, RSAD2, CD3E, IL1RL1, DDX21, CD247, ACVR2A, CD4, CD5, CD5L, CD6, DLG5, CD8A, MFHAS1, CD8B, MAPKAPK2, TIFA, CD8B2, BPIFB1, CD9, CD14, GPR55, CD19, SOCS6, CD83, MS4A1, CD22, VAMP3, SLIT2, ADIPOQ, CD27, SLC22A13, CLEC6A, CD28, LPXN, CD80, CD86, CHST2, NCR1, TNFSF8, AIM2, CD33, IL27RA, THEMIS2, ATG5, MAPK8IP1, CD36, CD38, BCAR1, NR1D1, CD40, SOX13, CD40LG, CARTPT, CD47, CD48, ISG15, IKBKE, CTR9, SOCS5, CD59, CD68, N4BP1, LRRC14, PUM1, CD70, CD74, CD79A, CD79B, CD81, RIPOR2, TOX, RASSF2, MATR3, TESPA1, GAB2, TRIL, PJA2, TOMM70, MAFB, OXSR1, USP15, NR1H4, THOC1</p> <p>ACIN1, ACVR1B, ACVR2A, AIM2, AKT1, ALAS2, ANXA11, APLN, APOA1, APOA2, APOA4, APOBEC3F, APOBEC3G, AQP9, ARHGDI1B, ATP6V0A2, AZU1, BCAR1, BCGF1, BCL10, BCL2, BLNK, BNIP3, BNIP3L, BST1, BST2, C15orf31, C1QBP, C2, C5AR1, CADM1, CALCA, CARTPT, CCBP2, CCL18, CCL19, CCL2, CCL20, CCL21, CCL22, CCL23, CCL24, CCL25, CCL26, CCL27, CCL4, CCL5, CCR1, CCR2, CCR4, CCR5, CCR6, CCR8, CCR9, CCRL1, CD164, CD1D, CD2, CD22, CD24, CD274, CD276, CD28, CD34, CD3D, CD3E, CD4, CD40LG, CD47, CD7, CD74, CD79A, CD79B, CD83, CD86, CD96, CD97, CDC42, CDK6, CEACAM8, CEBPB, CEBPG, CFHR1, CHST4, CHUK, CIITA, CKLF, CLEC7A, CMKLR1, CNIH, CNR2, COLEC12, CRHR1, CRTAM, CSF1, CST7, CTLA4, CTSC, CTSE, CTSG, CTSS, CTSW, CX3CL1, CXCL12, CXCL13, CXCR4, DEFA1, DEFB1, DEFB103A, DEFB118, DEFB127, DEFB4, DMBT1, DOCK2, DPP4, DPP8, DYRK3, EBI2, EBI3, EDG6, ELF4, ERAP2, EREG, ETS1, FCAR, FCGR1A, FCGR2B, FCGR3A, FCGR3B, FCGRT, FCN1, FCN2, FOXO3, FOXP3, FTH1, FYB, FYN, GBP2, GEM, GLMN, GPI, GPR44, GPR65, GTPBP1, GZMA, HAMP, HCLS1, HDAC4, HDAC5, HDAC7A, HDAC9, HELLS, HLA-DRB3, HRH2, ICOSLG, IFI16, IFI6, IFITM2, IFITM3, IFNK, IGSF6, IK, IKBKAP, IKBKG, IL10, IL10RB, IL12A, IL12B, IL15, IL16, IL17A, IL17B, IL18, IL18BP, IL1R2, IL2, IL21, IL27, IL27RA, IL28RA, IL29, IL2RA, IL2RG, IL31RA, IL32, IL4, IL4R, IL6, IL6R, IL6ST, IL7, IL7R, IL8, IL8RB, INHA, INHBA, INS, IRF8, ITGB2, JAG2, KIR2DL1, KIR2DL3, KIRREL3, KRT1, LAT, LAT2, LAX1, LCK, LCP2, LDB1, LIG1, LIG3, LILRB2, LRMP, LST1, LTB4R, LTF, LY75, LY86, LYN, MADCAM1, MAFB, MAL, MALT1, MAP3K7, MAP4K1, MAP4K2, MBL2, MBP, MIA3, MLF1, MLL, MMP9, MNX1, MR1, MS4A1, MS4A2, MYH9, MYST1, MYST3, NCF4, NCK1, NCK2, NCOA6, NCR1, NFAM1, NFIL3, NHEJ1, NLRC3, NOTCH2, NOTCH4, ODZ1, OPRD1, OPRK1, PAX5, PDCD1, PF4, POU2AF1, POU2F2, PRELID1, PREX1, PRG3, PRKRA, PRL, PSMB10, PTAFR, PTGER4, PTPRC, PYDC1, RAB3D, RAG1, RASGRP4, RFX1, RGS1,</p>

Gene sets name	Gene
MODULE 169	RPS19, RSAD2, RUNX1, SAA1, SART1, SCG2, SCIN, SCYE1, SECTM1, SEMA3C, SEMA4D, SEMA7A, SFTPD, SIRPG, SIT1, SKAP1, SLA2, SNRK, SOCS5, SOD1, SP2, SPACA3, SPI1, SPINK5, ST6GAL1, SYK, TAPBP, TARBP2, TAZ, TBX1, TCF12, TCF7, TGFB1, TGFB2, THY1, TLR4, TLR7, TLR8, TM7SF4, TNFAIP1, TNFRSF14, TNFRSF4, TNFSF13, TPD52, TRAF2, TRAF6, TRAT1, TREM1, TREM2, TRIM22, UBE2N, VIPR1, VTN, WAS, XBP1, YTHDF2, ZAP70, ZBTB16, ZEB1, ZNF675 ADA, DHRS9, CDK6, CLGN, STAG3, RIPK3, CR2, CRIP2, CYBB, DAPK1, AGA, DTX1, DUSP2, AHR, DENND3, KLRK1, NPIP3, FOS, HEATR5A, KAT2A, ATP2C1, GNG10, TRIB2, H1-2, HCK, HLA-DOA, HTR3A, ID2, IL2RB, IL7R, IL15RA, ITGA4, ITGB2, JUP, KCNJ5, STMN1, LMO2, SMAD7, MAL, MME, ABCC1, MT2A, MYBL1, PCDHGC3, SERPINA5, CRLF3, SCAND2P, LINC01949, PRKAR2B, PAG1, PSMB8, RGL3, SLC39A10, TP73-AS1, AICDA, ZNF608, STIM2, BCL2A1, RGS1, RGS13, RGS16, BCL6, BCL7A, SCD, CCL3, CCL4, CCL5, XCL1, BIK, TNS3, SLC2A5, BMP7, SON, SORL1, KLF10, TSPAN7, TXN, ZNF16, CACNA1A, DDA1, TNFAIP8L2, ASB13, SVEP1, CAMK4, ULK1, CREG1, IER3, KLHL6, USP2, CD2, CD3D, IL32, STK17A, CD86, ISG15, MICAL2, TOX CDH13, LPAR6, DLC1, IFITM3, IFI30, CEBPD, GNLY, IFITM2, CXCR6, NXPH3, DCTN3, MGLL, KCTD12, CCR1, CCR2, CCR5, EARS2, CPM, CSF1R, CTSB, CTSL, CYBB, CYP1B1, CYP27A1, DAB2, DAPK1, DES, AIF1, A2M, FAP, FCER1G, FCGR1A, FCGR2A, FN1, SRRM2, FPR1, FTH1, FTL, GAS6, GBP1, GBP2, GJB1, GPX1, GZMK, HBA2, HLA-DOA, CCN1, IL1R1, IL2RB, IL3RA, ITGB2, ITGB5, LAG3, FADS1, LMO2, LYZ, CXCL9, MMP1, MMP2, MMP9, MYLK, PCDH9, PDGFRA, PDGFRB, TBC1D8B, LGMN, BBS2, S100A4, MAPK12, CCL2, CCL5, CCL11, CCL14, CCL18, CCL21, CXCL12, SPARC, THBS1, TIMP1, TIMP2, TIMP3, TNFAIP6, C3AR1, TYROBP, VCAM1, VIM, VWF APOL3, VMP1, ZNF347, IFITM1, PLPP3, TNFSF13, TNFSF10, IER3, CCND2, IL32, CD14, CD63, CD151
MODULE 170	ADA, LANCL1, SEC61B, LILRA1, CPM, CYP27B1, SMPX, GRK6, HLA-DOA, HLX, IL7R, IL15RA, ITGB3, LAG3, LGALS3, LIMK2, LSS, NFKB2, NINJ1, NPPB, TIMMDC1, CTTNBP2NL, DNAJC3, GRAMD1A, PTPN1, PTPN2, RELB, SLAMF1, TGFA, TXN, SPSB1, MIR22HG, DENR, TRIP10
MODULE 522	ADA, NAMPT, GLYAT, CDKN1A, IGSF6, LILRB2, IFITM3, SEMA4D, SEMA3C, CEBPE, UBD, BATF, IFI44, CXCL13, GNLY, IFITM2, SH2B2, CES1, KLRA1P, CTSC, CCR9, LILRB1, CD300C, LILRB5, LILRB4, IL24, LILRA1, LILRB3, LILRA2, CHIT1, CHRM3, TIRAP, CLC, CLU, CCR1, CCR2, CCR5, CNR2, KLF6, MAP3K8, ADM, ADORA2A, CR1, CR2, CRIP1, CSF1, CSF2RB, CSF3, CSF3R, CSR2, CCN2, ADRA2A, CTSG, CTSS, CX3CR1, CYBB, DAB2, CD55, DAPK1, DEFA5, DEFB1, DEFB4A, NQO1, DPP4, AGRP, HBEGF, GPR183, EDN1, EDNRA, EGF, AHR, EGR4, EPHA2, AIF1, EMP1, EMP2, EMP3, ENDOG, ENPEP, EPHX1, EPHX2, EPS8, ERBB2, EREG, ERG, ETS1, EVI2A, ALCAM, F2, F3, F8, FCER1A, MS4A2, FCER1G, FCGR2A, FCGR3A, FCGR3B, FCGRT, FCN1, FCN2, FGA, FGB, FGF6, FGF7, FGG, FGR, KLRK1, FLT3, FN1, TNFRSF13B, IFIT5, FYB1, FYN, GAS6, GATA3, GBP1, GBP2, GBX2, GCG, GEM,
MODULE 75	

Gene sets name	Gene
MODULE 223	<p>LAT, LAMP3, SFN, GPX1, GPX2, GPX3, GRN, CXCL1, CXCL2, GSTA3, GZMA, H1-2, CFH, HFE, CFHR1, HLA-A, HLA-B, HLA-C, HLA-DMB, HLA-DOA, HLA-DRA, HLA-DRB5, HLA-F, HLA-G, HP, AIRE, IRF8, CFI, IFI27, IFIT1, IFNGR1, IGF1, APOE, IGF2, CCN1, IGLL1, FAS, IL1A, IL1B, IL1R1, IL1RAP, FASLG, IL2RB, IL2RG, IL3RA, IL4R, IL6, IL6R, IL6ST, IL7R, CXCL8, IL9, CXCR2, IL11, IL15, IL15RA, IL16, IL18, CXCL10, INSIG1, IRF1, AQP9, IRF7, ISG20, ITGB2, ITK, AREG, KCNN4, KIR2DL4, KIR3DL1, KLRC1, LBP, LCK, LCP2, LGALS3BP, ARHGDI, LIF, LRP1, LSP1, LTA, LTB, LTBR, LTF, LY6E, LY6H, SH2D1A, TACSTD2, MXD1, MDK, MGST2, MGST3, CXCL9, MNDA, MPO, MST1R, MTHFR, MX1, MX2, MYC, MYLK, NAB2, NCF1C, NCF2, NCF4, NFKBIA, NPY, NPY1R, NR4A2, OAS1, ORM1, ORM2, OSM, PAX5, PDCD1, PDGFA, PDGFB, PDGFRA, SERPINF1, PF4, CFP, PPBP, PRF1, PRG2, DNAJC3, AZGP1, B2M, PYY, PSMB9, PTAFR, PTGER4, PTMS, PTN, BCAT1, RAG1, REG1B, GRK1, RNASE6, BCL6, S100B, SAA1, CFB, CEACAM1, CCL1, CCL2, CCL3, CCL4, CCL7, CCL8, CCL11, CCL13, CCL14, CCL15, CCL17, CCL18, CCL19, CCL20, CCL21, CCL23, CXCL6, CXCL11, CXCL5, XCL1, CX3CL1, CXCL12, SELL, SELP, SELENOP, SFTPD, ST6GAL1, SLAMF1, SPOCK1, BPI, STAT1, STAT3, STAT5A, ZFP36L2, BST1, BST2, ZEB1, BTG1, TEK, TFF1, TFF3, TGFA, TGFBI, THPO, TIMP1, TLR1, TLR2, SERPING1, C1QA, C1R, C1S, C2, TPSAB1, C3, C3AR1, C4B, C4BPA, C4BPB, C5, C5AR1, C6, C7, TYROBP, C8A, C8B, C8G, C9, UMOD, VIPR1, VTN, BTG2, CXCR4, LST1, MIA, CAMP, CAPG, SNN, MAD1L1, DYRK3, GPR65, GALR3, IFITM1, CST7, TNFSF11, SKAP1, OASL, RUNX3, AKR1C3, TNFSF14, TNFSF12, TNFSF10, PSPHP1, CREG1, IL18R1, NRP1, CDK5R1, P4HA2, PGLYRP1, PSTPIP1, CD1C, CD2, CD3D, CD3G, OSMR, CD247, CD4, CD5, CD5L, CD6, CRLF1, CD8A, CD8B, CD14, CD19, CD83, MS4A1, CD22, CD24, CD27, CD101, CD86, AIM2, LY86, IL27RA, GMFG, CXCL14 CD48, CD53, ISG15, CD59, CD69, CD72, CD79A, CD79B, CD81, CLEC2B</p> <p>TSPAN3, NAMPT, LILRB5, LILRB4, LILRA1, LILRB3, LILRA2, UBE2C, CHRM3, KLF6, CRIP1, CSF1, CSF3, CSF3R, ADRA1D, CSRP2, DAB2, DEFA5, HBEGF, EDN1, EDNRA, EGF, EMP1, EMP2, EMP3, ENPEP, EPS8, ERBB2, EREG, EVI2A, FGA, FGB, FGF4, FGG, FTH1, GAS6, GCG, LAMP3, SFN, GRN, CXCL1, GRPR, HFE, HLA-A, HLA-B, HLA-C, HLA-DMB, HLA-DOA, HLA-DRA, HLA-DRB5, HLA-F, HLA-G, HP, IGF1, IGF2, CCN1, IL1A, IL1B, IL2RG, IL3, IL6, IL6R, IL15, IL15RA, IL18, CXCL10, INSIG1, IRAK1, ISG20, AREG, KCNN4, LIF, LRP1, LRPAP1, LY6E, TACSTD2, MXD1, MDK, MST1R, MTHFR, MYC, NAB2, NCF4, OSM, PRDX1, PDGFA, PDGFB, PDGFRA, SERPINF1, PPBP, DNAJC3, B2M, PTN, BCAT1, REG1B, RNASE6, BCL6, RPS4X, RPS27, S100B, CCL14, CXCL5, SELL, SELP, SHC1, SLAMF1, SPOCK1, ZFP36L2, BST2, ZEB1, BTG1, TFF3, TGFA, TGFBI, TIMP1, TLR1, TPSAB1, VIPR1, FOSL1, CAPN1, RUNX3, AKR1C3, TNFSF9, PSPHP1, CREG1, NRP1, CDK5R1, P4HA2, CD2, OSMR, CD4, CD5, CD8A, CD8B, CD83, CD86, LY86, BCAR1, CD48, CD69, CD79A, CD81</p>
MODULE 33	<p>ARL4A, PDZK1IP1, LPCAT3, MSLN, DCAF7, TCIRG1, MYL9, ADARB1, MERTK, CLEC10A, KAT5, P3H4, PMVK, KLF1, ME3, LMAN2,</p>

Gene sets name	Gene
MODULE 345	<p>MLLT11, ADIRF, SDS, LILRB4, TMSB15A, CHGA, CDC42EP1, CORO1A, CHIT1, CHKA, PRR4, KLHDC3, ADCYAP1R1, CLC, ADH1A, CNR2, COL6A1, COMP, ADM, COX7A1, CPA1, CPD, CR2, ATF2, CRYM, CSH2, CSRP2, CTSH, CTSL, CYBB, DEFB4A, CFD, DNM1, DRP2, DSG2, DTYMK, DUSP4, EPHA2, ELF3, ELF4, ELN, EMP1, EPAS1, EPB42, EPHA4, EPOR, ERBB2, ERF, ESRRA, ETS1, EVPL, FAAH, FABP4, FAT1, FBLN2, FCN1, FGFR4, FKBP1B, POMZP3, STAB1, ARC, MMD, PRAME, MAPK8IP2, FOSL2, ABCA4, ALOX15, FRZB, FUT4, FYB1, GABRB1, GATA2, GCH1, GCNT1, GHRHR, GJA1, GJB1, DMAC2L, BBC3, GLI1, GLI2, GLRA2, ANK1, GPT, GPX2, TRIB2, GRIK1, ANPEP, GSTM5, GUCY1B1, CCDC106, HAL, HBB, HCK, CFHR1, NRG1, HK2, ZBTB48, HMGCS1, HOXA4, APBA2, HOXB7, HSPG2, HTR3A, ID4, IFIT1, IGFBP6, IL1R1, INHA, CXCL10, INPP1, INPP5A, ITGA6, IRS1, ITGA5, ITGB7, ITIH1, ITPKB, JAK3, KCNH2, KCNMB1, KCNQ2, KIR2DL4, KIT, KRTAP5-9, KRT4, KRT5, KRT7, KRT8, KRT13, KRT18, KRT81, LAD1, LGALS3BP, ARHGDIG, LIPA, LNPEP, LRP1, LSP1, LTB, LTBP1, MARCKS, SMAD3, STS, MAN2A2, MAOA, MAT1A, ART3, BORCS8-MEF2B, MEST, MFAP2, ASAH1, MKI67, KMT2A, FOXO4, MMP1, MMP9, ASPH, ASS1, MUC1, MX1, MYH2, MYH7, MYL1, MYL2, MYL4, MYOG, NAB2, NEB, NF2, NFIX, NFKBIL1, NGF, NKX3-1, NOS1, FXYD2, NPAS1, ACR, NTN3, NTSR1, GPR143, OPRK1, FURIN, PAFAH1B3, PBX2, PCOLCE, PDCD1, WT1-AS, PDGFRA, ENPP2, PF4, PFKFB3, PFN2, SERPINB9, PKD1, PLCB3, PLOD2, PLXNB1, PRRX1, ACP5, PON2, POU3F1, KIF1A, PPBP, PPOX, PPP5C, PRB4, MAPK4, MAPK7, MAPK11, MAPK10, AZGP1, LGMN, PRSS8, KLK6, PSG6, PTAFR, PTH1R, PTK7, PTMS, PTN, PTPN3, PTPRH, PTPRS, PTX3, ARHGAP22, RAC2, RAD9A, ACTA2, RAPSN, RBMY1A1, PRPH2, RFC2, RGS3, BCL6, RORA, RPS4Y1, RPS6KA2, RRM2, RXRA, RXRG, S100A3, MAPK12, SCN4A, SCNN1A, SCNN1B, CEACAM1, CCL5, CCL17, CCL20, CCL21, CCL23, BIK, CXCL12, SECTM1, BLK, SELL, BLM, SELENOP, SGCA, SHMT1, ST3GAL4, PMEL, SLC1A6, SLC12A4, SLC19A1, SLC20A1, SLPI, SOD2, SOD3, SPARC, SPOCK1, SPRR1B, BPI, ZFP36L2, TAGLN, SERPINA7, TCEA2, HNF1A, TCN2, TEAD4, TESK1, TFF1, TFF3, TGM3, THBS1, THRA, NKX2-1, TK2, TLE1, TLE3, TSPAN7, CLDN5, TNFAIP2, TNFAIP6, TNFRSF1A, TNNI1, TNNT1, TNNT3, TPBG, TPM2, TPSAB1, C3, C3AR1, PHLDA2, C5AR1, C7, C8B, UBE2H, UCHL1, UGT8, UCK2, VWF, XK, CACNA2D1, CACNB3, CACNG1, LST1, CALD1, TCL1A, NPRL3, CAMP, CAPG, KDM5D, H2AC6, CNTNAP1, KCNAB2, TMEFF1, LY6D, RUNX1, AKR1C3, HRK, KYAT1, HCAR3, CCNA1, CCNE1, MAP7, SLC7A6, CD1C, SLC28A1, CD247, CD6, RAB11B, CD9, KLF4, CD24, EFTUD2, CD27, AKAP6, CD36, SPTLC2, GDF15, TP53I11, GTPBP1, AKAP12, RIN1, FEZ1, KIAA0040, CD70, CD79B, RIMS3, SPOCK2, DELE1, ELMO1, WASHC5, P2RY14, CLEC2B</p> <p>LPAR6, IFITM3, UNC13B, CEBPD, IFI44, GNLY, IFI44L, MST1L, CARD16, KCTD12, UNC5D, CSF3, CTSL, CYP1B1, DEFA1, KLRK1, FPR1, TXLNGY, CNRIP1, PPP1R16B, TTC30A, GBP1, GBP2, FOXP1, CACNG4, P2RY10, IGLJ3, GSTM2, BLNK, HBA2, ADGRE2, HLA-A, HLA-C, HLA-DMA, HLA-DMB, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQB1, HLA-DRA, IFI27, IFI35, IFIT1, IGHG3, IGHM,</p>

Gene sets name	Gene
MODULE 84	<p>IGKC, IGLL1, IL2RB, IL3RA, IL7R, AQP9, LGALS3BP, FADS1, MAL, MECP2, CXCL9, MX1, ATP2A3, OAS1, OAS3, SERPINA5, TREM1, POU2F2, PARP14, BANK1, RNF31, CCDC186, PNMA8A POLR3B, STK31, LGMN, KCNQ5, PELI1, RRP15, UNC79, SLC22A23, CCL7, CCL18, SDC2, SELL, SAMSN1, UNKL, SPIB, STAT1, BST2, TAP1 THBS1, TNFAIP6, UCP1, UTY, FCRL2, NEK11, RUBCNL, ABTB1, LIMD2, ZNF436, APOL3, TCL1A, CAMK4, AXIN1, TTLL2, HVCN1, TXLNGY, FCRLA, IFITM1, HELZ2, TNFRSF25, ADAM19, TNFSF10, CD2, CD3D, RSAD2, CD5, UBE2L6, CD14, CD19, MS4A1, TPTE2, CD27, CD86, CD37, ISG15, FAM53B, CD74, CD79A, CD79B, KIAA0753</p> <p>NAMPT, DHRS2, CDKN1A, IGSF6, RAMP2, LILRB2, IKZF1, TRIM22, MYL9, BASP1, CD52, IFI30, GPNMB, FST, SEMA4D, UBD, IFI44, GNLY, TACC2, PRELID3A, CELF2, CES1, GMEB1, CTSC, CEACAM3, LILRB1, FGL2, PNRC1, IFI44L, ADIRF, SDS, LILRB3, LILRA2, RAB31, PIM2, CORO1A, PTP4A3, CHI3L2, CHIT1, MST1L, SLCO2B1, CD300A, VSIG4, MGLL, PLIN2, CCR1, SLC38A10, ADH1B, COL1A2, COL4A1, COL6A1, COL6A2, COL6A3, COMP, ADM, COX7A1, CRABP1, DEFB104A, CRYAB, CSF1R, CSF3R, VCAN, CSTA, CTSS, CX3CR1, CYBA, CYBB, CYP1B1, CYP27A1, DAB2, DGKA, DBP, AEBP1, DEFA3, CFD, DNASE1L3, DNM2, DOCK2, DPYD, TSC22D3, DUSP6, DVL1, TYMP, EDA, ABCA1, AIF1, A2M, EMP3, ENG, STOM, EVI2A, EVI2B, F13A1, FABP4, ACSL1, FCER1G, FCGR2A, FCGR2B, FCGR3A, FCGRT, FCN1, FGFR1, FGR, FKBP5, FOXG1, POMZP3, KIF21B, TBC1D2B, EPB41L3, RGL1, SYNE1, FN1, EXOSC2, SLC7A8, TNFRSF13B, FOLR2, SRRM2, LILRA4, PSD4, FPR1, FPR2, TRIM29, SLC7A11, ALOX5, ALOX5AP, ALPL, ACKR1, QPCT, TNFAIP8, OLFML2B, CCDC9, LRIT1, ZBTB20, LRRC32, GAS1, GBP1, GBP2, GCH1, NUPR1, AMELX, GJB1, LAMP3, ST6GALNAC4, DKK4, CYTH4, SIT1, CNTN6, GLRX, GNA15, TRDD3, GPX3, IGLJ3, TRIB2, GRN, RAC2, ANPEP, CXCL1, GSTM1, GZMA, GZMB, GZMK, SLC40A1, ANXA1, HBA2, HCK, HCLS1, CD209, HK3, HLA-A, HLA-C, HLA-DMA, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQB1, HLA-DRA, HLA-DRB1, HLA-DRB3, HLA-DRB5, AOA, BIRC3, HSPA6, HSPG2, HTR4, ICAM1, ICAM3, IRF8, APOC1, IFI16, IFI27, IFI35, IFIT1, APOC2, IFNGR1, APOC4, APOD, APOE, IGFBP2, IGFBP3, IGFBP4, IGFBP7, IGHG3, IGHM, JCHAIN, IGKC, IL1B, IL1R1, IL1RAP, IL1RN, IL2RB, IL2RG, IL3RA, IL4R, IL6, IL7R, CXCL8, AQP1, IL10RA, ITGA6, IRF1, AQP9, ISG20, ITGAL, ITGAM, ITGB2, ITGB7, ITPR1, ITPR3, JUNB, KCNA5, KCND3, KCNQ3, KRT4, KRT5, KRT14, KRT15, KRT18, KRT19, KRT86, LAIR1, LAMA3, STMN1, LCK, LCP1, LCP2, LGALS3, LGALS9, ARHGDIB, LIF, ARHGDIG, LIPA, RHOH, FADS1, LMO2, LORICRIN, IRAG2, LRCH4, LSP1, LTBR, LTC4S, LTF, LYN, LYZ, M6PR, MAL, MAN2B1, MAT1A, MB, MDK, MFAP2, CXCL9, MME, MMP9, MNDA, MPO, MRC1, MSI1, MUC1, MX1, MX2, MYH11, NCF1C, NCF2, NCF4, NGFR, NINJ1, NKG7, NNAT, NNMT, ATP2A3, ACR, NRG1, ATP4A, ODF1, OLR1, SIX6, SLC22A18AS, ORM2, SERPINE1, DEF6, UBXN1, LAP3, PLEKHO1, PCOLCE, CRIM1, PLAC8, MS4A4A, CHST15, PDE2A, TRPV2, PDE4B, ANKFY1, PDGFRA, SLC25A39, ENPP1, PECAM1, PER1, CFP, PFKFB3, SERPINA1, PI3, PLA2</p>

Gene sets name	Gene
REACTOME INNATE IMMUNE SYSTEM	<p>PLEC, PLEK, PLSCR1, ACP5, SASH3, CPVL, ADAMTSL4, CCHCR1, DDIT4, PARP14, PPBP, PPL, OLAH, GIMAP4, PRF1, SRGN, RBM38, CADPS2, RABL6, ARHGAP15, LMO3, PPP4R2, LGMN, B2M, PSG7, SLAMF8, PTGDS, MTUS1, PTPN7, PTPRC, PTPRCAP, PTPRE, NECTIN2, CXCL16, MS4A7, RAB3IL1, RAC2, ACTA2, RARRES2, PLAAT4, RBP1, CCND1, BCL2A1, RGS1, RGS10, RNASE1, RNASE2, RNASE6, BCL6, S100A4, S100A8, S100A9, S100A11, S100P, SCN2B, CCL2, CCL3, CCL4, CCL5, CCL7, CCL11, CCL15, CCL18, CCL19, CCL21, SDC1, CXCL12, GPSM3, SECTM1, SELL, SELPLG, SAMS1, VSIR, SELENOP, SEMA4A, SFTPC, PARP12, ST6GAL1, BMP1, SLA, ACD, SMTN, SLC6A2, SLC15A2, SLPI, SNCG, SPIB, SPP1, STAT1, STAT4, TAGLN, TAP1, TBX1, TBXAS1, TCF7, TDO2, TFF3, TGFBI, TGFB2, TGM2, THRA, TIMP2, TLR1, TLR2, SERPING1, TSPAN7, TSPAN4, CLDN5, CLEC3B, TNF, TNFAIP2, TNFAIP3, C1QB, TNFAIP6, TNFRSF1B, C1QC, TNXB, C1S, C2, TPO, C3AR1, C7, TYROBP, UBE2D1, VCAM1, VWF, WNT10B, CA4, ZYX, LAPT5, CXCR4, LST1, PLA2G7, TNFAIP8L2, KCTD17, PLBD1, COPE, SPSB1, RUBCNL, FAM214B, PLEKHO2, TCL1A, CAPG, KDM5D, CASP1, FERMT3, SRPX, ID2B, NR0B2, CYSTM1, GPR65, ITGA10, IKBKG, H2BC12, CST7, LMO4, CAV1, TP63, RUNX3, DDX3Y, STX11, MARCO, S1PR4, ACTN1, TNFRSF25, ADAM19, TNFSF12, TNFSF10, TNFRSF10D, CREG1, ST3GAL5, IER3, AP1M1, BAIAP3, CCND2, KYNU, CCNF, SLC7A7, N4BP2L1, CLDN9, SLC16A3, CD2, CD3D, CD247, CD4, CD5L, MAGI1, CD6, IL32, UBE2L6, DHRS3, CD8A, CD8B, STK17B, CD14, CD22, CD163, SLC9A3R1, CD27, CD86, ITM2A, ARHGEF6, IL27RA, NAPSA, CD37, GMFG, ENTPD2, NRG2, CD48, CD53, ISG15, CEP135, MARF1, FAM53B, CD69, CD72, ECE2, CD74, CD79A, MAFB, CD302, GFPT2, CLEC2B, CDH1</p> <p>FGR, CFH, FUCA2, ENPP4, AOC1, CASP10, SARM1, CREBBP, MPO, ITGAL, LAMP2, MAP3K14, ALDH3B1, NOS2, PSMB1, MGST1, PGLYRP1, MMP25, MASP2, PRSS3, CD4, BTK, FYN, RNF216, PLAUR, TYROBP, LTF, ALOX5, PSMC4, MVP, POLR3B, DNASE1L1, CAPN1, ACP3, WAS, SLC11A1, MRE11, SERPINB1, C8B, ERP44, BIRC3, DERA, RNASET2, CD44, TNFRSF1B, GRN, LRRC7, GAB2, ATP6V0A1, MAP2K3, VCL, TIMP2, AGA, C6, PSMA4, LCP2, ATP6V1H, HEXB, MAPK9, PIK3CB, CYBA, HEBP2, SIKE1, CUL1, CYFIP2, TAB2, SERPINB3, GDI2, ATG5, ATP11B, POLR3E, SLC2A3, ACAA1, NCKAP1, ELMO2, CASP8, CTSA, CNN2, MAP2K4, PRKCQ, CDK13, PKM, RHOA, ROCK1, MEF2A, OTUD5, ATP11A, RASGRP2, PSME4, KCNAB2, RAB27A, CDC42, RPS6KA2, PRKACA, UBE2D1, NFATC3, STK10, FBXW11, AP1M1, ALPK1, TXK, ACTB, PLD1, RAB7A, ICAM3, MAP2K7, NFKB2, PAK3, UBE2K, PIK3C3, ITCH, BPIFB2, TOLLIP, XRCC5, CEACAM1, PGM1, DNM2, CPB2, PSEN1, HSP90AA1, CFHR2, MEF2C, PTPRC, PKP1, CYLD, PPIE, GSTP1, APOB, RAB10, CD59, FCN1, SCAMP1, CPNE3, B4GALT1, CEACAM6, LAT2, HUWE1, FTL, PSMC5, PTPN4, DEFB127, MAVS, DYNLL1, P2RX7, NOS1, IRAK3, LYZ, CD209, NLRC4, CMTM6, NLRP1, PSME1, SNAP23, UNC13D, ADA2, MAP3K1, PSMD5, TREM2, CRISP3, NCR2, HSP90AB1, ITPR3, DSP, ABL1, RAB18, MYO9B, PSMD8, CDC34, POLR2E, SNAP29, MAPK1, POLR2F, CYB5R3,</p>

Gene sets name	Gene
	<p>TOM1, HMOX1, ARSA, SYNGR1, TAB1, MYH9, GRAP2, NCF4, EP300, POLR3H, CTSG, PYGL, PSMC6, ATP6V1D, PSMA3, LGMN, CHGA, PSMC1, RPS6KA5, PSMB5, PSMA6, NFKBIA, PSME2, MMP9, PYGB, NFATC2, DNAJC5, CTSZ, PSMA7, SIRPB1, HCK, BPI, CST3, EPPIN, VAPA, RNF125, PSMD10, PGRMC1, TLR8, MAGT1, EEA1, GLA, DNAJC3, OLFM4, MAPK3, CCL22, CCL17, PSMD7, COTL1, CRISPLD2, MEFV, CPPED1, HMOX2, PYCARD, VPS35L, CTSH, ATP8B4, RIPK2, IKBKB, GSDMD, PPP2CB, ASAH1, MAN2B1, NFKBIB, RELB, RETN, VRK3, GPI, PLD3, CD33, SIGLEC5, RAB3D, PPP2R1A, PIK3R2, RAB3A, GSDME, ATP6V0A4, TAX1BP1, NOD1, CASP2, PDAP1, WASL, IMPDH1, PSMA2, LIMK1, C5, DNM1, DDX58, MAPK8, PPP3CB, MAP3K8, TSPAN14, PSMD3, P2RX1, KPNB1, ICAM2, PSMD11, DHX58, RAB5C, VAT1, DUSP3, MAP2K6, VTN, ALDOC, LAMTOR3, NFKB1, MANBA, UBE2D3, MAPK10, BST1, CTSC, HSPA8, DTX4, UNC93B1, FOLR3, PANX1, BIRC2, COMMD9, CD81, TCIRG1, PSMD9, MLEC, BIN2, LTA4H, ARPC3, CAND1, RAB5B, PTPN6, CLEC4A, FRK, MAPK14, WASF1, VNN1, CCR6, PPP2R5D, TMEM30A, LY86, C7, FAF2, ITK, ARSB, POLR3G, SKP1, PPP2CA, C9, ATP6V0E1, NIT2, ARMC8, ATP6V1A, MAPKAPK3, ACTR1B, ACTR3, PSMD14, IFIH1, GCA, GNLY, QPCT, SOS1, WIPF1, ATF2, ATP6V1B1, QSOX1, RAP1A, CAPZA1, LAMTOR2, NCF2, CFHR3, CD58, PADI2, CR2, CD46, ATP6V0B, PRDX6, RPS6KA1, CHRN4, MUC5B, CTSD, COLEC11, MMP8, CREB1, TTR, IRAG2, TNFAIP3, ARG1, VAMP8, STBD1, RAB14, TRIM32, NPC2, YPEL5, CPN1, IFNA6, IFNA8, CYSTM1, PDZD11, APAF1, DUSP4, CLU, EPX, TRIM25, A1BG, CAT, CCR2, POLR3GL, PIK3CA, WIPF3, SFTPA1, PLAU, HVCN1, ITPR2, PRDX4, ADGRE5, ATF1, ARHGAP9, NCKAP1L, RAB9B, TNFAIP6, RAP2C, C4BPA, C4BPB, PI3, SLPI, PLCG1, SEMG1, ZBP1, ATP8A1, CEACAM8, SERPINB6, TREM1, LRRFIP1, MYH2, IL1B, C3, DEFB126, CD93, PSMF1, DEFB129, BPIFB1, PSMB2, IRF3, HTN1, CFP, ELK1, TRAF2, MASP1, RAP1B, PTPRB, PIN1, UBR4, TICAM1, AAMP, SEM1, FGL2, RAC2, ATP6V1F, COPB1, PSMA1, PLD2, CD68, SLC44A2, SIGLEC9, RIPK3, ART1, LBP, CRACR2A, MOSPD2, ECSIT, PRKCSH, BST2, ARPC1B, UBE2M, GMFG, LILRB2, BPIFA2, DEFB118, ATP6V1E1, NFATC1, CAP1, TRAF3, ADGRE3, RBSN, PSME3, ACLY, DIAPH1, UBE2D2, ACTR10, LGALS3, TRIM21, RAF1, CLEC10A, SNAP25, POLR3F, CRP, CASP9, WASF3, CHI3L1, CHIT1, SFTPD, KRAS, AMPD3, CD180, IRAK2, VAV3, CFHR4, CFHR5, DOCK2, KLRD1, DSG1, DSC1, TCN1, C5AR2, OSTF1, CTSL, CD36, MAP3K7, CD63, TEC, GNS, DHX9, TMBIM1, CAB39, CKAP4, RAC1, DBNL, TANK, ABI1, TXN, TLR4, ATP6V1G1, PSMB7, CTSV, IFNA21, CNPY3, RIPK1, TLR2, PRCP, GGH, SDCBP, PPP2R1B, CASP1, ADAM10, ACTR2, DNAJC13, IDH1, ABI2, ITGAV, HERC5, PPP3CA, GLIPR1, DUSP6, SLC15A4, GPR84, RHOF, PELI2, SLC27A2, SRP14, PSTPIP1, IQGAP1, ITGAX, NLRC5, PDPK1, GALNS, TMC6, PFKL, VAV1, TRPM2, APP, PSMB6, SLC2A5, FCN3, BCL10, PRKACB, PSMA5, CD53, CREG1, FCGR2A, CTSK, FLG2, S100A8, S100A7, ILF2, DEGS1, C1orf35, ARL8A, ATP6V1C2, RPS27A, REG3G, STK11IP, DYNC1L1, UBA3, MUC4, AHSG, PLAC8, TIFA, MYO10, PIK3R1, IQGAP2, ATG12, DOK3, DYNLT1, TRIM4, FRMPD3, ATP6V1B2, GOLGA7, PLPP5, ATP6V0D2,</p>

Gene sets name	Gene
	<p>POLR2K, NAPRT, IFNA5, IFNA16, STOM, GSN, ALAD, SURF4, PTGES2, LCN2, COMMD3, POLR3A, SERPING1, PTPRJ, PAK1, LAMTOR1, TKFC, MS4A3, MS4A2, DSN1, ALDOA, FCGR1A, TIRAP, DOCK1, UBC, ITPR1, NDUFC2, ATP6V1G3, ADAM8, LPCAT1, TOMM70, LY96, PSMA8, PTPRN2, ATP6V1C1, ELMO1, CCT8, EEF1A1, PRG3, UBE2L6, MAPK13, C8A, TAB3, NCK1, WASF2, NCF1, CDA, FCER1G, C1QC, PSMD4, PSMB4, C1R, PGLYRP3, ATP6V0D1, ATAD3B, PDXK, CSTB, ITGB2, VAV2, S100B, FCN2, NLRP4, CD3G, S100A1, SHC1, NLRX1, NBEAL2, HK3, PGLYRP2, PSMC2, DCD, POLR3K, AGL, ARPC5, NLRP3, NCSTN, FCGR3B, MAPKAPK2, PIGR, CTSS, S100A11, PGLYRP4, S100A9, S100A12, CXCR1, ARPC2, NFASC, MNDA, IFI16, AIM2, PSMD6, PTX3, PPBP, CXCL1, GYG1, POLR2H, PRKCD, S100P, CAMP, APEH, DUSP7, TLR3, LEAP2, CGAS, FABP5, BRI3, CTSB, DEFA5, DEFA4, DEFA6, DEFB1, NOS3, SYK, PRKACG, HGSNAT, CYBB, ATP7A, VCP, SUGT1, MBL2, RNASE7, PSMC3, BTRC, CCT2, C2, PLD4, MAPK7, CLEC4E, CLEC4D, HSP90B1, SERPINB12, B2M, ANPEP, STAT6, BPIFB6, CRK, NOD2, LPO, RAB4B, LAIR1, EEF2, KRT1, CD300A, GHDC, NLRC3, FTH1, CTNNA1, FADD, PAFAH1B2, NKIRAS2, RAB31, POLR3D, AHCYL1, TNIP2, MAP2K1, RAB24, PGM2, RNASE2, RNASE3, PTK2, PTAFR, RNASE6, MUC15, AGPAT2, TRIM56, MUC17, MUC3A, ITGAM, GUSB, TRAPPC1, GLB1, UBB, FOS, CD14, PA2G4, OSCAR, CEACAM3, FPR2, FPR1, ATP6V0E2, PRKCE, MUC7, LRG1, GAA, CANT1, PGAM1, POLR1C, WIPF2, BCL2L1, FGG, FGA, FGB, DEFB4A, RASGRP4, BCL2, IFNB1, C3AR1, REG3A, ORMDL3, MALT1, AZU1, CLEC7A, CLEC12A, MUCL1, RASGRP1, CFL1, RAB37, MYD88, RELA, HPSE, HSPA6, C1QB, C1QA, OLR1, RNASE8, SAA1, PSMD1, MUC13, JUP, SLCO4C1, TLR10, TLR1, TLR6, PELI3, HRAS, DHX36, TRAF6, PSMD2, TBC1D10C, RAB6A, BAIAP2, YES1, KCMF1, DEFB104A, DEFB103A, C8G, MUC20, DPP7, DEFB104B, RHOG, ANO6, RPS6KA3, DEFB103B, DEFB4B, CD19, ATOX1, JUN, DEFB114, POLR2L, GRB2, UBE2N, IMPDH2, CALML5, DEFB125, CPN2, CD300LB, FUCA1, PTPN11, FCER1A, ABCA13, ITLN1, F2, PAK2, DEFB124, DEFB123, ARHGAP45, DEFB119, CXCR2, DEFB112, MUC16, RAP2B, RNF135, IST1, UBA7, ATP6AP2, C1S, ANXA2, LCK, ADGRG3, MCEMP1, AP2A2, DDX41, TUBB, TBK1, ACTG1, IRAK1, DEFB108B, S100A7A, COLEC10, PLA2G6, NEU1, PROS1, STING1, MUC6, DGAT1, C6orf120, SIGIRR, SFTPA2, SOCS1, ATP6V0A2, MAPK11, METTL7A, TMEM179B, MUC1, IRF7, PSMD13, ATP6V0C, LAMP1, DEFB128, POLR3C, DEFB131A, POLR1D, BPIFB4, CD300E, FCAR, DEFB132, DEFB105A, DEFB107A, NF2, DEFB106A, DEFB105B, PRG2, IFNA10, DEFB106B, TLR5, ISG15, CARD9, MAPK12, TUBB4B, PLA2G2A, IFNA2, SELL, NHLRC3, HMGB1, SERPINA3, TMEM63A, TUBB, PPIA, CD55, PRTN3, XRCC6, PIK3R4, MME, TLR7, GM2A, CD47, CASP4, SIGLEC15, IGF2R, DYNC1H1, PCBP2, SRC, PSMD12, SERPINA1, PELI1, C5AR1, MYO5A, GZMM, ATG7, ELANE, SPTAN1, PSAP, CFD, MYO1C, NKIRAS1, HRNR, IFNA1, PLCG2, DNM3, IRAK4, SIRPA, DEFB107B, SVIP, CLEC4C, BPIFA1, CARD11, CALM1, CEP290, PNP, CD247, CAPZA2, APRT, CR1, FCGR3A, PLPP4, DEFB110, PSMB8, AGER, C2, NEU1, HSPA1B, HSPA1A, CSNK2B, HLA-C, MUC21, DEFB121, LILRB3, HLA-E,</p>

Gene sets name	Gene
	<p>CD177, PSMB10, MUC12, CFI, HTN3, KLRC2, CLEC6A, DEFB134, DEFB135, DEFB136, DEFA1, PSMB8, AGER, C4A, C2, CSNK2B, ATP6V1G2, HLA-E, HLA-A, HLA-A, IGKV4-1, IGKV5-2, IGKV3D-20, IGLV6-57, IGLV1-51, IGLV1-47, IGLV1-44, IGLV7-43, IGLV1-40, IGLV3-27, IGLV3-25, IGLV2-23, IGLV3-21, IGLV3-19, IGLV2-14, IGLV2-11, IGLV3-1, IGLC2, IGLC3, IGHE, IGHG4, IGHG2, IGHG1, IGHV1-2, IGHV2-5, IGHV3-7, IGHV3-11, IGHV3-13, IGHV3-23, IGHV3-33, IGHV4-34, IGHV4-39, IGHV1-46, IGHV3-48, IGHV3-53, IGHV1-69, HSPA1B, NRAS, CHUK, LAT, NCKIPSD, TREX1, ATP6V1G2, KLRK1, IFNA7, CPNE1, DEFB113, DEFB133, MUC5AC, DDX3X, HSPA1A, DEFB116, DEFB115, PPP3R1, UBA52, PSMB11, HLA-B, NEU1, HLA-A, TUBB, IGHV4-59, C4B, CSNK2B, HSPA1B, CSNK2B, HLA-E, HLA-C, PSMB8, C2, ATP6V1G2, NEU1, NEU1, MUC21, ATP6V1G2, TUBB, C4A, IFNA14, C4B, ORM2, C4B, NEU1, CSNK2B, AGER, HLA-E, ORM1, TUBB, PSMB8, HLA-E, AGER, PSMB8, CSNK2B, ATP6V1G2, AGER, C2, HSPA1B, PSMB8, TUBB, TUBB, HSPA1B, DEFB130A, CSNK2B, DEFB130B, C4B_2, IFNA13, HLA-E, NEU1, HSPA1A, ATP6V1G2, AGER, HLA-B, IFNA17, NEU1, ATP6V1G2, C2, TUBB, NFAM1, C2, PSMB8, HSPA1A, PSMB8, C4B, HLA-E, IFNA4, AGER, HSPA1A, TXNDC5, IGKV2D-30, TLR9, CFB, PSMB9, DEFA3, IGKV3-20, IGKV1D-33, PSMB9, PSMB9, DEFA1B, IGKV1-17, PSMB9, IGKV1-16, MIF, IGKV1D-16, CFB, CRCP, IGKV3-11, CFB, ARPC4, ARPC1A, PLEKHO2, IGKV1-33, CFB, IGKV1-39, IGKV2D-28, SERPINB10, PSMB9, PSMB9, IGKV2-30, IGKV1-12, TICAM2, IGKV1-5, CFB, PSMB9, CFB, NME2, PSMB9, DDOST, IGKV2-28, CFHR1, IGKV3-15, UBE2V1, C4A, HBB, TARM1, EPPIN-WFDC6, ATP6V1E2, IGKV2D-40, IGKV1D-39, PRKDC, LYN, SIGLEC14, BRK1, RAB44, HP, MGAM, CLEC5A, PECAM1, PTPRC, ATP6V1G3, IKBKE, TXNIP, IKBKG, IGHV3-30, OSCAR, DEFB103B, B2M, FCAR, CYFIP1, TARM1, LILRA3, LAIR1, KIR2DS4, IGHG2, LILRB2, IGLV1-40, IGHV2-70, FCAR, LILRB3, CFD, OSCAR, DEFB105B, IGLV1-44, TARM1, KIR2DS4, KIR2DS4, LILRB3, TARM1, FCAR, FCAR, KIR2DS4, TARM1, KIR3DS1, DEFB4B, KIR2DS2, LILRB2, MUC20, OSCAR, FCAR, ALOX5, OSCAR, KIR2DS4, OSCAR, DEFB106B, TARM1, LILRA3, PRSS2, PSMB3, FCAR, LAIR1, TARM1, LILRB2, KIR2DS4, LAIR1, LILRA3, IGHE, KIR2DS1, TARM1, KIR2DS4, IGHV4-34, HRAS, IRF7, MUC20, TARM1, KIR2DS4, MIF, CHGA, FCAR, KIR2DS4, OSCAR, FCAR, DEFB104B, IGHG4, OSCAR, TARM1, IGHV2-5, HMOX2, DEFB107B, ELANE, IGHG1, PSMB3, PRTN3, KIR2DS2, LILRA3, MUC20, KIR2DS1, LAIR1, IGLV2-8, IGLV7-43, KIR2DS2, OSCAR, FCAR, NAPRT, OSCAR, AZU1, GSDMD, IGKV1D-12, SURF4, PSMC4, RPS6KA1, IGKV2-30, IGHV3-23, IGKV1-17, IGKV2-28, PRSS2, IGKV1-39, IGHV1-46, IGKV5-2, IGHV3-7, IGKV1-16, IGHV3-13, IGHV3-11, IGHV1-69, IGKV3-20, IGKV3-15, IGHV1-2, IGHV4-39, IGHV3-53, IGHV3-48, IGHV4-59, IGKV1-12, IGHV3-30, IGKV1-5, IGKV1-33, IGKV3-11, NFKBIB, HTN3, HTN1, MUC5AC, MUC6, FCAR, KIR2DS4, KIR2DS4, FCAR, FCAR, FCAR, KIR2DS1, KIR2DS1, FCAR, KIR2DS4, POLR3E, DEFB134, DEFB1, PSME2, PSME1, DEFB106B DEFB103A, DEFB107B, DEFA1, DEFB105B, DEFB104A, DEFB136, CTSB, DEFA6, DEFA1B, DEFB4A, DEFB130A, DEFA5, DEFA4, DEFB104B, DEFB135, DEFB103A, RIPK3, DEFB105B, DEFB107A, DEFB4B,</p>

Gene sets name	Gene
DGAT1, DEFB106A, KIR2DS5, STING1, KIR2DS5, CYFIP1, PRKACA	

Supplementary Table 2 Immune response gene sets from from the MsigDB database (<https://www.gsea-msigdb.org/gsea/msigdb>).

Gene sets name	Genes
Antigen Processing and Presentation	<p>AZGP1, B2M, CALR, CANX, CD1A, CD1B, CD1C, CD1D, CD1E, CD4, CD8A, CD8B, CD74, CREB1, CTSB, CTSE, CTSL, CTSS, FCER1G, FCGRT, PDIA3, HFE, HLA-A, HLA-B, HLA-C, HLA-DMA, HLA-DMB, HLA-DOA, HLA-DOB, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQA2, HLA-DQB1, HLA-DRA, HLA-DRB1, HLA-DRB3, HLA-DRB4, HLA-DRB5, HLA-E, HLA-F, HLA-G, HLA-H, MR1, HSPA1A, HSPA1B, HSPA1L, HSPA2, HSPA4, HSPA5, HSPA6, HSPA8, HSP90AA1, HSP90AB1, ICAM1, IFNA1, IFNA2, IFNA4, IFNA5, IFNA6, IFNA7, IFNA8, IFNA10, IFNA13, IFNA14, IFNA16, IFNA17, IFNA21, IFNG, KIR2DL1, KIR2DL2, KIR2DL3, KIR2DL4, KIR2DS1, KIR2DS3, KIR2DS4, KIR2DS5, KIR3DL1, KIR3DL2, KLRC1, KLRC2, KLRC3, KLRD1, LTA, CIITA, MICA, MICB, NFYA, NFYB, NFYC, LGMN, PSMB8, PSMC1, PSMC2, PSMC3, PSMC4, PSMC5, PSMC6, PSMD1, PSMD2, PSMD3, PSMD4, PSMD5, PSMD7, PSMD8, PSMD10, PSMD11, PSMD13, PSME1, PSME1, PSME2, PSME2, RELB, RFX5, RFXAP, SLC10A2, TAP1, TAP2, TAPBP, THBS1, SEM1, KLRC4, AP3B1, RFXANK, PSMD6, PSME3, PSMD14, CLEC4M, IFI30, PROCR, ADRM1, ECPAS, TRPC4AP, CD209, UBXN1, ERAP1, TAPBPL, KIR2DL5A, ERAP2, ULBP3, ULBP2, ULBP1, KIR3DL3, RAET1E, RAET1L, UBR1, RAET1G, PDIA2</p>
Antimicrobials	<p>HAMP, PI3, CAMP, DEFB4A, PPBP, REG3G, CXCL14, CXCL16, SLPI, CXCL8, CXCL10, CXCL9, CXCL5, CXCL11, CXCL6, CXCL1, CXCL12, CXCL13, CXCL2, PF4, XCL1, CXCL3, DEFB103B, CCL13, CCL1, DEFB1, CCL8, ELANE, DEFB103A, DEFA3, DEFA1, TMSB10, DEFA6, DEFA5, DEFA4, LCN2, LCN1, COLEC10, BPI, S100A9, S100A8, DCD, LCN6, S100A12, HTN3, LCN8, DEFA1B, CCR10, CELA1, DEFB106A, PENK, BPIFC, MMP12, BPIFB6, LEAP2, SFTPD, LCN9, BPIFB2, PTGDS, TMSB4X, PGLYRP1, ZC3HAV1, TMSB15A, S100B, S100A13, S100A6, DEFB119, DEFB107A, DEFB105A, SERPIND1, DEFB129, DEFB127, S100P, S100A7, DEFB104A, DEFB126, DEFB106B, DEFB104B, DEFB107B, PGLYRP3, PGLYRP2, S100A10, S100A2, DEFB125, DEFB123, DEFB105B, DEFB132, BPIFB3, LCN12, PGLYRP4, S100A11, S100A5, S100A3, S100A1, DEFB128, DEFB108B, HTN1, LMBR1L, S100A7A, DEFB118, COLEC12, TMSB4Y, DEFB131A, DEFB134, DEFB130A, DEFB124, DEFB121, DEFB116, DEFB115, DEFB114, DEFB113, DEFB112, DEFB110, TMSB15B, DEFB133, S100Z, MAVS, TMSB4XP8, S100A14, LCN10, S100A16, DEFB136, DEFB135, DEFB117, DEFB110, ZC3HAV1L, S100A7L2, MBL3P, DEFB4B, BPIFB4, IFNAR1, AZU1, DEFB131B, DEFA1A3, LCN1P1, S100G, DEFA7P, DEFB130B, DEFB108F, DEFB131C, TCHHL1, TINAGL1, IFNGR1, SLC22A17, WFIKKN1, WFDC2, IL6, UMODL1, TGFB1, PF4V1, MMP9, ANOS1, TLR4, IFNG, SPAG11B, A2M, CTSL, NFKB1, APOBEC3G, FABP6, NOD2, MBL2, SFTPA1, RBP1, TLR2, SLC40A1, PLAU, IL1B, PAEP, HJV, MUC5AC, CTSS, OBP2A, PLTP, MX1, DDX58, IFNL1, IRF3, SFTPA2, LPA, LBP, RBP4, SFTPA1, NOX4, LTF, IFNB1, RBP5, FABP7, FABP5, FABP3, FABP2, FABP4, R3HDML, BPIFA3, BPIFB1, OASL, CRABP2, CRABP1, RBP7, DUOX1, OBP2B, RBP2, LCN15, CETP, FABP12, FABP9, BPIFA1, LCNL1, C8G, SPAG11A, PI15, NOX1, PMP2, APOD, ORM2, ORM1, TNF, CTSG, PRTN3, MAPK1, PML, AEN, CYBB, BPIFA2, ISG20, BCL3, ISG20L2, NOX5, NOX3, DUOX2, TLR3, TFRC, IFIH1, LRP1, TRIM5, IDO1, GDF15, NEDD4, ADIPOQ, STAT3, STAT1, IFNL2, SOCS3, SEMG1, TNFSF10, CCL20, SOCS1, RNASEL, IRF1, IL15, APOBEC3F, PLAAT4, CHIT1, IFNA1, CD40, TLR7, PPIA, HFE, ZYX, NLRX1, PGC, VEGFA, IKBKE, ISG15, DHX58, TNFAIP3, TFR2, FCN2, MUC4, F2R, ELN, IL27, MAPT, LYZ, CCL5, LEP, CYLD, KLKB1, CST4, CSRP1, MAPK14, JUN, ITGAV,</p>

Gene sets name	Genes
BCR Signaling_Pathway	<p>IRF5, CCR6, IL12B, TLR8, GNLY, CD81, EIF2AK2, APOM, CACYBP, NOD1, MAPK8, MAPK3, BST2, BPHL, PLA2G2A, GRN, NEWENTRY, PDGFRA, GNAI1, WNT5A, FURIN, ADAR, TYK2, NOS2, TRAF3, TPT1, TPM2, NEO1, AHNAK, TLR1, TK2, PRDX2, MX2, FGF2, FGA, TCF7L2, F2RL1, TKFC, MSR1, NFKBIZ, LMBR1, EPPIN, SRC, MPO, ELAVL1, ROBO3, SP1, SOD1, PDF, DLL4, ECD, SLC11A1, DMBT1, STING1, SKIV2L, SEMG2, LTA, DES, DCK, DAXX, TNFRSF10A, TNFRSF10B, EED, CCL4, LIMS1, LALBA, APOBEC3H, TMPRSS6, SPINK5, MARCO, BECN1, TNFSF11, KNG1, CSK, KLRK1, KCNH2, JUND, JAK1, CREB1, CLDN4, CCL28, RNASE3, RN7SL1, IRF7, IREB2, ILK, IL18, IL17A, LTB4R, APOBEC3A, MASP2, TRIM27, RELA, IL7R, IL1A, PTX3, IFNAR2, IFN1@, SYTL1, APOBEC3C, DDX17, PTGS2, HTR1A, SEPTIN7, CD40LG, CD14, CD8A, CD4, MASP1, PROC, MAP2K2, MAP2K1, HRG, NDRG1, IRF9, TRIM22, LANCL1, PPP4C, HMOX1, HMGB1, HLA-B, RNASE7, ABCC4, HGF, HDAC1, IFNLR1, PLSCR1, B2M, BACH2, TANK, PIK3CG, ARRB1, RSAD2, STAB2, TBK1, PDYN, PDGFRB, PDCD1, PCSK2, PCSK1, ARG2, AQP9, FASLG, APOH, BIRC5, ANXA6, IL22, VTN, VIM, VCAM1, PRDX1, GFAP, GBP2, ALB, SLC29A3, OAS1, AGER, UNC93B1, TNFSF4, NOS1, ACTG1, ACTA1, ACO1, SERPINA3, CXCR1, CCL15, CCL14, CCL4, CCL16, CCL19, CCL13, CCL18, CCL17, CCL26, CCL22, CCR3, CCL28, CCL4L1, ACKR2, CCR7, CCL27, CCR8, ACKR4, CCR10, CCL2, CCL21, CCL7, CCL5, CCL3, CCL20, CCL11, CCR5, CCL23, CCL25, CCL1, CCL3L3, CCL4L2, CXCL12, XCL1, CCL8, CCL3L1, CCR1, CCL24, XCL2, CXCL1, CXCL10, CXCR4, CXCL2, CXCR6, CCR4, CXCL11, TAFA5, TAFA3, TAFA4, TAFA1, TAFA2, CCL15-CCL14, IL6, TNF, IL1B, IL18, PTK2B, VEGFA, IL4, CDH1, CD40, DEFB103B, F2RL1, MMP9, LTBP1, DEFB4A, TNFSF10, IL13, IL10, IL2, PPARG, FGR, MIF, CRP, JAK2, IL1A, PTK2, PTGDR, CD86, HCK, ARRB1, GNAI1, VDR, OLR1, GRK2, TXK, RNASE2</p> <p>CD79A, CD79B, LYN, SYK, BTK, BLNK, VAV3, VAV1, VAV2, RAC1, RAC2, RAC3, PPP3CA, PPP3CB, PPP3CC, CHP1, PPP3R1, PPP3R2, CHP2, NFAT5, NFATC1, NFATC2, NFATC3, NFATC4, HRAS, KRAS, NRAS, FOS, JUN, CARD11, BCL10, MALT1, CHUK, IKBKB, IKBKG, NFKB1, RELA, NFKBIA, NFKBIB, NFKBIE, CD81, CD19, CR2, PIK3R5, PIK3R1, PIK3R2, PIK3R3, PIK3CA, PIK3CB, PIK3CD, PIK3CG, AKT3, AKT1, AKT2, GSK3B, INPP5D, CD22, CD72, PTPN6, LILRB3, FCGR2B, RASGRP3, PLCG2, PRKCB, IFITM1, IGH, IGHA1, IGHA2, IGHD, IGHD1-1, IGHD1-14, IGHD1-20, IGHD1-26, IGHD1-7, IGHD2-15, IGHD2-2, IGHD2-21, IGHD2-8, IGHD3-10, IGHD3-16, IGHD3-22, IGHD3-3, IGHD3-9, IGHD4-11, IGHD4-17, IGHD4-23, IGHD4-4, IGHD5-12, IGHD5-18, IGHD5-24, IGHD5-5, IGHD6-13, IGHD6-19, IGHD6-25, IGHD6-6, IGHD7-27, IGHE, IGHG1, IGHG2, IGHG3, IGHG4, IGHJ1, IGHJ2, IGHJ3, IGHJ4, IGHJ5, IGHJ6, IGHM, IGH, IGHV1-18, IGHV1-2, IGHV1-24, IGHV1-3, IGHV1-45, IGHV1-46, IGHV1-58, IGHV1-69, IGHV1-8, IGHV1-38-4, IGHV1-69-2, IGHV2-26, IGHV2-5, IGHV2-70, IGHV3-11, IGHV3-13, IGHV3-15, IGHV3-16, IGHV3-20, IGHV3-21, IGHV3-23, IGHV3-30, IGHV3-30-3, IGHV3-30-5, IGHV3-33, IGHV3-35, IGHV3-38, IGHV3-43, IGHV3-48, IGHV3-49, IGHV3-53, IGHV3-64, IGHV3-66, IGHV3-7, IGHV3-72, IGHV3-73, IGHV3-74, IGHV3-9, IGHV3-38-3, IGHV3-69-1, IGHV4-28, IGHV4-30-1, IGHV4-30-2, IGHV4-30-4, IGHV4-31, IGHV4-34, IGHV4-39, IGHV4-4, IGHV4-59, IGHV4-61, IGHV4-38-2, IGHV5-51, IGHV5-10-1, IGHV6-1, IGHV7-4-1, IGHV7-81, IGK, IGKC, IGKDEL, IGKJ, IGKJ1, IGKJ2, IGKJ3, IGKJ4, IGKJ5, IGKV@, IGKV1-12, IGKV1-13, IGKV1-16, IGKV1-17, IGKV1-27, IGKV1-33, IGKV1-37, IGKV1-39, IGKV1-5, IGKV1-6, IGKV1-8, IGKV1-9, IGKV1D-12, IGKV1D-13, IGKV1D-16, IGKV1D-17, IGKV1D-33, IGKV1D-37, IGKV1D-39, IGKV1D-42, IGKV1D-43, IGKV1D-8, IGKV2-24, IGKV2-28, IGKV2-30, IGKV2-40, IGKV2D-24,</p>

Gene sets name	Genes
Chemokine Receptors	IGKV2D-28, IGKV2D-29, IGKV2D-30, IGKV2D-40, IGKV3-11, IGKV3-15, IGKV3-20, IGKV3-7, IGKV3D-11, IGKV3D-15, IGKV3D-20, IGKV3D-7, IGKV4-1, IGKV5-2, IGKV6-21, IGKV6D-21, IGKV6D-41, IGL, IGLC1, IGLC2, IGLC3, IGLC6, IGLC7, IGLJ, IGLJ1, IGLJ2, IGLJ3, IGLJ4, IGLJ5, IGLJ6, IGLJ7, IGLV@, IGLV1-36, IGLV1-40, IGLV1-44, IGLV1-47, IGLV1-50, IGLV1-51, IGLV10-54, IGLV11-55, IGLV2-11, IGLV2-14, IGLV2-18, IGLV2-23, IGLV2-33, IGLV2-8, IGLV3-1, IGLV3-10, IGLV3-12, IGLV3-16, IGLV3-19, IGLV3-21, IGLV3-22, IGLV3-25, IGLV3-27, IGLV3-32, IGLV3-9, IGLV4-3, IGLV4-60, IGLV4-69, IGLV5-37, IGLV5-39, IGLV5-45, IGLV5-48, IGLV5-52, IGLV6-57, IGLV7-43, IGLV7-46, IGLV8-61, IGLV9-49 C5AR1, ACKR2, CCR1, CCR10, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR9, ACKR4, CCRL2, CMKLR1, CX3CR1, CXCR3, CXCR4, CXCR5, CXCR6, ACKR3, CYSLTR1, CYSLTR2, ACKR1, EDNRA, EDNRB, FPR1, FPR2, FPR2, GPR17, GPR32, GPR33, PTGDR2, C5AR2, CXCR1, CXCR2, LTB4R, LTB4R2, PLAUR, PLXNA1, PLXNA2, PLXNA3, PLXNA4, PLXNB1, PLXNB2, PLXNB3, PLXNC1, PLXND1, PTAFR, ROBO1, ROBO2, ROBO3, RXFP3, XCR1
Chemokines	C3, C5, CAMP, CCL1, CCL11, CCL13, CCL14, CCL15, CCL16, CCL17, CCL18, CCL19, CCL2, CCL20, CCL21, CCL22, CCL23, CCL24, CCL25, CCL26, CCL27, CCL28, CCL3, CCL3L1, CCL3P1, CCL3L3, CCL4, CCL4L2, CCL4L1, CCL5, CCL7, CCL8, CKLF, CMA1, CTSG, CX3CL1, CXCL1, CXCL10, CXCL11, CXCL12, CXCL13, CXCL14, CXCL16, CXCL17, CXCL2, CXCL3, CXCL5, CXCL6, CXCL9, CCN1, DEFA1, DEFA3, DEFA5, DEFB1, DEFB103B, DEFB104A, DEFB4A, EDN1, EDN2, EDN3, FGF10, FGF2, HTN3, CXCL8, LECT2, PF4, PF4V1, PLAU, PPBP, PPBPP1, PROK2, RNASE2, SAA1, SAA2, SBDS, SEMA3A, SEMA3B, SEMA3C, SEMA3D, SEMA3E, SEMA3F, SEMA3G, SEMA4A, SEMA4B, SEMA4C, SEMA4D, SEMA4F, SEMA4G, SEMA5A, SEMA5B, SEMA6A, SEMA6B, SEMA6C, SEMA6D, SEMA7A, SLIT1, SLIT2, TNC, TYMP, XCL1, XCL2
Cytokine Receptors	ACVR1B, ACVR1C, ACVR2A, ACVR2B, ACVRL1, ADCYAP1R1, ADIPOR1, ADIPOR2, ADRB1, ADRB2, AGTR1, AGTR2, AMHR2, ANGPT1, ANGPT4, ANGPTL1, ANGPTL2, ANGPTL3, ANGPTL4, ANGPTL6, APLNR, AR, AVPR1A, AVPR1B, AVPR2, BMPR1A, BMPR1B, BMPR2, BRD8, C3AR1, C5AR1, CALCR, CALCRL, ACKR2, CCR1, CCR10, CCR3, CCR4, CCR5, CCR6, CCR7, CCR8, CCR9, ACKR4, CCRL2, CD40, CMKLR1, CNTFR, CRHR1, CRHR2, CRIM1, CRLF1, CRLF2, CRLF3, CSF1R, CSF2RA, CSF2RB, CSF3R, CX3CR1, CXCR3, CXCR4, CXCR5, CXCR6, ACKR3, CYSLTR1, CYSLTR2, ACKR1, EDNRA, EDNRB, EGFR, ENG, EPOR, ESR1, ESR2, ESRRA, ESRRB, ESRRG, FGFR1, FGFR2, FGFR3, FGFR4, FGFR4, FGFR4, FGFR4, FGFR4, FLT1, FLT3, FLT4, FPR1, FPR2, FPR2, FSHR, GALR2, GALR3, GCGR, GHR, GHRHR, GHSR, GIPR, GLP1R, GLP2R, GNRHR, GPER1, GPR17, GPR32, GPR33, PTGDR2, C5AR2, HNF4A, HNF4G, HTR3A, HTR3B, HTR3C, HTR3D, HTR3E, IFNAR1, IFNAR2, IFNGR1, IFNGR2, IGF1R, IGF2R, IL10RA, IL10RB, IL11RA, IL12RB1, IL12RB2, IL13RA1, IL13RA2, IL15RA, IL2RB, IL17RA, IL17RB, IL17RC, IL17RD, IL17RE, IL18R1, IL18RAP, IL1R1, IL1R2, IL1RAP, IL1RL1, IL1RL2, IL20RA, IL20RB, IL21R, IL22RA1, IL22RA2, IL23R, IL27RA, IFNLR1, IL2RA, IL2RB, IL2RG, IL31RA, IL3RA, IL4R, IL5RA, IL6R, IL7R, CXCR1, CXCR2, IL9R, INSR, KDR, LEPR, LGR4, LGR5, LGR6, LHCGR, LIFR, LTB4R, LTB4R2, LTBR, MC1R, MC2R, MC3R, MC4R, MCHR1, MCHR2, MET, MLNR, MPL, MTNR1A, MTNR1B, NGFR, NMBR, NPR1, NPR3, NR0B1, NR0B2, NR1D1, NR1D2, NR1H2, NR1H3, NR1H4, NR1I2, NR1I3, NR2C1, NR2C2, NR2E1, NR2E3, NR2F1, NR2F2, NR2F6, NR3C1, NR3C2, NR4A1, NR4A2, NR4A3, NR5A1, NR5A2, NR6A1, NRP1, NRP2, OGR1, OPRD1, OPRK1, OPRL1, OPRM1, OSMR, OXTR, PGR, PGRMC2, PLAUR, PLXNA1, PLXNA2, PLXNA3, PLXNA4, PLXNB1, PLXNB2, PLXNB3, PLXNC1, PLXND1, PPARA, PPARG, PPARG,

Gene sets name	Genes
Cytokines	<p>PRLHR, PRLR, PTAFR, PTGDR, PTGDS, PTGER1, PTGER2, PTGER3, PTGER4, PTGFR, PTH1R, PTH2R, RARA, RARB, RARG, ROBO1, ROBO2, ROBO3, RORA, ROXB, RORC, RXFP1, RXFP2, RXFP3, RXRA, RXRB, RXRG, S1PR1, S1PR2, SCTR, SDC1, SDC2, SDC3, SDC4, SORT1, SSTR1, SSTR2, SSTR5, ST2, TACR1, TEK, TGFB1, TGFB2, TGFB3, THRA, THRB, TIE1, TNFRSF10A, TNFRSF10B, TNFRSF10C, TNFRSF10D, TNFRSF11A, TNFRSF12A, TNFRSF13B, TNFRSF13C, TNFRSF14, TNFRSF17, TNFRSF18, TNFRSF19, TNFRSF1A, TNFRSF1B, TNFRSF21, TNFRSF25, TNFRSF4, TNFRSF6B, TNFRSF8, TNFRSF9, TRHR, TSHR, TUBB3, VDR, VIPR1, VIPR2, XCR1</p> <p>ADIPOQ, ADM, ADM2, AGRP, AGT, AMBN, AMELX, AMH, ANGPTL5, ANGPTL7, APLN, AREG, MANF, CDNF, ARTN, AVP, AZU1, BDNF, BMP1, BMP10, BMP15, BMP2, BMP3, BMP4, BMP5, BMP6, BMP7, BMP8A, BMP8B, BTC, MYDGF, C3, C5, CALCA, CALCB, CAMP, CAT, CCK, CCL1, CCL11, CCL13, CCL14, CCL15-CCL14, CCL15, CCL16, CCL17, CCL18, CCL19, CCL2, CCL20, CCL21, CCL22, CCL23, CCL24, CCL25, CCL26, CCL27, CCL28, CCL3, CCL3L1, CCL3P1, CCL3L3, CCL4, CCL4L2, CCL4L1, CCL5, CCL7, CCL8, CD320, CD40LG, CD70, ADA2, CER1, CGA, CGB3, CGB1, CGB2, CGB5, CGB7, CGB8, CHGA, CHGB, CKLF, CLCF1, CLEC11A, CMA1, CMTM1, CMTM2, CMTM3, CMTM4, CMTM5, CMTM6, CMTM7, CMTM8, CNTF, CORT, CRH, CSF1, CSF2, CSF3, CSH1, CSH2, CSHL1, CSPG5, CTF1, CCN2, CTSB, CX3CL1, CXCL1, CXCL10, CXCL11, CXCL12, CXCL13, CXCL14, CXCL16, CXCL17, CXCL2, CXCL3, CXCL5, CXCL6, CXCL9, CCN1, DEFA1, DEFA3, DEFA5, DEFB1, DEFB103B, DEFB104A, DEFB4A, DKK1, EBI3, EDN1, EDN2, EDN3, EGF, EPGN, EPO, EREG, ESM1, FAM3B, FAM3C, FAM3D, FASLG, FGF1, FGF10, FGF11, FGF12, FGF13, FGF14, FGF16, FGF17, FGF18, FGF19, FGF2, FGF20, FGF21, FGF22, FGF23, FGF3, FGF4, FGF5, FGF6, FGF7, FGF8, FGF9, VEGFD, FIGLN2, FLT3LG, FSHB, GAL, GALP, GAST, GCG, GDF1, GDF10, GDF11, GDF15, GDF2, GDF3, GDF5, GDF6, GDF7, GDF9, GDNF, GH1, GH2, GHRH, GHRL, GIP, GKN1, GMFB, GMFG, GNRH1, GNRH2, GPHA2, GPHB5, GPI, GREM1, GREM2, GRN, GRP, GUCA2A, HAMP, HBEGF, HDGF, HDGFL3, HGF, HTN3, IAPP, IFNA1, IFNA10, IFNA13, IFNA14, IFNA16, IFNA17, IFNA2, IFNA21, IFNA4, IFNA5, IFNA6, IFNA7, IFNA8, IFNB1, IFNE, IFNG, IFNK, IFNW1, IGF1, IGF2, IL10, IL11, IL12A, IL12B, IL13, IL15, IL16, IL17A, IL17B, IL17C, IL17D, IL17F, IL18, IL19, IL1A, IL1B, IL1F10, IL36RN, IL36A, IL37, IL36B, IL36G, IL1RN, IL2, IL20, IL21, IL22, IL23A, IL24, IL25, IL26, IL27, IFNL2, IFNL3, IFNL1, IL3, IL31, IL32, IL33, IL34, IL4, IL5, IL6, IL6ST, IL7, CXCL8, IL9, INHA, INHBA, INHBB, INHBC, INHBE, INS, INS-IGF2, INSL3, INSL4, INSL5, INSL6, JAG1, JAG2, FGF7P6, FGF7P3, KITLG, KL, LACRT, LECT2, LEFTY1, LEFTY2, LEP, LHB, LIF, LRSAM1, LTA, LTB, LTBP1, LTBP2, LTBP3, LTBP4, MDK, MIA, MIF, MLN, MSTN, NAMPT, NDP, NENF, NGF, NMB, NODAL, CCN3, NPFF, NPPA, NPPB, NPPC, NPY, NRG1, NRG2, NRG3, NRG4, NRTN, NTF3, NTF4, NTS, NUDT6, OGN, OSGIN1, OSM, OSTN, OXT, ENDOU, PDGFA, PDGFB, PDGFC, PDGFD, PDGFRA, PDGFRB, PDGFR1, PDYN, PENK, PF4, PF4V1, PGF, PLAU, PMCH, PNOC, POMC, PPBP, PPBP1, PPBP2, PPY, PRL, PRLH, PROK1, PROK2, PSPN, PTH, PTH2, PTHLH, PTN, PYY, QRF1, RABEP1, RABEP2, REG1A, RETN, RETNLB, RLN1, RLN2, RLN3, RNASE2, S100A6, SAA1, SAA2, SBDS, SCG2, SCGB3A1, SCT, AIMP1, SECTM1, SEMA3A, SEMA3B, SEMA3C, SEMA3D, SEMA3E, SEMA3F, SEMA3G, SEMA4A, SEMA4B, SEMA4C, SEMA4D, SEMA4F, SEMA4G, SEMA5A, SEMA5B, SEMA6A, SEMA6B, SEMA6C, SEMA6D, SEMA7A, SLIT1, SLIT2, SLURP1, SPP1, SST, STC1, STC2, TAC1, TDGF1, TDGF1P3, TG, TGFA, TGFB1, TGFB2, TGFB3, THPO, TNC, TNF, TNFRSF11B, TNFSF10, TNFSF11, TNFSF12,</p>

Gene sets name	Genes
Interferons	TNFSF13, TNFSF13B, TNFSF14, TNFSF15, TNFSF18, TNFSF4, TNFSF8, TNFSF9, TOR2A, TRH, TSHB, TSLP, TXLNA, TYMP, UCN, UCN2, UCN3, UTS2, UTS2B, VEGFA, VEGFB, VEGFC, VGF, VIP, XCL1, XCL2 IFNA10, IFNA13, IFNA14, IFNA16, IFNA17, IFNA2, IFNA21, IFNA4, IFNA5, IFNA6, IFNA7, IFNA8, IFNB1, IFNE, IFNG, IFNK, IFNW1
Interleukins	IL11, IL12A, IL12B, IL13, IL15, IL16, IL17A, IL17B, IL17C, IL17D, IL17F, IL18, IL19, IL1A, IL1B, IL1F10, IL36RN, IL36A, IL37, IL36B, IL36G, IL1RN, IL2, IL20, IL21, IL22, IL23A, IL24, IL25, IL26, IL27, IFNL2, IFNL3, IFNL1, IL3, IL31, IL32, IL33, IL34, IL4, IL5, IL6, IL6ST, IL7, CXCL8, IL9, TXLNA
Interleukins Receptors	IL10RA, IL10RB, IL11RA, IL12RB1, IL12RB2, IL13RA1, IL13RA2, IL15RA, IL2RB, IL17RA, IL17RB, IL17RC, IL17RD, IL17RE, IL18R1, IL18RAP, IL1R1, IL1R2, IL1RAP, IL1RL1, IL1RL2, IL20RA, IL20RB, IL21R, IL22RA1, IL22RA2, IL23R, IL27RA, IFNLR1, IL2RA, IL2RB, IL2RG, IL31RA, IL3RA, IL4R, IL5RA, IL6R, IL7R, CXCR1, CXCR2, IL9R, ST2
Natural Killer Cell	HLA-A, HLA-B, HLA-C, HLA-E, HLA-G, KIR3DL1, KIR3DL2, KIR2DL1, KIR2DL2, KIR2DL3, KIR2DL4, KIR2DL5A, KLRC1, KLRC2, KLRC3, KLRD1, PTPN6, PTPN11, ICAM1, ICAM2, ITGAL, ITGB2, PTK2B, VAV3, VAV1, VAV2, RAC1, RAC2, RAC3, PAK1, MAP2K1, MAP2K2, MAPK1, MAPK3, TNF, CSF2, IFNG, KIR2DS1, KIR2DS3, KIR2DS4, KIR2DS5, NCR2, TYROBP, LCK, FCGR3A, FCGR3B, NCR1, NCR3, FCER1G, CD247, ZAP70, SYK, LCP2, LAT, PLCG1, PLCG2, SH3BP2, PIK3CA, PIK3CB, PIK3CD, PIK3CG, PIK3R5, PIK3R1, PIK3R2, PIK3R3, FYN, SHC2, SHC4, SHC3, SHC1, GRB2, SOS1, SOS2, HRAS, KRAS, NRAS, ARAF, BRAF, RAF1, MICA, MICB, ULBP3, ULBP2, ULBP1, KLRK1, HCST, CD48, CD244, PPP3CA, PPP3CB, PPP3CC, CHP1, PPP3R1, PPP3R2, CHP2, NFAT5, NFATC1, NFATC2, NFATC3, NFATC4, PRKCA, PRKCB, PRKCG, SH2D1B, SH2D1A, IFNGR1, IFNGR2, IFNA1, IFNA2, IFNA4, IFNA5, IFNA6, IFNA7, IFNA8, IFNA10, IFNA13, IFNA14, IFNA16, IFNA17, IFNA21, IFNB1, IFNAR1, IFNAR2, TNFSF10, TNFRSF10D, TNFRSF10C, TNFRSF10B, TNFRSF10A, FASLG, FAS, GZMB, PRF1, CASP3, BID
TCR Signaling Pathway	CD3D, CD3E, CD3G, CD247, CD4, CD8A, CD8B, PTPRC, LCK, FYN, ZAP70, LCP2, LAT, ITK, TEC, NCK1, NCK2, VAV3, VAV1, VAV2, GRAP2, GRB2, PAK1, PAK2, PAK3, PAK4, PAK6, PAK5, RHOA, CDC42, PPP3CA, PPP3CB, PPP3CC, CHP1, PPP3R1, PPP3R2, CHP2, NFAT5, NFATC1, NFATC2, NFATC3, NFATC4, SOS1, SOS2, HRAS, KRAS, NRAS, FOS, JUN, CARD11, BCL10, MALT1, CHUK, IKBKB, IKBKG, NFKB1, RELA, NFKBIA, NFKBIB, NFKBIE, CD28, ICOS, CD40LG, PIK3R5, PIK3R1, PIK3R2, PIK3R3, PIK3CA, PIK3CB, PIK3CD, PIK3CG, AKT3, AKT1, AKT2, MAP3K8, MAP3K14, PDCD1, CTLA4, PTPN6, CBL, CBLB, IL2, IL4, IL5, IL10, IFNG, CSF2, TNF, CDK4, RASGRP1, PDK1, PLCG1, PRKCC, TRAC, TRAJ1, TRAJ2, TRAJ3, TRAJ4, TRAJ5, TRAJ6, TRAJ7, TRAJ8, TRAJ9, TRAJ10, TRAJ11, TRAJ12, TRAJ13, TRAJ14, TRAJ15, TRAJ16, TRAJ17, TRAJ18, TRAJ19, TRAJ20, TRAJ21, TRAJ22, TRAJ23, TRAJ24, TRAJ25, TRAJ26, TRAJ27, TRAJ28, TRAJ29, TRAJ30, TRAJ31, TRAJ32, TRAJ33, TRAJ34, TRAJ35, TRAJ36, TRAJ37, TRAJ38, TRAJ39, TRAJ40, TRAJ41, TRAJ42, TRAJ43, TRAJ44, TRAJ45, TRAJ46, TRAJ47, TRAJ48, TRAJ49, TRAJ50, TRAJ52, TRAJ53, TRAJ54, TRAJ56, TRAJ57, TRAJ58, TRAJ59, TRAJ61, TRAV1-1, TRAV1-2, TRAV2, TRAV3, TRAV4, TRAV5, TRAV7, TRAV8-1, TRAV8-2, TRAV8-3, TRAV8-4, TRAV8-6, TRAV8-7, TRAV9-1, TRAV9-2, TRAV10, TRAV12-1, TRAV12-2, TRAV12-3, TRAV13-1, TRAV13-2, TRAV14DV4, TRAV16, TRAV17, TRAV18, TRAV19, TRAV20, TRAV21, TRAV22, TRAV23DV6, TRAV24, TRAV25, TRAV26-

Gene sets name	Genes
TGF-b Family Members	1, TRAV26-2, TRAV27, TRAV29DV5, TRAV30, TRAV34, TRAV35, TRAV36DV7, TRAV38-1, TRAV38-2DV8, TRAV39, TRAV40, TRAV41, TRBC1, TRBC2, TRBD1, TRBD2, TRBJ1-1, TRBJ1-2, TRBJ1-3, TRBJ1-4, TRBJ1-5, TRBJ1-6, TRBJ2-1, TRBJ2-2, TRBJ2-3, TRBJ2-4, TRBJ2-5, TRBJ2-6, TRBJ2-7, TRBV2, TRBV3-1, TRBV4-1, TRBV4-2, TRBV4-3, TRBV5-1, TRBV5-4, TRBV5-5, TRBV5-6, TRBV5-7, TRBV5-8, TRBV6-1, TRBV6-2, TRBV6-3, TRBV6-4, TRBV6-5, TRBV6-6, TRBV6-7, TRBV6-8, TRBV6-9, TRBV7-2, TRBV7-3, TRBV7-4, TRBV7-6, TRBV7-7, TRBV7-8, TRBV7-9, TRBV9, TRBV10-1, TRBV10-2, TRBV10-3, TRBV11-1, TRBV11-2, TRBV11-3, TRBV12-3, TRBV12-4, TRBV12-5, TRBV13, TRBV14, TRBV15, TRBV16, TRBV17, TRBV18, TRBV19, TRBV20-1, TRBV24-1, TRBV25-1, TRBV27, TRBV28, TRBV29-1, TRBV30, TRDC, TRDD1, TRDD2, TRDD3, TRDJ1, TRDJ2, TRDJ3, TRDJ4, TRDV1, TRDV2, TRDV3, TRGV9, TRGV8, TRGV5, TRGV4, TRGV3, TRGV2, TRGJP2, TRGJP1, TRGJP, TRGJ2, TRGJ1, TRGC2, TRGC1, TRAV6 BMP1, BMP10, BMP15, BMP2, BMP3, BMP4, BMP5, BMP6, BMP7, BMP8A, BMP8B, GDF1, GDF10, GDF11, GDF15, GDF2, GDF3, GDF5, GDF6, GDF7, GDF9, GDNF, INHA, INHBA, INHBB, INHBC, INHBE, LEFTY1, LEFTY2, NODAL, TGFB1, TGFB2, TGFB3
TGF-b Family Members Receptors	ACVR1B, ACVR1C, ACVR2A, ACVR2B, ACVRL1, AMHR2, BMPR1A, BMPR1B, BMPR2, TGFBR1, TGFBR2, TGFBR3
TNF Family Members	TNFRSF11B, TNFSF10, TNFSF11, TNFSF12, TNFSF13, TNFSF13B, TNFSF14, TNFSF15, TNFSF18, TNFSF4, TNFSF8, TNFSF9
TNF Family Members Receptors	TNFRSF10B, TNFRSF10C, TNFRSF10D, TNFRSF11A, TNFRSF12A, TNFRSF13B, TNFRSF13C, TNFRSF14, TNFRSF17, TNFRSF18, TNFRSF19, TNFRSF1A, TNFRSF1B, TNFRSF21, TNFRSF25, TNFRSF4, TNFRSF6B, TNFRSF8, TNFRSF9

Supplementary Table 3 Lipid metabolism gene sets from MSigDB database (<https://www.gsea-msigdb.org/gsea/msigdb>).

Gene sets name	Genes
HALLMARK FATTY ACID METABOLISM	AADAT, ACAA1, ACAA2, ACADL, ACADM, ACADS, ACADVL, ACAT2, ACO2, ACOT2, ACOT8, ACOX1, ACSL1, ACSL4, ACSL5, ACSM3, ACSS1, ADH1C, ADH7, ADIPOR2, ADSL, ALAD, ALDH1A1, ALDH3A1, ALDH3A2, ALDH9A1, ALDOA, AOC3, APEX1, AQP7, AUH, BCKDHB, BLVRA, BMPR1B, BPHL, CA2, CA4, CA6, CBR1, CBR3, CD1D, CD36, CEL, CIDEA, CPOX, CPT1A, CPT2, CRAT, CRYZ, CYP1A1, CYP4A11, CYP4A22, D2HGDH, DECR1, DHCR24, DLD, DLST, ECH1, ECHS1, ECI1, ECI2, EHHADH, ELOVL5, ENO2, ENO3, EPHX1, ERP29, ETFDH, FABP1, FABP2, FASN, FH, FMO1, G0S2, GABARAPL1, GAD2, GAPDHS, GCDH, GLUL, GPD1, GPD2, GRHPR, GSTZ1, H2AZ1, HADH, HADHB, HAO2, HCCS, HIBCH, HMGCL, HMGCS1, HMGCS2, HPGD, HSD17B10, HSD17B11, HSD17B4, HSD17B7, HSDL2, HSP90AA1, HSPH1, IDH1, IDH3B, IDH3G, IDI1, IL4I1, INMT, KMT5A, LDHA, LGALS1, LTC4S, MAOA, MCEE, MDH1, MDH2, ME1, METAP1, MGLL, MIF, MIX23, MLYCD, NBN, NCAPH2, NSDHL, NTHL1, ODC1, OSTC, PCBD1, PDHA1, PDHB, PPARA, PRDX6, PSME1, PTPRG, PTS, RAP1GDS1, RDH11, RDH16, REEP6, RETSAT, S100A10, SDHA, SDHC, SDHD, SERINC1, SLC22A5, SMS, SUCLA2, SUCLG1, SUCLG2, TDO2, TP53INP2, UBE2L6, UGDH, UROD, UROS, VNN1, XIST, YWHAH
KEGG FATTY ACID METABOLISM	ACAA1, ACAA2, ACADL, ACADM, ACADS, ACADSB, ACADVL, ACAT1, ACAT2, ACOX1, ACOX3, ACSL1, ACSL3, ACSL4, ACSL5, ACSL6, ADH1A, ADH1B, ADH1C, ADH4, ADH5, ADH6, ADH7, ALDH1B1, ALDH2, ALDH3A2, ALDH7A1, ALDH9A1, CPT1A, CPT1B, CPT1C, CPT2, CYP4A11, CYP4A22, ECHS1, ECI1, ECI2, EHHADH, GCDH, HADH, HADHA, HADHB
KEGG GLYCEROLIPID METABOLISM	AGK, AGPAT1, AGPAT2, AGPAT3, AGPAT4, AKR1A1, AKR1B1, ALDH1B1, ALDH2, ALDH3A2, ALDH7A1, ALDH9A1, AWAT2, CEL, DGAT1, DGAT2, DGKA, DGKB, DGKD, DGKE, DGKG, DGKH, DGKI, DGKQ, DGKZ, GK, GK2, GLA, GLYCTK, GPAM, GPAT2, GPAT3, GPAT4, LCLAT1, LIPC, LIPF, LIPG, LPL, MBOAT1, MBOAT2, MGLL, PLPP1, PLPP2, PLPP3, PNLIP, PNLIPRP1, PNLIPRP2, PNPLA3, TKFC
KEGG GLYCEROPHOSPHOLIPID METABOLISM	ACHE, ADPRM, AGPAT1, AGPAT2, AGPAT3, AGPAT4, CDIPT, CDS1, CDS2, CHAT, CHKA, CHKB, CHPT1, CRLS1, DGKA, DGKB, DGKD, DGKE, DGKG, DGKH, DGKI, DGKQ, DGKZ, ETNK1, ETNK2, GNPAT, GPAM, GPAT2, GPAT3, GPAT4, GPD1, GPD1L, GPD2, JMJD7-PLA2G4B, LCAT, LCLAT1, LPCAT1, LPCAT2, LPCAT3, LPCAT4, LPGAT1, LYPLA1, LYPLA2, MBOAT1, MBOAT2, MBOAT7, PCYT1A, PCYT1B, PCYT2, PEMT, PGS1, PHOSPHO1,

Gene sets name	Genes
KEGG SPHINGOLIPID METABOLISM	PISD, PLA2G10, PLA2G12A, PLA2G12B, PLA2G15, PLA2G1B, PLA2G2A, PLA2G2C, PLA2G2D, PLA2G2E, PLA2G2F, PLA2G3, PLA2G4A, PLA2G4B, PLA2G4E, PLA2G5, PLA2G6, PLD1, PLD2, PLPP1, PLPP2, PLPP3, PTDSS1, PTDSS2, TFAZZIN
REACTOME FATTY ACID METABOLISM	ACER1, ACER2, ACER3, ARSA, ASAH1, ASAH2, B4GALT6, CERK, DEGS1, DEGS2, ENPP7, GAL3ST1, GALC, GBA, GLA, GLB1, KDSR, NEU1, NEU2, NEU3, NEU4, PLPP1, PLPP2, PLPP3, SGMS1, SGMS2, SGPL1, SGPP1, SGPP2, SMPD1, SMPD2, SMPD3, SMPD4, SPHK1, SPHK2, SPTLC1, SPTLC2, UGCG, UGT8
REACTOME GLYCOSPHINGOLIPID METABOLISM	ABCC1, ABCD1, ACAA1, ACAA2, ACACA, ACACB, ACAD10, ACAD11, ACADL, ACADM, ACADS, ACADVL, ACBD4, ACBD5, ACBD6, ACBD7, ACLY, ACOT1, ACOT11, ACOT12, ACOT13, ACOT2, ACOT4, ACOT6, ACOT7, ACOT8, ACOT9, ACOX1, ACOX2, ACOX3, ACOXL, ACSBG1, ACSBG2, ACSF2, ACSF3, ACSL1, ACSL3, ACSL4, ACSL5, ACSL6, ACSM3, ACSM6, AKR1C3, ALDH3A2, ALOX12, ALOX12B, ALOX15, ALOX15B, ALOX5, ALOX5AP, ALOXE3, AMACR, AWAT1, CBR1, CBR4, CPT1A, CPT1B, CPT2, CRAT, CROT, CYP1A1, CYP1A2, CYP1B1, CYP2C19, CYP2C8, CYP2C9, CYP2J2, CYP2U1, CYP4A11, CYP4A22, CYP4B1, CYP4F11, CYP4F2, CYP4F22, CYP4F3, CYP4F8, CYP8B1, DBI, DECR1, DECR2, DPEP1, DPEP2, DPEP3, ECHS1, ECI1, ECI2, EHHADH, ELOVL1, ELOVL2, ELOVL3, ELOVL4, ELOVL5, ELOVL6, ELOVL7, EPHX2, FAAH, FAAH2, FADS1, FADS2, FASN, GGT1, GGT5, GPX1, GPX2, GPX4, HACD1, HACD2, HACD3, HACD4, HACL1, HADH, HADHA, HADHB, HAO2, HPGD, HPGDS, HSD17B12, HSD17B3, HSD17B4, HSD17B8, HTD2, LTA4H, LTC4S, MAPKAPK2, MCAT, MCEE, MECR, MID1IP1, MLYCD, MMAA, MMUT, MORC2, NDUFAB1, NUDT19, NUDT7, OLAH, PCCA, PCCB, PCTP, PECR, PHYH, PLA2G4A, PON1, PON2, PON3, PPARD, PPT1, PPT2, PRKAA2, PRKAB2, PRKAG2, PRXL2B, PTGDS, PTGES, PTGES2, PTGES3, PTGIS, PTGR1, PTGR2, PTGS1, PTGS2, RXRA, SCD, SCD5, SCP2, SLC22A5, SLC25A1, SLC25A17, SLC25A20, SLC27A2, SLC27A3, TBXAS1, TECR, TECRL, THEM4, THEM5, THRSP, CYP2A13, CYP2A7, CYP2B6, CYP2D6, CYP2F1, CYP2J2, CYP4A11, CYP4A22, CYP4B1, CYP4F11, CYP4F12, CYP4F2, CYP4F22, CYP4F3, CYP4F8
REACTOME GLYCOSPHINGOLIPID METABOLISM	ARSA, ARSB, ARSD, ARSF, ARSG, ARSH, ARSI, ARSJ, ARSK, ARSL, ASAH1, ASAH2, B3GALNT1, B4GALNT1, CERK, CPTP, CTSA, ENPP7, ESYT1, ESYT2, ESYT3, GALC, GBA, GBA2, GLA, GLB1, GLB1L, GLTP, GM2A, HEXA, HEXB, NEU1, NEU2, NEU3, NEU4, PSAP, SMPD1, SMPD2, SMPD3, SMPD4, STS, SUMF1, SUMF2,

Gene sets name	Genes
REACTOME METABOLISM OF LIPIDS	UGCG, UGT8 AACs, ABCA1, ABCB11, ABCB4, ABCC1, ABCC3, ABCD1, ABHD3, ABHD4, ABHD5, ACAA1, ACAA2, ACACA, ACACB, ACAD10, ACAD11, ACADL, ACADM, ACADS, ACADVL, ACAT1, ACAT2, ACBD4, ACBD5, ACBD6, ACBD7, ACER1, ACER2, ACER3, ACHE, ACLY, ACOT1, ACOT11, ACOT12, ACOT13, ACOT2, ACOT4, ACOT6, ACOT7, ACOT8, ACOT9, ACOX1, ACOX2, ACOX3, ACOXL, ACP6, ACSBG1, ACSBG2, ACSF2, ACSF3, ACSL1, ACSL3, ACSL4, ACSL5, ACSL6, ACSM3, ACSM6, ACSS3, AGK, AGMO, AGPAT1, AGPAT2, AGPAT3, AGPAT4, AGPAT5, AGPS, AGT, AHR, AHRr, AKR1B1, AKR1B15, AKR1C1, AKR1C2, AKR1C3, AKR1C4, AKR1D1, ALAS1, ALB, ALDH3A2, ALDH3B1, ALDH3B2, ALOX12, ALOX12B, ALOX15, ALOX15B, ALOX5, ALOX5AP, ALOXE3, ALPI, AMACR, ANGPTL4, ANKRD1, APOA1, APOA2, APOA5, ARF1, ARF3, ARNT, ARNT2, ARNTL, ARSA, ARSB, ARSD, ARSF, ARSG, ARSH, ARSI, ARSJ, ARSK, ARSL, ARV1, ASAH1, ASAH2, AWAT1, AWAT2, B3GALNT1, B4GALNT1, BAAT, BCHE, BDH1, BDH2, BMX, CARM1, CAV1, CBR1, CBR4, CCNC, CD36, CDIPT, CDK19, CDK8, CDS1, CDS2, CEPT1, CERK, CERS1, CERS2, CERS3, CERS4, CERS5, CERS6, CERT1, CGA, CH25H, CHAT, CHD9, CHKA, CHKB, CHPT1, CIDEA, CIDEc, CLOCK, CPNE1, CPNE3, CPNE6, CPNE7, CPT1A, CPT1B, CPT2, CPTP, CRAT, CREBBP, CRLS1, CROT, CSNK1G2, CSNK2A1, CSNK2A2, CSNK2B, CTSa, CUBN, CYP11A1, CYP11B1, CYP11B2, CYP17A1, CYP19A1, CYP1A1, CYP1A2, CYP1B1, CYP21A2, CYP24A1, CYP27A1, CYP27B1, CYP2C19, CYP2C8, CYP2C9, CYP2D6, CYP2E1, CYP2J2, CYP2R1, CYP2U1, CYP39A1, CYP3A4, CYP46A1, CYP4A11, CYP4A22, CYP4B1, CYP4F11, CYP4F2, CYP4F22, CYP4F3, CYP4F8, CYP51A1, CYP7A1, CYP7B1, CYP8B1, DBI, DDHD1, DDHD2, DECR1, DECR2, DEGS1, DEGS2, DGAT1, DGAT2, DGAT2L6, DHCR24, DHCR7, DHRS7B, DPEP1, DPEP2, DPEP3, EBP, ECHS1, ECI1, ECI2, EHHADH, ELOVL1, ELOVL2, ELOVL3, ELOVL4, ELOVL5, ELOVL6, ELOVL7, ENPP6, ENPP7, EP300, EPHX2, ESRRA, ESYT1, ESYT2, ESYT3, ETNK1, ETNK2, ETNPPL, FA2H, FAAH, FAAH2, FABP1, FABP12, FABP2, FABP3, FABP4, FABP5, FABP6, FABP7, FABP9, FADS1, FADS2, FAM120B, FAR1, FAR2, FASN, FDFT1, FDPS, FDX1, FDX2, FDXR, FHL2, FIG4, FITM1, FITM2, G0S2, GALC, GBA, GBA2, GC, GDE1, GDPD1, GDPD3, GDPD5, GGPS1, GGT1, GGT5, GK, GK2, GK3P, GLA, GLB1, GLB1L, GLIPR1, GLTP, GM2A, GNPAT, GPAM, GPAT2, GPAT3, GPAT4, GPCPD1, GPD1, GPD1L, GPD2, GPS2, GPX1, GPX2, GPX4, GRHL1, GSTM4, HACD1, HACD2, HACD3, HACD4, HAcl1, HADH, HADHA, HADHB, HAO2,

Gene sets name	Genes
	<p>HDAC3, HELZ2, HEXA, HEXB, HILPDA, HMGCL, HMGCLL1, HMGCR, HMGCS1, HMGCS2, HPGD, HPGDS, HSD11B1, HSD11B2, HSD17B1, HSD17B11, HSD17B12, HSD17B13, HSD17B14, HSD17B2, HSD17B3, HSD17B4, HSD17B7, HSD17B8, HSD3B1, HSD3B2, HSD3B7, HTD2, IDI1, IDI2, INPP4A, INPP4B, INPP5D, INPP5E, INPP5F, INPP5J, INPP5K, INPPL1, INSIG1, INSIG2, KDSR, KPNB1, LBR, LCLAT1, LGMN, LHB, LIPE, LIPH, LIPI, LPCAT1, LPCAT2, LPCAT3, LPCAT4, LPGAT1, LPIN1, LPIN2, LPIN3, LRP2, LSS, LTA4H, LTC4S, MAPKAPK2, MBOAT1, MBOAT2, MBOAT7, MBTPS1, MBTPS2, MCAT, MCEE, ME1, MECR, MED1, MED10, MED11, MED12, MED13, MED13L, MED14, MED15, MED16, MED17, MED18, MED19, MED20, MED21, MED22, MED23, MED24, MED25, MED26, MED27, MED28, MED29, MED30, MED31, MED4, MED6, MED7, MED8, MED9, MFSD2A, MGLL, MID1IP1, MIGA1, MIGA2, MLYCD, MMAA, MMUT, MOGAT1, MOGAT2, MOGAT3, MORC2, MSMO1, MTF1, MTM1, MTMR1, MTMR10, MTMR12, MTMR14, MTMR2, MTMR3, MTMR4, MTMR6, MTMR7, MTMR8, MTMR9, MVD, MVK, NCOA1, NCOA2, NCOA3, NCOA6, NCOR1, NCOR2, NDUFAB1, NEU1, NEU2, NEU3, NEU4, NFYA, NFYB, NFYC, NPAS2, NR1D1, NR1H2, NR1H3, NR1H4, NRF1, NSDHL, NUDT19, NUDT7, OCRL, OLAH, ORMDL1, ORMDL2, ORMDL3, OSBP, OSBPL10, OSBPL1A, OSBPL2, OSBPL3, OSBPL5, OSBPL6, OSBPL7, OSBPL8, OSBPL9, OXCT1, OXCT2, PCCA, PCCB, PCTP, PCYT1A, PCYT1B, PCYT2, PDCD6-AHRR, PECR, PEMT, PEX11A, PGS1, PHOSPHO1, PHYH, PI4K2A, PI4K2B, PI4KA, PI4KB, PIAS4, PIK3C2A, PIK3C2B, PIK3C2G, PIK3C3, PIK3CA, PIK3CB, PIK3CD, PIK3CG, PIK3R1, PIK3R2, PIK3R3, PIK3R4, PIK3R5, PIK3R6, PIKFYVE, PIP4K2A, PIP4K2B, PIP4K2C, PIP4P1, PIP5K1A, PIP5K1B, PIP5K1C, PISD, PITPNB, PITPNM1, PITPNM2, PITPNM3, PLA1A, PLA2G10, PLA2G12A, PLA2G15, PLA2G1B, PLA2G2A, PLA2G2D, PLA2G2E, PLA2G2F, PLA2G3, PLA2G4A, PLA2G4B, PLA2G4C, PLA2G4D, PLA2G4E, PLA2G4F, PLA2G5, PLA2G6, PLA2R1, PLAAT1, PLAAT2, PLAAT3, PLAAT4, PLAAT5, PLB1, PLBD1, PLD1, PLD2, PLD3, PLD4, PLD6, PLEKHA1, PLEKHA2, PLEKHA3, PLEKHA4, PLEKHA5, PLEKHA6, PLEKHA8, PLIN1, PLIN2, PLIN3, PLPP1, PLPP2, PLPP3, PLPP6, PMVK, PNPLA2, PNPLA3, PNPLA4, PNPLA5, PNPLA6, PNPLA7, PNPLA8, POMC, PON1, PON2, PON3, PPARA, PPARG, PPARGC1A, PPARGC1B, PPM1L, PPP1CA, PPP1CB, PPP1CC, PPT1, PPT2, PRKAA2, PRKAB2, PRKACA, PRKACB, PRKACG, PRKAG2, PRKD1, PRKD2, PRKD3, PRXL2B, PSAP, PTDSS1, PTDSS2, PTEN, PTGDS, PTGES, PTGES2, PTGES3, PTGIS, PTGR1, PTGR2, PTGS1, PTGS2,</p>

Gene sets name	Genes
REACTOME REGULATION OF LIPID METABOLISM BY PPARALPHA	<p>PTPMT1, PTPN13, RAB14, RAB4A, RAB5A, RAN, RGL1, RORA, RUFY1, RXRA, RXRB, SACM1L, SAMD8, SAR1B, SBF1, SBF2, SC5D, SCAP, SCD, SCD5, SCP2, SEC23A, SEC24A, SEC24B, SEC24C, SEC24D, SELENOI, SERPINA6, SGMS1, SGMS2, SGPL1, SGPP1, SGPP2, SIN3A, SIN3B, SLC10A1, SLC10A2, SLC22A5, SLC25A1, SLC25A17, SLC25A20, SLC27A1, SLC27A2, SLC27A3, SLC27A5, SLC44A1, SLC44A2, SLC44A3, SLC44A4, SLC44A5, SLC51A, SLC51B, SLCO1A2, SLCO1B1, SLCO1B3, SMARCD3, SMPD1, SMPD2, SMPD3, SMPD4, SP1, SPHK1, SPHK2, SPNS2, SPTLC1, SPTLC2, SPTLC3, SPTSSA, SPTSSB, SQLE, SRD5A1, SRD5A2, SRD5A3, SREBF1, SREBF2, STAR, STARD10, STARD3, STARD3NL, STARD4, STARD5, STARD6, STARD7, STS, SULT2A1, SUMF1, SUMF2, SUMO2, SYNJ1, SYNJ2, TAFAZZIN, TBL1X, TBL1XR1, TBXAS1, TECR, TECRL, TGS1, THEM4, THEM5, THRAP3, THRSP, TIAM2, TM7SF2, TMEM86B, TNFAIP8, TNFAIP8L1, TNFAIP8L2, TNFAIP8L3, TNFRSF21, TPTE, TPTE2, TRIB3, TSPO, TSPOAP1, TXNRD1, UBE2I, UGCG, UGT1A9, UGT8, VAC14, VAPA, VAPB, VDR</p> <p>ABCA1, ABCB4, ACADM, ACOX1, ACSL1, AGT, AHR, AHRR, ALAS1, ANGPTL4, ANKRD1, APOA1, APOA2, APOA5, ARNT, ARNT2, ARNTL, CARM1, CCNC, CD36, CDK19, CDK8, CHD9, CLOCK, CPT1A, CPT2, CREBBP, CYP1A1, CYP4A11, CYP7A1, EP300, ESRRA, FABP1, FADS1, FAM120B, FDFT1, FHL2, G0S2, GLIPR1, GPS2, GRHL1, HDAC3, HELZ2, HMGCR, HMGCS1, HMGCS2, ME1, MED1, MED10, MED11, MED12, MED13, MED13L, MED14, MED15, MED16, MED17, MED18, MED19, MED20, MED21, MED22, MED23, MED24, MED25, MED26, MED27, MED28, MED29, MED30, MED31, MED4, MED6, MED7, MED8, MED9, MTF1, NCOA1, NCOA2, NCOA3, NCOA6, NCOR1, NCOR2, NFYA, NFYB, NFYC, NPAS2, NR1D1, NR1H2, NR1H3, NR1H4, NRF1, PDCD6-AHRR, PEX11A, PLIN2, PPARA, PPARG, PPARGC1A, PPARGC1B, RGL1, RORA, RXRA, RXRB, SIN3A, SIN3B, SLC27A1, SMARCD3, SP1, SREBF1, SREBF2, SULT2A1, TBL1X, TBL1XR1, TGS1, THRAP3, TIAM2, TNFRSF21, TRIB3, TXNRD1, UGT1A9</p>
WP CHOLESTEROL METABOLISM WITH BLOCH AND KANDUTSCHRUSSELL PATHWAYS	<p>ABCA1, ABCG1, ACAT2, ACOT2, ACSL1, ACSL3, ACSL4, CH25H, CYP27A1, CYP46A1, CYP51A1, DHCR24, DHCR7, EBP, ELOVL2, ELOVL3, ELOVL4, ELOVL5, FADS1, FADS2, FASN, FDFT1, FDPS, GGPS1, HMGCR, HMGCS1, HMGCS2, HSD17B7, IDI1, LBR, LSS, MIR1908, MSMO1, MVD, MVK, MYLIP, NR1H2, NR1H3, NSDHL, PMVK, SC5D, SCD, SOAT1, SOAT2, SQLE, SREBF1, SREBF2, TM7SF2</p>

Gene sets name	Genes
REACTOME SPHINGOLIPID METABOLISM	ACER1, ACER2, ACER3, ALDH3A2, ALDH3B1, ALDH3B2, ARSA, ARSB, ARSD, ARSF, ARSG, ARSH, ARSI, ARSJ, ARSK, ARSL, ASAH1, ASAH2, B3GALNT1, B4GALNT1, CERK, CERS1, CERS2, CERS3, CERS4, CERS5, CERS6, CERT1, CPTP, CSNK1G2, CTSA, DEGS1, DEGS2, ENPP7, ESYT1, ESYT2, ESYT3, FA2H, GALC, GBA, GBA2, GLA, GLB1, GLB1L, GLTP, GM2A, HEXA, HEXB, KDSR, NEU1, NEU2, NEU3, NEU4, ORMDL1, ORMDL2, ORMDL3, OSBP, PLPP1, PLPP2, PLPP3, PPM1L, PRKD1, PRKD2, PRKD3, PSAP, SAMD8, SGMS1, SGMS2, SGPL1, SGPP1, SGPP2, SMPD1, SMPD2, SMPD3, SMPD4, SPHK1, SPHK2, SPNS2, SPTLC1, SPTLC2, SPTLC3, SPTSSA, SPTSSB, STS, SUMF1, SUMF2, UGCG, UGT8, VAPA, VAPB
WP LIPID METABOLISM PATHWAY	ABHD5, ACACA, ACLY, ACSBG1, ACSS2, AKT1, AKT2, AKT3, BCKDHA, FASN, HILPDA, LIPE, PDHA1, PLIN1, PNPLA2, PRKAA1, PRKAA2, PRKAB1, PRKAB2, PRKACA, PRKACB, PRKACG, PRKAG1, PRKAG2, PRKAG3, PRKAR1A, PRKAR1B, PRKAR2A, PRKAR2B
PHOSPHOLIPID METABOLIC PROCESS	ACSL3, ADGRF5, APOC2, CAPN2, CHP1, ENPP7, FABP3, HTR2A, HTR2B, HTR2C, NR1H4, PRKCD, RAB38, STOML2, TFAFAZZIN, ABCA2, ABCA3, APOC1, CHRM5, DNAJC19, GNB3, IDH1, LDLR, LPCAT1, LPIN1, MFSD2A, MIR30C1, MTMR1, MTMR2, MTMR3, MTMR4, MTMR9, PDGFA, PDGFB, PHB2, SCARB1, SLC27A1
REACTOME KETONE BODY METABOLISM	AACS, ACAT1, ACSS3, BDH1, BDH2, HMGCL, HMGCLL1, HMGCS2, OXCT1, OXCT2
GO REGULATION OF CHOLESTEROL METABOLIC PLIC PROCESS	APOE, ERLIN1, ERLIN2, MIR185, MIR30C1, MIR548P, SCAP, SOD1, ABCG1, ABCG4, CES1, CYP7A1, FGF1, LDLRAP1, MIR182, MIR96, POR, PRKAA1, SREBF1, ABCA2, ACADL, ACADVL, APOB, ARV1, DGAT2, DGKQ, DHCR7, EPHX2, FMO5, GNB3, LDLR, LPCAT3, MBTPS1, MBTPS2, NR1H4, SEC14L2, SERPINA12, TTC39B
REACTOME PHOSPHOLIPID METABOLISM	ABHD3, ABHD4, ACHE, ACP6, AGK, AGPAT1, AGPAT2, AGPAT3, AGPAT4, AGPAT5, ALPI, ARF1, ARF3, AWAT2, BCHE, BMX, CDIPT, CDS1, CDS2, CEPT1, CHAT, CHKA, CHKB, CHPT1, CPNE1, CPNE3, CPNE6, CPNE7, CRLS1, CSNK2A1, CSNK2A2, CSNK2B, DDHD1, DDHD2, DGAT1, DGAT2, DGAT2L6, ENPP6, ETNK1, ETNK2, ETNPPL, FIG4, GDE1, GPD1, GPD3, GPD5, GNPAT, GPAM, GPAT2, GPAT3, GPAT4, GPCPD1, GPD1, GPD1L, GPD2, HADHA, HADHB, INPP4A, INPP4B, INPP5D, INPP5E, INPP5F, INPP5J, INPP5K, INPPL1, LCLAT1, LIPH, LIPI, LPCAT1, LPCAT2, LPCAT3, LPCAT4, LPGAT1, LPIN1, LPIN2, LPIN3, MBOAT1, MBOAT2, MBOAT7, MFSD2A, MGLL, MIGA1, MIGA2, MTM1, MTMR1, MTMR10, MTMR12, MTMR14, MTMR2, MTMR3, MTMR4,

Gene sets name	Genes
<p>REACTOME TRANSCRIPTIONAL REGULATION OF W OF WHITE ADIPOCYTE DIFFERENTIATION</p>	<p>MTMR6, MTMR7, MTMR8, MTMR9, OCRL, OSBPL10, OSBPL5, OSBPL8, PCTP, PCYT1A, PCYT1B, PCYT2, PEMT, PGS1, PHOSPHO1, PI4K2A, PI4K2B, PI4KA, PI4KB, PIK3C2A, PIK3C2B, PIK3C2G, PIK3C3, PIK3CA, PIK3CB, PIK3CD, PIK3CG, PIK3R1, PIK3R2, PIK3R3, PIK3R4, PIK3R5, PIK3R6, PIKFYVE, PIP4K2A, PIP4K2B, PIP4K2C, PIP4P1, PIP5K1A, PIP5K1B, PIP5K1C, PISD, PITPNB, PITPNM1, PITPNM2, PITPNM3, PLA1A, PLA2G10, PLA2G12A, PLA2G15, PLA2G1B, PLA2G2A, PLA2G2D, PLA2G2E, PLA2G2F, PLA2G3, PLA2G4A, PLA2G4B, PLA2G4C, PLA2G4D, PLA2G4E, PLA2G4F, PLA2G5, PLA2G6, PLA2R1, PLAAT1, PLAAT2, PLAAT3, PLAAT4, PLAAT5, PLB1, PLBD1, PLD1, PLD2, PLD3, PLD4, PLD6, PLEKHA1, PLEKHA2, PLEKHA3, PLEKHA4, PLEKHA5, PLEKHA6, PLEKHA8, PNPLA2, PNPLA3, PNPLA6, PNPLA7, PNPLA8, PTDSS1, PTDSS2, PTEN, PTPMT1, PTPN13, RAB14, RAB4A, RAB5A, RUFY1, SACM1L, SBF1, SBF2, SELENOI, SLC44A1, SLC44A2, SLC44A3, SLC44A4, SLC44A5, STARD10, STARD7, SYNJ1, SYNJ2, TAFAZZIN, TMEM86B, TNFAIP8, TNFAIP8L1, TNFAIP8L2, TNFAIP8L3, TPTE, TPTE2, VAC14</p> <p>ADIPOQ, ADIRF, ANGPTL4, CARM1, CCNC, CCND3, CD36, CDK19, CDK4, CDK8, CEBPA, CEBPB, CEBPD, CHD9, CREBBP, EBF1, EGR2, EP300, FABP4, FAM120B, HDAC3, HELZ2, KLF4, KLF5, LEP, LPL, MED1, MED10, MED11, MED12, MED13, MED13L, MED14, MED15, MED16, MED17, MED18, MED19, MED20, MED21, MED22, MED23, MED24, MED25, MED26, MED27, MED28, MED29, MED30, MED31, MED4, MED6, MED7, MED8, MED9, NCOA1, NCOA2, NCOA3, NCOA6, NCOR1, NCOR2, NFKB1, NR2F2, PCK1, PLIN1, PPARA, PPARG, PPARGC1A, RELA, RXRA, SLC2A4, SMARCD3, SREBF1, SREBF2, TBL1X, TBL1XR1, TGFB1, TGS1, THRAP3, TNF, WNT1, WNT10B, ZNF467, ZNF638</p>
<p>REACTOME PLASMA LIPOPROTEIN ASSEMBLY REMODELING AND CLEARANCE</p>	<p>A2M, ABCA1, APOA1, APOA2, APOA4, APOB, APOC1, APOC2, APOC3, APOC4, APOE, BMP1, MTPP, P4HB, PRKACA, PRKACB, PRKACG, SAR1B, ZDHHC8, A2M, ABCA1, ABCG1, ALB, AMN, ANGPTL3, ANGPTL4, ANGPTL8, AP2A1, AP2A2, AP2B1, AP2M1, AP2S1, APOA1, APOA2, APOA4, APOA5, APOB, APOBR, APOC1, APOC2, APOC3, APOC4, APOE, APOF, BMP1, CES3, CETP, CIDEA, CLTA, CLTC, CREB3L3, CUBN, FGF21, FURIN, GPIHBP1, HDLBP, LCAT, LDLR, LDLRAP1, LIPA, LIPC, LIPG, LMF1, LMF2, LPA, LPL, LSR, MBTPS1, MBTPS2, MTPP, MYLIP, NCEH1, NPC1, NPC2, NR1H2, NR1H3, P4HB, PCSK5, PCSK6, PCSK9, PLTP, PRKACA, PRKACB, PRKACG, SAR1B, SCARB1, SOAT1, SOAT2, VLDLR, ZDHHC8, AMN, AP2A1, AP2A2, AP2B1, AP2M1,</p>

Gene sets name	Genes
WP SPHINGOLIPID PATHWAY	AP2S1, APOA1, APOB, APOBR, APOC1, APOC4, APOE, CES3, CLTA, CLTC, CUBN, HDLBP, LDLR, LDLRAP1, LIPA, LIPC, LSR, MYLIP, NCEH1, NPC1, NPC2, NR1H2, NR1H3, PCSK9, SCARB1, SOAT1, SOAT2, VLDLR, ABCG1, ALB, ANGPTL3, ANGPTL4, ANGPTL8, APOA1, APOA2, APOA4, APOA5, APOB, APOC2, APOC3, APOE, APOF, CETP, CIDEA, CREB3L3, FGF21, FURIN, GPIHBP1, LCAT, LIPC, LIPG, LMF1, LMF2, LPA, LPL, MBTPS1, MBTPS2, MTPP, P4HB, PCSK5, PCSK6, PLTP ACER1, ASAH1, ASAH2, B4GALT6, CERK, CERS2, CERS3, CERS4, CERS5, CERS6, CERT1, GAL3ST1, GBA, GBA2, KDSR, PLPP1, PPP1CA, PPP2CA, SERINC1, SGMS1, SGMS2, SGPL1, SGPP2, SPHK1, SPHK2, SPTLC1, SPTLC2, SPTLC3, UGCG, UGT8
REACTOME TRIGLYCERIDE BIOSYNTHESIS	AGMO, DGAT1, DGAT2, GK, GK2, GK3P, GPAM, GPAT2, LPIN1, LPIN2, LPIN3, MOGAT1, MOGAT2, MOGAT3
REACTOME TRIGLYCERIDE CATABOLISM	ABHD5, CAV1, FABP1, FABP12, FABP2, FABP3, FABP4, FABP5, FABP6, FABP7, FABP9, GPD2, LIPE, MGLL, PLIN1, PLIN3, PNPLA4, PNPLA5, PPP1CA, PPP1CB, PPP1CC, PRKACA, PRKACB, PRKACG
REACTOME TRIGLYCERIDE METABOLISM	ABHD5, AGMO, CAV1, DGAT1, DGAT2, FABP1, FABP12, FABP2, FABP3, FABP4, FABP5, FABP6, FABP7, FABP9, GK, GK2, GK3P, GPAM, GPAT2, GPD2, LIPE, LPIN1, LPIN2, LPIN3, MGLL, MOGAT1, MOGAT2, MOGAT3, PLIN1, PLIN3, PNPLA4, PNPLA5, PPP1CA, PPP1CB, PPP1CC, PRKACA, PRKACB, PRKACG
WP CHOLESTEROL BIOSYNTHESIS PATHWAY	CYP51A1, DHCR7, FDFT1, FDPS, HMGCR, HMGCS1, IDI1, LSS, MSMO1, MVD, MVK, NSDHL, PMVK, SC5D, SQLE
REACTOME REGULATION OF CHOLESTEROL BIOSYNTHESIS BY SREBP SREBF	ACACA, ACACB, CARM1, CHD9, CREBBP, CYP51A1, DHCR7, ELOVL6, FASN, FDFT1, FDPS, GGPS1, GPAM, HELZ2, HMGCR, HMGCS1, IDI1, INSIG1, INSIG2, KPNB1, LSS, MBTPS1, MBTPS2, MED1, MTF1, MVD, MVK, NCOA1, NCOA2, NCOA6, NFYA, NFYB, NFYC, PMVK, PPARA, RAN, RXRA, SAR1B, SC5D, SCAP, SCD, SEC23A, SEC24A, SEC24B, SEC24C, SEC24D, SMARCD3, SP1, SQLE, SREBF1, SREBF2, TBL1X, TBL1XR1, TGS1, TM7SF2

Supplementary Table 4 TG, TC, HDL, and LDL gene sets from MsigDB database (<https://www.gsea-msigdb.org/gsea/msigdb>).

Gene sets name	Genes
GOBP TRIGLYCERIDE METABOLIC PROCESS	AADAC, ABHD5, ACSL1, AGMO, APOA1, APOA2, APOA4, APOA5, APOB, APOBEC1, APOBR, APOC1, APOC2, APOC3, APOE, APOH, ATG14, C3, CAT, CAV1, CAV3, CETP, CNEP1R1, CPS1, CPT1A, CTDNEP1, CYP2E1, DAGLB, DDHD2, DGAT1, DGAT2, FBXW7, FGF21, FITM2, G6PC1, GK, GK2, GK5, GNB3, GPAM, GPAT2, GPAT3, GPAT4, GPIHBP1, GPLD1, GPX1, INSIG1, INSIG2, LDLR, LIPC, LIPE, LIPF, LIPG, LIPH, LIPI, LMF1, LPGAT1, LPIN1, LPIN2, LPIN3, LPL, MBOAT7, MFSD2A, MGLL, MIR29B1, MIR30C1, MIR548P, MOGAT1, MOGAT2, MOGAT3, MTPP, NKX2-3, NR1H2, NR1H3, PANK2, PCK1, PCK2, PCSK9, PIK3CG, PLAAT3, PLB1, PLIN5, PNLIPRP2, PNPLA1, PNPLA2, PNPLA3, PNPLA4, PNPLA5, PTPN11, RGN, SCARB1, SEL1L, SERPINA12, SIK1, SIRT1, SLC22A4, SLC27A1, SLC27A5, SORL1, SREBF1, TBL1XR1, THRSP, TNXB
GOBP REGULATION OF LOW DENSITY LIPOPROTEIN PARTICLE CLEARANCE	ABCC8, ANXA2, APOC3, CNPY2, CSK, FGF21, HNRNPK, IL19, KHSRP, LDLR, LDLRAP1, MIR133A1, MIR148A, MIR17, MIR185, MIR199A1, MIR27A, MIR27B, MYLIP, NR1H4, PCSK9, TREM2
GOBP POSITIVE REGULATION OF LOW DENSITY LIPOPROTEIN RECEPTOR ACTIVITY	ANXA2, CNPY2, FGF21, HNRNPK, PPARG
GOBP NEGATIVE REGULATION OF LOW DENSITY LIPOPROTEIN RECEPTOR ACTIVITY	ABCA2, ADIPOQ, APP, ITGAV, ITGB3, MIR185, MIR27A, PCSK9, PSEN1
GOBP NEGATIVE REGULATION OF LOW DENSITY LIPOPROTEIN PARTICLE CLEARANCE	ABCC8, APOC3, CSK, IL19, KHSRP, LDLR, MIR133A1, MIR148A, MIR17, MIR185, MIR199A1, MIR27A, MIR27B, MYLIP, PCSK9
GOBP LOW DENSITY LIPOPROTEIN RECEPTOR PARTICLE METABOLIC PROCESS	ABCA2, ANXA2, APOE, FURIN, MYLIP, PCSK9
GOBP LOW DENSITY LIPOPROTEIN PARTICLE REMODELING	ABCG1, AGT, AGTR1, APOA2, APOB, APOE, CETP, LIPC, MPO, MTPP, PLA2G10, PLA2G2A, PLA2G2E, PLA2G3, PLA2G5, PLA2G7
GOBP LOW DENSITY LIPOPROTEIN PARTICLE CLEARANCE	ABCC8, ADIPOQ, ANXA2, APOB, APOC3, CD36, CES3, CNPY2, CSK, DGAT2, EHD1, FGF21, HMOX1, HNRNPK, IL19, KHSRP, LDLR, LDLRAP1, LIPA, MIR133A1, MIR148A, MIR17, MIR185, MIR199A1, MIR27A, MIR27B, MYLIP, NCEH1, NR1H4, PCSK9, SCARB1, SOAT1, SOAT2, TREM2
GOBP CELLULAR RESPONSE TO OXIDISED LOW DENSITY LIPOPROTEIN PARTICLE STIMULUS	ADTRP, AKT1, CD36, CD68, MIA3, MIR146A, MYD88, SMPD3, TICAM1, TLR4, TLR6, TREM2
GOBP CELLULAR RESPONSE TO LOW DENSITY	ABCA1, CASR, CD36, CD81, CD9, CDH13, CES1, FCER1G, FGF21, ITGB1, ITGB2,

Gene sets name	Genes
LIPOPROTEIN PARTICLE STIMULUS	LDLR, LPL, MIR302A, MIR758, MIR92A1, NPC1, PPARG, SOCS5, SREBF2, SYK
GOBP REGULATION OF HIGH DENSITY LIPOPROTEIN PARTICLE CLEARANCE	APOC3, GPLD1, LIPG, MIR144, MIR302A, MIR33A, MIR33B, TREM2
GOBP HIGH DENSITY LIPOPROTEIN PARTICLE REMODELING	ABCA5, ABCG1, APOA1, APOA2, APOA4, APOC1, APOC3, APOE, APOM, CETP, LCAT, LIPC, LIPG, PLA2G3, PLTP, SCARB1
GOBP HIGH DENSITY LIPOPROTEIN PARTICLE CLEARANCE	APOA1, APOA2, APOC2, APOC3, APOE, APOM, GPLD1, LDLR, LIPG, MIR144, MIR302A, MIR33A, MIR33B, SCARB1, TREM2
GOBP HIGH DENSITY LIPOPROTEIN PARTICLE ASSEMBLY	ABCA1, ABCA7, APOA1, APOA2, APOA4, APOA5, APOE, APOM, LCAT, MIR144, NR1H2, PRKACA, PRKACB, PRKACG, ZDHHC8
GOBP CELLULAR RESPONSE TO CHOLESTEROL	CES1, CYP7A1, DAG1, GPLD1, GRAMD1A, GRAMD1B, GRAMD1C, INHBA, INHBB, LRP6, LRP8, MIR182, MIR185, MIR96, MLC1, OSBPL7, PTCH1, SMO
GOBP NEGATIVE REGULATION OF CHOLESTEROL EFFLUX	ABCA2, EGF, MIR128-1, MIR130B, MIR144, MIR148A, MIR19B1, MIR206, MIR26A1, MIR27A, MIR27B, MIR301B, MIR302A, MIR33A, MIR33B, MIR613, MIR758, PLA2G10, SHH, SREBF2
GOBP NEGATIVE REGULATION OF CHOLESTEROL METABOLIC PROCESS	APOE, ERLIN1, ERLIN2, MIR185, MIR30C1, MIR548P, SCAP, SOD1
GOBP NEGATIVE REGULATION OF CHOLESTEROL STORAGE	ABCA1, ABCG1, CES1, MIR146A, NR1H2, NR1H3, PPARA, PPARD, PPARG, TREM2, TTC39B
GOBP POSITIVE REGULATION OF CHOLESTEROL EFFLUX	ABCA1, ABCA12, ABCA3, ABCA7, ABCA8, ABCG1, ABCG4, ADIPOQ, APOA1, APOE, CAV1, CES1, EEPD1, GPS2, LRP1, MIR206, NFKBIA, NR1H2, NR1H3, PLTP, PON1, PPARG, PTCH1, RXRA, SIRT1, TREM2, ZDHHC8
GOBP POSITIVE REGULATION OF CHOLESTEROL ESTERIFICATION	AGT, AGTR1, APOA1, APOA2, APOA4, APOA5, APOC1, APOE, STARD4
GOBP POSITIVE REGULATION OF CHOLESTEROL METABOLIC PROCESS	ABCG1, ABCG4, CES1, CYP7A1, FGF1, LDLRAP1, MIR182, MIR96, POR, PRKAA1, SCAP, SREBF1
GOBP POSITIVE REGULATION OF CHOLESTEROL STORAGE	APOB, CD36, EHD1, LPL, MIR144, MSR1, SCARB1, SREBF2
GOBP RECEPTOR MEDIATED ENDOCYTOSIS INVOLVED IN CHOLESTEROL TRANSPORT	ABCA2, ANXA2, LDLR, LDLRAP1, LRP6, MIR17, MIR27B, PCSK9
GOBP REGULATION OF CHOLESTEROL EFFLUX	ABCA1, ABCA12, ABCA2, ABCA3, ABCA5, ABCA7, ABCA8, ABCG1, ABCG4, ADIPOQ, APOA1, APOE, CAV1, CES1, CETP, EEPD1, EGF, GPS2, LAMTOR1, LRP1, MIR128-1, MIR130B, MIR144, MIR148A, MIR19B1, MIR206, MIR26A1, MIR27A, MIR27B,

Gene sets name	Genes
GOBP REGULATION OF CHOLESTEROL ESTERIFICATION	MIR301B, MIR302A, MIR33A, MIR33B, MIR613, MIR758, NAXE, NFKBIA, NR1H2, NR1H3, PLA2G10, PLTP, PON1, PPARG, PTCH1, RXRA, SHH, SIRT1, SREBF2, TREM2, TTC39B, YJEFN3, ZDHHC8 ABCA2, ABCG1, AGT, AGTR1, APOA1, APOA2, APOA4, APOA5, APOC1, APOE, LAMTOR1, MIR27A, MIR27B, STARD4
GOBP REGULATION OF CHOLESTEROL METABOLIC PROCESS	ABCA2, ABCG1, ABCG4, ACADL, ACADVL, APOB, APOE, ARV1, CES1, CYP7A1, DGAT2, DGKQ, DHCR7, EPHX2, ERLIN1, ERLIN2, FGF1, FMO5, GNB3, LDLR, LDLRAP1, LPCAT3, MBTPS1, MBTPS2, MIR182, MIR185, MIR30C1, MIR548P, MIR96, NR1H4, POR, PRKAA1, SCAP, SEC14L2, SERPINA12, SOD1, SREBF1, TTC39B
GOBP REGULATION OF RECEPTOR MEDIATED ENDOCYTOSIS INVOLVED IN CHOLESTEROL TRANSPORT GOBP RESPONSE TO CHOLESTEROL	ABCA2, ANXA2, LDLRAP1, MIR17, MIR27B, PCSK9 ABCA2, CCL3, CCR5, CES1, CYP7A1, CYP8B1, DAG1, F7, GPLD1, GRAMD1A, GRAMD1B, GRAMD1C, INHBA, INHBB, LRP6, LRP8, MIR182, MIR185, MIR96, MLC1, OSBPL7, PMVK, PTCH1, SMAD2, SMO, TGFB1, TGFBR1, TGFBR2
GOCC TRIGLYCERIDE RICH PLASMA LIPOPROTEIN PARTICLE	APOA1, APOA2, APOA4, APOA5, APOB, APOBR, APOC1, APOC2, APOC3, APOC4, APOE, APOH, APOL1, APOM, APOO, LPL, LSR, PCYOX1, SELENOS, VLDLR
GOCC LOW DENSITY LIPOPROTEIN PARTICLE	APOA5, APOB, APOBR, APOC2, APOE, APOF, APOM, APOO, LDLR, LSR, MSR1, PLA2G7, SELENOS
GOCC SPHERICAL HIGH DENSITY LIPOPROTEIN PARTICLE	APOA1, APOA2, APOC2, APOC3, APOM, CLU, HPR, PON1
GOCC HIGH DENSITY LIPOPROTEIN PARTICLE	APOA1, APOA2, APOA4, APOA5, APOB, APOC1, APOC2, APOC3, APOC4, APOE, APOF, APOH, APOL1, APOM, APOO, CETP, CLU, HDLBP, HPR, LCAT, LIPC, PLA2G7, PLTP, PON1, SAA1, SAA2, SAA4
GOMF LOW DENSITY LIPOPROTEIN PARTICLE RECEPTOR BINDING	ANKRA2, AP2A1, AP2M1, APBB1, APBB3, APOA5, APOB, APOE, CLTC, CLU, CRP, DAB2, DKK1, DNAJA1, HSP90B1, HSPG2, LANCL1, LDLRAP1, LRPAP1, MESD, PCSK9, PICALM, SNX17, SYT1
GOMF LOW DENSITY LIPOPROTEIN PARTICLE RECEPTOR ACTIVITY	CD36, CXCL16, LDLR, LRP1, LRP10, LRP12, LRP1B, LRP2, LRP6, LRP8, OLR1, SORL1, STAB1, STAB2, VLDLR
GOMF LOW DENSITY LIPOPROTEIN PARTICLE BINDING	APCS, CD36, CDH13, COLEC12, CRP, LDLR, LIPC, MSR1, PCSK9, PLTP, SAMD1, SCARB1, SCARF1, SORL1, STAB1, STAB2, THBS1, TREM2
GOMF HIGH DENSITY LIPOPROTEIN PARTICLE BINDING	APOA1, APOA2, APOL2, APOL5, CD36, HSPD1, LRP8, MIR30C1, MIR9-1, PLTP, SCARB1, TREM2
GOMF CHOLESTEROL BINDING	ABCA1, ABCG1, ANXA6, APOA1, APOA2, APOA4, APOA5, APOC3, APOD, APOF,

Gene sets name	Genes
BIOCARTA LDL PATHWAY	CAV1, CD81, CETP, ERLIN1, ERLIN2, GRAMD1A, GRAMD1B, GRAMD1C, NPC1, NPC2, NR1H3, OSBP2, OSBPL10, OSBPL1A, OSBPL2, OSBPL3, OSBPL5, OSBPL6, OSBPL7, OSBPL8, PMP2, PROM1, PROM2, PTCH1, SCARB2, SCP2, SIDT1, SOAT1, SOAT2, STAR, STARD3, STARD3NL, STARD4, STARD5, SULT2B1, SYP, TSPO, TSPO2, VDAC1, VDAC2
WP CHOLESTEROL BIOSYNTHESIS PATHWAY	ACAT1, CCL2, CSF1, IL6, LDLR, LPL
HP HYPERTRIGLYCERIDEMIA	CYP51A1, DHCR7, FDFT1, FDPS, HMGCR, HMGCS1, IDI1, LSS, MSMO1, MVD, MVK, NSDHL, PMVK, SC5D, SQLE
HP HYPOTRIGLYCERIDEMIA	ABCA1, ABHD5, AEBP1, AGL, AGPAT2, AKT2, ALMS1, APOA5, APOC2, APOE, BSCL2, CAV1, CAVIN1, CEP19, CIDEA, CREB3L3, CYP7A1, DAAM2, DEAF1, EMD, FARSA, FECH, FHL1, FLII, FOS, GK, GPD1, HAVCR2, IQSEC2, JAG1, LCAT, LDLRAP1, LEP, LEPR, LIPA, LIPC, LIPE, LMF1, LMNA, LPL, LRP6, LYST, MC4R, MCM10, MTX2, NSMCE2, PHKA2, PHKG2, PIGH, PIGT, PLIN1, PLVAP, PNPLA2, POLD1, POLR3A, PPARG, PRF1, PSMB10, PSMB4, PSMB8, PSMB9, PYGL, RAI1, RSPO1, SGPL1, SLC25A13, SLC29A3, SLC2A2, SLC37A4, SLC7A7, SMPD1, STX11, STXBP2, SYNE1, SYNE2, TMEM43, TTPA, UNC13D, XIAP, XRCC4, YARS1
HP ABNORMAL CIRCULATING CHOLESTEROL CONCENTRATION	ANGPTL3, APOC3, CETP, GALNT2, MTTP, NGLY1, PCYT1A, SAR1B
HP HYPERCHOLESTEROLEMIA	ABCA1, ABCA2, ABCB4, ABCG5, ABCG8, AGPAT2, ALB, ALG12, ALG6, ALMS1, ANGPTL3, APOA1, APOA2, APOA5, APOB, APOC2, APOC3, APOE, APTX, ATAD3A, ATP6AP1, BSCL2, CAV1, CAV3, CAVIN1, CCDC115, CCT5, CEP19, CETP, COG4, CREB3L3, CYP11A1, CYP27A1, CYP7A1, DAAM2, DEAF1, DGAT1, DHCR24, DHCR7, DLK1, DMPK, DYRK1B, EBP, EMD, EPHX2, FDFT1, FHL1, FLCN, FLII, FOS, GALK1, GALNT2, GHR, GPIHBP1, HSD3B7, HTT, IQSEC2, JAG1, LBR, LCAT, LDLR, LDLRAP1, LIPA, LIPC, LMNA, LPL, LRP6, MEF2A, MEG3, MSMO1, MTTP, MTX2, NGLY1, NPC2, NSDHL, NUP107, OCRL, PANK2, PCSK9, PEX12, PHKA2, PHKG2, PIK3R5, PMM2, PPARG, PPP1R17, PSAP, PSMB8, PYGL, RAI1, RSPO1, RTL1, SAR1B, SC5D, SETX, SLC25A13, SLC2A3, SLC37A4, SLC7A7, SMPD1, SYNE1, SYNE2, TBL1X, TDP1, TMEM199, TMEM43, TSHB, TTPA, UBE3B, UBR1
	ABCB4, ABCG5, ABCG8, AGPAT2, ALB, APOB, APOC2, APOC3, APOE, APTX, ATP6AP1, BSCL2, CAV1, CAV3, CAVIN1, CCDC115, CEP19, CETP, COG4, CREB3L3, CYP7A1, DAAM2, DEAF1, DGAT1, DLK1, DMPK, DYRK1B, FLII, FOS, GALK1, GHR, IQSEC2, JAG1, LDLR, LDLRAP1, LIPA, LIPC, LMNA, LPL, LRP6, MEF2A, MEG3,

Gene sets name	Genes
HP HYPOCHOLESTEROLEMIA	MTX2, NUP107, OCRL, PCSK9, PHKA2, PHKG2, PIK3R5, PPARG, PYGL, RAI1, RSP01, RTL1, SETX, SLC25A13, SLC37A4, SLC7A7, TBL1X, TDP1, TMEM199, TSHB, TTPA
GOERING BLOOD HDL CHOLESTEROL QTL TRANS	ABCA1, ALG12, ATAD3A, CCT5, DHCR7, FDFT1, FLCN, HSD3B7, MSMO1, MTPP, PEX12, PMM2, PSAP, SAR1B, UBE3B
GOERING BLOOD HDL CHOLESTEROL QTL CIS	CYP4F35P, EPB41L4A, FLT4, KLK3, LDLRAD4, MAPK8IP1, MPO, MSI1, NACC2, PAF1, SCRIB, SELENON, TMEM241, ZC3HC1
HALLMARK CHOLESTEROL HOMEOSTASIS	GSTM1, HLA-DRB3, HLA-DRB5, IKZF1, LGALS2, LINC00339, PPA2, RPL14, RPS26, TIMM10, TMEM176B, UBA52, UTS2
REACTOME CHOLESTEROL BIOSYNTHESIS	ABCA2, ACAT2, ACSS2, ACTG1, ADH4, ALCAM, ALDOC, ANTXR2, ANXA13, ANXA5, ATF3, ATF5, ATXN2, AVPR1A, CBS, CD9, CHKA, CLU, CPEB2, CTNNB1, CXCL16, CYP51A1, DHCR7, EBP, ECH1, ERFFI1, ETHE1, FABP5, FADS2, FASN, FBXO6, FDFT1, FDPS, GLDC, GNAI1, GPX8, GSTM2, GUSB, HMGCR, HMGCS1, HSD17B7, IDI1, JAG1, LDLR, LGALS3, LGMN, LPL, LSS, MAL2, MVD, MVK, NFIL3, NIBAN1, NSDHL, PCYT2, PDK3, PLAUR, PLSCR1, PMVK, PNRC1, PPARG, S100A11, SC5D, SCD, SEMA3B, SQLE, SREBF2, STARD4, STX5, TM7SF2, TMEM97, TNFRSF12A, TP53INP1, TRIB3 ACAT2, ARV1, CYP51A1, DHCR24, DHCR7, EBP, FDFT1, FDPS, GGPS1, HMGCR, HMGCS1, HSD17B7, IDI1, IDI2, LBR, LSS, MSMO1, MVD, MVK, NSDHL, PLPP6, PMVK, SC5D, SQLE, TM7SF2

Supplementary Table 5 Lipids genes from MsigDB database (<https://www.gsea-msigdb.org/gsea/msi>)

AADAT
ACAA1
ACAA2
ACADL
ACADM
ACADS
ACADVL
ACAT2
ACOT2
ACOT8
ACOX1
ACSL1
ACSL4
ACSL5
ACSM3
ADH1C
ADH7
ALDH3A2
ALDH9A1
CBR1
CD36
CEL
CIDEA
CPT1A
CPT2
CRAT
CYP1A1
CYP4A11
CYP4A22
DECR1
DHCR24
ECHS1
ECI1
ECI2
EHHADH
ELOVL5
FABP1
FABP2
FASN
G0S2
GCDH
GPD1
GPD2
HADH
HADHB
HAO2
HMGCL
HMGCS1
HMGCS2

HPGD
HSD17B11
HSD17B4
HSD17B7
IDH1
IDI1
LTC4S
MCEE
ME1
MGLL
MLYCD
NSDHL
PPARA
SERINC1
SLC22A5
ACAT1
ACOX3
ACSL3
ACSL6
ALDH1B1
ALDH2
ALDH7A1
CPT1B
HADHA
AGK
AGPAT1
AGPAT2
AGPAT3
AGPAT4
AKR1B1
AWAT2
DGAT1
DGAT2
DGKA
DGKB
DGKD
DGKE
DGKG
DGKH
DGKI
DGKQ
DGKZ
GK
GK2
GLA
GPAM
GPAT2
GPAT3
GPAT4
LCLAT1

LIPC
LIPG
LPL
MBOAT1
MBOAT2
PLPP1
PLPP2
PLPP3
PNPLA3
ACHE
CDIPT
CDS1
CDS2
CHAT
CHKA
CHKB
CHPT1
CRLS1
ETNK1
ETNK2
GNPAT
GPD1L
LCAT
LPCAT1
LPCAT2
LPCAT3
LPCAT4
LPGAT1
MBOAT7
PCYT1A
PCYT1B
PCYT2
PEMT
PGS1
PHOSPHO1
PISD
PLA2G10
PLA2G12A
PLA2G15
PLA2G1B
PLA2G2A
PLA2G2D
PLA2G2E
PLA2G2F
PLA2G3
PLA2G4A
PLA2G4B
PLA2G4E
PLA2G5
PLA2G6

PLD1
PLD2
PTDSS1
PTDSS2
TAFAZZIN
ACER1
ACER2
ACER3
ARSA
ASAH1
ASAH2
B4GALT6
CERK
DEGS1
DEGS2
ENPP7
GAL3ST1
GALC
GBA
GLB1
KDSR
NEU1
NEU2
NEU3
NEU4
SGMS1
SGMS2
SGPL1
SGPP1
SGPP2
SMPD1
SMPD2
SMPD3
SMPD4
SPHK1
SPHK2
SPTLC1
SPTLC2
UGCG
UGT8
ABCC1
ABCD1
ACACA
ACACB
ACAD10
ACAD11
ACBD4
ACBD5
ACBD6
ACBD7

ACLY
ACOT1
ACOT11
ACOT12
ACOT13
ACOT4
ACOT6
ACOT7
ACOT9
ACOX2
ACOXL
ACSBG1
ACSBG2
ACSF2
ACSF3
ACSM6
AKR1C3
ALOX12
ALOX12B
ALOX15
ALOX15B
ALOX5
ALOX5AP
ALOXE3
AMACR
AWAT1
CBR4
CROT
CYP1A2
CYP1B1
CYP2C19
CYP2C8
CYP2C9
CYP2J2
CYP2U1
CYP4B1
CYP4F11
CYP4F2
CYP4F22
CYP4F3
CYP4F8
CYP8B1
DBI
DECR2
DPEP1
DPEP2
DPEP3
ELOVL1
ELOVL2
ELOVL3

ELOVL4
ELOVL6
ELOVL7
EPHX2
FAAH
FAAH2
FADS1
FADS2
GGT1
GGT5
GPX1
GPX2
GPX4
HACD1
HACD2
HACD3
HACD4
HACL1
HPGDS
HSD17B12
HSD17B3
HSD17B8
HTD2
LTA4H
MAPKAPK2
MCAT
MECR
MID1IP1
MMAA
MMUT
MORC2
NDUFAB1
NUDT19
NUDT7
OLAH
PCCA
PCCB
PCTP
PECR
PHYH
PON1
PON2
PON3
PPARD
PPT1
PPT2
PRKAA2
PRKAB2
PRKAG2
PRXL2B

PTGDS
PTGES
PTGES2
PTGES3
PTGIS
PTGR1
PTGR2
PTGS1
PTGS2
RXRA
SCD
SCD5
SCP2
SLC25A1
SLC25A17
SLC25A20
SLC27A2
SLC27A3
TBXAS1
TECR
TECRL
THEM4
THEM5
THRSP
CYP2D6
ARSB
ARSD
ARSF
ARSG
ARSH
ARSI
ARSJ
ARSK
ARSL
B3GALNT1
B4GALNT1
CPTP
CTSA
ESYT1
ESYT2
ESYT3
GBA2
GLB1L
GLTP
GM2A
HEXA
HEXB
PSAP
STS
SUMF1

SUMF2
AACS
ABCA1
ABCB4
ABHD3
ABHD4
ABHD5
ACP6
ACSS3
AGMO
AGPAT5
AGT
AHR
AHRR
ALAS1
ALB
ALDH3B1
ALDH3B2
ALPI
ANGPTL4
ANKRD1
APOA1
APOA2
APOA5
ARF1
ARF3
ARNT
ARNT2
ARNTL
ARV1
BCHE
BDH1
BDH2
BMX
CARM1
CAV1
CCNC
CDK19
CDK8
CEPT1
CERS1
CERS2
CERS3
CERS4
CERS5
CERS6
CERT1
CH25H
CHD9
CIDEA

CLOCK
CPNE1
CPNE3
CPNE6
CPNE7
CREBBP
CSNK1G2
CSNK2A1
CSNK2A2
CSNK2B
CUBN
CYP27A1
CYP46A1
CYP51A1
CYP7A1
DDHD1
DDHD2
DGAT2L6
DHCR7
EBP
ENPP6
EP300
ESRRA
ETNPPL
FA2H
FABP12
FABP3
FABP4
FABP5
FABP6
FABP7
FABP9
FAM120B
FDFT1
FDPS
FHL2
FIG4
GDE1
GDPD1
GDPD3
GDPD5
GGPS1
GK3P
GLIPR1
GPCPD1
GPS2
GRHL1
HDAC3
HELZ2
HMGCLL1

HMGCR
INPP4A
INPP4B
INPP5D
INPP5E
INPP5F
INPP5J
INPP5K
INPPL1
INSIG1
INSIG2
KPNB1
LBR
LIPE
LIPH
LIPI
LPIN1
LPIN2
LPIN3
LSS
MBTPS1
MBTPS2
MED1
MED10
MED11
MED12
MED13
MED13L
MED14
MED15
MED16
MED17
MED18
MED19
MED20
MED21
MED22
MED23
MED24
MED25
MED26
MED27
MED28
MED29
MED30
MED31
MED4
MED6
MED7
MED8

MED9
MFSD2A
MIGA1
MIGA2
MOGAT1
MOGAT2
MOGAT3
MSMO1
MTF1
MTM1
MTMR1
MTMR10
MTMR12
MTMR14
MTMR2
MTMR3
MTMR4
MTMR6
MTMR7
MTMR8
MTMR9
MVD
MVK
NCOA1
NCOA2
NCOA3
NCOA6
NCOR1
NCOR2
NFYA
NFYB
NFYC
NPAS2
NR1D1
NR1H2
NR1H3
NR1H4
NRF1
OCRL
ORMDL1
ORMDL2
ORMDL3
OSBP
OSBPL10
OSBPL5
OSBPL8
OXCT1
OXCT2
PDCD6-AHRR
PEX11A

PI4K2A
PI4K2B
PI4KA
PI4KB
PIK3C2A
PIK3C2B
PIK3C2G
PIK3C3
PIK3CA
PIK3CB
PIK3CD
PIK3CG
PIK3R1
PIK3R2
PIK3R3
PIK3R4
PIK3R5
PIK3R6
PIKFYVE
PIP4K2A
PIP4K2B
PIP4K2C
PIP4P1
PIP5K1A
PIP5K1B
PIP5K1C
PITPNB
PITPNM1
PITPNM2
PITPNM3
PLA1A
PLA2G4C
PLA2G4D
PLA2G4F
PLA2R1
PLAAT1
PLAAT2
PLAAT3
PLAAT4
PLAAT5
PLB1
PLBD1
PLD3
PLD4
PLD6
PLEKHA1
PLEKHA2
PLEKHA3
PLEKHA4
PLEKHA5

PLEKHA6
PLEKHA8
PLIN1
PLIN2
PLIN3
PMVK
PNPLA2
PNPLA4
PNPLA5
PNPLA6
PNPLA7
PNPLA8
PPARG
PPARGC1A
PPARGC1B
PPM1L
PPP1CA
PPP1CB
PPP1CC
PRKACA
PRKACB
PRKACG
PRKD1
PRKD2
PRKD3
PTEN
PTPMT1
PTPN13
RAB14
RAB4A
RAB5A
RAN
RGL1
RORA
RUFY1
RXRB
SACM1L
SAMD8
SAR1B
SBF1
SBF2
SC5D
SCAP
SEC23A
SEC24A
SEC24B
SEC24C
SEC24D
SELENOI
SIN3A

SIN3B
SLC27A1
SLC44A1
SLC44A2
SLC44A3
SLC44A4
SLC44A5
SMARCD3
SP1
SPNS2
SPTLC3
SPTSSA
SPTSSB
SQLE
SREBF1
SREBF2
STARD10
STARD7
SULT2A1
SYNJ1
SYNJ2
TBL1X
TBL1XR1
TGS1
THRAP3
TIAM2
TM7SF2
TMEM86B
TNFAIP8
TNFAIP8L1
TNFAIP8L2
TNFAIP8L3
TNFRSF21
TPTE
TPTE2
TRIB3
TXNRD1
UGT1A9
VAC14
VAPA
VAPB
ABCG1
MIR1908
MYLIP
SOAT1
SOAT2
APOC2
ABCA2
APOC1
GNB3

LDLR
MIR30C1
SCARB1
APOE
LDLRAP1
APOB
A2M
APOA4
APOC3
APOC4
BMP1
MTTP
P4HB
ZDHC8
AMN
ANGPTL3
ANGPTL8
AP2A1
AP2A2
AP2B1
AP2M1
AP2S1
APOBR
APOF
CES3
CETP
CLTA
CLTC
CREB3L3
FGF21
FURIN
GPIHBP1
HDLBP
LIPA
LMF1
LMF2
LPA
LSR
NCEH1
NPC1
NPC2
PCSK5
PCSK6
PCSK9
PLTP
VLDLR

gdb).

Supplementary Table 6 Predicted upstream miRNAs of SELP, CD93, VAV1, and IL2RG.

mRNA	miRNA	Miwalk	TargetScan	miRDB	StarBase
SELP	hsa-miR-510-5p	+	+	+	
SELP	hsa-miR-583	+	+	+	
SELP	hsa-miR-608	+	+	+	
SELP	hsa-miR-659-3p	+	+	+	
SELP	hsa-miR-671-5p	+	+	+	
SELP	hsa-miR-2110	+	+	+	
SELP	hsa-miR-3126-5p	+	+	+	
SELP	hsa-miR-3158-5p	+	+	+	
SELP	hsa-miR-3179	+	+	+	
SELP	hsa-miR-3202	+	+	+	
SELP	hsa-miR-3663-5p	+	+	+	
SELP	hsa-miR-4456	+	+	+	
SELP	hsa-miR-4465	+	+	+	
SELP	hsa-miR-4476	+	+	+	
SELP	hsa-miR-4651	+	+	+	
SELP	hsa-miR-6772-3p	+	+	+	
SELP	hsa-miR-6815-3p	+	+	+	
SELP	hsa-miR-6875-5p	+	+	+	
SELP	hsa-miR-6875-3p	+	+	+	
SELP	hsa-miR-6876-5p	+	+	+	
SELP	hsa-miR-7152-3p	+	+	+	
SELP	hsa-miR-570-5p	+	+	+	
SELP	hsa-miR-3664-3p	+	+	+	
SELP	hsa-miR-548ai		+	+	
CD93	hsa-miR-192-5p	+	+	+	+
CD93	hsa-miR-204-5p	+	+	+	+
CD93	hsa-miR-211-5p	+	+	+	+
CD93	hsa-miR-143-3p	+	+	+	+
CD93	hsa-miR-330-3p	+	+	+	+
CD93	hsa-miR-520a-5p	+	+	+	+
CD93	hsa-miR-525-5p	+	+	+	+
CD93	hsa-miR-33b-5p	+	+	+	+
CD93	hsa-miR-1301-3p	+	+	+	+
CD93	hsa-miR-3605-5p	+	+	+	+
CD93	hsa-miR-3679-5p	+	+	+	+
CD93	hsa-miR-3681-3p	+	+	+	+
CD93	hsa-miR-5047	+	+	+	+
VAV1	hsa-miR-24-3p	+	+	+	
VAV1	hsa-miR-711	+	+	+	
VAV1	hsa-miR-3125	+	+	+	
VAV1	hsa-miR-4793-5p	+	+	+	
VAV1	hsa-miR-6734-5p	+	+	+	

mRNA	miRNA	Miwalk	TargetScan	miRDB	StarBase
VAV1	hsa-miR-6817-3p	+	+	+	
VAV1	hsa-miR-6859-5p	+	+	+	
VAV1	hsa-miR-609	+	+	+	
VAV1	hsa-miR-3916	+	+	+	
IL2RG	hsa-miR-513c-5p	+	+	+	+
IL2RG	hsa-miR-1321	+	+	+	+
IL2RG	hsa-miR-514b-5p	+	+	+	+
IL2RG	hsa-miR-4640-5p	+	+	+	+
IL2RG	hsa-miR-4726-5p	+	+	+	+
IL2RG	hsa-miR-4739	+	+	+	+
IL2RG	hsa-miR-4756-5p	+	+	+	+

Supplementary Table 7 Predicted upstream lincRNAs of miRNAs.

mRNA	miRNA	lincRNA
SELP	hsa-miR-510-5p	LINC00662
SELP	hsa-miR-671-5p	XIST
SELP	hsa-miR-3126-5p	LINC00665, MALAT1
SELP	hsa-miR-3179	NEAT1, XIST, LINC00665, MIR4458HG
SELP	hsa-miR-4465	LINC00665, LINC01111, LINC00847
SELP	hsa-miR-6875-5p	LINC00665, LINC00858, MALAT1
SELP	hsa-miR-1297	MALAT1, WASIR2, MIR181A1HG, LINC00665, LINC01111
VAV1	hsa-miR-24-3p	DIO3OS, LINC00662
IL2RG	hsa-miR-1321	LINC00885, LINC01503, LINC00638
IL2RG	hsa-miR-4640-5p	LINC00662, XIST
IL2RG	hsa-miR-4726-5p	LINC00662, XIST, LINC00943
IL2RG	hsa-miR-4739	NEAT1, LINC00511, LINC00638
IL2RG	hsa-miR-4756-5p	LINC00910, LINC00638, LINC01503
CD93	hsa-miR-192-5p	LINC01089, SMC2-AS1
CD93	hsa-miR-204-5p	HCG11, NEAT1
CD93	hsa-miR-211-5p	NEAT1, HCG11
CD93	hsa-miR-143-3p	LINC00662, TSIX, UCA1, PCAT19
CD93	hsa-miR-330-3p	NEAT1, XIST, LINC00662, LINC01355
CD93	hsa-miR-448	XIST, LINC00667, LINC01003, PAXIP1-AS1
CD93	hsa-miR-1301-3p	MIR99AHG
CD93	hsa-miR-3679-5p	NEAT1
CD93	hsa-miR-3681-3p	NEAT1, C22orf34, GLIDR
CD93	hsa-miR-5047	MIR99AHG