

Table S27: GO component analysis of ranked signals from YRI population using the  $T_2$  test statistic.

Description	p-value	Enrichment	Genes
Membrane part	$1.9 \times 10^{-13}$	1.3	AADAC, ABCA1, ABCA12, ABCA13, ABCA4, ABCB11, ABCB5, ABCC4, ABCC8, ABCD4, ABHD2, ABHD6, ABO, ACBD5, ACPP, ADAM12, ADAM28, ADAM29, ADAM32, ADCY5, ADCY8, ADRA1A, AGMO, AGPAT5, AKAP6, ALG8, ALK, ALPL, ANGPT1, ANK2, ANK3, ANKH, ANO2, ANO3, ANO6, APIS3, ART3, ASGR2, ASIC2, ASTN2, ATP10A, ATP10B, ATP10D, ATP13A5, ATP1A2, ATP2C2, ATP6V0A4, ATP6V0E2, ATP8A1, ATP8A2, ATRNL1, BAI3, BEST3, BMPR1B, BRI3BP, BST1, BTBD11, BTN3A1, BTNL2, BTNL3, C1GALT1, CACNA1A, CACNA1C, CACNA2D1, CACNA2D3, CADM2, CALCR, CALN1, CAMK2D, CAPN3, CASQ2, CATSPERB, CD200, CD81, CD84, CDH10, CDH12, CDH13, CDH23, CDH4, CDH9, CDKAL1, CDON, CELSR2, CHODL, CHRM5, CHRN3, CHST1, CHST8, CHST9, CLCA2, CLCNKB, CLDN10, CLDN14, CLDN23, CLEC12A, CLEC1A, CLEC4D, CLEC6A, CLECL1, CLMN, CLSTN2, CMTM8, CNGA3, CNH3, CNR2, CNTN1, CNTN2, CNTN4, CNTN5, CNTN6, CNTNAP2, CNTNAP4, CNTNAP5, COL23A1, COL25A1, COLEC12, COPA, CPLX1, CSMD1, CSMD2, CSMD3, CTNNA2, CTNS, CUBN, CUX1, CXADR, CYB5A, CYBRD1, CYP2E1, CYP2U1, CYP39A1, CYP3A43, CYP4F11, CYP4F12, CYP4F3, CYP4F8, CYP4Z1, DAD1, DCC, DCHS2, DDR2, DIO1, DLC1, DMBT1, DNER, DPP6, DRAM1, DSCI, DSC3, DSCAM, DSG1, DSG3, DYSF, EGFR, ELFN2, ELOVL6, ELTD1, EMR1, EMR2, ENPP1, EPB41L4A, EPHA3, EPHA6, ERAP1, ERAP2, ERBB4, ERO1LB, ESRI1, ESYT2, EVC, EVC2, EXT1, FAM155A, FAM189A1, FAT2, FAT3, FCAR, FCER2, FER, FERL16, FGD5, FLNB, FLOT1, FLT3, FLVCR1, FMO2, FMO4, FMO5, FNDC9, FRAS1, FRS1, FSHR, FUT10, FUT9, GABBR2, GABBR3, GABRG3, GABRR1, GALNT10, GALNT2, GALNTL4, GALNTL5, GALNTL6, GGA1, GGT1, GLDN, GLRA3, GNG2, GNG4, GP5, GPC5, GPC6, GPM6A, GPNMB, GPR111, GPR115, GPR137B, GPR158, GPR39, GRAMD1A, GRI1, GRID1, GRID2, GRIK1, GRIK2, GRIK4, GRIN2A, GRIP1, GRM1, GRM5, GRM7, GRM8, GZMB, HHAT, HHLA2, HK1, HLA-A, HLA-B, HLA-C, HLA-DOB, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQA2, HLA-DQB1, HLA-DQB2, HLA-DRA, HLA-DRB1, HLA-DRB5, HLA-F, HLA-G, HMGCLL1, HS3ST2, HS3ST4, IER3, IFI27L1, IGSF5, IL12RB2, IL1R2, IL1RAP, IL1RL1, IL1RL2, IL28RA, IMMP2L, INADL, IQGAP3, ITGA1, ITGA11, ITGA2, ITGA6, ITGA8, ITGA9, ITGAE, ITGB3, ITGB5, ITGBL1, KANK1, KCNA6, KCNAB1, KCNC2, KCND3, KCNH7, KCNH8, KCNJ12, KCNJ6, KCNK10, KCNK18, KCNK2, KCNMB2, KCNMB3, KCNQ5, KCNV2, KIAA0319, KIAA0922, KIAA1244, KIAA1324L, KIRREL, KIRREL3, KL, KLHL14, KLRB1, LAMP3, LAPTM4B, LARGE, LCT, LDLRAD3, LGR5, LHFP, LHFPL2, LHFPL3, LPHN3, LPPR1, LPPR5, LRFN5, LRP1B, LRPS, LRPPRC, LRRC4C, LRRC52, LRRTM4, LYPD6B, MAEA, MARCH1, MARCH4, MCTP2, MDGA2, MEGF11, MGAM, MGAT1, MGAT5, MGAT5B, MGST3, MOGAT2, MRGPRX4, MSA412, MSRI1, MTCHI, MUC12, MUC16, MUC22, MX1, MYH9, MYO10, MYOF, NAALADL2, NALCN, NAV3, NCALD, NCAM2, NDST4, NDUFB1, NEDD4, NETO1, NFAM1, NFASC, NKAIN1, NKAIN3, NLGN1, NOTCH2, NOTCH4, NPF2F2, NPR3, NPSR1, NRCAM, NRG1, NRG3, NRXN1, NRXN3, NTM, NTRK2, NTRK3, NUP88, OCA2, ODZ3, ODZ4, OMA1, OPCML, OPN3, OPRK1, OR10C1, OR12D2, OR13C5, OR14A16, OR1A2, OR1N2, OR2AK2, OR2B11, OR2L13, OR2L8, OR2W3, OR4C3, OR4C45, OR51B6, OR51E1, OR51F1, OR51L1, OR51M1, OR51Q1, OR52B6, OR52E2, OR52E4, OR52E6, OR52J3, OR52R1, OR5B3, OR5P2, OR6K6, OR9K2, OSTM1, OTOP1, PCDH15, PCDHA1, PCDHA10, PCDHA11, PCDHA12, PCDHA13, PCDHA2, PCDHA3, PCDHA4, PCDHA5, PCDHA6, PCDHA7, PCDHA8, PCDHA9, PCDHAC1, PCNXL2, PCSK5, PCSK9, PDE3A, PDIA6, PEX5L, PGAP3, PGDB5, PIEZO2, FIGG, FIGL, PIKFYVE, PKD1L1, PKD1L2, PKDREJ, PKHD1, PKHD1L1, PLA2G4C, PLA2R1, PLB1, PLD1, PLD5, PLEKHH2, PLOD2, PLSCR1, PLXDC2, PLXNA4, PNPLA3, PNPLA6, PQLC2, PRKAB2, PRKCA, PRKDI, PRKG2, PRLR, PTCHI, PTCHD3, PTGER3, PTGFRN, PTGS1, PTPRB, PTPRD, PTPRH, PTPRM, PTPRN2, PTPRQ, PTPRT, RAB27A, RAMP3, RAPGEF4, RECK, RGS6, RGS7, RGSLL1, RNF144B, RNF150, RNFT2, RNPEP, ROBO2, ROR1, RRP12, RYR2, RYR3, SCARA5, SCARB1, SCD5, SCN11A, SCN1A, SCN3A, SCN3B, SCN9A, SCNN1G, SCTR, SCUBE1, SDHA, SDHC, SDK1, SEMA5A, SEMA6D, SERINC5, SERPINE2, SGC6, SGCZ, SGIP1, SHISA2, SHISA6, SHISA9, SHROOM3, SIRPA, SLC12A3, SLC12A6, SLC12A8, SLC14A2, SLC15A2, SLC15A5, SLC16A14, SLC16A9, SLC17A5, SLC19A3, SLC1A2, SLC1A6, SLC1A7, SLC22A23, SLC22A9, SLC24A3, SLC24A4, SLC25A21, SLC25A25, SLC25A37, SLC26A7, SLC27A2, SLC27A6, SLC28A3, SLC2A9, SLC35B3, SLC35F1, SLC35F2, SLC35F3, SLC35F4, SLC36A2, SLC37A1, SLC38A9, SLC39A11, SLC39A12, SLC5A12, SLC6A15, SLC7A1, SLC9A4, SLC9A9, SLC9C1, SLC01B3, SLC05A1, SLC06A1, SNTB1, SNTG1, SNTG2, SORCS1, SORCS2, SPATA13, SPINK5, SPRED1, SPTB, SPTLC3, SRD5A1, SSR1, ST3GAL6, ST6GAL1, ST6GALNAC3, ST8SIA1, ST8SIA6, STK39, STON1, STON2, STT3A, STXBP6, STYK1, SV2B, SV2C, SYK, SYNE1, SYNGR1, SYNJ2, SYNJ2BP, SYNPR, SYT1, SYT10, SYT5, SYT6, SYT9, TAP2, TECRL, TEK, TESC, TEX2, TGFA, THSD7A, THSD7B, TIMM21, TKT, TLR10, TMC1, TMC2, TMC5, TMCC3, TMCO4, TMCO5A, TMEM106B, TMEM108, TMEM110, TMEM117, TMEM128, TMEM132B, TMEM132C, TMEM132D, TMEM156, TMEM163, TMEM176B, TMEM196, TMEM220, TMEM229B, TMEM244, TMEM39A, TMEM63C, TMPRSS5, TM-PRSS9, TMTC1, TMTC2, TNFRSF10D, TNFR, TREM1, TRHDE, TRPA1, TRPC4, TRPC6, TRPM3, TSHR, TSPAN8, TSPAN9, UCP2, UGT1A10, UGT1A5, UGT1A6, UGT1A7, UGT1A8, UGT1A9, UNC5C, UNC5D, UNC79, UTRN, VNN1, VPS26A, VPS45, VWF, WBS-SCR17, WDFY4, WDR11, WNT3, WSCD2, XKR4, XKR6, XYLT1, YIPF1, ZDHHC14, ZD-HHC7
Integral to luminal side of endoplasmic reticulum membrane	$1.0 \times 10^{-12}$	34.9	HLA-A, HLA-B, HLA-C, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQA2, HLA-DQB1, HLA-DRB1, HLA-DRB5

GO categories in which false discovery rate is less than 0.01.

Table S27 continued.

Description	p-value	Enrichment	Genes
Membrane	$1.1 \times 10^{-12}$	1.3	AADAC, ABCA1, ABCA12, ABCA4, ABCB11, ABCB5, ABCC4, ABCC6, ABCC8, ABCD4, ABO, ACBD5, ACPP, ACSBG2, ADAM12, ADAM28, ADCY5, ADCY8, ADD2, ADRA1A, AGMO, AGPAT5, AGPAT9, AKAP6, ALDH9A1, ALG8, ALPL, ALS2, AMPH, ANGPT1, ANGPT2, ANK2, ANK3, ANKH, ANKS1B, ANO2, ANO6, AP1S3, APBB1IP, APBB2, APPBP2, ARAP1, ARHGAP15, ARHGAP24, ARHGEP18, ASAP1, ATP10A, ATP10B, ATP10D, ATP12A, ATP1A2, ATP2C2, ATP6V0A4, ATP6V0E2, ATP8A1, AVEN, BAI3, BCR, BEST3, BFSP1, BICD1, BLK, BLNK, BMPR1B, BNC2, BRI3BP, BSPRY, BOST1, BTN3A1, C1GALT1, C8A, CACNA1A, CACNA1C, CADM2, CADPS, CADPS2, CALCR, CALN1, CAMK2D, CAP1, CAP2, CAPN2, CAPN3, CASQ2, CBFA2T3, CCDC88A, CCDC91, CCZ1B, CD200, CD81, CD84, CDH10, CDH12, CDH13, CDH18, CDH23, CDH4, CDH9, CDKALI, CDON, CELSR2, CERS6, CHCHD3, CHMP4C, CHN2, CHRM5, CHRNB3, CHST11, CHST8, CHST9, CLDN10, CLDN14, CLDN18, CLDN23, CLEC12A, CLECL1, CLSTN2, CNGA3, CNH3, CNR2, CNTLN, CNTN1, CNTN2, CNTN4, CNTN5, CNTN6, CNTNAP2, COG6, COL23A1, COL25A1, COPG1, CORIN, CORO2B, CPE, CSF2RB, CSMD2, CSMD3, CTNS, CUBN, CUX1, CXADR, CYB5A, CYBRD1, CYP2E1, CYP2U1, CYP39A1, CYP3A43, CYP4F11, CYP4F12, CYP4F3, CYP4F8, CYP4Z1, DAD1, DCC, DCHS2, DGKB, DGKH, DGKI, DHRS4, DIO1, DISC1, DLG2, DLGAP1, DLGAP2, DMBT1, DMXL2, DNER, DOCK1, DOCK2, DOCK4, DRAM1, DSC1, DSC3, DSCAM, DSG1, DSG3, DTNA, DYNC2H1, DYSF, DYTN, EBNA1BP2, EGFR, ELMO1, ELOVL6, ELTD1, EMID2, EMR2, ENOX1, ENPF1, ERAP1, ERAP2, ERBB4, ERC2, ERO1LB, ESR1, ESRP1, ESYT2, EXOC2, EXT1, F5, FABP2, FAM188A, FAS, FAT2, FAT3, FCAR, FCRL2, FCRL5, FHIT, FLNB, FLOT1, FLVCR1, FMN1, FMO2, FNDC1, FRAS1, FRMPD1, FSHR, FUT10, FUT9, FXYP6, GAA, GABBR2, GABBR3, GABRG3, GABRR1, GALNT10, GALNT14, GALNT2, GALNT4, GALNTL5, GALNTL6, GAS2, GGA1, GGT1, GLDN, GLRA3, GNG2, GNG4, GP5, GPC5, GPC6, GPM6A, GPR111, GPR115, GPR137B, GPR158, GPR39, GPR78, GRB10, GRIA1, GRID1, GRID2, GRIK1, GRIK2, GRIK4, GRIN2A, GRIP1, GRK5, GRM1, GRM5, GRM7, GRM8, GUCA1A, GUCA1B, HADHB, HHAT, HK1, HLA-A, HLA-B, HLA-C, HLA-DOB, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQA2, HLA-DQB1, HLA-DQB2, HLA-DRA, HLA-DRB1, HLA-DRB5, HLA-F, HLA-G, HMGCLL1, HMMR, HOMER1, HPSE, HPSE2, HS3ST2, HS3ST4, IGSF5, IKZF3, IL1R2, IL1RAP, INADL, INPP5D, ITGA1, ITGA11, ITGA2, ITGA6, ITGA8, ITGA9, ITGAE, ITGB3, ITGB5, KCNA6, KCNAB1, KCNB2, KCNC2, KCND3, KCNE1, KCNH5, KCNH7, KCNH8, KCNIP1, KCNIP4, KCNJ12, KCNJ6, KCNK10, KCNK18, KCNK2, KCNMB2, KCNMB3, KCNQ5, KCNV2, KIAA0319, KIF13A, KIF16B, KIRREL, KIRREL3, KL, KLHL14, KLRB1, KNG1, KRT5, KSR2, LAMA2, LAMP3, LCT, LDLRAD3, LHCGR, LOC646627, LOXL2, LPHN3, LPP, LRPS, LRPPRC, LRRC4C, LRRC52, LRRTM4, LYPD6B, MAG1, MAG2, MAMDC2, MAPK10, MARC2, MARCHI, MARCHA4, MBP, MCC, MDGA2, MGAM, MGAT1, MGAT5, MGAT5B, MGST3, MOGAT2, MPP6, MRAP2, MRGPRX4, MTCH1, MTUS1, MUC16, MX1, MYH9, MYO10, MYO16, MYO1B, MYO5B, MYOF, NAV3, NCAM2, NDST4, NDUFAF6, NDUFB1, NEDD4, NETO1, NFAMI, NFASC, NKAIN1, NKAIN3, NLGN1, NMNAT2, NMURI, NOTCH2, NOTCH4, NPPFR2, NPSR1, NR3C1, NRCAM, NRG1, NRP1, NRXN1, NTM, NTN4, NTRK2, NTRK3, OCA2, ODZ3, OMA1, OPCML, OPRK1, OR10C1, OR12D2, OR13C5, OR14A16, OR1A2, OR1N2, OR2AK2, OR2B11, OR2L13, OR2L8, OR2W3, OR4C3, OR4C45, OR51B6, OR51E1, OR51F1, OR51I2, OR51L1, OR51M1, OR51Q1, OR52B6, OR52E2, OR52E4, OR52E6, OR52J3, OR52R1, OR5B3, OR5P2, OR6K6, OR9K2, OSBPL5, OSTM1, PALM2, PALMD, PARD3, PARD6G, PARVA, PCDH15, PCDHA12, PCDHA13, PCDHA9, PCLO, PCMI, PDE2A, PDE4D, PDE6C, PDGFD, PDIA6, PDLIM5, PEX5L, PGAP3, PGLYRP4, PGS1, PHLDDB2, PIGG, PIGH, PIGL, PIK3C2G, PIK3R6, PIKFYVE, PITPNB, PKD1L1, PKDREJ, PLA2G4C, PLA2G4E, PLA2G6, PLA2R1, PLB1, PLCB1, PLCG2, PLCH1, PLD1, PLOD2, PLSCR1, PLXNA4, PNKD, PNPLA3, PNPLA6, POMP, PPFIBP1, PPP1R14C, PPP2CA, PPP3CA, PQLC2, PRICKLE1, PRKCA, PRKCB, PRKCE, PRKDI, PRKGI, PRLR, PSD3, PSTPIP2, PTCHI, PTGER3, PTGFRN, PTGS1, PTPRN2, PTPRO, PTPRT, PXX, RAB27A, RAB36, RAMP3, RAPGEF4, RECK, RGENEF, RGS1, RGS12, RGS13, RGS6, RGS7, RIMBP2, RIMS1, RIMS2, RNF144B, RNPEP, ROR1, RPSA, RRP12, RYR2, RYR3, SBF2, SCARB1, SCD5, SCG3, SCLT1, SCN3B, SCTR, SDF4, SDHA, SDHC, SEC22A, SEMA3A, SEMA3E, SEMA5A, SEMA6D, SERINC5, SERPINB2, SGCG, SGCZ, SGIP1, SH3GL2, SHISA2, SIRPA, SKAP2, SLC12A3, SLC12A6, SLC14A2, SLC15A2, SLC16A14, SLC16A9, SLC17A5, SLC19A3, SLC1A2, SLC1A6, SLC1A7, SLC22A16, SLC24A3, SLC24A4, SLC25A21, SLC25A25, SLC25A37, SLC26A7, SLC27A2, SLC27A6, SLC28A3, SLC2A9, SLC35B3, SLC36A2, SLC39A14, SLC44A3, SLC6A15, SLC7A1, SLC9A4, SLC9A9, SLC9C1, SLC01B3, SLC01C1, SLC05A1, SLC06A1, SNTB1, SNTG2, SNX19, SNX7, SORCS1, SORCS2, SORD, SPINK5, SPRED1, SPTLC3, SQRLD, SRD5A1, SSR1, ST3GAL6, ST6GAL1, ST8SIA6, STARD13, STT3A, STYK1, SV2B, SV2C, SVL, SWAP70, SYK, SYN3, SYNE1, SYNGR1, SYNPR, SYTI, SYTI10, SYT5, SYT6, SYT9, TANC1, TAP2, TASI2, TEK, TESC, TGFA, THSD7A, TIAMI, TIMM21, TJP2, TKT, TLR10, TMEM106B, TMEM163, TMEM176B, TMEM63A, TMEM70, TNKS, TOM1, TREM1, TRIP11, TRPC4, TRPC6, TSHR, TSPAN9, TST, TUBB, TULP3, TYMS, UBR2, UCP2, UGT1A10, UGT1A5, UGT1A6, UGT1A7, UGT1A8, UGT1A9, UNC13A, UNC13C, UNC5C, USP32, UTRN, VAV1, VAV2, VAV3, VCL, VEPH1, VNN1, VPS26A, VPS36, VPS45, WBSCR17, WDCP, WDR93, WNT3, WWOX, XXYLT1, XYLT1, ZFYVE28

GO categories in which false discovery rate is less than 0.01.

Table S27 continued.

Description	p-value	Enrichment	Genes
Intrinsic to membrane	$2.8 \times 10^{-12}$	1.3	<p>AADAC, ABCA1, ABCA12, ABCA13, ABCA4, ABCB11, ABCB5, ABCC4, ABCD4, ABHD2, ABHD6, ABO, ACBD5, ACPP, ADAM12, ADAM28, ADAM29, ADAM32, ADCY5, ADCY8, ADRA1A, AGMO, AGPAT5, ALG8, ALK, ALPL, ANK2, ART3, ASGR2, ASIC2, ASTN2, ATP10A, ATP10B, ATP10D, ATP13A5, ATP2C2, ATP6V0A4, ATP6V0E2, ATP8A1, ATP8A2, ATRNL1, BAI3, BMPRI3, BST1, BTBD11, BTN3A1, BTN2L2, BTN3L3, C1GALT1, CACNA1A, CACNA1C, CACNA2D3, CADM2, CALCR, CALN1, CD200, CD81, CD84, CDH10, CDH12, CDH13, CDH23, CDH4, CDH9, CDKAL1, CDON, CELSR2, CHODL, CHR5, CHRN3, CHST11, CHST8, CHST9, CLCA2, CLCNKB, CLDN10, CLDN14, CLDN23, CLEC12A, CLEC1A, CLEC4D, CLEC6A, CLECL1, CLMN, CLSTN2, CMTM8, CNGA3, CNR2, CNTN1, CNTN2, CNTN4, CNTN5, CNTN6, CNTNAP2, CNTNAP4, CNTNAP5, COL23A1, COL25A1, COLEC12, CSMD1, CSMD2, CSMD3, CTNS, CUX1, CXADR, CYB5A, CYBRD1, CYP2E1, CYP2U1, CYP4F11, CYP4F12, CYP4F3, CYP4F8, CYP4Z1, DAD1, DCC, DCHS2, DDR2, DIO1, DNER, DPP6, DRAM1, DSCI, DSC3, DSCAM, DSG1, DSG3, DYSE, EGFR, ELOVL6, ELTD1, EMR1, EMR2, ENPP1, EPHA3, EPHA6, ERAP1, ERAP2, ERBB4, ESRI, ESYT2, EVC, EVC2, EXTI, FAM155A, FAM189A1, FAT2, FAT3, FCAR, FCER2, FER1L6, FLNB, FLOT1, FLT3, FLVCR1, FMO2, FMO4, FMO5, FNDC9, FRAS1, FSHR, FUT10, FUT9, GABBR2, GABBR3, GABRG3, GABRR1, GALNT10, GALNT2, GALNTL4, GALNTL5, GALNTL6, GGT1, GLDN, GLRA3, GP5, GPC5, GPC6, GPM6A, GPNMB, GPR111, GPR115, GPR137B, GPR158, GPR39, GRAMD1A, GRID1, GRID2, GRIK1, GRIK2, GRIK4, GRIN2A, GRM1, GRM5, GRM7, GRM8, HHAT, HHLA2, HLA-A, HLA-B, HLA-C, HLA-DOB, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQA2, HLA-DQB1, HLA-DQB2, HLA-DRA, HLA-DRB1, HLA-DRB5, HLA-F, HLA-G, HS3ST2, HS3ST4, IER3, IFI27L1, IGSF5, IL12RB2, IL1R2, IL1RAP, IL1RL1, IL1RL2, IL28RA, IMM2L, ITGB3, KCNAB1, KCNH7, KCNH8, KCNJ12, KCNK10, KCNK18, KCNM3, KIAA0319, KIAA1324L, KIRREL, KIRREL3, KL, KLRB1, LAMP3, LAPTM4B, LARGE, LCT, LDLRAD3, LGR5, LHFP, LHFP2, LHFP3, LPHN3, LPPR1, LPPR5, LRFN5, LRP1B, LRP8, LRRC4C, LRRC52, LRRTM4, LYPD6B, MAEA, MARCH1, MARCH4, MCTP2, MDGA2, MEGF11, MGAM, MGAT1, MGAT5, MGST3, MS4A12, MSRI, MTCH1, MUC12, MUC16, MUC22, MYOF, NAALADL2, NALCN, NCAM2, NDST4, NDUFB1, NETO1, NFAM1, NFASC, NKAIN1, NKAIN3, NLGN1, NOTCH2, NOTCH4, NPPFR2, NPR3, NPSR1, NRCAM, NRG1, NRG3, NRXN1, NRXN3, NTM, NTRK2, NTRK3, OCA2, ODZ3, ODZ4, OMA1, OPCML, OPN3, OPRK1, OR10C1, OR12D2, OR13C5, OR14A16, OR1A2, OR1N2, OR2AK2, OR2B11, OR2L13, OR2L8, OR2W3, OR4C3, OR4C45, OR51B6, OR51E1, OR51F1, OR51M1, OR52B6, OR52E2, OR52E4, OR52E6, OR52J3, OR5B3, OR5P2, OR6K6, OR9K2, OSTM1, OTOF, PCDH15, PCDHA1, PCDHA10, PCDHA11, PCDHA12, PCDHA13, PCDHA2, PCDHA3, PCDHA4, PCDHA5, PCDHA6, PCDHA7, PCDHA8, PCDHA9, PCDHAC1, PCNX2, PCSK5, PDE3A, PGAP3, PGBD5, PIEZO2, PIGG, PIGL, PKD1L1, PKD1L2, PKDREJ, PKHDI, PKHD1L1, PLA2R1, PLB1, PLD5, PLEKH2, PLSCR1, PLXDC2, PLXNA4, PNPLA3, PNPLA6, PQLC2, PRKD1, PRLR, PTCH1, PTCHD3, PTGER3, PTGFRN, PTPRB, PTPRD, PTPRH, PTPRM, PTPRN2, PTPRQ, PTPRT, RAMP3, RECK, RGS1, RNF144B, RNF150, RNF2, ROBO2, ROR1, RRP12, RYR3, SCARB1, SCD5, SCN1A, SCN3B, SCNN1G, SCTR, SDHC, SDK1, SEMA5A, SEMA6D, SERINC5, SGCG, SGCZ, SHISA2, SHISA6, SIRPA, SLC12A3, SLC12A6, SLC12A8, SLC14A2, SLC15A2, SLC15A5, SLC16A14, SLC16A9, SLC17A5, SLC19A3, SLC1A2, SLC1A6, SLC1A7, SLC22A23, SLC22A9, SLC24A3, SLC24A4, SLC25A21, SLC25A25, SLC25A37, SLC26A7, SLC27A2, SLC27A6, SLC28A3, SLC2A9, SLC35B3, SLC35F1, SLC35F2, SLC35F3, SLC35F4, SLC36A2, SLC37A1, SLC38A9, SLC39A11, SLC39A12, SLC5A12, SLC6A15, SLC7A1, SLC9A4, SLC9A9, SLC9C1, SLC01B3, SLC05A1, SORCS1, SORCS2, SPTB, SPTLC3, SRD5A1, SSR1, ST3GAL6, ST6GAL1, ST6GALNAC3, ST8SIA1, ST8SIA6, STT3A, STXBP6, STYK1, SV2B, SV2C, SYNE1, SYNGR1, SYNJ2BP, SYNPR, SYT1, SYT10, SYT5, SYT6, SYT9, TAP2, TECRL, TEK, TEX2, TGFA, THSD7A, THSD7B, TIMM21, TLR10, TMC1, TMC2, TMC5, TMCC3, TMC04, TMC05A, TMEM106B, TMEM110, TMEM117, TMEM128, TMEM132B, TMEM132C, TMEM132D, TMEM163, TMEM176B, TMEM196, TMEM220, TMEM229B, TMEM244, TMEM39A, TMEM63C, TMPRSS15, TMPRSS9, TMTC1, TMTC2, TNFRSF10D, TREM1, TRHDE, TRPA1, TRPC4, TRPC6, TRPM3, TSHR, TSPAN8, TSPAN9, UCP2, UGT1A10, UGT1A5, UGT1A6, UGT1A7, UGT1A8, UGT1A9, UNC5C, UNC5D, UNC79, VNN1, VPS45, WBSCR17, WDFY4, WDR11, XKR4, XKR6, XYLT1, YIPF1, ZDHHC14, ZD-HHC7</p>

GO categories in which false discovery rate is less than 0.01.

Table S27 continued.

Description	<i>p</i> -value	Enrichment	Genes
Integral to membrane	$4.4 \times 10^{-12}$	1.3	AADAC, ABCA1, ABCA12, ABCA13, ABCA4, ABCB11, ABCB5, ABCC4, ABCD4, ABHD2, ABHD6, ABO, ACBD5, ACPP, ADAM12, ADAM28, ADAM29, ADAM32, ADCY5, ADCY8, ADRA1A, AGMO, AGPAT5, ALG8, ALK, ALPL, ANK2, ART3, ASGR2, ASIC2, ASTN2, ATP10A, ATP10B, ATP10D, ATP13A5, ATP2C2, ATP6V0A4, ATP6V0E2, ATP8A1, ATP8A2, ATRNL1, BAI3, BMPRI1, BTBD11, BTN3A1, BTNL2, BTNL3, C1GALT1, CACNA1A, CACNA1C, CACNA2D3, CADM2, CALCR, CALN1, CD200, CD81, CD84, CDH10, CDH12, CDH23, CDH4, CDH9, CDKAL1, CDON, CELSR2, CHODL, CHRM5, CHRNB3, CHST11, CHST8, CHST9, CLCA2, CLCNKB, CLDN10, CLDN14, CLDN23, CLEC12A, CLEC1A, CLEC4D, CLEC6A, CLECL1, CLMN, CLSTN2, CMTM8, CNGA3, CNR2, CNTN2, CNTNAP2, CNTNAP4, CNTNAP5, COL23A1, COL25A1, COLEC12, CSMD1, CSMD2, CSMD3, CTNS, CUX1, CXADR, CYB5A, CYBRD1, CYP2U1, CYP4F11, CYP4F12, CYP4F3, CYP4F8, CYP4Z1, DAD1, DCC, DCHS2, DDR2, DIO1, DNER, DPP6, DRAM1, DSC1, DSC3, DSCAM, DSG1, DSG3, DYSF, EGFR, ELOVL6, ELTD1, EMR1, EMR2, ENPP1, EPHA3, EPHA6, ERAP1, ERAP2, ERBB4, ESR1, ESYT2, EVC, EVC2, EXT1, FAMI55A, FAMI89A1, FAT2, FAT3, FCAR, FCER2, FER1L6, FLNB, FLOT1, FLT3, FLVCR1, FMO2, FMO4, FMO5, FNDC9, FRAS1, FSHR, FUT10, FUT9, GABBR2, GABBR3, GABRG3, GABRR1, GALNT10, GALNT2, GALNT4, GALNT5, GALNT6, GGT1, GLDN, GLRA3, GP5, GPC5, GPC6, GPM6A, GPNMB, GPR111, GPR115, GPR137B, GPR158, GPR39, GRAMD1A, GRID1, GRID2, GRIK1, GRIK2, GRIK4, GRIN2A, GRM1, GRM5, GRM7, GRM8, HHAT, HHLA2, HLA-A, HLA-B, HLA-C, HLA-DOB, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQA2, HLA-DQB1, HLA-DQB2, HLA-DRA, HLA-DRB1, HLA-DRB5, HLA-F, HLA-G, HS3ST2, HS3ST4, IER3, IFI27L1, IGSF5, IL12RB2, IL1R2, IL1RAP, IL1RL1, IL1RL2, IL28RA, IMMP2L, ITGB3, KCNAB1, KCNH7, KCNH8, KCNJ12, KCNK10, KCNK18, KCNMB3, KIAA0319, KIAA1324L, KIRREL, KIRREL3, KL, KLRB1, LAMP3, LAPTM4B, LARGE, LCT, LDLRAD3, LGR5, LHFP, LHFPL2, LHFPL3, LPHN3, LPPR1, LPPR5, LRFN5, LRP1B, LRF8, LRRC4C, LRRC52, LRRTM4, MAEA, MARCH1, MARCH4, MCTP2, MEGF11, MGAM, MGAT1, MGAT5, MGST3, MS4A12, MSRI, MTCH1, MUC12, MUC16, MUC22, MYOF, NAALADL2, NALCN, NCAM2, NDST4, NDUFB1, NETO1, NFAMI, NFASC, NKAIN1, NKAIN3, NLGN1, NOTCH2, NOTCH4, NPF2F2, NPR3, NPSR1, NRCAM, NRG1, NRG3, NRXN1, NRXN3, NTRK2, NTRK3, OCA2, ODZ3, ODZ4, OMA1, OPCML, OPN3, OPRK1, OR10C1, OR12D2, OR13C5, OR14A16, OR1A2, OR1N2, OR2AK2, OR2B11, OR2L13, OR2L8, OR2W3, OR4C3, OR4C5, OR51B6, OR51E1, OR51F1, OR51M1, OR52B6, OR52E2, OR52E4, OR52E6, OR52J3, OR5B3, OR5P2, OR6K6, OR9K2, OSTM1, OTOP1, PCDH15, PCDHA1, PCDHA10, PCDHA11, PCDHA12, PCDHA13, PCDHA2, PCDHA3, PCDHA4, PCDHA5, PCDHA6, PCDHA7, PCDHA8, PCDHA9, PCDHAC1, PCNXL2, PCSK5, PDE3A, PGAP3, PGBD5, PIEZO2, PIGG, PIGL, PKD1L1, PKD1L2, PKDREJ, PKHDI, PKHD1L1, PLA2R1, PLB1, PLD5, PLEKHH2, PLSR1, PLXDC2, PLXNA4, PNPLA3, PNPLA6, PQLC2, PRKD1, PRLR, PTCH1, PTCHD3, PTGER3, PTGFRN, PTPRB, PTPRD, PTPRH, PTPRM, PTPRN2, PTPRQ, PTPRT, RAMP3, RGS1, RNF144B, RNF150, RNF2, ROBO2, ROR1, RRP12, RYR3, SCARB1, SCD5, SCN1A, SCN3B, SCNN1G, SCTR, SDHC, SDK1, SEMA5A, SEMA6D, SERINC5, SGGC, SGCZ, SHISA2, SHISA6, SIRPA, SLC12A3, SLC12A6, SLC12A8, SLC14A2, SLC15A2, SLC15A5, SLC16A14, SLC16A9, SLC17A5, SLC19A3, SLC1A2, SLC1A6, SLC1A7, SLC22A23, SLC22A9, SLC24A3, SLC24A4, SLC25A21, SLC25A25, SLC25A37, SLC26A7, SLC27A2, SLC27A6, SLC28A3, SLC2A9, SLC35B3, SLC35F1, SLC35F2, SLC35F3, SLC35F4, SLC36A2, SLC37A1, SLC38A9, SLC39A11, SLC39A12, SLC5A12, SLC6A15, SLC7A1, SLC9A4, SLC9A9, SLC9C1, SLC01B3, SLC05A1, SORCS1, SORCS2, SPTLC3, SRD5A1, SSR1, ST3GAL6, ST6GAL1, ST6GALNAC3, ST8SIA1, ST8SIA6, STT3A, STXBP6, STYK1, SV2B, SV2C, SYNE1, SYNGR1, SYNJ2BP, SYNPR, SYT1, SYT10, SYT5, SYT6, SYT9, TAP2, TECL, TEK, TEX2, TGFA, THSD7A, THSD7B, TIMM21, TLR10, TMCL, TMC2, TMC5, TMCC3, TMC04, TMC05A, TMEM106B, TMEM110, TMEM117, TMEM128, TMEM132B, TMEM132C, TMEM132D, TMEM163, TMEM176B, TMEM196, TMEM220, TMEM229B, TMEM244, TMEM39A, TMEM63C, TMPRSS15, TMPRSS9, TMTCL, TMTCL2, TNFRSF10D, TREM1, TRHDE, TRPA1, TRPC4, TRPC6, TRPM3, TSHR, TSPAN8, TSPAN9, UCP2, UGT1A10, UGT1A5, UGT1A6, UGT1A7, UGT1A8, UGT1A9, UNC5C, UNC5D, UNC79, VNN1, VPS45, WBSCR17, WDFY4, WDR11, XKR4, XKR6, XYLT1, YIPF1, ZDHHC14, ZDHHC7
ER to Golgi transport vesicle membrane	$9.4 \times 10^{-12}$	29.1	HLA-A, HLA-B, HLA-C, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQA2, HLA-DQB1, HLA-DRB1, HLA-DRB5
MHC protein complex	$4.0 \times 10^{-11}$	25.7	HLA-A, HLA-B, HLA-C, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQA2, HLA-DQB1, HLA-DRB1, HLA-DRB5

GO categories in which false discovery rate is less than 0.01.

Table S27 continued.

Description	<i>p</i> -value	Enrichment	Genes
Plasma membrane	$9.8 \times 10^{-11}$	1.3	ABCA1, ABCA4, ABCB11, ABCB5, ABCC4, ABCC6, ABCC8, ACPP, ADAM12, ADAM28, ADCY5, ADCY8, ADD2, ADRA1A, ALDH9A1, ALPL, ANGPT1, ANGPT2, ANK2, ANK3, ANKH, ANKS1B, ANO2, ANO6, APBB1IP, ARAP1, ARHGAP24, ARHGEF18, ATP10A, ATP10D, ATP12A, ATP1A2, ATP6V0A4, ATP8A1, BAI3, BCR, BEST3, BFPSP1, BLK, BLNK, BMPR1B, BNC2, BST1, BTN3A1, CACNA1A, CACNA1C, CADM2, CALCR, CALN1, CAMK2D, CAP1, CAP2, CAPN2, CAPN3, CCDC88A, CD200, CD81, CD84, CDH10, CDH12, CDH13, CDH18, CDH23, CDH4, CDH9, CDON, CELSR2, CHR5, CHRN3, CLDN10, CLDN14, CLDN18, CLDN23, CLEC12A, CLECL1, CLSTN2, CNGA3, CNR2, CNTN1, CNTN2, CNTN4, CNTN5, CNTN6, COL23A1, COL25A1, CORIN, CPE, CSF2RB, CSMD2, CSMD3, CTNS, CUBN, CXADR, CYBRD1, DCC, DCHS2, DGKB, DGKH, DGKI, DIO1, DISC1, DLG2, DLGAP1, DLGAP2, DNER, DSC1, DSC3, DSCAM, DSG1, DSG3, DTNA, DYNC2H1, DYSF, DYT1, EGFR, ELMO1, ELTD1, EMID2, EMR2, ENOX1, ENPP1, ERBB4, ESR1, ESRP1, ESYT2, EXOC2, F5, FAPP2, FAS, FAT2, FAT3, FCAR, FCRL2, FCRL5, FHIT, FLNB, FLOT1, FLVCR1, FMN1, FNDC1, FRAS1, FRMPD1, FSHR, FXYP6, GABBR2, GABBR3, GABRG3, GABRR1, GGT1, GLDN, GLRA3, GNG2, GNG4, GP5, GPC5, GPC6, GPM6A, GPR111, GPR115, GPR158, GPR39, GRB10, GRIA1, GRID1, GRID2, GRIK1, GRIK2, GRIK4, GRIN2A, GRIP1, GRK5, GRM1, GRM5, GRM7, GRM8, GUCA1B, HLA-A, HLA-B, HLA-C, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQA2, HLA-DQB1, HLA-DRA, HLA-DRB1, HLA-DRB5, HLA-F, HLA-G, HMMR, HPSE2, IGSF5, IKZF3, IL1R2, IL1RAP, INADL, INPP5D, ITGA1, ITGA11, ITGA2, ITGA6, ITGA8, ITGA9, ITGAE, ITGB5, KCNAB1, KCNAB2, KCNC2, KCND3, KCNE1, KCNH5, KCNH7, KCNH8, KCNIP1, KCNIP4, KCNJ12, KCNJ6, KCNK10, KCNK18, KCNK2, KCNMB2, KCNMB3, KCNQ5, KCNV2, KIAA0319, KIRREL, KIRREL3, KL, KLRB1, KNG1, KRT5, LAMA2, LCT, LDLRAD3, LHCGR, LOC646627, LPHN3, LPP, LRP8, LRRC52, LRRTM4, LYPD6B, MAG1, MAG2, MAPK10, MARCH1, MBP, MCC, MDGA2, MGAM, MPP6, MRAP2, MRGPRX4, MTUS1, MUC16, MYH9, MYO10, MYO16, MYO1B, MYOF, NCAM2, NEDD4, NETO1, NFAM1, NFASC, NKAIN1, NKAIN3, NMUR1, NOTCH2, NOTCH4, NPF2F2, NPSR1, NRCAM, NRPI, NRXN1, NTM, NTN4, OPCML, OPRK1, OR10C1, OR12D2, OR13C5, OR14A16, OR1A2, OR1N2, OR2AK2, OR2B11, OR2L13, OR2L8, OR2W3, OR4C3, OR4C45, OR51B6, OR51E1, OR51F1, OR51I2, OR51L1, OR51M1, OR51Q1, OR52B6, OR52E2, OR52E6, OR52J3, OR52R1, OR5B3, OR5P2, OR6K6, OR9K2, PALM2, PARD3, PARD6G, PARVA, PCDH15, PCDHA12, PCDHA13, PCDHA9, PDE2A, PDE6C, PDIA6, PDLIM5, PHLDB2, PIC3C2G, PKDREJ, PLA2R1, PLB1, PLCG2, PLSCR1, PLXNA4, PPFIBP1, PPP2CA, PRKCA, PRKCB, PRKCE, PRKD1, PRKG1, PRLR, PSD3, PTCH1, PTGER3, PTPRO, PTPRT, PKX, RAMP3, RAPGEF4, RECK, RGNF, RGS1, RGS12, RGS13, RGS6, RGS7, RIMBP2, RIMS1, RIMS2, RNPEP, ROR1, RPSA, RYR2, SCARB1, SCLT1, SCN3B, SCTR, SDF4, SEMA5A, SEMA6D, SGCZ, SGCZ, SGIP1, SH3GL2, SIRPA, SKAP2, SLC12A3, SLC12A6, SLC14A2, SLC15A2, SLC16A14, SLC16A9, SLC19A3, SLC1A2, SLC1A6, SLC1A7, SLC22A16, SLC24A3, SLC24A4, SLC26A7, SLC27A6, SLC28A3, SLC2A9, SLC36A2, SLC39A14, SLC4A4, SLC6A15, SLC7A1, SLC9A4, SLC01B3, SLC01C1, SLC05A1, SLC06A1, SNTB1, SNTG2, SPRED1, STYK1, SVIL, SWAP70, SYK, SYT1, SYT6, TANC1, TAP2, TAS1R2, TEK, TESC, TGFA, THSD7A, TIAM1, TJP2, TLR10, TREM1, TRPC4, TRPC6, TSHR, TST, TUBB, TULP3, UBR2, UNC13A, UNC13C, UNC5C, UTRN, VAV1, VAV2, VAV3, VCL, VEPH1, VNN1, WDPCP, WNT3, WWOX
Cell junction	$1.1 \times 10^{-10}$	1.9	ABCB11, ABCB5, AFAP1, AMPH, AMTN, ANK2, ANK3, ANKS1B, APBB1IP, ARHGAP24, ARHGAP26, ARHGEF18, BSPRY, CADM2, CADPS, CCDC85C, CDC42BPA, CDSN, CHR5, CHRN3, CLCA2, CLDN10, CLDN14, CLDN23, CNH3, CTNNA3, CTNNA3, CTNND2, CXADR, CYFIP2, DISC1, DLCL1, DLG2, DLGAP1, DMXL2, DSC1, DSC3, DSG1, DSG3, DTNA, ERC2, FAT2, FER, FLNB, FNDC1, FRMD4A, GABBR2, GABBR3, GABRG3, GABRR1, GLRA3, GRIA1, GRID1, GRID2, GRIK1, GRIK2, GRIK4, GRIN2A, GRIP1, IGSF5, INADL, IQGAP3, IQSEC1, ITGB5, KIRREL, LIMD1, LPP, LRRTM4, MAG1, MAG2, MYH9, NETO1, NFASC, NFIA, NLGN1, NRAP, NRXN1, PALLD, PARD3, PARVA, PCLO, PHACTR1, PLEKHA7, POLR1E, PRKD1, PSD3, PTPRM, RIMBP2, RIMS1, RIMS2, SCN1A, SEPT11, SHISA9, SHROOM3, SNTB1, SV2B, SV2C, SVIL, SYN3, SYNGR1, SYNPR, SYT1, SYT10, SYT5, SYT6, SYT9, TANC1, TEK, TIAM1, TJP2, TMEM163, TNSI, TRIM9, TRPC4, TRPC6, UNC13C, UTRN, VCL, XIRP2
Transport vesicle	$3.9 \times 10^{-10}$	17.5	CPE, HLA-B, HLA-C, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQA2, HLA-DQB1, HLA-DRB1, HLA-DRB5
MHC class II protein complex	$5.3 \times 10^{-10}$	14.5	HLA-DOB, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQA2, HLA-DQB1, HLA-DQB2, HLA-DRA, HLA-DRB1, HLA-DRB5
Synapse part	$8.4 \times 10^{-10}$	2.3	ABCC8, ALS2, AMPH, ANK2, ANK3, ANKS1B, CACNA1C, CHR5, CHRN3, CLSTN2, CNH3, CTNND2, DDC, DISC1, DLG2, DLGAP1, DMXL2, DNM3, ERBB4, ERC2, ESR1, GABBR2, GABBR3, GABRG3, GABRR1, GLRA3, GRIA1, GRID1, GRID2, GRIK1, GRIK2, GRIK4, GRIN2A, GRIP1, GRM1, GRM5, GRM7, GRM8, LRRTM4, MAG1, NLGN1, NR3C1, NRXN1, NTRK2, PCLO, PLCB4, PSD3, RIMS1, SLC1A2, STON2, SV2B, SV2C, SYN3, SYNE1, SYNGR1, SYNPR, SYT10, SYT5, SYT6, SYT9, TANC1, TMEM163, TRIM9, UNC13C, UTRN
Cell projection	$1.2 \times 10^{-9}$	1.9	ACPP, ADCY5, ANGPT2, APBB1IP, APBB2, APOA1BP, ARHGAP24, ARPC5, BMPR1B, CACNA1A, CADM2, CATSPERB, CDH13, CDH23, CNGA3, CNR2, CNTN4, CNTNAP2, CPLX1, CTNNA3, CYFIP2, DCC, DDC, DNAH8, DNER, DOCK4, DPYSL3, DSCAM, DYNC2H1, EVC, FAM65B, FGD5, FOPNL, FRMD4B, GAS7, GRIA1, GRID2, GRIP1, GRM1, GRM7, GRM8, IFT57, IQGAP2, ITGA1, KALRN, KCND3, KCNIP1, KCNIP4, KCNJ6, KIRREL3, KLHL1, KLHL14, KLHL24, LDB3, LDHC, LRRC16A, MAG1, MTSS1, MYH9, MYO10, MYO1B, MYO3A, MYO5B, MYRIP, NCAM2, NLGN1, NOV, NRCAM, NTM, PACRG, PALLD, PARVA, PCDH15, PCSK1, PKHDI, PLD1, PTGS1, PTPRM, RAB27A, RAPGEF4, RELN, RPTOR, SCN11A, SDF4, SEMA3A, SEPT11, SLC1A2, SLC9C1, SORD, SPATA13, SVIL, SWAP70, SYNPR, SYT5, TEK, TIAM2, TRIM9, TLL11, TULP3, WWOX

GO categories in which false discovery rate is less than 0.01.

Table S27 continued.

Description		p-value	Enrichment	Genes
Plasma membrane part		$1.4 \times 10^{-9}$	1.5	ABCA1, ABCA4, ABCB11, ABCB5, ABCC8, ADAM29, ADRA1A, ALK, ANK2, ANK3, ART3, ASIC2, ATP1A2, ATP6V0A4, BMPRI1, CACNA1A, CACNA1C, CACNA2D1, CALCR, CAMK2D, CAPN3, CASQ2, CATSPERB, CD200, CD81, CD84, CDH13, CDH4, CHRM5, CHRN3, CLCA2, CLCNKB, CLEC1A, CNIH3, CNR2, CNTN2, CNTNAP2, COL25A1, CTNNA2, CUBN, CXADR, CYBRD1, CYP4F12, DCC, DDR2, DLC1, DSCAM, DSG1, DYSF, EGFR, EMR1, EMR2, ENPP1, EPHA3, EPHA6, ERBB4, ESR1, EVC, EVC2, FCAR, FCER2, FER, FGD5, FLOT1, FLT3, FLVCR1, GABBR2, GABBR3, GABRR1, GGT1, GLRA3, GNG2, GNG4, GP5, GPC5, GPC6, GPNMB, GPR137B, GPR39, GRIA1, GRID2, GRIK1, GRIK2, GRIK4, GRIN2A, GRM1, GRM5, GRM7, GRM8, GZMB, HLA-A, HLA-B, HLA-C, HLA-DOB, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQA2, HLA-DQB1, HLA-DRA, HLA-DR, HLA-DRB1, HLA-DRB5, HLA-F, HLA-G, IL12RB2, IL1RAP, IL1RL1, IL1RL2, IL28RA, INADL, IQGAP3, ITGA1, ITGA11, ITGA2, ITGA6, ITGA8, ITGA9, ITGAE, ITGB3, ITGB5, ITGBL1, KANK1, KCNA6, KCNC2, KCND3, KCNJ6, KCNK18, KCNK2, KCNMB2, KCNMB3, KCNQ5, KCNV2, KIRREL, KL, LCT, LGR5, LRP8, MAEA, MEGF11, MGAM, MSR1, MUC12, MYH9, MYO10, MYOF, NEDD4, NLGN1, NOTCH2, NOTCH4, NPFFR2, NPR3, NRCAM, NRG1, NRG3, NRXN1, NRXN3, NTRK2, NTRK3, OPCML, OPN3, OPRK1, PCDHA1, PCDHA10, PCDHA11, PCDHA2, PCDHA3, PCDHA4, PCDHA5, PCDHA6, PCDHA7, PCDHA8, PCDHAC1, PCSK9, PKHD1, PLA2R1, PLB1, PLSCR1, PRKAB2, PRKDI, PRKGT2, PTCH1, PTGER3, PTPRB, PTPRD, PTPRH, PTPRM, PTPRN2, RAB27A, RAMP3, RAPGEF4, RGS6, RGS7, RNPEP, ROBO2, ROR1, SCARA5, SCARB1, SCN11A, SCN1A, SCN3A, SCN3B, SCN9A, SCNN1G, SCTR, SCUBE1, SERPINE2, SGCG, SGCCZ, SGIP1, SHISA9, SHROOM3, SLC12A3, SLC12A6, SLC14A2, SLC15A2, SLC17A5, SLC1A2, SLC1A6, SLC26A7, SLC2A9, SLC5A12, SLC6A15, SLC7A1, SLC9A4, SLC9C1, SLC01B3, SNTB1, SNTG1, SNTG2, SPATA13, SPRED1, SPTB, STK39, SYK, SYNJ2, TEK, TESC, TGFA, TMPRSS9, TRHDE, TRPA1, TRPC4, TSHR, TSPAN9, UTRN, VWF
Trans-Golgi membrane	network	$5.1 \times 10^{-9}$	25.9	HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQA2, HLA-DQB1, HLA-DRB1, HLA-DRB5, MARCH1
Endocytic membrane	vesicle	$2.5 \times 10^{-8}$	10.4	CUBN, DMBT1, HLA-A, HLA-B, HLA-C, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQA2, HLA-DQB1, HLA-DRB1, HLA-DRB5
Clathrin-coated endocytic membrane	vesicle	$3.4 \times 10^{-8}$	27.8	HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQA2, HLA-DQB1, HLA-DRB1, HLA-DRB5
Integral to endoplasmic reticulum membrane		$5.4 \times 10^{-8}$	11.3	HLA-A, HLA-B, HLA-C, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQA2, HLA-DQB1, HLA-DRB1, HLA-DRB5, TAP2
Cytoplasmic membrane	vesicle	$2.4 \times 10^{-7}$	8.0	CPE, DMBT1, HLA-B, HLA-C, HLA-DPA1, HLA-DPB1, HLA-DQB1, MARCH1, MYO5B, SNX19
Intrinsic to endoplasmic reticulum membrane		$2.4 \times 10^{-7}$	8.6	FMO5, HLA-A, HLA-B, HLA-C, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQA2, HLA-DQB1, HLA-DRB1, HLA-DRB5, TAP2
Vesicle membrane		$3.9 \times 10^{-7}$	7.6	CPE, DMBT1, HLA-A, HLA-C, HLA-DPA1, HLA-DPB1, HLA-DQB1, HLA-DRB5, MARCH1, MYO5B, SNX19
Coated vesicle membrane		$6.4 \times 10^{-7}$	9.0	HLA-A, HLA-B, HLA-C, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQA2, HLA-DQB1, HLA-DRB1, HLA-DRB5, SYT9
Cell projection part		$9.1 \times 10^{-7}$	1.7	ALS2, AMPH, ANK3, ANKS1B, APBB2, ATP1A2, ATP6V0A4, C2CD3, CACNA1C, CDH23, CNIH3, CNTN2, CNTNAP2, CTNND2, CUBN, CXADR, CYBRD1, DCC, DFNB31, DISC1, DLG2, DLGAP1, DLGAP2, ERCC2, GABBR2, GABBR3, GABRG3, GABRR1, GLRA3, GRIA1, GRID1, GRID2, GRIK1, GRIK2, GRIK4, GRIN2A, GRIP1, GRM1, GRM7, GRM8, HOMER1, LRRTM4, NETO1, NLGN1, NRXN1, PDE2A, PDLIM5, PSD3, RIMS1, RIMS2, SLC1A2, SYNE1, SYT1, TANC1, UNC13A, UNC13C, UTRN
Synaptic membrane		$3.1 \times 10^{-6}$	2.1	ANK2, ANK3, ANKS1B, CADPS2, CHRM5, CHRN3, CLSTN2, CNIH3, DISC1, DLG2, DLGAP1, DLGAP2, ERCC2, GABBR2, GABBR3, GABRG3, GABRR1, GLRA3, GRIA1, GRID1, GRID2, GRIK1, GRIK2, GRIK4, GRIN2A, GRIP1, GRM1, GRM7, GRM8, HOMER1, LRRTM4, NETO1, NLGN1, NRXN1, PDE2A, PDLIM5, PSD3, RIMS1, RIMS2, SLC1A2, SYNE1, SYT1, TANC1, UNC13A, UNC13C, UTRN
Cytoplasmic membrane part	vesicle	$3.6 \times 10^{-6}$	2.1	ABCC4, AMPH, AP1S3, APPBP2, ATP10B, ATP6V0A4, ATP6V0E2, ATP8A1, CADPS, CAMK2D, CPE, CUBN, DMBT1, DMXL2, DYSF, F13A1, F5, GRIA1, HLA-A, HLA-B, HLA-C, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQA2, HLA-DQB1, HLA-DQB2, HLA-DRA, HLA-DRB1, HLA-DRB5, HLA-F, HLA-G, KNG1, LAMP3, MARCH1, MYO5B, MYOF, NCALD, OCA2, RAB27A, SNX19, SNX7, SV2C, SYN3, SYNGR1, SYNPR, SYT5, SYT6, SYT9, TMEM163, VWF
Clathrin-coated vesicle membrane		$9.6 \times 10^{-6}$	3.1	ABCC8, AMPH, DMXL2, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQA2, HLA-DQB1, HLA-DQB2, HLA-DRA, HLA-DRB1, HLA-DRB5, SH3GL2, SV2B, SV2C, SYN3, SYNGR1, SYNPR, SYT1, SYT10, SYT5, SYT6, SYT9
Collagen type IV		$9.8 \times 10^{-6}$	23.1	COL4A1, COL4A2, COL4A3, COL4A4
Intrinsic to organelle membrane		$2.0 \times 10^{-5}$	4.8	FMO5, HLA-A, HLA-B, HLA-C, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQA2, HLA-DQB1, HLA-DRB1, HLA-DRB5, STS1A1, TAP2
Integral to organelle membrane		$2.4 \times 10^{-5}$	5.1	HLA-A, HLA-B, HLA-C, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQA2, HLA-DQB1, HLA-DRB1, HLA-DRB5, STS1A1, TAP2
Neuron projection		$2.4 \times 10^{-5}$	1.9	ALS2, BMPRI1, CACNA1A, CADM2, CDH13, CNR2, CNTN4, CNTNAP2, CPLX1, CTNNA2, CYFIP2, DCC, DDC, DNER, DNM3, DSCAM, GABBR2, GRIA1, GRID2, GRIK4, GRIP1, GRM1, GRM7, GRM8, ITGA1, KALRN, KCND3, KCNIP1, KCNIP4, KCNJ6, KIRREL3, KLHL1, KLHL14, KLHL24, MYO10, MYO5A, MYO5B, NCAM2, NLGN1, NOV, NRCAM, NTM, ODZ4, PALMD, PCSK1, PEX5L, PRKCA, RAB27A, RAPGEF4, RELN, RPTOR, SCN11A, SEMA3A, SEPT11, SLC1A2, SYNPR, SYT5, TRIM9
Synapse		$4.6 \times 10^{-5}$	2.4	APBB2, CADM2, CADPS, CAMK2D, CDH23, CPLX1, CYFIP2, DTNA, GRID2, GRM7, MAGI2, MYH9, MYRIP, NLGN1, NRCAM, NRXN1, NTM, NTRK2, PCDH15, PCLO, PHACTR1, RAPGEF4, RIMBP2, SEPT11, SERPINE2, SHISA9, SNTB1, UTRN

GO categories in which false discovery rate is less than 0.01.

Table S27 continued.

Description		p-value	Enrichment	Genes
Integral to plasma membrane		$5.4 \times 10^{-5}$	1.5	ABCA1, ABCA4, ABCB11, ABCB5, ADAM29, ADRA1A, ALK, ANK2, ART3, ASIC2, BMPRI1, CALCR, CD200, CD81, CD84, CDH4, CHRM5, CLCA2, CLCNKB, CLEC1A, CNR2, CNTN2, COL25A1, CXADR, DDR2, DSCAM, EMR1, EPHA3, EPHA6, FCAR, FCER2, FLT3, FLVCR1, GABBR2, GABBR3, GABRR1, GLRA3, GP5, GPC5, GPC6, GPNMB, GPR137B, GPR39, GRID2, GRIK1, GRIK2, GRIK4, GRIN2A, GRM1, GRM5, GRM7, GRM8, HLA-A, HLA-B, HLA-C, HLA-DPA1, HLA-DQA1, HLA-DQA2, HLA-DRA, HLA-DRB1, IL12RB2, IL1RAP, IL1RL2, ITGB3, KCNK18, KCNMB3, KL, LCT, LGR5, MAEA, MSR1, MUC12, NLGN1, NOTCH2, NOTCH4, NPFPR2, NPR3, NRCAM, NRG1, NRG3, NRXN1, NRXN3, NTRK2, NTRK3, OPCML, OPN3, OPRK1, PCDHA1, PCDHA10, PCDHA11, PCDHA2, PCDHA3, PCDHA4, PCDHA5, PCDHA6, PCDHA7, PCDHA8, PCDHAC1, PLA2R1, PLSCR1, PRKD1, PTGER3, PTPRB, PTPRD, PTPRH, PTPRM, PTPRN2, RAMP3, ROR1, SCARB1, SCNN1G, SCTR, SLC12A3, SLC15A2, SLC17A5, SLC1A6, SLC2A9, SLC6A15, SLC7A1, SLC01B3, TEK, TMPRSS9, TRHDE, TRPA1, TRPC4, TSHR, TSPAN9
Lysosomal membrane		$5.8 \times 10^{-5}$	5.6	CUBN, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQA2, HLA-DQB1, HLA-DRB1, HLA-DRB5, MARCH1, SLC17A5, TMEM106B
Sheet-forming collagen		$6.1 \times 10^{-5}$	18.5	COL4A1, COL4A2, COL4A3, COL4A4
Integrin complex		$6.3 \times 10^{-5}$	4.7	ITGA1, ITGA11, ITGA2, ITGA6, ITGA8, ITGA9, ITGAE, ITGB3, ITGB5, ITGBL1, MYH9
Ion channel complex		$6.4 \times 10^{-5}$	2.0	ABCC8, AKAP6, ANO2, ANO3, ANO6, BEST3, CACNA1A, CACNA1C, CACNA2D1, CASQ2, CATSPERB, CHRNB3, CLCNKB, CNTN2, CNTNAP2, GABBR3, GABRG3, GABRR1, GLRA3, KCNA6, KCNB2, KCNC2, KCND3, KCNE1, KCNJ6, KCNK2, KCNMB2, KCNMB3, KCNQ5, KCNV2, PEX5L, RYR2, SCN11A, SCN1A, SCN3A, SCN3B, SCN9A, SCNN1G, TRPC4
Sarcolemma		$6.5 \times 10^{-5}$	8.1	ADCY5, ANK3, FLOT1, KCND3, SGCG, SGCZ, SNTG2, [LAMA2
Extracellular matrix part		$8.3 \times 10^{-5}$	2.2	AMTN, CCBE1, COL11A1, COL20A1, COL21A1, COL23A1, COL24A1, COL25A1, COL27A1, COL2A1, COL4A1, COL4A2, COL4A3, COL4A4, COL5A1, COLEC12, EMID1, EMID2, FBLN1, GLDN, LAMA2, LAMA4, LAMC1, LAMC2, LEPREL1, LOXL2, MSR1, NID2, NTN4, SMOC2, THBS2, TNF
Vacuolar membrane		$9.2 \times 10^{-5}$	4.8	CUBN, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQA2, HLA-DQB1, HLA-DRB1, HLA-DRB5, MARCH1, SLC17A5, TMEM106B
Phagocytic membrane	vesicle	$9.5 \times 10^{-5}$	28.0	DMBT1, HLA-A, HLA-B, HLA-C
Vacuolar part		$1.1 \times 10^{-4}$	3.3	ARSB, ASAH1, CUBN, GALC, GPC5, GPC6, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQA2, HLA-DQB1, HLA-DRB1, HLA-DRB5, MARCH1, OCA2, SLC17A5, TMEM106B
Intrinsic to plasma membrane		$1.2 \times 10^{-4}$	1.4	ABCA1, ABCA4, ABCB11, ABCB5, ADAM29, ADRA1A, ALK, ANK2, ART3, ASIC2, BMPRI1, CALCR, CD200, CD81, CD84, CDH4, CHRM5, CLCA2, CLCNKB, CLEC1A, CNR2, CNTN2, COL25A1, CXADR, DDR2, DSCAM, EMR1, EPHA3, EPHA6, FCAR, FCER2, FLT3, FLVCR1, GABBR2, GABBR3, GABRR1, GGT1, GLRA3, GP5, GPC5, GPC6, GPNMB, GPR137B, GPR39, GRID2, GRIK1, GRIK2, GRIK4, GRIN2A, GRM1, GRM5, GRM7, GRM8, HLA-A, HLA-B, HLA-C, HLA-DPA1, HLA-DQA1, HLA-DQA2, HLA-DRA, HLA-DRB1, IL12RB2, IL1RAP, IL1RL2, ITGB3, KCNK18, KCNMB3, KL, LCT, LGR5, MAEA, MSR1, MUC12, NLGN1, NOTCH2, NOTCH4, NPFPR2, NPR3, NRCAM, NRG1, NRG3, NRXN1, NRXN3, NTRK2, NTRK3, OPCML, OPN3, OPRK1, PCDHA1, PCDHA10, PCDHA11, PCDHA2, PCDHA3, PCDHA4, PCDHA5, PCDHA6, PCDHA7, PCDHA8, PCDHAC1, PKHD1, PLA2R1, PLSCR1, PRKD1, PTGER3, PTPRB, PTPRD, PTPRH, PTPRM, PTPRN2, RAMP3, ROR1, SCARB1, SCNN1G, SCTR, SLC12A3, SLC17A5, SLC1A6, SLC2A9, SLC6A15, SLC7A1, SLC01B3, SPTB, TEK, TMPRSS9, TRHDE, TRPA1, TRPC4, TSHR, TSPAN9
Cytoskeleton		$1.4 \times 10^{-4}$	1.6	ABLIM1, ADH4, AFAP1, AMPH, ANK2, ANK3, APBB1P, ARHGAP24, ARPC5, BICD1, BIN3, CAPI, CDSN, CORO2B, COTL1, CTNNA2, CTNNA3, DENND2A, DNAH9, EPB41L4A, ERC2, FAM65B, FGD5, FLNB, FRMD4A, FRMD4B, FRMPD1, GYS2, IFT43, INPP5D, IQ-GAP2, KALRN, KLHL1, KLHL5, LDB3, LRPPRC, LRRFIP1, MAEA, MLPH, MTSS1, MYH9, MYO9B, MYPN, MYRIP, NPFPR2, PARVA, PCLO, PDLIM1, PHLDDB2, PKNOX2, PLEKHH2, PPP2CA, PRKCE, PSTPIP2, PTPN14, PTPN21, SCLT1, SGCG, SGCZ, SHROOM3, SKA1, SNTB1, SNTG1, SNTG2, SORBS2, SPRR1B, SPTB, STK39, SVIL, SYNE1, TBCA, TNS1, TRIM9, TRIP11, TRPC4, TUBB, UTRN, VCL
Endoplasmic reticulum part	reticu-	$1.4 \times 10^{-4}$	2.6	ABCD4, ALG8, ATP10D, CASQ2, COL24A1, COL25A1, CYP4Z1, EMID2, ERO1LB, HLA-A, HLA-B, HLA-C, HLA-DPA1, HLA-DPB1, HLA-DQA1, HLA-DQA2, HLA-DQB1, HLA-DRB1, HLA-DRB5, HMGCLL1, KLHL14, MARCH1, RYR2, SPINK5, TAP2
Presynaptic membrane	mem-	$1.5 \times 10^{-4}$	3.1	CADPS2, ERC2, GRIK1, GRIK2, GRIK4, GRIN2A, GRM1, GRM7, GRM8, NRXN1, PDE2A, RIMS1, RIMS2, SLC1A2, SYT1, UNC13A, UNC13C
Cilium		$1.7 \times 10^{-4}$	3.8	ADCY5, CDH23, CNGA3, DYNC2H1, FOPNL, IFT57, MYRIP, PACRG, PCDH15, PKHD1, SLC9C1, SORD, TLL11
Cell body		$1.8 \times 10^{-4}$	1.9	ALS2, APOA1BP, BMPRI1, CACNA1C, CNTN2, CNTNAP2, CPLX1, CXADR, DDC, DFNB31, DISC1, DLG2, DNER, DPYSL2, DPYSL3, GPM6A, GRIA1, GRIK1, GRM8, KALRN, KCND3, KCNIP1, KCNIP4, KLHL1, KLHL14, MAP2, MBP, MYO10, MYO5A, MYO5B, NOV, NTRK2, PACRG, PCSK1, PRKCA, RBFOX3, RPTOR, SCN1A, SERPINE2, SRD5A1, SYT5, TANC1, TUBB
Cation channel complex		$2.1 \times 10^{-4}$	2.3	ABCC8, AKAP6, CACNA1A, CACNA1C, CACNA2D1, CASQ2, CATSPERB, CNTN2, CNTNAP2, KCNA6, KCNB2, KCNC2, KCND3, KCNE1, KCNJ6, KCNK2, KCNMB2, KCNMB3, KCNQ5, KCNV2, PEX5L, RYR2, SCN11A, SCN1A, SCN3A, SCN3B, SCN9A, SCNN1G, TRPC4
Postsynaptic membrane	mem-	$2.1 \times 10^{-4}$	2.2	ANK2, ANK3, ANKS1B, CHRM5, CHRNB3, CLSTN2, CNH3, DISC1, DLG2, DLGAP1, GABBR2, GABBR3, GABRG3, GABRR1, GLRA3, GRIA1, GRID1, GRID2, GRIK1, GRIK2, GRIK4, GRIN2A, GRIP1, GRM7, LRRTM4, NLGN1, PSD3, SYNE1, TANC1, UTRN
Endoplasmic reticulum lumen	reticu-	$2.2 \times 10^{-4}$	2.1	ARSB, ARSG, ARSJ, CASQ2, COL11A1, COL20A1, COL21A1, COL23A1, COL24A1, COL25A1, COL27A1, COL2A1, COL4A1, COL4A2, COL4A3, COL4A4, COL5A1, EMID2, ERAP1, ERAP2, FLT3, GLT25D2, H6PD, LEPREL1, OLFM1, P4HA1, PDGFD, PDIA6, RCN3, SLC27A2

GO categories in which false discovery rate is less than 0.01.

Table S27 continued.

Description	<i>p</i> -value	Enrichment	Genes
Flagellum part	$2.5 \times 10^{-4}$	12.3	<i>PACRG, SLC9C1, SPAG16, TEKT4, TEKT5</i>
Microtubule-based flagellum part	$2.5 \times 10^{-4}$	12.3	<i>PACRG, SLC9C1, SPAG16, TEKT4, TEKT5</i>
Extracellular matrix	$2.5 \times 10^{-4}$	1.7	<i>ABI3BP, ADAMTS12, ADAMTS16, ADAMTS18, ADAMTS2, ADAMTSL2, ADAMTSL3, AMBN, AMTN, CDON, COL20A1, COL21A1, COL4A1, COL4A2, COL5A1, CRTAC1, DMBT1, DPT, FBLN1, FGF1, FRAS1, GPC5, GPC6, GPLD1, HMCN1, HPSE2, IGFBP7, LAMA1, LAMA2, LAMA4, LAMC1, LMCD1, LTBP1, MAMDC2, MATN1, MEPE, MMP20, NAV2, NID2, NOV, PLSCR1, PXDN, RELN, SERPINE2, SMOC2, SPARCL1, SPON1, TNN, TNFR, VIT, VWF, WNT3</i>

GO categories in which false discovery rate is less than 0.01.