

A combined transcriptomic and genomic analysis identifies a gene signature associated with the response to anti-TNF therapy in rheumatoid arthritis.

Adrià Aterido^{1,2}, Juan D Cañete³, Jesús Tornero⁴, Francisco Blanco⁵, Benjamín Fernández-Gutierrez⁶, Antonio González⁷, Joan Maymó⁸, Mercedes Alperi-López⁹, Alex Olivè¹⁰, Héctor Corominas¹¹, Víctor Martínez-Taboada¹², Isidoro González¹³, Antonio Fernandez-Nebro¹⁴, Alba Erra¹⁵, Simón Sánchez-Fernández¹⁶, María López-Lasanta¹, Mireia López Corbeto¹, Raül Tortosa¹, Sara Marsal¹, Antonio Julià^{1,*}

¹ Rheumatology Research Group, Vall d'Hebron Research Institute, Barcelona, Spain

² Department of Experimental and Health Sciences, Universitat Pompeu Fabra, Barcelona, Spain

³ Rheumatology Department, Hospital Clínic de Barcelona, Barcelona, Spain

⁴ Rheumatology Department, Hospital Universitario De Guadalajara, Guadalajara, Spain

⁵ Rheumatology Department, INIBIC-Hospital Universitario A Coruña, A Coruña, Spain

⁶ Rheumatology Department, Hospital Clínico San Carlos, Madrid, Madrid, Spain

⁷ Instituto de Investigación Sanitaria Hospital Clínico Universitario de Santiago, Santiago de Compostela, Spain

⁸ Rheumatology Department, Hospital del Mar, Barcelona, Barcelona, Spain

⁹ Rheumatology Department, Hospital Universitario Central de Asturias, Oviedo, Spain

¹⁰ Rheumatology Department, Hospital Universitari Germans Trias i Pujol, Barcelona, Spain

¹¹ Rheumatology Department, Hospital Moisès Broggi, Barcelona, Spain

¹² Rheumatology Department, Hospital Universitario Marqués de Valdecilla, Santander, Spain

¹³ Rheumatology Department, Hospital Universitario La Princesa. IIS Princesa, IIS La Princesa, Madrid, Spain

¹⁴ UGC Reumatología, Instituto Investigación Biomédica Málaga, Hospital Regional Universitario, Universidad de Málaga, Málaga, Spain

¹⁵ Rheumatology Department, Hospital Sant Rafael, Barcelona, Spain

¹⁶ Rheumatology Department, Hospital General La Mancha Centro, Ciudad Real, Spain

* Correspondence: Antonio Julià, Rheumatology Research Group, Vall d'Hebron Research Institute, Barcelona, 08035, Spain. Tel: +34934029082, Fax:+34934034510, e-mail:toni.julia@vhir.org.

SUPPLEMENTARY TABLES AND FIGURES

INDEX

1. Supplementary Tables	3
1.1 Table S1. Clinical and epidemiological characteristics of the two GWAS cohorts of RA patients included in the study	3
1.2 Table S2. Gene coexpression module associations with the clinical response to anti-TNF treatment at the transcriptomic level	4
1.3 Table S3. Gene coexpression module associations with the clinical response to anti-TNF treatment at the genetic level	13
1.4 Table S4. Gene overlap between the 149 GCMs and genetic findings from previous studies	17
1.5 Table S5. Genes mapping to the biological processes that are nominally enriched in genes from the adalimumab-associated module	18
2. Supplementary Figures	22
2.1 Figure S1. Principal components of the RA cohort used in the discovery stage of the genetic association analysis	22
2.2 Figure S2. Nucleotide metabolism pathway integrating GCM and SNP information	23
2.3 Figure S3. Epigenetic fine-mapping of genetic variation from the GCM-7 and the cell-type specific H3K27ac and K3K4me1 marks	24

1. Supplementary Tables

1.1 Table S1. Clinical and epidemiological characteristics of the two GWAS cohorts of RA patients included in the study

CHARACTERISTIC	GWAS COHORT RA-1	GWAS COHORT RA-2
Population	Spain	Europe and US (Cui et al. <i>PLoS Genet</i> , 2013)
Disease diagnosis	1987 ACR criteria for RA	1987 ACR criteria for RA
Molecular data	DNA	DNA
Sample size (N)	348	2706
Gender (female, %)	83,84	73,58
Age at diagnosis (years, m ± sd)	42.98 ± 11.46	54.83 ± 12.26
Adalimumab		
Baseline DAS28 (m ± sd)	5.30 ± 1.04	5.64 ± 1.15
Responders (N)	41	438
Moderate (N)	33	462
Non-responders (N)	20	171
Infliximab		
Baseline DAS28 (m ± sd)	5.65 ± 1.02	5.94 ± 1.22
Responders (N)	30	289
Moderate (N)	57	361
Non-responders (N)	41	244
Etanercept		
Baseline DAS28 (m ± sd)	5.71 ± 1.17	5.85 ± 1.28
Responders (N)	46	253
Moderate (N)	52	319
Non-responders (N)	28	161
Anti-TNF		
Baseline DAS28 (m ± sd)	5.58 ± 1.22	5.79 ± 1.23
Responders (N)	117	980
Moderate (N)	142	1,142
Non-responders (N)	89	576

Abbreviations: ACR, American College of Rheumatology; DAS28, disease activity score before treatment initiation; M, mean; N, number of patients; NA, not analyzed; RA, rheumatoid arthritis; SD, standard deviation; TNF, tumor necrosis factor; USA, United States of America.

1.2 Table-S2. Gene coexpression module associations with the clinical response to anti-TNF treatment at the transcriptomic level

GCM	P	GENE#	GENES
GCM-1	2,10E-04	21	<i>SLC25A11,MRE11A,PSMD3,RUVBL2,CLPP,C6orf125,NUDC,DULLARD,C19orf24,DDX1,ZDHC16,TFPT,MRPS5,IGF1R,PLCB2,RHBDD3,HORMAD1,HPS4,C1orf71,SNX4,STIP1</i>
GCM-2	4,76E-03	61	<i>UBXD8,CUTL1,C22orf5,TOR1A,C21orf66,DFNA5,EDF1,SOCS4,BCCIP,RAB25,KIAA0406,MLL4,CSTF3,C6orf62,C12orf52,ABCF3,MRC1,ZCCHC3,NUDT16L1,HIST1H4E,ANXA4,OSBPL7,PEO1,GHRL,ACSS1,PPIL2,YTHDF1,DIDO1,MTMR4,ANAPC1,C1orf142,GAGE1,HDGFRP3,GBA2,SFXN2,TNRC15,PPP1R3G,CABYR,RECQL5,API5,TRRAP,CCNB1IP1,ORF1-FL49,HDLBP,ATP2B2,ZNF202,PPP1R10,HS3ST3B1,CDC2L5,MASK-BP3,SLC16A5,KCNMB3,TSTA3,CHMP4B,ME1,DKK3,NINJ1,SMG7,YTHDF2,TNFSF12,RAD9A</i>
GCM-3	7,57E-03	52	<i>PLS3,ITGAI1,CDC14A,ARID1A,LRRC14,GALIG,ZGPAT,DNAJB4,CABP5,SMA RCB1,KREMEN1,TF1,GBE1,NR3C1,CCDC8,MOG,UBE2B,TMEM67,RGS11,P PP1R3C,OSBPL9,RIPK5,ARHGAP27,BNIP3L,MCM3AP,BNIP3,RPUSDI1,PCSK 7,RESP18,PSMA8,HABP4,AMMECR1,SAV1,TXLNA,GOLGA7,AQP3,C17orf62,CRIM1,AGTPBP1,ATP9A,RAPGEF1,FLAD1,DAOA,CCDC50,TMEM28,RCSD1,RYK,AK3L1,NAP1L1,C1orf59,RGS18,AVP11</i>
GCM-4	7,65E-03	22	<i>KIAA1468,ID3,LRMP,SP2,PIAS4,TNFRSF11B,UGT2B7,TARBP2,KLHDC4,IDI1,PIGL,TNK2,VEPH1,DUS2L,MBD3L1,ANKRD42,HSPA2,SRM,POU2F2,SLC25A37,FMOD,OR6K6</i>
GCM-5	1,35E-02	143	<i>C19orf25,APOA4,ZNF264,LCMT2,TGFBRAP1,OAS1,LY6H,RG9MTD3,ACTR3B,E2F3,E1F1AX,RHOQ,EHD3,ADRA2C,DBT,ATP5S,PHF21A,CTAGE6,VPS26B,FAM108A1,NR1D2,RNU33,DMRT2,CCT6B,PCYOX1,BRD3,C7orf36,DNM1L,ARRHGFEF11,TMEM113,FBXO7,TAIP-1,ZFYVE1,EFNA4,SPIN,CAPZA3,KIAA1166,RRAGC,ABI2,RNF170,CYP7B1,BBX,NR1D1,JMJD2D,PCSK9,DNAH10,ITM2A,SYNJ2BP,HNRPA1,C1orf84,C1orf93,ZNHIT4,GATAD2B,PCDH1,ZNF136,STK32B,TCF4,CDC73,PDCC4,OR8K1,TRIM6,C6orf69,LOC153684,CDKN1A,FOXO1,MRPS18B,SIAE,TPH2,TNRC6A,JUN,OR8K3,OR7E24,FGF18,CACNA1C,DIP2A,IRGM,PIP5K2B,TSEN2,PCOLCE2,SH3KBP1,CCDC55,UPF3A,ZNF689,C2orf15,WDR23,TERF1,PCDHB7,TME M63C,SHC1,ARMCX5,HYDIN,APIP,ZNF641,RPL10,TUSC3,REXO4,CD164,SA MD4B,ITPKA,FDXR,ACOX1,CHES1,UNC5A,MAP4,C9orf85,UPP2,DPF2,ZNF148,ANXA11,RAB3GAP1,RPS20,KCTD12,UBL4A,TAF1,SERPINH1,ZNF197,C10orf67,USP14,SPANX-N3,TAF7L,BANK1,PPP1R2,CCDC25,FOXO1A,CAMP,RAB7L1,ALDH3B2,GCC2,RPPH1,RNF43,SYCE1,VPS54,LIF,GLT8D1,VPS13A,HIF1AN,ISG20L2,KIAA0649,CYP3A5,ACVRL1,MEF2C,LGR6,SMARCC2</i>
GCM-6	1,90E-02	27	<i>CCDC6,SLC28A2,ZDHC6,SPATA19,DAZAP1,MRPL22,C20orf85,INCA,CHM P4A,C6orf142,TBL1X,NME2,RNMTL1,TTTC13,IFT57,CSTL1,GJB1,SCAMP1,C22orf23,ASC22,TMEM97,PDGFC,STAMBIP,CLSPN,EGFR,KCNK10,MRPL9</i>
GCM-7	2,47E-02	18	<i>BIN3,OATL1,GALNTL2,SAFB,AGPAT7,DYPD,KIAA1456,RNU26,AK5,PIK3R1,TRIM36,KRT2A,LARP1,ZNF562,SPEP1,MTX2,HIPK1,FAM53C</i>
GCM-8	3,26E-02	119	<i>USP4,IL23A,HTR4,RSC1A1,UCK2,CD163,ARSB,SDSL,BCL7A,RFWD3,FAM49B,ZNF706,C6orf75,JRK,IMP5,LSM14B,ATF7IP,TREML2,NBPFF1,ADRA1A,C12orf46,RP3,FGF7,CHD9,UBE2Q1,RNU28,CEP290,FAM8A1,ATP1B3,MYH7B,CCDC77,FEM1A,C1orf41,MAD2L2,MRPS35,VPS33A,CARD14,PDCC5,NDUF S2,SLC6A6,SYAP1,CCDC44,F2RL1,NUDT18,C17orf60,BAG5,STX6,ZNF577,L1LRB1,MAGEA8,ACOT11,TLR1,ATP6V1H,CHUK,FAM82B,NAP5,THPO,EP400,ARPC4,GTTF2,HDHD1A,GATA5,RBNI1,MKLN1,MRPS12,CYB561D2,SP8,ZNF135,C1orf38,TTL13,ZNF606,C3orf18,BAT5,SLIC1,CPNE3,PPP2R5C,COMMD 2,GTPBP8,CDC42SE1,NXPH3,B4GALNT4,GOLGA8A,MS4A5,GAS6,LSM4,BC ORL2,PIAS2,CUGBP2,FHL2,KIAA0753,B3GALT5,APRIN,PHF20L1,CD46,AP1G2,TMTC2,ZSCAN4,KRTAP4-4</i>
GCM-9	3,33E-02	18	<i>GPR61,ADCY2,SLC6A4,PFDN4,RDH8,DMRTA1,TBC1D22A,C20orf118,PRR11,PGD,PRICKLE1,MYBPC3,HNRPU,C8orf42,DNASE2,RNF126,NALP13,IMP4,KIDINS220,CDC7,PDCL3</i>
GCM-10	3,58E-02	87	<i>HUWE1,ASZ1,DDX24,BPGM,SERPINA5,RPL3L,NUPL1,PDSS2,PHF11,ZNF710,CLTCL1,APC,KLHL21,HIP1,MDN1,ALS2CR8,LENG8,C21orf91</i>
GCM-11	3,70E-02	32	<i>IFNA10,C17orf71,CDC14B,TSPAN17,RTTN,MBIP,ANKRD16,IKBKE,MDS025,SEMA6B,ATP5J2,ANKRD27,TMSL8,EDA,TPD52L3,DVLI,WDR48,VHL,WNT7A,OR52D1,TRHR,KIAA0774,UBN1,CTAGE1,HEYL,HELZ,ARAF,OR10H1,TMED10,KCNQ2,OLFML2B,U2AF1L4,BXDC2,GULP1,GAK,EFTUD2,RBMY1A3P,CACYPB,KLHL8,TBX10,ARHGFEF1,SNRPG,ABCB4,SPDY1,PTBP1,APOA1,OR13G1,SNRPN,RBM10,C9orf42,TSNAX,FAM73B,STAC,C9orf86,ZNF289,SH2D3C,TXNDC8,CAPN7,RLN1,CENTB2,ALDOB,ZFAND1,HAL,HBLD2,STK10,KIAA0350,GMIP,WDR18,TMEM106B,CETN1,ADAMTS10,ACIN1,GAB3,PCNP,FAM78A,C1orf171,KBTBD7,PRR7,LGR7,UBAP2,C2orf27,WIBG,MPP5,TNFAIP8,CLDN10,ZNF425,C9orf142</i>
GCM-12	3,78E-02	70	<i>NIPSNAP3A,ZNF322A,P518,COQ6,SCYL1,SCOC,ADAMTS16,RANBP17,ACTB L1,MOAP1,B3GALT1,DOPEY2,GABRG,GSTT1,ARMCX6,CPSF2,OR4C6,RNF151,REGL,MORC1,EPS15,MDGA1,RP1,TATDN1,ANKRD6,OR10A6,M160,TIM M50,CAPN10,PIGB,CYTL1,FER1L4</i>
			<i>ATP10D,SRF,SMYD5,ZNF410,CEBPG,GPHA2,GFER,ARRDC1,POP2,CLDN9,NYD-</i>
			<i>SP14,C21orf100,KLK2,GAD2,OR11A1,FKRP,LCE3A,KLHL7,LOC554223,PPARG,MDK,RAB27B,DBH,GFRA2,LRBA,GPR133,TRAPPC2,PDAP1,WHSC1,EXTL1,TGM5,ZNF516,RCBTB1,LOC284023,SFRS3,OPN1LW,BRD1,RPL39,SHH,H</i>

			<p>RH3,PCDHA2,OR6C3,UBL5,FLT1,PRLR,LRP5L,TOPORS,KRTAP26-1,CCDC35,ZNF230,OR5F1,EIF4ENIF1,OR10K1,TUBGCP2,LNPEP,IMPACT,CPLX2,TMEM16G,FGF4,NRK,NT5C3,POLRMT,SPAM1,MAPT,CRTC1,OR1J1,EP1,PC1,WDR66,KIAA0232,ANKRD15</p>
GCM-13	4,56E-02	24	<p>AYTL1,PCDHA6,COMP,CNOT4,MAST1,HS3ST3A1,SLC27A4,XRCC3,CAPN2,CHRNA10,UBE2E3,BDKRBI,QP-C,DSTN,AKR1C1,HIST1H2BB,STEAP2,NDUFB11,CRMP1,LSM2,PRUNE,DSCRI,COL8A2,RPL35</p>
GCM-14	5,39E-02	17	<p>MATN3,THRAP5,NEK8,WDR68,KIAA0103,MTMR7,ADCK5,NACAP1,PTPN23,NROB1,SLIT1,C12orf40,CNOT10,FKBP9L,MAEA,IRS4,PRKCBP1</p>
GCM-15	5,87E-02	128	<p>LDLR,LRRC4C,ATP8A2,MFAP5,WDR63,CCRN4L,WDR21A,SART3,STXBP6,CHX10,COL24A1,OR5M8,SLC4A1AP,LEPROT,FAM24A,GPR112,C10orf12,GGA2,ATF3,CALM2,HSPH1,UGCGL2,IFRD1,KIAA0241,LOXL4,OGFRL1,SPATA2,TPRXL,AP2A1,RPL34,ZNF45,RANBP9,HDCC2,EGFL6,WDR73,SYT1,UBR2,ZNF217,SSX1,PSCA,BCAM,CRIPT,NFYA,ARID5A,ARL4C,HYAL2,TWIST1,ALG12,ZNF688,ADCY1,FAM13C1,CTSQ,DNAJC5B,ARL6IP5,C2orf123,ADORA3,SPATA5L1,LARS,C8orf40,GOLGA1,TADA2L,MAGEE2,TIFAB,BCL2,PLEKHA2,IIFT74,CH25H,GRIN3B,COPS2,IFNB1,ABCA7,CCT4,INSIG1,UBPH,SELP,PZDK1,IL1B,IGSF11,DUSP16,CAD,DARC,RSHL3,PLK2,HIC2,XDH,NFAM1,ZBTB26,CCL26,SLC9A8,C18orf54,B3GAT1,FBXL20,SNN,RBK5,OR9G4,PIP5K3,CCDC16,DUSP2,SLK,CHORDC1,C21orf81,TRIM28,USP11,RNF111,CDYL2,C1orf149,IVNS1ABP,CFTR,GUCY1A2,DHRS4L2,S100A7L1,NXPH4,MYOHD1,TLL4,CUEDC1,KAL1,USP37,APLP1,ZA20D2,THBS1,NME5,DYSL4,PARS2,SLC7A2,RAPEF4,LAYN,LANCL2,OR6C68</p>
GCM-16	6,32E-02	31	<p>ZNF10,URP2,SMAD5,CHCHD1,C2orf4,ATG7,ABCA5,SERPIN8,TRPV2,ZNF510,PUM1,RPS6KB1,FNS,UBE2S,FBXO21,CARD9,PCBP2,GNG5,C6orf55,MFS4,GLTSCR2,EIF4E2,PSIP1,HPRT1,SDC3,EIF4B,RCC1,SLTM,FNBP4,SNX8,RBJ</p>
GCM-17	6,64E-02	244	<p>WDR59,CCDC7,CNDP2,G3BP,SVIL,TNPO2,SGPL1,ACTR2,DHX34,MAB21L2,TSEN34,ACTL6B,SOX15,ST3GAL2,RNASE12,SMARCA1,DEPDC6,UQ2541,GPX3,ZFYVE26,ATP6V1D,MFAP3,ZXDC,ZNF563,TCEA3,AIM2,AVEN,CAMLG,MLZE,IL11RA,TCP11L1,PACS2,TTC9C,PAPSS1,SEMA4A,GSTA4,PSME2,POU6F1,TLR8,DCAKD,RBL1,YAF2,HNRPH3,PRIM2A,C14orf151,CDK5,ERALL,YPEL3,RABGGTA,LCP2,C6orf146,TOR1AIP1,FYN,EVI5L,DTX3L,LSM12,NRAS,YARS2,MAPK3,TRHDE,BAK1,VAPA,SMYD2,EPN2,IL6,GSTM5,CAI2,TSSC1,TAOK2,GNGT2,AP2B1,HLA-DPA1,TMEM80,CEACAM3,FSIP1,PCDHB12,CPO,ZDHH5,ZNF449,HPS5,SFRS8,CATSPER2,NHLRC2,ATG3,RAB3D,HOXA5,ABCA3,C1orf155,SLC2A6,CITED4,NUP50,KCNJ14,SP100,ZNF200,GRB10,C12orf5,IMPDH1,OVGP1,MYH8,HSD3B1,SLC39A8,HLA-DRA,AGL,NBPF15,ZNF274,LYSMD2,IL15RA,SLC8A3,MLSTD1,PEX5,MYB,IQCG,BST1,GLI1,ARP10,CBEB1,PHF2,PITPNM3,MORF4L1,STX17,SEC22L3,ZNF96,ADAMDEC1,VAX2,CRY2,C5orf16,SPIRE1,ATP6V1A,C10orf4,CHCHD4,MCFP,TNFSF13B,FAM58A,ACOT7,TAGAP,ZNF629,CENTG1,MOXD1,XTP3T,PA,SQLE,HMBS,TIMM23,RASSF4,STAT5B,HSF4,TMPRSS3,PRPS2,LTC4S,VEGFB,HSPA8,OR6C74,CNTNAP5,MXD4,TRIM25,MECP2,PCGF2,LRP8,KIAA0831,FAM38A,SLC25A15,RHEBL1,RAB24,PDCC1LG2,ATF6,PHLPP,C19orf33,HTR3D,CYP20A1,PCDHB4,GNRH1,SYT17,ECT2,FAM21C,KIAA0179,RUTBC1,IL12RB1,SYNGR1,RGS19,SLC5A10,SLC27A2,DCUN1D2,ERIC1,C9orf52,SDCAG10,DDX49,TCL6,TOMM20,IQWD1,PLEK,TSPYL2,CCL18,DNAJA1,CANT1,IPO4,DDR2,YWHAZ,HNMT,SLC39A11,VRK2,SH3GL3,NUDT5,GOLGA2,TME38B,SEC63D1,LTBP4,EZH2,ZDHH18,COPSS,LIX1L,PPP2R3A,RAVER1,HIP2,WHSC1L1,CFD,SGTA,FAM112A,ADAMTS3,TMOD3,RASGEF1A,RPE,GUCY1B3,A4GNT,SF3A3,ZFYVE21,ANKRA2,EIF2C3,HEM1,PLD2,ASGR2,TRAGL3,PANK4,PPM1A,PINK1,PEBP1,HLF,GNA14,UCK1,PITPNM1,DOK6,PKCN,DIRAS2,ZNF680,ZNF259,CLEC6A</p>
GCM-18	7,32E-02	16	<p>OR1E1,SETD8,TAS2R40,PPFIBP1,STEAP1,CMYA3,GJAI,CPT1A,SYNJ2,DEFB32,ABCD3,SOX11,CDK5RAP1,PER2,ZNF41,AADAC</p>
GCM-19	9,39E-02	93	<p>SORD,DNAJC5,SNX12,SLC4A8,CLCN1,MMP14,ADAR,ABHD8,NUDT21,GEMIN7,LMLN,CYP4F11,OR4N5,KRTAP10-10,WBP11,OR9Q1,CASP8AP2,VARS1,MTIF3,TM2D3,SSX2IP,WDSUB1,C1orf58,MARCH8,ABCC2,ZNF291,ZNF664,SCAND2,NKIRAS2,VAMP8,OR5M3,KIAA2026,UNC5D,LAPTMS,MYO5A,C14orf93,C9orf90,MAN2B1,H2AFV,ACRBP,CHMP6,CAPN1,C11orf45,SCGB1D1,SLC13A5,NFKBIB,MED9,TPP1,ARRB1,LRR3C3,C9orf97,DNAJC15,KRT17,CD33L3,TESSP2,PIWIL4,TNFAIP3L2,PDPRL,C39A5,NIPSNAP1,ADCK2,RTEL1,RHCG,PIK3AP1,RAB35,BIRC5,MYST2,GLT25D1,NPC2,NEXN,OR13A1,PAK3,TNP1,RBL2,USP42,WNK1,C20orf55,SF3A2,RPUSD3,TBX19,ZMYND10,C14orf94,DSG2,PQLC1,AYTL2,TMEM127,FBXW11,CD4,MET,TMEM86A,TULP4,PIN1,LUZP4</p>
GCM-20	1,02E-01	30	<p>RNU42A,NEUROD6,P2RY14,PCDHGA5,C3orf42,ZNF37A,KATNA1,OR8S1,GRK2,C1orf185,NANOS2,TRIO,DKFZP586H2123,OR3A4,DGKZ,PQLC3,IL13RA2,CEACAM6,SCNN1G,SEPX1,SERPINA7,ZNF530,FAM70A,SMOC1,PRR5,DPP8,HDHD3,ZBTB10,KRTAP5-7,KATNAL2</p>
GCM-21	1,13E-01	19	<p>INSL5,MARCH3,SESN3,GPR35,MRM1,NHS,INSM2,MC3R,RAD54B,KLHL18,PP1R7,FOXO3,ASH2L,FOXO3A,RBM28,RRAGB,GLIS1,TAS2R7,ZNF660</p>
GCM-22	1,28E-01	112	<p>FRAS1,GPR65,MASP2,WHSC2,KRTHB2,CEP1,MST1R,BRS3,TPH1,ENTPD5,ZNF439,PLXDC1,FMO3,LSM5,CYorf16,MULK,PTOV1,HIST1H2BM,THBS2,COL1A2,TSPAN11,IGFL1,HIST1H3I,SERHL,CTSG,SLC5A5,MLH3,CA7,WFD3C,L,EPREL2,AIM1,NEDD4,ANTXR1,HMCN1,CXorf38,ARGFXP2,CPA3,GNB4,ROR2,LBX1,KIAA1217,OPCML,KIT,IGSF8,HIST1H2BF,COL21A1,MAP2K1,NLGN2,DLX5,MRPL23,PDGFRL,RTKN,LYG2,COL14A1,VPS29,GPR155,OR6C6,GDF11,MTBP,LSM3,ADCYAP1,KIFAP3,TMEM98,NOX4,ELOVL4,BSG,FILIP1,SIX4,DOT1L,THRA,GPR15,C9orf24,CER1,MS4A2,HRG,RDS,SCG2,SMOC2,CYC1,CRY1,PRSS23,TMEM119,GOLPH2,CARL,AFAP,GLI3,SPAG17,ZNF77,TM4SF11,ZNF38,HAMP,PRAMI,BNC2,TMEM16E,SCGN,HIST1H2BC,FBXO36,ZNF414,MLL5,NDUFA7,TNFRSF19,MRPS7,SLC35E2,PGCP,PMS2,MASTL,NPTX2,F</p>

GCM-23	1,34E-01	35	NEUROD1,SPRR2F,FOXN4,TRIM52,PAGE4,XYLT1,MS4A12,ELA2A,SGK2,SE RPINA9,DPPA3,COL4A5,VPS53,GALP,DAZ2,TCPI1L2,SETX,C12orf30,PML,S EC14L3,GLRA1,RANBP2,DMRTB1,PNPT1,CBX1,RNASEL,SELV,KIAA0261,PK DREJ,NYD-SP21,UCN3,SULT1C3,C4orf15,ELP4,HCG18
GCM-24	1,35E-01	32	PTTG2,MYO1B,ZNF419,CCR10,C1orf128,ZNF8,ZNF501,ACY1L2,INPP1,SLC2 6A5,RPS3A,GRK4,PVRL1,MDF1,SPHK1,TRAIP,CRYBA4,SMOX,ACY3,EEF1D, WNT5B,TRPT1,PPP1R3E,TUBA2,CCDC24,FTSJ3,GBP7,B3GALT2,MLNR,DSP ,GAD1,CNTNAP4
GCM-25	1,36E-01	33	XYLB,AP1S3,EML2,TMEM46,C14orf72,SNX22,LY6G5B,EVX1,KISS1R,MAGEA 2B,DPEP1,CXorf33,LRP2,DCTN5,CATSPER4,SETD3,GJB4,NXP2,GH2,TIM M13,BCL2L11,PDIA3,PCDHGB7,LRRC50,LRRN1,OR10G4,FAM92B,ILDRI,H MGB3,CALML4,DDO,RYBP,BCAS4
GCM-26	1,38E-01	40	NOS1AP,PRSS27,PKK4,VTN,NR4A1,TEKT2,CACNG8,CLDN6,LRRC21,CYP11 B1,CYP2A7,INT1,ZNF554,APOC1,NDUFA3,TMOD2,LDHAL6A,RLN3,NPBWR 2,C9orf14,C15orf2,ZNF580,KIR2DS4,PEX6,SAPS2,YWHAQ,ISL1,CCDC72,RO PN1,KIAA1946,COL25A1,LRRC48,KIN,KCNA2,KRTAP1- 1,CLDN19,NDUFS6,C17orf56,OR4S1,PSKH2
GCM-27	1,39E-01	37	SLC26A10,LGALS3BP,MAP3K14,RHO,RPL10A,TCEB3,KRTAP4- 12,DGKA,CES7,BTK,PLCD4,RANBP3,MPG,BST2,CYP4Z1,FBXO33,MAG,LEN G9,HBE1,ALPI,PKD2L2,HMX1,CAVI,ITGB6,FERD3L,WIPI2,GTTF2H5,KIF17,L IMD1,FXR2,PEX10,GAB2,SELI,DCUN1D3,UXS1,LRRC8B,TK2
GCM-28	1,42E-01	15	ATG4D,FAM112B,THAP10,NGFR,MRPL55,MAT2B,CXCR4,GATS,TDRD10,HI FX,C17orf73,HSD17B3,PCDH12,UBE2V1,ASMTL
GCM-29	1,47E-01	210	STARD10,RNU21,IDS,BCL10,FRAP1,ACP1,PREI3,OR8D2,MEF2A,EXOC6,TAS 2R39,SLC25A26,PFDNI,ZNF18,LARS2,SPG21,OBFC2A,SPACA3,C9orf72,TRE X1,STAC2,C17orf81,ALOX5AP,MAST3,STAT2,GMPPA,TNFRSF8,BCL9,DEFA6 ,GPR82,RNMT,FARP1,TNFRSF14,RBMS1,GPR12,CPNE1,GIMAP8,PEMT,TTT Y4,CLIC3,C7orf26,DHX37,HHIP,TRPC6,USP22,TRG20,TRPV1,SFRS14,PDCC 10,C1S,COX4I1,MCM3,CGRRF1,BTF3,SEPT10,TMEM126B,PPP1CB,ST8SIA1, CD58,CAPS,RIC8B,TUBGCP6,ODF2,GPR42,FANCD2,NTN1,KIAA1191,PHF1 7,AMICA1,WNT16,DDX19B,SEC24B,ABHD11,JMID4,DDX6,C1orf96,SCP2,YI PF7,BAZ2A,BAX,C20orf70,CEBPE,DGAT2L4,PPP3CA,TAC3,SDFR1,TOR2A,S TRN3,DTNBP1,KLF4,LCN9,TMPRSS7,PSD2,C8B,CRISP1,ZNF92,DBRI,SCTR, CCNK,PCDH8,B3GAT2,ADH5,LBA1,C21orf19,IPO11,GPR20,DPC2,BCAS2, NAGK,OTUD6B,PYGO2,RAB28,DHX16,APAF1,RPTN,IL31RA,SLC11A1,ZSCA N2,GNMT,RIP,DNAHL1,MUS81,HS3ST1,CPN2,CDC27,CDC25B,BAG1,C14orf 24,HHLA1,C10orf26,FOS,SOC57,HIP1R,PANK2,SLC25A16,CAMK1A,ERG,ZC 3H3,PCDHA3,TMEM14A,NEK2,SPATA9,PITPNC1,OTOA,MICAL1,KRTHA1,O CIAD1,SEH1L,NSUN5,RAFTLIN,PRPF40B,THYN1,RBP5,CHMP2B,CRYZ,FBX O22,USP53,PTPRZ1,RPL10L,LOC441242,RAB37,GNL1,CALML6,PBX4,MET RN,MLR2,POLE,CMAS,TNFSF10,ZNF17,TERF2,SATL1,LRR1Q1,ASAH1,LRRC 30,BTF3L4,DHRS7,FAM92A1,RPS10,RASL10B,CAST,CHMP1B,PRKCH,GABR G2,CPT1B,DCTN6,EME2,XRCC2,FBXL10,RFK1,RAD52,SPTLC1,C2orf28,SF4, SKP2,FVT1,C12orf38,LYZL2,NF2,CLEC10A,LYCAT,SLC25A21,C1orf105,AQP1 ,FUND2,FBN2,PTPNS1L3,TATDN2,PTP4A1,TAAR6
GCM-30	1,47E-01	29	QIL1,CCDC74A,ASB9,STAG1,HIST1H3D,ATP4B,C6orf84,CLEC2L,PAPD4,SM NDC1,PBXIP1,CKLFSF4,ANP32B,TROVE2,TSPAN4,LCE2C,RNF146,MYO3B, ANKFY1,TMEM118,MPZL1,MRPL12,LYSMD3,SLC9A4,CECR2,TIPRL,GAS2,K LK5,TKB1
GCM-31	1,52E-01	40	CNOT1,SPEN,PECI,TSPYL5,KCNB2,LAMB3,R3HDM1,MSH3,CXorf20,KIF1B, RGC32,GGPS1,DSCR4,OR8D1,PSMD1,MLL,CLDN23,IFI27,LGMN,KRTAP19- 2,APOL4,GPR128,MXD3,PPM1G,CDKL3,SENPI,SFRS2,NR2C1,RFK,DAK,BM F,ST6GAL2,ZNF224,IL21R,CDH23,VN1R5,PSME4,C5orf15,FRMD4B,HNRPD SYNGR4,DDI2,KIAA1205,DTX4,TSKS,DNAJC12,SLC6A2,VSIG2,KRTHA7,MAX ,FAM59B,HTR1D,CSNK2A1,ABCC13,SPSB1,CUEDC2,PARP3,C20orf45,TMIG D,CPSF3L,DDC,C16orf5,DNAJA5
GCM-32	1,75E-01	23	SMARCC1,TEX13B,HERC1,ZNF692,KIAA1467,ITGB1,C17orf77,CHRAC1,HPS E2,PNMA5,MFAP3L,C10orf13,APOA1BP,TAS2R43,RAX,ATP13A5,HEMK1 ZSWIM4,ADC,C12orf34,ARRDC2,PHF1,RSPO2,VPS39,C6orf108,HSPC176,ZF P41,OR1J4,SLC44A3,CYLC2,FAM19A5,LMX1B,ZXDA,GLYCTK,KRTAP6- 3,MSX2,NALP12,AFM,RAMP1,NDUFB10,TAS2R50,EDA2R,C1orf2,CHERP,DP M3,ZBTB2,RAB17,LYPLA2,OR52K2,PRSS3,HSD3B2,MCTP1,ATP5G2,FSCN3, NGEF,CIB4,RHPN1,PCSK4,ANKRD24,ALS2CR19,TAF6L,HCN1,CASK,SLC9A 11,POPDC3,AIM1L,OMD,CBS,HAK,TRIM60,OR2A5,RPS28,C17orf61,ATP5D, KLHL4,GPSM1,ORA0V1,ASB1,SLC30A1,MLLT11,TRIM51,WISP3,OR13C5
GCM-33	1,79E-01	17	TREML1,IDI2,HLA- C,HSA9761,SLC34A3,RHPN2,C16orf3,TMEM121,TG,ZNF549,KCNF1,MRV11, C10orf9,CYP19A1,STIM2,GCHFR,IL16,TPD52L1,DJ12208.2,ABCG8,TAAR8,R NF20,RBM4B,FAM82C
GCM-34	1,81E-01	66	KA36,PHIP,RNU38A,CYP26B1,LKAP,ARL16,MTUS1,NPLOC4,AFF3,OBFC2B, HMGB1,HIST1H2AD,PLCL2,ECE1,PPGB,DNHD1,TEP1,C16orf28,C1orf33,SU MF2,NPTXR,STAT3,DENND1B,C14orf130,SENPI8,ZFYVE28,KCNE2,DKFZp68 6O24166,EXOSC2,SH2D4B,SLC22A13
GCM-35	1,85E-01	24	ZCCHC16,FAM102B,NPM2,RPA1,CYorf14,CRHR1,ATP12A,PHF15,GRIN1A, SPANXC,IL13RA1,AGPAT4,SPRR2A,GCAT,CAPZA2,FGG,IFT81,MAGEB4,C7o rf13,RHBDL2,MRS2L,FBN1,RFX2,MDH2,RPS2
GCM-36	1,89E-01	31	C20orf39,RNPC3,MOCS3,NEUROD2,CXCL13,LDHD,SDC2,LRP11,SERBP1,M GAT5B,OGN,C6orf32,RASSF2,SELL,VNN1,ZNF433,PPP40,SLC2A7
GCM-37	2,19E-01	25	SLC30A9,SF1,UBE2Q2,TMEM77,BAG4,ELOVL7,CD24,VPS36,TP53BP2,CYLD ,PHTF2,C14orf92,FOXF2,MKRN1,PKN2,CPLX3
GCM-38	2,35E-01	18	GDPD1,ARN2T,TSC22D1,SERPIN3,IGSF4C,OR51M1,COL8A1,RHD,ATPBD1 C,ARMCX3,FBXO32,SLC25A25,MAK,C9orf11,USP30,SLC39A10,PGDB3,PRA MEF10,VRK3,PLCXD2,ARL10
GCM-39	2,39E-01	16	
GCM-40	2,43E-01	21	

GCM-41	2,45E-01	45	LSAMP,ADAMTS17,C11orf38,LMBR1L,FBXW8,CAV3,RBP1,KCNH2,ELAC1,USP20,PAIP1,ABRA,ZNF187,ZFYVE19,ZMYND12,ANXA9,ZNF626,RCN2,KRT23,DBF4B,WNT4,SLC22A14,C11orf37,HMG20B,HDCMA18P,SULT2B1,MGAT5,PXMP3,RPS13,HUS1,TECTA,ZNF703,DLG4,C20orf173,GSTA3,FGL2,AB11,C6orf106,FURIN,JMJD2B,DICER1,GOLGA2L1,PRPF39,PSCD2,KRTHB3
GCM-42	2,48E-01	18	CACNG3,RNF14,KIAA0556,TMEM89,FBLN1,LOC339529,ATP1B1,GNRHR,CD5N,TRIM67,IL1RL2,PH-4,PUNC,TTC5,CPNE8,FKBP2,GALRI,BDNF
GCM-43	2,63E-01	27	TTN,CTTN,TRMT5,KCTD19,DUXA,CRYBA2,LRRC37B,ACVR2A,NFASC,SMTN,HIRA,ZNF84,FAM53B,PAX3,FAM48A,ZMYM1,BTLA,KCNG2,C17orf32,PLXNA2,SLC26A7,NTRK3,PRRX1,AQP2,IGSF1,CEACAM1,DYNC2L1
GCM-44	2,65E-01	19	WNT1,IL28B,CREB5,DNAH11,EXOSC8,CDIPT,PTPN3,TNFSF18,TP53AP1,SLC6A3,KLF2,KPNB1,IKBKAP,TGM3,FAM69A,REC8L1,ARL4D,HIST3H2BB,DEFA4
GCM-45	2,66E-01	51	OR51A7,DNAJC13,GRIN2C,ACP6,BGN,PDZD6,TBL1XR1,RILP,KRT24,ZNF43,ARMCX2,ZNF334,ZCCHC13,ITGA2B,CCDC11,ACSBG2,TMC1,C14orf162,KLHDC6,OSR1,CPS1,KCNS2,MDH1B,C6orf165,EYA4,SLC37A3,ZNF605,TUBB1,C10orf79,LMX1A,SNAP29,GGTL3,C14orf44,GABRB3,PITX1,RSPQ3,SART2,GF11B,SLC7A8,KLF8,DNAH9,CASC1,ERBB3,KCNAB1,KRTAP5-11,COX11,MAPK7,CCDC74B,NAP1L5,DEADC1,PF4V1
GCM-46	2,69E-01	40	4,SLA/LP,MT1G,GYPE,CRLF1,SLC41A3,DISC1,DNAH8,DLCL1,ISL2,UBL4B,TUBA4,KDR,GRIK1,SNX2,SH2D1B,NCRI,PNMA2,SH2D4A,MICALCL,PDE4C,REXO2,IL1F7,OR10Q1,AQR,RASGRP4,MSTO1,DLGAP4,DOCK4,G9P,MEGF10,PLEKHK1,FGF8,USP18,TYSND1,IGSF4B,DUSP7,ADSSLI,HOP
GCM-47	2,72E-01	16	ST3GAL5,FAM111B,ABCD4,ITLN2,MOBP,C10orf99,PPP2R2D,CDC5L,SUPT3H,TDP1,OR11H6,CUL2,STK11,C3orf52,RAB41,ASTN
GCM-48	2,92E-01	22	DKFZP434P211,RPL35A,ZNF592,HKR3,RGS9,ITGA9,CD3EAP,WNT2B,CYP2C18,C20orf135,B3GNT3,KCTD18,METTL5,GPR154,AAA1,SMG5,AMPD3,CC2D1B,FES,CCHCR1,TXNDC4,CTDSP1
GCM-49	3,07E-01	16	CAMKV,GAL3ST2,RTP3,NONO,SLC6A20,MAP3K8,ACE2,GJA5,FAM5C,PART1,SOSTDC1,CLEC2B,RAE1,PLSCR2,MESP2,NPPC
GCM-50	3,13E-01	16	SGNE1,REST,WFDC13,C9orf78,AMY1A,CALCA,C6orf114,CG018,GTF3C2,C8orf35,KIAA0892,HMG20A,DNAH1,VPS35,FLRT1,PGBD5
GCM-51	3,18E-01	46	TRIAP1,PGLYRP3,C10orf130,ANXA6,RAB22A,SEPP1,WWC1,TKT,C14orf101,COX7B,CSN3,PRR6,ITGAX,MMP9,DDX4,PSMF1,BTNL8,DKFZP434L187,PCDHB9,ICT1,RASSF8,MAN2B2,RRH,PSMB6,C21orf2,EEFSEC,SLC24A4,ADFP,SLITRK1,TNFSF14,PIGA,ILIRN,OR10X1,LOXL2,CAPN14,ASCL4,MTMR3,HSF1,ASPH,XKR5,TBC1D21,FSTL1,SUOX,CST6,BRMS1L,TM7SF4
GCM-52	3,32E-01	45	CD200R1,AQP9,TGIF,TAPBP,DCDC2,AANAT,S100A12,FOXH1,ARHGAP12,ABTB1,COL6A2,SOD2,OR2T3,CALR3,GEMIN6,MAGEC3,FXYP2,CXCL6,PDCC6,AGXT2L1,OR8A1,GPR83,RFX4,MCEMP1,LAD1,EDD1,LETMD1,ZNF114,CQ7,LITAF,CCND3,C1QL1,OR2M7,LILRA5,ACSL6,KIR3DL2,ASNA1,CLEC4E,GHRHR,ECCGF1,RPL32,WDR77,DEPDC2,FRAT1,NALP2
GCM-53	3,36E-01	35	RRS1,SIRT5,BZW2,AKR1C4,DPRXP4,PRR3,ADAM11,TRIM54,GSTA1,MAPKBP1,C12orf61,CLEC1B,SETD1A,IHPK3,ZNF548,A2ML1,CBX6,EXOSC6,CLEC12A,MRPL11,CITED2,TLR5,RABL5,WDR5,PTK6,TMEM41A,SLC17A3,UHRF2,EIF2S3,KCNRG,CTRC,UTRN,RDH13,ALDH1A3,SCARA3
GCM-54	3,40E-01	18	GNB1,COMMD7,OR5H1,ATP6V1G2,UMPS,TA7F,SUHW3,TRIAD3,AP4M1,C6orf64,KLC4,AOC2,ABC9,CDPC2,PRKG1,ZNF556,OR6A2,IL1RAPL2
GCM-55	3,40E-01	23	GTDC1,SLC9A9,DPYS,AMBN,FRMD5,SPATA6,ALDH3A1,CLEC12B,RASD2,HSP90AA1,AK2,DCHS2,ABAT,ANGPTL6,NPC1L1,C14orf45,CGREF1,THEDC1,C1orf176,RHBDL3,CBLB,RPS23,RNASE13
GCM-56	3,41E-01	53	KCNQ1,OPN4,AOX12,LIN41,C12orf58,UMOD,TRAF5,ARL13A,ITIH2,ICEBERG,SET7,ANKRD1,KRT14,MRPS21,TMED8,PDCL2,APPBP1,NKX6-1,TNFSF7,CCL8,COL13A1,ITPA,GAL3ST1,SNAP23,LOC642929,NCND,SPATA16,CTNND2,GUCY2F,PCDH15,TEX12,HIST1H4G,OR2L1P,GPCS,PPP1R8,ITSN1,MUC4,TNIP3,FAM14B,CLUAP1,FOLR1,TMEM34,OR13C3,CXorf48,ODF4,ST7OT2,PCDH11X,EIF2S2,SEPHS2,GBX2,SHD,RNF11,CASZ1
GCM-57	3,44E-01	23	SGCB,ADAMTS5,PDCC8,MGST1,HIVEP3,CTNNA2,RUNX1,OR4K13,TRIM35,FOXC2,PRKCABP,ZSWIM3,SPINK7,C1orf188,FKBP8,CA9,WBP2,PARP10,ZNF408,ZNF124,C9orf89,B4GALT2,SLC7A3
GCM-58	3,53E-01	49	AKAP4,VAMP2,DMD,C16orf56,T2R55,SFRP4,NOS1,MBP,BRD9,NRG1,C10orf125,ACPP,TTY10,C3orf19,BMP8B,MARCH4,DEFB129,PHACTR1,EIF2C4,NUF2,TCHP,PLTP,PYGO1,ZNF214,S100A2,MASS1,ADAM2,LHPP,C9orf29,EIF4E,PTPRG,FOXJ3,AKAP12,MESDC1,PIPOX,HDAC3,NR2E1,MSLN,CDH16,CARM1,STAM,IFIT1,C6orf103,ADD2,DSC2,WNT2,PTPRO,LIPT1,RAB11FIP4
GCM-59	3,54E-01	218	POLD4,TRPM1,HS1BP3,C1orf27,C14orf156,IL8RBP,TTC7A,KCNMB2,ELF5,SCUBE3,LOC441155,OR10H4,IDH3G,MIDN,PYY,GPNPAT1,SIRT2,SLC10A3,FAM32A,NCOR2,DOK2,THAP9,ANKRD13B,OACT1,PHF13,CGI-38,MRPL33,ARHGDI,ZNF313,LRRC25,LSM7,TYROBP,AP4E1,PRIC285,GHITM,TAF5L,COX6B1,TRIM41,VEZT,P15RS,RAB39B,IRXL1,ATP5H,CECR5,MFSD5,FCAR,FHOD1,KCTD13,DEFB106A,GNB2,NTE,UBE2A,RPAP1,PSMD8,BRWD1,FGF3,C1orf76,BAZ1B,HK3,COL4A4,USP5,ATP6V0D1,C22orf25,HGS,CASP1,MMP17,MGRN1,POLR2G,LY86,APH1A,MRPS18C,CGB1,DNAJC14,NRGN
			KRTAP9-4,ASPSCR1,SF3B4,ANK1,S100A11,SLC6A5,OGFR,MBNL2,TMEM116,IFNW1,C1orf103,IDH3A,ITGB4BP,UPB1,KRTAP19-7,CD33,KIFC3,SAC3D1,ARFRP1,BCL3,ATXN10,TIMM8B,PLEKHQ1,ASNSD1,ARHGEF10L,LFNG,CCDC22,TTYH3,DRAP1,ZXDB,N4BP2,PHF7,RAB5C,SH3BGL3,SLC39A1,ACSM2,C6orf89,ADAM12,WDR58,DEFB108B,PRMT8,HDFG,ZNF181,NUP188,RNF2,SLC6A11,SEMA4C,PCDHB14,LACRT,ATP6V1F,FZD2,TSPAN3,DMN,MPV17,PCAF,RPL31,HSPC049,NUDT1,SELO,NUP43,PTRH1,RPS21,NDST2,SHHBP1,COP56,IERSL,FFAR2,NOX5,ZNHIT2,CCDC41,AOF2,ANAPC2,EXOC2,PRSS8,STK11IP,GPR146,TRIM22,GNPDA1,NOC4L,CCDC38,HNRPA8,LETM2,CLK1,ARS2,DRG2,RPL27A,C6orf205,MYO1F,EXDL2,LTBR,

			KIAA1409,C2orf24,DPEP2,PECAM1,MSN,NEFH,REPS2,RENBP,C1orf85,MVP,C2orf17,UBE2D1,RASSF5,C16orf7,RPS6KC1,DNNTIP1,CCNG1,TBC1D10B,BAIAP2,NDUFB4,CSNK1A1,ZBTB11,FBXW9,RSAD2,SEC6L1,PCDC7,PCGF6,PPA1,SPANX-N5,PNPLA1,GNAI2,LYPLA3,RNF130,RBMS2,KLHDC8A,CD99,WDR81,CORO1B,AP2S1,TOLLIP,PSTPIP1,SSX8,SULT1A1,UNC5B,C18orf22,LYL1,SPIN1,CSTA,KIAA1602,IMPAD1,POLDIP3,STARD3,C1orf164,IL4R
GCM-60	3,69E-01	14	TPP2,MPP7,THAP5,ORC5L,SOCS5,SPRY1,HERC2,CLEC1A,ACRV1,RB1,MGST2,C20orf74,PRPF4,GFOD1
GCM-61	3,77E-01	24	HMX3,OR5L2,SERPINA6,KCNA6,FOSB,OR51B2,MPP2,SORCS1,DUSIL,SDS,TAPP,WDR76,OR8H2,NME7,ALS2CR4,DYNC1I2,SLFN5,TBC1D19,EML5,NA,KIAA0804,RUNX1T1,PIK3R3,NHLRC1
GCM-62	3,78E-01	25	COL5A3,ZNF347,KCNJ8,NOTCH1,TFAP2E,LMBRD1,IMP3,ZNF9,SIPA1L1,OPRM1,C7orf34,LECT2,RNF17,SEMA3F,MOV10,COLA2,COL4A1,RCN1,FMO1,DHRS1,TM2D1,RPRC1,GH1,HIST1H2BL,NOS3
GCM-63	3,89E-01	43	RNF34,OR7A10,ARMC2,DNPEP,POLR2C,SMARCD3,WNT9B,TMC4,OR2AK2,FAIM2,KCTD11,OR2D2,GPSN2,NFATC1,FAM73A,ALPK3,DNAH5,RAB36,PTGIR,CELSR2,MLC1,AGXT2,TMEM125,MED12L,PLA2G2F,KIAA1641,SMAD7,CAMK2A,KCNJ1,RCBTB2,OR5D18,FAM26A,C20orf112,F9,PFKFB3,DHCR24,GCNT2,IGJ,TRIM44,AMPD1,RNF113B,OR52E2,FHL3
GCM-64	3,90E-01	40	KLC3,ESSPL,CCDC47,KCNJ15,MAGEL2,EID3,C12orf12,LGICZ1,BPNT1,BFAR,HCTSL-s,OR2AE1,RCHY1,TLK2,C8orf71,SDCCAG8,AKR7A3,LGR5,ZNF435,MANEAL,UNC119,OR6N1,ARNTL2,DIO1,COCH,HTR2B,C10orf72,FAHD1,GRK7,GPS1,C14orf54,SELK,MRCL3,ABCG1,CALML5,C3orf60,OR4L1,OR2T12,ARTS-1,HNRPF
GCM-65	4,00E-01	24	OVCA2,DLNB14,GYLT1B,MAMDC4,DALRD3,SDC1,ERMAP,KIAA1958,ZNF507,C21orf90,OTP,CCL13,EDARADD,ERV3,LRRC39,TRAPP6A,FKBP4,C3orf35,LARP5,CACNA1G,ZFX,KCNE3,LZIC,AHSA1
GCM-66	4,03E-01	18	PDZRN3,SLC30A3,C10orf111,DPPA5,RNU83A,LYNX1,AXIN2,MID2,ZNF434,PROCC,SUNC1,UNQ467,STARD6,DYRK3,KRT18,CDH15,NCOA6IP,MAP4K4
GCM-67	4,03E-01	24	ORM1,ORM2,UTS2,YWHAE,NTSR1,RETN,CXorf26,C9orf74,PTPN12,HLA-DRB5,F2R,ELF3,LGR8,IAK2,SPINK5L2,SULT1C1,HLA-DPB2,ARSF,CNNM3,NFATC2,ALDH1B1,PPP2R3B,NOS2A,TSPAN10
GCM-68	4,09E-01	30	HMGCLL1,PGRMC2,DMBX1,SOCS2,ADRM1,STEAP3,ZNF519,PCCA,ZIK1,KIAA1199,SERPINE2,HPD,RAB11FIP2,TIMP1,OTC,LAT2,CSNK1D,LANCL3,GSK3B,ACTL7A,TUBA6,ARHGAP11A,BCKDHB,PFN4,SPINT2,ZFP106,PILRB,OXCT1,TMEM35,CDH19
GCM-69	4,12E-01	32	HLA-DRB1,FGF2,UXT,HIST1H2BO,TRY1,OMG,DKK2,C8orf34,UGT1A6,LOC643201,SLC5A7,OR8G2,RTN4,FBL,PHOX2A,OR7D2,KIR2DL1,TRAF6,ZNF132,KRT13,PLA2G1B,SNTG1,SERAC1,CPM,MAGEA4,KPNA3,FRMPD2,KIAA1279,C3orf1,NUDCD1,FAM40B,MUSK
GCM-70	4,25E-01	15	CART,NALP9,ANUBL1,ZNF560,POU4F2,TGIF2LX,FBXO9,ZCCHC10,LOC643406,NUP155,ANKS4B,JMJD1B,NYD-SP18,FSD1NL,CCDC52
GCM-71	4,29E-01	45	MED25,ZNF653,GFM1,RAB9P1,C2,C4orf11,KRTAP10-2,TBC1D22B,APOA2,TCP11,PRDX2,FOSL1,ATP2B1,SLC9A6,FDX1,C6orf155,RBPSUH,PLOD1,CHRNA1,PCQAP,STX1A,DENND3,C21orf37,AXIN1,CDX2,SSX7,LYPD4,H2AFY2,PCDHAC1,APBA2,HMGB4,WDR74,CRBN,TCF7,PAOLG,PAQR4,AKAP3,FCGR2B,PPP1R14B,AKAP1,TEX264,LEPRE1,CLDN14,CSF1R,NFAT5
GCM-72	4,41E-01	14	MRPL24,TAT,KIAA1826,IMPG1,C1GALT1,TCEAL4,SUSD2,GJA7,C6orf168,RP18,NAPA,PRDM16,IL2,HAVCR1
GCM-73	4,50E-01	26	CYBASC3,DHH,C20orf6,RLF,LASS1,CPNE2,PPP2R5D,SLCO4C1,ASB17,XLF,POLDIP2,OSBPL6,RBM9,PMS2L1,NYD-SP26,PLA2G2E,TMC7,ZNF451,KCNK16,RBMY2EP,SULT4A1,RPS6,SYPL1,CAB39L,SERPINA12,PTPRC
GCM-74	4,63E-01	131	LPIN3,VPREB3,FAM83A,IGF2BP1,ATP50,FAM13A1,KRT25B,FER1L3,RG9M TD3,AGRP,SPAST,FBP2,ITIH4,FCRLM1,SF3B1,RAB7,MYST1,MAP3K5,TPMT,TNFRSF13B,KIAA1644,PLA2G2D,PPWD1,C11orf11,ZBTB32,OLIG3,TOX,WA C,RAB11FIP5,JOSD3,HSZFP36,GNL1,ARHGAP22,TMEM54,GPR27,VANGL1,C11orf35,LSG1,ARHGAP25,RBBP7,LRRC8A,FLT3,CD19,MAP4K2,DUSP1,K61RS4,SP4,ACTR6,MYCBP2,SPAG1,VCPIP1,EIF3S10,CACNB2,SACM1L,MOSPD2,OCIAD2,CR2,UBOX5,C5orf4,BAZ1A,PPP1R2P9,RPL7A,KIFC2,ZNF721,CARD8,SLC16A14,TDG,BAIAP3,FAIM3,CCR6,C16orf63,KLHL26,RND3,SYT3,GLMN,RASGRP3,FXSD6,AOF1,GVIN1,SUPT4H1,C9orf45,ARPM1,TLR10,NT5C2,LAMA1,DHX36,MAP3K7,SP110,FKBP9,NUP85,MALTI,FCRL3,BLOC1S2,CNTNAP2,TLK1,ANKRD12,PUM2,GTF3C1,HIST1H4C,FLI1,PYHIN1,C11orf34,LGI3,BLR1,DCTD,76P,FCRL1,RASA2,BLK,GLUD1,STRAP,S100Z,STAP2,AKT2,C1orf49,DAB2,TNFRSF7,ULK1,RCOR2,SIRT1,CRYM,C20orf94,RABGAP1L,LRRC61,NDUFAB1,SLCO1B1,ZNF140,NDUFV2,ZNF75A,NODAL,FKBP7
GCM-75	4,65E-01	27	SH2B,AP1S1,C22orf8,STX11,FAM3A,SNX10,CHMP5,VPS25,MAGEA3,SLC30A10,KRT2B,DGAT2L6,DKK1,RAB11FIP1,TRIP4,SLC34A1,UBE3C,PSMB8,VM D2L1,FBXO44,NTRK1,ALKBH4,LACEL,CHCHD3,GAGE7,YTHCD2,DTYMK
GCM-76	4,67E-01	15	SLC1A2,HHLA3,LZTS1,TAS2R5,UBE2L6,ERCC4,CCRK,SLC35C2,HIST1H2BD,CDK9,CSNK1G2,FGF23,CTCF,KTAP13-2,PRG2
GCM-77	4,68E-01	120	KLHL24,NCF4,SERINC3,KIAA1274,MPST,ATP7B,BCMO1,ELAVL2,IRAK4,ME TT5D1,PAK11P1,SURF1,RNU108,NIP7,OSTF1,DMRT3,NCAM1,DKC1,RNF149,OR51T1,ZNF545,GRB2,HOXD3,CD2BP2,CRYGB,MNDA,MERTK,SPRY2,EEF1E1,SSBP2,DNAJC7,SH3RF2,C5orf13,PCDH18,ANKRD50,CPEB3,DUSP12,BAIAP2L1,C17orf47,ZNF23,MGAT4A,OR5M9,DSCR2,NOL1,C2orf11,PSENE1,FA DD,CTPS2,DKFZp686K1684,CLCNKB,ADAM28,CGI-115,PRLH,PREX1,BTBD7,RDX,CHST7,PUS1,CABLES1,BRD8,TANC1,PGEA1,CBFB,SYNCRIP,BAALC,CTBS,ACA33,GTPBP4,KIAA0020,PIGW,CMKLR1,VN N2,CASC3,HOXD8,SUPT7L,RPUSD2,GPR152,GCN5L2,PBK,DOK3,CLEC4D,

			HIST1H2BI,TCEAL7,FPRL1,TBKBP1,KLHL11,MMP28,C19orf35,RFC5,SLC7A7,C16orf46,TCEAL6,SLC6A8,NPHP3,HIST1H1B,UBE3B,GRK6,C21orf25,SLC25A19,NUP98,RBM24,GTF2F1,ETV6,PAK6,MMACHC,SLC4A3,C12orf59,HMP19,LEPR,E2F4,LRRC27,DHX33,SERPINB1,NAPB,ITV1,ABCE1,TOMM40,CDKN3,ARPC2,RCOR1
GCM-78	4,78E-01	31	IL9R,CTNBN1,ZNF440,PABPC3,RNF6,MASP1,C15orf28,BAP1,SNRPA,ZNF354B,RPPL2,MRPL2,EPSSL1,IFNA5,PRPF3,OGFOD2,PPP1R1B,AAASD1,AAMP,LTATA,PHB2,AP3B2,TIGD5,RBM21,CASR,MAGED2,MRPL38,ST8SIA6,PURB,OR5H15,GMEB2
GCM-79	4,83E-01	53	LTBP1,XRCCI,GRIPAP1,LHFPL3,XCRI,KCNC3,MRFAP1L1,TACR1,PCGF5,OR4F21,LUC7L,TMEM23,C6orf61,PRPF18,COQ10B,TXNL4A,UBA52,TSG101,C21orf13,RTN1,CEL,KRTHA2,UBE1,FN1,EML3,SLC18A2,RENT1,HRB2,SOX5,DX23,DCST1,OPA3,NXT1,SPATA12,ABCC5,B4GALT6,GRLF1,ZNF277,OR10K2,BECN1,TSEN54,URB,NBR1,TBCD,GP6,EVL,IGFALS,GOLT1B,IERS3IP1,ATP6V1G1,FAM76A,DDT,AMFR
GCM-80	4,92E-01	42	ORC4L,JMJD2C,ZNF403,CLEC11A,PRDX5,DGCR14,SHOX,CES4,RASAL2,ACSM3,POLG2,PDLIM1,CXCL16,VMO1,SENP7,LAMP1,SOX30,ZMYND15,PRIMA1,MCFD2,TRPM4,MYO9B,RHOC,FAM50A,HNRPL1,RG9MTD1,HSPC023,TFE3,CACNA1I,USP46,FAM113A,STAT6,GATAD2A,SLC22A18,FCHO2,MYOCD,MYL4,ALOX15,PLXND1,RWDD2,ZNF3,KIF1A
GCM-81	5,00E-01	26	SLC6A18,OR1S2,TP73L,GPR39,C14orf161,PRO0149,TH,KRTAP15-1,OR1L8,NOX3,C6orf113,TM4SF18,CDKL2,KLHL10,PPFIBP2,ZFFM1,NDUFB9,PARP4,NPAL1,GJB3,MRPS28,GLG1,RBMY1A1,OR7C1,OR1N2,ZNF257
GCM-82	5,03E-01	27	DEX1,PLAG1,ITGB1BP2,ENAM,C6orf128,RFX5,RDHE2,KCNC2,RASSF3,PSMB10,CD37,RP1L1,SPRR4,ASCL2,SMC4L1,FECH,TM4SF20,CRYGD,PDZRN4,SPIB,SYNGR2,ZBTB37,PAQR8,C14orf124,BCL11A,CHGA,PLEKHG5
GCM-83	5,12E-01	20	MAGEA2,HCN2,LMO3,C18orf25,RPL12,SCN7A,PZK1IP1,P2RX2,WDR49,FLG,C7orf25,PCSK5,CDK5R2,RYR2,SCGB3A2,TRPV4,UNQ9356,MPN2,ANKZF1,CD1E
GCM-84	5,14E-01	18	TDRD9,GPR172B,FAM71B,EPC2,CREBBP,TCEB1,LSM16,MSX2P,APOH,SDHB,MYST3,C7orf11,LCE1E,PES1,LYPLAL1,ABCA12,GALM,TUBB
GCM-85	5,14E-01	30	NOVA2,RNU40,SNRPD2,C13orf18,OR8G1,IFI44,C6orf136,CLCN6,SYNE2,HSPBAP1,G1P2,PLOD2,DHDH,HERC6,ZNF213,IFI44L,PCSD1,SPRED2,HTR1B,C11orf36,ZNF526,HOM-TES-103,SLC22A7,LY6E,CLSTN1,SREBF1,BIRC4BP,HYAL4,ZNF365,OR51F1,SUZ12P,NDUFA12,C9orf93,DEFB126,PCDHGA9,GNG4,ASAH3,SCRL,KRTAP21-
GCM-86	5,17E-01	23	2,CLYBL,KRT7,MYO6,MS4A3,SNX26,CSPG3,GRIN1,GABRA1,CD300E,POOX,CCRL1,ST7OT4,TIGD6,UNC45A
GCM-87	5,17E-01	48	PLEKHN1,C15orf43,TTC1,SLC45A2,THAP11,HP1BP3,TM9SF1,TMEM111,THSD4,CLOCK,AQP4,NSUN3,PRDM14,HAO1,CHRNA4,C10orf118,TMEM32,ZNF26,KLHDC8B,EZH1,C6orf122,CDC37,C8orf55,TACR2,ZNF567,MGLL,RHAG,PRDM10,MAN2A2,DUSP11,FBXW7,IL11,C6orf94,C9orf23,SLC17A4,ADCY3,FRMPD1,CYP3A4,C14orf142,OR52H1
GCM-88	5,17E-01	40	TENC1,STOML3,C7orf20,RNF175,AMHR2,C14orf168,ITPKC,OIT3,ZIC2,OR52R1,AMIGO2,WDR6,C9orf153,CNIH4,RNU54,ANGPTL4,ARL17P1,NFKBIA,COX6A2,PHLPP1,OTX1,C1orf127,OR3A3,DLX1,HAS3,LCMT1,TMPRSS11A,C6orf206,ZBTB16,TSSK6,UBXD7,PSG7,HSPD1,KRT1B,SPACA1,GOLGA8G,PHACTR4,SPTB,DEC1,IBRDC2
GCM-89	5,21E-01	18	POLR3C,GALNTL5,DHRS4,AHSG,NIN,SLC5A9,A4GALT,ROPN1L,CFH,TIGD2,DDX3X,PDGFRA,NCAM2,DHFR,C1orf170,TMEM108,TFPI,KIF5A
GCM-90	5,22E-01	31	ARHGAP6,FAM78B,EDN3,PTPRN,KLHDC5,TSGA10,C1orf120,DDX27,TMEM70,ZAP70,RNASEN,RPL18A,SLC22A4,AHSA2,ODF1,TREM2,CLECA7,GLRA3,HRBL,ADAAC1,MCART6,STARD3NL,GNGT1,NT5C1B,DUS4L,C1orf121,C20orf35,SMAD4,KRT6IRS,MAGEA10,PP1A
GCM-91	5,44E-01	23	LGII,DDX25,NPAS3,EXOSC10,TXNDC6,TMPRSS5,RBMY2FP,PLEC1,CTSC,HIST1H1T,DEFB1,HAS1,SLC43A3,CHRNA4,C20orf152,OR4D9,SH2D5,POU3F4,IQCC,FANCM,VGLL1,TPTE2,KIFC1
GCM-92	5,46E-01	27	DIAPH3,SNX30,CLDN20,PUS7,TMEM102,C16orf44,IFT122,MYL1,NT5C3L,SLCO6A1,GDAP1L1,TIMM10,C12orf36,CLEC2D,ZNF268,LAT,PIG38,HMGCS2,PNRC1,NAGLU,MRPL45,IFITM1,FAM106B,C6orf143,OR52A1,KCNT2,C1orf87
GCM-93	5,64E-01	16	OVOL2,OR5BUI,POLR3A,GOLGA4,NXF4,NANOS3,GIPR,OR5A2,NFATC3,UBL7,APEX1,MUC6,SLC2A4RG,HFE2,PKD2L1,KCNA5
GCM-94	5,82E-01	74	RAB18,CORO7,RNF135,PLD4,DNMT3B,SLC26A9,NRL,CC2D1A,SNAPC4,AA5DHPPT,NBEAL1,C7orf27,SIDT2,ZMYND17,SI,IKBKB,KIAA1754L,KIAA0372,ABC8,C6orf97,PTDSR,TMEM39B,RASA1,RPAA,ENPP4,SLC22A17,SLC12A5,GABPA,TAF15,SSFA2,C6orf151,ANKS6,OR5M1,EN2,CAGE1,STAB1,WFRAND2A,NUFIP2,OAZ2,USP33,C20orf43,HTRA2,C8orf1,KRTAP19-4,EIF3S7,PSMA1,USP50,ARL11,PIK4CB,C1orf65,IRF2BP2,OR10A3,SNF1LK,ETAA16,TMEM103,LRRC20,DSCR5,USF2,PELL1,DMAP1,SARS2,RNPEPL1,ATP6V1E2,C17orf67,TCHHL1,NARG1L,AMBP,CCNB3,CASP7,SLC2A4,ARFGAP1,CABP4,POLN,ZMYM5
GCM-95	5,89E-01	74	C21orf6,ERBB2IP,C12orf41,TAAR1,USH2A,RBBP4,KLK10,PAK7,GNAT3,DTWD1,FGFR1OP2,SCN3B,PCDHB6,PAX6,GADD45A,ICAM2,EPHA8,CXCL3,EHD1,FFAR1,PRMT2,OR6C76,ABCA13,OR4N2,DNAJC8,MEF2D,DSCR10,COL12A1,GMFB,H2AFB3,USP2,BIRC1,F25965,NME1,CAPSL,SCN10A,CST11,TMLHE,VTCN1,SMR3B,GLDN,7A5,PCDHGC5,DUSP3,RABL2A,EIF3S3,ACOT12,RTN4RL2,OR5H6,LARP4,OR2T10,CACNG7,CSNK1A1L,KRTAP8-1,ALKBH5,SMURF1,NLE1,LOC388692,TDGF1,FMO5,DSCAM,NR5A1, CDC42EP3,QTRTD1,MAPK8,LPIN2,PRB4,ZNF79,NBR2,C5orf3,SAMD14,ZNF383,RB8,OR2K2
GCM-96	5,97E-01	30	PRMT7,DUPD1,NRAP,MBD6,MORC3,LOC145845,C3orf33,LSP1,DNAJC5G,A2M,CDKAL1,SRP14,HPS3,PFDN5,CMTM8,MIB1,WFIKKN1,ANKRD37,KIAA1219,CD99L2,SP1,TAF1A,SCAP,SERPINF1,SLC2A14,ZNF189,CACNA2D3,EXO

C8,MTRF1L,DIO2

GCM-97	5,99E-01	15	SLC1A6,C1orf36,LYK5,C17orf78,CDC2L1,OR4D6,CDH17,MRPS26,HIST1H1E,TADA3L,DHRS8,PEX5L,UPK3A,TTTC16,GABRG1
GCM-98	6,06E-01	26	RGS13,NID2,CLK8,GSTA5,MRPL48,DERPC,PSMB7,C17orf64,ZNF155,KIR3DL3,ITGA2,OR7G3,OR5V1,CDR1,ACF,PKD1L3,TAS2R44,C3orf58,GPR139,TMEM40,NMT1,MRGPRD,OR10H2,PRG-3,VMAC,SMCP
GCM-99	6,11E-01	19	UGT1A4,OR4P4,BSDC1,PCLKC,RPB9,HS747E2A,BA3,TNFRSF19L,SYN1,TAGLN,PRM1,TRIM33,RNF41,SLITRK5,TPM3,USP32,PLD5,BID,CORO2A
GCM-100	6,13E-01	23	ESRRG,COX15,SLC10A1,CYP26C1,CLDN2,FIBCD1,BRDT,ANP32E,MYT1L,TNRC6B,C9orf110,WFD10B,DHX8,HNRNPG-T,IGSF4D,HIST1H3B,ZFP95,CYP24A1,PLXNA1,BRP44L,AUH,TGM7,TRPS1P2RY1,KCNK13,ST8SIA4,HLA-
GCM-101	6,26E-01	24	DMB,CEACAM20,ZIC5,IAPP,KCNH7,UBXD3,CNNM2,CIITA,UCKL1,H2BFM,C1orf52,ADAMTS20,B3GNT6,RTDR1,MCOLN2,ERN2,KLHL15,KMO,GRM2,CGI-09,C13orf12
GCM-102	6,36E-01	20	CKS1B,RAPH1,SFRS16,LUC7L2,KRTAP9-5,PFKL,TNS3,OR52B4,PPM1B,TRAPPC3,LCE1B,ZNRF1,OSTAlpha,POU3F2,PVALB,MAFG,OR2M2,RPL9,PRP2,PPP2R4
GCM-103	6,39E-01	251	LRRK1,ASL,C1GALT1C1,CREB3L2,GALE,C6orf118,MRPL1,EPHB2,GSPT2,C8orf58,TINAG,GMD5,CHI3L2,ARL6,KCNH5,CYP27A1,KCNN3,CFHR2,YPEL5,LGALS1,SCNN1B,TMEM84,PPARD,AFP,MT01,FIGN,DEK,RNU31,XRN2,ZNF624,SFRS5,C21orf42,C20orf71,LCE1F,RPRM,MRPS10,TRIB2,TAS2R4,ZNF682,SEPHS1,HSD17B12,EIF2B1,HUNK,ZCCHC2,GTPBP1,PCOTH,GNE,NRP1,ARPP-19,SIPAL3,UNG,RIC3,BTBD4,TUBGCP3,BTN2A1,LRRC7,DCC,TBPL1,TMEM104,SULF1,COL9A2,PRKRA,ARPP-21,ZNF527,CD40,MC4R,TMEM59,ALKBH3,TCF20,ZF,ARL5,APOL2,LRRC28,THEM2,KLHDC7B,KIF23,PPAPDC2,GPR149,RFP20S,ELMO1,CEP63,RNF44,SRPX2,FABP5,HS3ST5,POLR3F,EPPB9,PLA2R1,KIAA1086,ATPIF1,CARS,PARVG,RTBDN,SLC1A4,ZNF406,RPS6KL1,DDX52,FCRL2,C1orf108,NDEL1,SUHW1,FBXO3,FKBP1A,ITGA1,FEZ1,DDX18,RAF1,ZNF499,UGT2A3,SHANK1,WBSCR22,EFCAB1,ACBD7,ARV1,JUP,TMOD4,ZBTB1,PROCA1,TNNI2,MKKS,RAP80,PEX11B,FZD5,WDR61,C11orf16,KCNH3,RAPGEF6,MVK,PLEKHG3,PLGLA1,ESPN,POU1F1,CNDP1,IGFBP3,PPHLN1,TETRA,TEST1,OR2T1,APOM,CRSP3,PRPF4B,RKHD1,ART5,TTY5,G6PD,PPP1CC,FAM3D,CHST2,OR6T1,C14orf115,HGF,HOXC5,DOPEY1,TAF11,MPHOSPH10,TPT1,ASTE1,SUV420H1,RPS11,OVCH1,DSPG3,CCDC71,PDHB,C4orf6,HOXB9,LENG4,TTBK2,CBFA2T3,SLC16A7,TES,KRT8,ATP13A4,GNMG7,HOXA10,FAM62B,LOR,C21orf94,ASPHD1,CYP2E1,MYH16,ATOX1,ACTN1,AP1G1,ST8SIA5,THAP7,KIAA2013,HARSL,KIAA1212,TMEM86B,TMEM87A,SMYD3,RPL36AL,ZNF690,NECAP2,RFXAP,TLN1,WDR8,NR112,ATG16L2,PITX2,C8ORFK36,PTPN6,CIT,TRAF2,SAAI,TMEM9,MPP3,EPN3,NEU2,RARSL,DAZAP2,CDCA1,GCNT1,DCBLD1,HDAC9,OPTC,MAGEH1,GNMG3,ARL1,MMP20,CMAH,POLR1C,DERA,LOXHD1,TP53RK,C17orf75,LRRCS2,UNQ501,NEB,C20orf195,SOD3,EFHC1,ZNF35,SRP46,OGDH,REG1A,SLC22A1,SOX14,STARD4,OR51S1,CABLES2,OR5AK2,C17orf44,TWISTNB,TAS2R10,LHX6,OR52E8,EEF1A2,COL15A1,TNIP1,MARCH5
GCM-104	6,40E-01	38	RSPO1,GPC1,GGTLA1,C1orf83,VIPR2,C3orf23,XAB2,TMEM129,ZHX1,NEK6,CSAG1,OR52I1,OR2T8,TBC1D13,ADAMTS9,HS3ST6,OR5A1,UCP2,CD226,TTLL10,COX7A2L,SH3BP5,KRTAP6-2,OR2S2,CRADD,CCDC17,APBB1,TRIM7,WHDC1L1,ZNF679,CHKA,FLJ37201,PALM2,C7orf23,MARCH2,KLRC3,USP19,SIHA1
GCM-105	6,44E-01	62	CD44,MEFV,ERCC3,ZBED3,IGFBP2,CASP8,FMO4,APPBP2,TRIM4,BCDIN3,SLAMF8,YSK4,RANBP10,SPRY3,C7,CA2,GALNT13,ATP6A2,ALX4,PLCB1,ZSWIM5,HAGHL,DNAJB6,PTGDS,FMO6,APBA2BP,EBI2,GPBAR1,ZNF76,MPEE1,ALB,INS,HYPB,NAP1L2,RGS1,FBLN5,CNTN1,KRTAP11-1,PKIG,HSN2,PLA2G4E,DEAF1,TAF1C,BHLHB3,GUK1,FAS,TCEA2,RPESP,SLC35E3,PRKAB1,SIGLEC11,BMX,PFN3,SERPINB12,C10orf81,PTEN,PPPIA2,ARL8B,CAPN3,GBP3,ZIC1,FUT4
GCM-106	6,52E-01	18	GADD45GIP1,F8,REG1B,VENTXP7,RNF190,C9orf128,P2RY2,RBM35B,GFRA4,PROL1,FXN,AMOTL2,KRT25D,KIF27,IFIT5,OR1A2,TFE2,C11orf42
GCM-107	6,69E-01	17	ZNF694,SREBF2,PAK1,NUDT22,ZYG11A,DDX42,ABHD14A,SCNN1D,SCPEP1,K5B,RPS18,ANKDD1A,RPS29,CXCL12,IBRDC3,GGT1,WDR42A
GCM-108	6,72E-01	19	HAND1,AQP10,TKX,XYL2,ECE2,GPR62,FBXL12,C20orf141,SNAPC1,EREG,PRKAB2,EPGN,TAS1R2,ONECUT2,SOX21,TBC1D5,ZNF615,BAHD1,MRPS33,DUS3L,ATP4A,TLX2,FGF5,MSMB,CLUU1,SLC5A4,CLDN17,ZNF184,OR10AG1,RPH3A,IGF2AS,DGKI,KCNG3,NUP153,B3GALT3,PRKACB,FAM194A,WDR5B,AGC1,CLCN5,PRPF19,OR5R1,RNF7,OR4C12,CYP2C9,NFE2L2,HTR1A,ZNF595,RNF8,TP53,PET112L,IL17,DDDB1,NBN
GCM-110	7,23E-01	42	CDGAP,NALP8,TEDDM1,EEF1B2,CRX,NUDT14,RHBG,USH1G,UBE1L,FRMD4A,THUMPD3,B4GALT4,UTS2R,MAML3,RELB,C1orf159,LMO6,PTK2B,IGBP1,VAMP4,ST7,OR10A7,ZCCHC8,NR1H3,KRTAP5-6,TBC1D1,MFHAS1,PRKCZ,ACBD3,ARID2,FAM9B,ARCN1,KIAA1008,ZNF628,TBX5,C9orf71,GOLPH3L,FLNA,MGC16025,ASCC1,ZBTB17,SLC15A3
GCM-111	7,27E-01	30	SLC14A2,RHOT2,C3orf57,UBB,C21orf127,MON1A,DPP9,ZNF282,SPO11,CM7,RNF128,CART1,C1orf19,ICHTHYIN,U2AF1,BAT2,VENTX,APOL6,FMNL3,HCG4P6,KALRN,SYCP3,KIAA0913,PRDX3,RBM35A,MTMR12,GSTM4,OR52M1,RAD18,C3orf27
GCM-112	7,31E-01	19	TP53I13,PROSC,USP38,C11orf46,ARSK,TRPC4AP,CFL2,OR51A4,STRN4,OKI,PCMT1,TPD52L2,KCNIP2,C14orf125,KIAA1967,TMEM52,SP3,PTPN18,NUCB1
GCM-113	7,32E-01	18	CNIH2,OR2T4,ZMYND11,TNFSF15,MYBPH,OR1S1,IL19,OAZ1,OR4D5,FOXQ1,WDHD1,SPAG9,RNPC2,FAM71A,ZNF469,LTA4H,SEC10L1,ADAMTSL5
GCM-114	7,41E-01	31	RAD50,FAM77D,GDF15,WWP2,CHEK2,RARRES3,TGFBR1,AKT3,C18orf16,ILF3,ESCO2,PRM3,BBS7,PAK4,STX18,C20orf132,CRELD1,CLK11,U2AF1L3,TD

			RD7,ZNF442,NYD-
			SP11,ZNF304,FCHSD1,C13orf24,FSHB,ZNF645,USP15,OR1G1,NAB2,IL26
GCM-115	7,63E-01	112	TMEM16A,COL6A3,COL3A1,CYP2W1,TCO2,OR2Y1,EDNRA,HE55,OLFM3,ZNHIT3,PDE9A,ACTRT1,BACE2,COL5A2,APXL,CA5B,C12orf43,CTSK,EPHB1,KCNN2,C20orf96,RKHD3,CTNBL1,TNFRSF10B,CTAGE5,CA11,KCNJ13,EPHA10,SORCS2,BHLHB5,PLA2G12B,ATP6V0A4,SPATA3,SOX6,SLC9A5,DIP2B,IL3RA,MICAL-L2,KIF21B,PSMAL,GNAS,C6orf130,CDH13,C14orf150,PPIL4,PAXIP1,VMP,C
GCM-116	7,75E-01	28	HST6,KDELC1,MMP11,HIVEP1,COL5A1,CHST1,MTMR11,SBSN,MEIS1,RFC1,ZNF31,RFFL,C14orf37,ASPN,DAZL,PPEF1,CPT1C,SCRIB,MUC5B,C20orf177,APOL1,MAG11,IDH3B,PRAMEF8,ALAS2,ATP1B4,MXRA5,KIAA1324L,SLC12A1,IL29,STATIP1,WWC3,MYOM3,LRRN6A,COL6A1,COL1A1,CEACAM16,KCNK2,MAP2,SLC25A4,GPR162,GEMIN4,BMS1L,RGL1,PIGY,ARSG,POSTN,SEMA5B,C20orf22,THY1,MRPS18A,ZDHC9,MEIS3,C1QTNF6,LOXLI,TYRP1,ADAMTS12,ATP8B1,TRIM6-TRIM34,OR5AU1,OR10G3,GOSR2,ATP6V1B1,CLEC4C,TBX22
GCM-117	7,78E-01	24	CABP1,SERPINA11,GATM,ELOVL2,CHN1,IL22RA1,OR4C16,BPIL2,GLIS2,HTRIE,OR1L3,C14orf73,SYT13,HIST1H2BA,KIR2DL3,IGSF2,ING4,BMP3,DCNT1,LOC399715,FOXFI,OCLN,ANG,CGB2,TAP2,PTER,LRRC17,ARL9
GCM-118	7,89E-01	18	LIM2,TMPRSS4,GATA6,ATP6V1G3,NOTCH2NL,C14orf21,OR52L1,KCNIP1,PERQ1,MMP25,GPX5,MED19,ADPRHL1,TSC22D3,ERCC1,USP29,IFT20,CLSTN3,OR1A1,KIAA0141,SCOTIN,FKBP6,LYPD2,ARRB2
GCM-119	7,89E-01	22	WRB,BCL2L14,TOP2B,BCAP29,C1orf63,MIB2,YTHDC1,FAM11B,SCAMP3,TSPLYL,PITPNA,LRRFIP2,MITF,S100BP,ZNF594,NANP,RPS8,MBNL3
GCM-120	8,03E-01	55	FOXR1,SENP6,AIP,IFNA16,HILS1,MOBK2B,OPN5,C9orf98,INADL,TREH,HAO2,mimitin,CTBP2,SLC01A2,CMTM3,C14orf70,IL20RA,TAS1R1,ARL5C,HSPA1A,ZNF287,ZNF302
GCM-121	8,09E-01	17	CAPN12,GlyBP,NPAS2,GNAI3,POLE4,TMEM16B,LOC541473,HSP90AB1,CO
GCM-122	8,24E-01	33	PA,PBX1,OR52E6,PITX3,CASKIN1,SE C24D,BCL2L1,MTMR8,ZNF432,GJB7,P
GCM-123	8,33E-01	30	ABPC4,C8orf4,OR9G1,ILK,PEL3,KIAA1751,ZNF691,COG6,LOH12CRI,HDA
GCM-124	8,43E-01	16	C11,GCSH,TUBB2C,RBAK,TCF15,COL11A1,TJP2,OR4A47,NDRG4,ATCAY,ES
GCM-125	8,53E-01	16	PNP,GRM1,SFMBT2,C1orf179,KBTBD3,NAV2,HIST1H1D,BTBD8,NPNT,PCB
GCM-126	8,76E-01	30	D1,INGX,KNDC1,MRLC2,FABP2,NTHL1,OR7G1,RNUT1,CD200
GCM-127	8,79E-01	15	PVR,MYO7A,AAAS,TLE6,MAP3K3,SEZ6L2,DYRK2,GALNS,ZNF185,KLF7,C6orf134,TBC1D10A,GGN,UCP3,ASB6,PPA2,SCRNI
GCM-128	8,94E-01	22	KIAA0514,MAK10,ZSWIM1,USP8,MAP1LC3C,CLDND1,PRPF31,BAT2D1,UQ
GCM-129	8,95E-01	26	CR,LY6K,ANKRD11,SMG6,CCDC49,GSTP1,C20orf26,PTPRJ,FCHSD2,GYS2,C
GCM-130	8,97E-01	27	6orf71,CD63,STAU,SMPX,EPIM,NUDT16,ZNF205,DHX15,CYP2J2,TDRKH,CX
GCM-131	9,02E-01	23	orf42,MRPL43,ITR,SPACA4,DHX29
GCM-132	9,09E-01	22	EML1,PHF10,C6orf27,TGFB2,AACS,KRT20,THH,TRSPAP1,IFNA14,TMEM85,
GCM-133	9,13E-01	19	PRDM2,RHOBTB1,OR5K2,HLA-DPB1,MTFR1,OPLAH,CACNA1E,RHO,SH3TC2,C1orf32,HEXIM1,DOCK11,HS
GCM-134	9,18E-01	17	CARG,GUCA1C,ATP8B2,HSPC152,CYP17A1,ZNF696,UST,CST8
GCM-135	9,25E-01	37	RBPSUHL,NPHS2,FADS6,SPPL2B,TOP1MT,ABC7,SLC39A2,NRXN1,PDHA2,
GCM-136	9,33E-01	225	TMPRSS11F,BRCC2,HSD17B4,TRPM5,KCN4,PAD16,KIAA1840
			RTN2,EP58L2,DKFZp686O1327,FOLH1,SURF2,PCDH7,LZTR2,IREB2,ITGB1
			BP3,NUDT12,LRRTM4,MCHR2,UNQ2446,RORA,IL1F5,SLC7A13
			RBM7,C20orf29,PCNXL3,GPR56,C12orf23,C18orf51,HECA,CREB3L1,GALNT
			1,C3orf62,NADK,NTSR2,PDE4D,JUB,RELA,SMAP,MAP3K7IP2,TPST2,ZNF25
			0,CLIC4,ZNF160,PAFAH2,C10orf128,C1orf141,POFUT1,INPP5F,TFEB,ZFYV
			E9,ZNF295,OR2M5
			DSPP,TCF2,RUNX3,ASB15,CSPG6,FBXW2,KIAA1333,SLC6A7,CLCN3,GPA33,
			MLN,TOR1AIP2,CDH22,MME,HCN4
			ZC3HC1,RAP2C,IGSF6,ZNF93,PIK3R4,OSBPL8,FAM5B,BTRC,NAPE-
			PLD,THTPA,C6orf154,CLC,XAGE5,PDIA5,HSPBP1,C4orf16,C20orf144,POU6
			F2,SLC38A6,L3MBTL,C3orf28,CAPG
			TBX6,NOM1,SH3BGR,FREM2,FAM55D,DKK1,ARL14,C21orf45,KIR3DL1,SIR
			T6,GRAMD1C,MS4A10,WNT10B,C1orf125,LCE2A,TD02,MYOG,KIRREL3,LG
			ALS8,OR2B3,TUBB8,AKR1CL2,PCNA,NKD2,GAGE6,ATP10B
			GIF,OR52WI,MOBK2C,C1orf186,CLK3,CRSP7,SCD5,EXOSC4,MRPL52,PRR
			G4,EXOSC1,CDH24,SURF6,GPX7,ATP11C,TXNDC2,ZNF137,PPP3R1,ZNF354
			C,PRR10,CYHR1,SLC31A1,ZNF585A,UNC13A,ZNF512,KIAA0528,GRPEL1
			RNASEH1,LRRC29,EIF2S1,TPRX1,ME3,FAM43A,CACNG5,SEZ6L,CLTC,FOX
			P1,RBM13,SAS10,FXR1,TIGD1,LEPREL1,VDR,RBM3,MATN1,C9orf7,KIAA181
			5,MTFMT,CPAMD8,KRTAP2-2
			FBS1,GMPR,BAG2,THRAP2,MAT1A,FAM20A,APOC3,MPI,OR8B3,DENND1A,
			HRAS,PPY,ANKHD1,KLF17,ZNFX1,NUBP1,IHH,SLC6A15,PRDM13,BMP1,OB
			SL1,TCEB3B
			GLT6D1,PCDH20,ENTPD8,TTBK1,TNFRSF4,DLG1,ALDOA,KSR2,CACNB4,R
			GR,BTBD2,RXRG,SYN2,C20orf52,SCO1,C17orf41,ODF2L,FAM12B,MATN4
			CMTM2,CSTF1,LAMA3,PAD14,S100P,INVS,SRY,ZNRF2,OTUD7,ZDHC22,IL
			8RA,FGD2,GPR173,POPDC2,TPCN2,MUC13,VNN3
			BALI,ZNF335,PCNT2,LRRC51,CCL20,C15orf21,TTC19,PARP16,SCFD1,DEFA
			5,GPD2,ANGPTL3,UBE4B,BMP2,HSD11B1,TNFRSF9,RAP1A,PAK2,FANCA,C
			4orf8,C9orf46,C15orf48,SH3MD4,RASGRF1,DNASE1L3,LZTR1,TFEC,MAP2K
			3,ABCC12,LGTN,SNAP91,CTAG2,EEF2,GUCY1B2,MAP3K4,EIF3S6IP,ACBD5
			UBE2D3,VGLL4,C3orf21,RALBP1,UBE3A,OXAIL,C17orf70,LSM10,ALKBH8,T
			MEM1,NUP35,PRDM7,LYN,C20orf98,EMILIN1,SALL1,BLM,LHX4,CCNT1,CY
			SLTR1,KLHDC3,COBRA1,MYH6,NLF1,PIK3CG,APXL2,C19orf4,SAT,TBX1,LE
			MD3,C8orf38,ELMOD1,PTGFRN,CNTD,MLLT7,RASL12,VPS37D,DDX20,OR5
			2K1,CEP350,ZNF297B,PAD12,ARMC1,NKRF,NT5M,PTPLAD1,GUSBL1,C1orf
			35,PLXNB2,ACD,KIAA0195,DTNA,PLCB3,C8orf53,PLEKHF1,TFIP11,SGEF,K
			CND3,COL4A3,DNAJB5,STK38L,NES,CDC2L6,HLA-
			E,ALG14,RNF19,ZNF576,SRPK2,IFNAR2,TTC17,SLC23A3,SLC35D2,FAM99A,
			BTBD14B,ZNF573,FREQ,NRBP1,ASH1L,COPG2,CDC42EP5,ZNF364,SC5DL,

			SAMD1, C14orf104, PHC1, UBE2L3, WDTC1, TUBB4, TMEM5, NDE1, EIF5, DYRK1B, C3orf9, SLC9A1, FAM98A, DNAJB14, TXNDC9, ARMC8, TSR1, ADRA1B, PSG8, FLJ46906, TM7SF3, C1orf82, KLP1, SLC3A1, SPATA8, TMEM30A, TBRG4, TULP3, PRKAR2A, DNAJB2, CCAR1, EP300, PLA2G3, ZNF281, YIPF6, DIP13B, PAPD5, KATNAL1, CATSPER3, UROD, YPEL4, SLC25A5, ST3GAL4, C13orf23, ADNP, SLC2A1, RPS6KA6, RBM4, YPEL2, FSCN1, CABIN1, SRP19, UBE2N, IFIT3, TAX1BP1, SCDR10, E2F6, ARHGEF16, ITPR2, YWHAB, NOX1, SUZ12, OR5BF1, SF3B3, SDCCAG1, MUM1, CEP76, SETD6, NOL5A, FLG2, UBE2O, DLEU1, GLC2I1, LRFN3, LMO4, C9orf12, PLSR1, HEL308, COL4A3BP, TAF6, ASXL2, ATG9A, DUSP18, ABHD4, C15orf15, NFX1, CDV3, CEBPZ, LTV1, GTF2B, MRPL20, PDGFB, ATP6V0A2, YY1, BCOR, C6orf66, ARMCX1, TAZ, CCN1, TNPO1, PIAS1, UGCGLI, WDR12, MLANA, EIF2C2, USP35, ABCD1, ZNF157, KIAA0133, ASS, C20orf149, CAMK2G, TCAP, PTPN21, ZBTB40, CHCHD2, CNH3, RNU73, CDK10, CARD4, PSPC1, SLC7A1, TTC15, FZD9, MRPL50, FBXL7, IL18BP, HEBP1, MYO1E, ZCSL3, PLAC4, PPARBP, LRRC6, HYPE, TFB2M, FLCN, ZNF609, ING3, IL1F10, OR11G2, FAM55C, DRB1, UNQ1912, OR2AG2, XIST, CA6, ZFY, BCL11B, CHAT, PRKY, UTY, USP9Y, TRIM16, TTTY15, CENPC1, OTUD3, NAG6, SMCY, FGF1, LRSAM1, C19orf21, NLGN4Y, VGLL2, EIF1A, YCHCHD8, C9orf15A, RPS4Y1, C9orf57, OR2L13, C9orf15B, OR52J3, FGF12, RYR3, RNF12, OR6X1, TNFRSF11A, TMEM128, DPP6, H1T2, PCDHG3, TAAR9, FGA, ZNF407, C20orf79, SLC22A12, P18SRP, HISPPD2A, OR2F2, BCAN, FBXO24, MIP, CLEC9A
GCM-137	9,36E-01	29	
GCM-138	9,36E-01	20	
GCM-139	9,42E-01	26	NRXN3, HIST1H4F, MB, SPATA4, NT5DC3, HM13, DUSP4, BZW1, ZNF627, NPY, SDC4P, C1orf146, HOXD13, BICC1, TMEM74, HOXA1, SESN2, OTUB1, CTNNA3, C1QL2, FXYP7, DBI, HTR3E, RBX1, HTR7, LTB
GCM-140	9,48E-01	69	ADII, DCI, AHRN, NDRG1, SLC25A24, DP58, SNFT, PGLYRP1, SKI, UTP14C, OTUB2, KRTAP10-7, CGGBP1, MKRN2, CTTNBP2NL, ANXA2, ALDOC, TBP, ACYP2, SERINC2, ZNF11B, ZNF616, ARL6IP4, PSPN, ADRB1, ADORA2B, FCER2, RNF25, MFN1, TPST1, NAGS, PPP2R2B, MRPL42P5, ADAMTS2, YEATS2, KIAA0409, CXorf34, DDIT4L, IFNA7, QSCN6, C6orf59, AKAP13, HEXDC, HECW1, HBS1L, KCNE4, ABCC1, SLC25A3, XPO4, CP110, ANAPC5, PABPC1, RAB40B, VPS52, C10orf35, HCF2, MED6, BRUNOL5, FBXO47, AGMAT, RPL4, FBP1, CORO1C, MAP3K1, BDP1, ZNF700, ZZZ3, WDR70, UTP15
GCM-141	9,54E-01	34	F7, CYP4F2, MF12, CCDC69, IK, DBX1, HHAT, AMACIL2, CSDC2, ELK3, MBD3, C1orf88, IL20, SLC24A5, OR51A2, STAC3, MAPK8IP3, MAS1, CD276, MAFA, MTM1, PTPDC1, GPR157, PARC, C14orf111, IRGQ, NR4A3, ARG1, WDR47, RAXLX, DHX38, SETDB1, ANKRD28, BRF1
GCM-142	9,55E-01	56	TLE1, MOV10L1, GTF2A2, PCDHB17, TMCC3, RCL1, SKP1A, IL10RB, SYT14, C1orf60, CHDH, CD84, HDAC6, COLEC11, ASTN2, C12orf31, C15orf37, GATA4, CASC2, PDLIM5, ZNF256, PRND, VARS, NARG2, OR8G5, MAGED1, SLC43A1, PLXNB3, GAS2L3, PACSIN3, TMEM44, BNIPL, SLC22A3, DSCR3, EGF8, ALS2CR12, SLC30A8, HMBOX1, RGS3, EPX, GPM6B, CDH10, BMP2K, C10orf19, XAGE3, TM6SF2, PDLIT, CAMK2D, LRRC42, KIAA1914, ARPC5, RDH12, RET, OLR1, CHST5, ATOH8, RNF141, IL1RAP, RBP2, PKD1L1, DDX10, UNQ6975, GART, GRM7, C18orf26, FLOT2, CDC40, FAM11A, KIAA1838, SIGIRR, TDH, MYBPC1, DFFA, MYADML, EXOC1, RNASE8, PCSK2, TFAP4, SLC7A14, HRH4, SF3A1, BAI2, FAM20C, FBP1, CEBPB, FMNL2
GCM-143	9,61E-01	30	
GCM-144	9,79E-01	82	GLRX5, GMPR2, RAB19B, OR10H3, PCM1, NR6A1, MAPK11, Tenr, CRI2, C6orf25, C21orf7, SCN2A2, PRSSL1, RNU64, HIST3H2A, TPR, ZNF558, HS3ST4, ZPBP2, ERH, PMCHL1, GPATC4, A2BP1, MOCS2, KIAA0090, OR5112, C9orf21, LSM8, C2orf18, RSHL2, PHEX, PCK2, SYT7, PCSK6, PPAP2C, TH1L, C2orf59, TCN2, SLC26A8, RPP38, SCT, KCNK4, TMEM76, SYNPO2L, PIGH, COG8, SS18L1, GPR6, PRMT3, C10orf162, USP39, THRAP6, ANKRD30A, NDUFA10, FOXN1, KBTBD2, OR5K1, IPPK5, TK32A, ST3GAL1, C21orf121, MYOD1, GPR24, STMN1, RAD52B, EIF2AK1, TSPAN1, NIPBL, RNU35B, IL31, PLRG1, SYCP1, PANK1, VLDLR, FBXO38, H19, HIGD1A, OR13D1, PNLIP, MYEF2, PCDHA12, RNF13
GCM-145	9,83E-01	28	RFPL2, MIR16, NUDT6, UTS2D, LHFPL1, ZFYVE27, P2RY6, ICOSLG, DGKK, AKA P5, USP1, ZNF482, SAMD12, LIPF, SLC5A1, TBX21, C10orf47, OR2L2, LBX2, SLC5A32, SRP35, KRTHB5, BZRPL1, OR10G8, RNF186, CPEB2, DUSP22, TTTY18
GCM-146	9,85E-01	28	MAP1B, PTPN2, POLR2H, APOBEC3A, CXorf17, C14orf105, psiTPTE22, ABL1, MDC1, LECT1, BMP15, UROS, NUDT19, CEBPD, PPP1R1C, C10orf62, G1P3, IRF3, IL6ST, RIMS4, STK35, F3, OLIG1, TMEM62, PSMC1, CROP, COL20A1, ANKRD17, POMGNT1, CTSE, ABHD7, SNRPD3, SLC44A2, GREB1, LOC645752, GOLPH4, SLC7A4, C5, ARNT, TBC1D4, OR5H14, PPFIA1, VPS45A, NOTCH2, MDM2, ARHGAP18, RAP1B, POLL, TNFSF8, C6orf85, LACTB2, ASB4, SRMS, NPFF, SCCPDH, PDZD4, TA-PP2C, BMPR1B, KBTBD11, TLL2, NAG, SEMA6C, MAP3K2, THAP3, WDSOF1, PBEF1, LAPTM4B, FAM19A2, PSCD3, NUP133, ZNF272, MAP2K5, WTAP, PSM7, VIP, MECR, CD200R2, CASP12, OR5AC2, GALNT6, C9orf39, OR9K2, ZNF444, C6orf96, HECTD3, YY2, OR4M1, TNFRSF25, MRPL32, KIAA1377, BTBD5, PPP1R9B, C14orf126, PDK2, USP21, RALGDS, MRPS30, C21orf62, U18C, PLEKH2, UBTF, CBX3, ENPP3, DDX21, ZNF193, COG4, MRPL35, ALS2, ZPBP, MRPS27, RBM19, RAB40C, HRB, TSCOT
GCM-147	9,87E-01	86	
GCM-148	9,89E-01	75	GPR25, FBN3, C1orf57, GPX1, YBX1, MYL5, ITGB3BP, CCDC12, XRCC6, C7orf31, CCDC54, GNAZ, PIGS, C20orf27, C17orf65, CAMK2B, LOC642852, BEXL1, ESCO1, IL17RE, OR4C45, WDR37, MTCH2, C6orf57, F11R, GPR110, ANKRD19, PTPRF, I MPA2, CDH18, U1SNRNPBP, DOC2A, PSKH1, LMAN1L, C9orf75, PDXK, TBC1D2B, SMAD1, COX8A, LIG4, MEP1A, CNGB3, ZNF226, INSL6, FOXR2, C15orf40, VTI1B, C12orf62, NMB, PISD, H2AFJ, ICAM4, WFDC8, CAB39, PCDHGA11, KLCC2, IVD, TAS2R46, RPL23, TAF10, OR5A1, OR6B1, ZNF336, GPR161, ZW10, SLIT2, OR4K1, NDUFS7, APC2, FRK, LGALS4, TSC1, LCE3D, FLJ20021, LSM6
GCM-149	9,90E-01	24	LOC200726, VCX, KRT12, SHBG, OR6K3, RTN3, CASP4, ZNF354A, ALPL, KRTAP10-12, FOXL1, NOPE, KRTAP19-, U101, THRB, PAGE2, PSG6, CST1, SIVA, FMN2, OR7C2, OTOPI, FGF14, SGIP1

Abbreviations: GCM, gene coexpression module.

1.3 Table-S3. Gene overlap between the 149 GCMs and genetic findings from previous studies

GCM	GWAS RISK LOCI FOR RA	GENES TRANSCRIPTOMICALLY ASSOCIATED WITH ANTI-TNF RESPONSE IN THE RA SYNOVIUM	GENES ASSOCIATED WITH ANTI-TNF RESPONSE AT THE GENETIC LEVEL
GCM-1			
GCM-2	<i>SMG7</i>		
GCM-3		<i>PCSK7, RAPGEF1</i>	
GCM-4		<i>VEPH1</i>	
GCM-5		<i>ADRA2C, TCF4, SHC1</i>	
GCM-6			
GCM-7			
GCM-8	<i>RSBN1</i>	<i>PRICKLE1, SYAPI, PGD, CD163</i>	
GCM-9			
GCM-10		<i>ZNF425</i>	
GCM-11		<i>GSTT1, RANBP17</i>	
GCM-12		<i>NT5C3</i>	
GCM-13			
GCM-14			
GCM-15		<i>INSIG1, PLEKHA2, MFAP5, DPYSL4, STXBP6, SLK</i>	
GCM-16		<i>EIF4E2</i>	
GCM-17	<i>HLA-DRA, TAGAP, SYNGR1, MECP2</i>	<i>HLA-DPA1, RASSF4, GNRH1, GSTA4, IL6, OR6C74</i>	
GCM-18		<i>SYNJ2</i>	
GCM-19		<i>TPP1, MET, BIRC5, NEXN</i>	
GCM-20		<i>IL13RA2</i>	
GCM-21			
GCM-22		<i>MASP2, CTSG, ELOVL4</i>	
GCM-23			
GCM-24		<i>MYO1B, GBP7</i>	
GCM-25		<i>LRP2</i>	
GCM-26		<i>TMOD2</i>	
GCM-27			
GCM-28		<i>CXCR4</i>	
GCM-29	<i>TNFRSF14, PRKCH</i>	<i>USP53, C8B, TNFSF10, FANCD2, STAT2, CLIC3</i>	
GCM-30	<i>STAG1</i>		
GCM-31		<i>IL21R</i>	
GCM-32	<i>SPSB1</i>		
GCM-33			

GCM-34		<i>TAS2R50</i>	
GCM-35			
GCM-36	<i>AFF3, PLCL2</i>		
GCM-37		<i>AGPAT4</i>	
GCM-38	<i>NEUROD2</i>		
GCM-39			
GCM-40			
GCM-41			
GCM-42			
GCM-43			
GCM-44			
GCM-45		<i>RSPO3</i>	<i>EYA4</i>
GCM-46		<i>DLC1, HOP</i>	
GCM-47			
GCM-48			
GCM-49		<i>NONO</i>	
GCM-50			
GCM-51	<i>SUOX</i>	<i>ITGAX, MMP9</i>	
GCM-52	<i>CD200R1</i>	<i>AQP9</i>	
GCM-53		<i>ALDH1A3, SCARA3</i>	
GCM-54			
GCM-55			
GCM-56	<i>GPC5</i>	<i>RNF11</i>	
GCM-57	<i>RUNX1</i>	<i>FOXC2, ADAMTS5</i>	
GCM-58		<i>MBP</i>	
GCM-59	<i>EXOC2</i>	<i>TYROBP, MRPL33, ATP5H</i>	
GCM-60		<i>MGST2, MPP7</i>	
GCM-61			
GCM-62			
GCM-63		<i>IGJ, GCNT2, MED12L</i>	
GCM-64		<i>COCH</i>	
GCM-65			
GCM-66		<i>AXIN2</i>	
GCM-67	<i>HLA-DRB5, UTS2</i>		
GCM-68		<i>TIMP1</i>	
GCM-69	<i>HLA-DRB1, TRAF6</i>		
GCM-70			
GCM-71	<i>FCGR2B</i>		
GCM-72	<i>IL2</i>		
GCM-73	<i>PTPRC</i>	<i>SYPL1</i>	
GCM-74	<i>FCRL3, CCR6, BLK</i>	<i>RABGAP1L, VANGL1, MAP4K2, DUSP1</i>	<i>MAPK37</i>
GCM-75			
GCM-76			
GCM-77		<i>MPST, RDX, SLC6A8, MNDA,</i>	

<i>CDKN3, KIAA1274</i>		
GCM-78		
GCM-79	<i>UBA52, SOX5, FN1, PCGF5</i>	
GCM-80	<i>HSPC023</i>	
GCM-81		
GCM-82	<i>SMC4L1</i>	
GCM-83		
GCM-84		
GCM-85	<i>SPRED2</i>	
GCM-86	<i>GNG4</i>	
GCM-87	<i>THAP11, MGLL</i>	
GCM-88		
GCM-89	<i>TFPI</i>	
GCM-90	<i>ZAP70</i>	
GCM-91		
GCM-92		
GCM-93		
GCM-94	<i>PLD4</i>	<i>ENPP4</i>
		<i>OR10A3</i>
GCM-95	<i>GLDN, CDC42EP3, CXCL3</i>	
GCM-96		
GCM-97		
GCM-98		<i>PKD1L3</i>
GCM-99	<i>CORO2A</i>	
GCM-100		
GCM-101	<i>HLA-DMB</i>	
GCM-102		
GCM-103	<i>TNIP1, CD40, APOM</i>	<i>LGALS1, SCNN1B, TWISTNB, TBPL1, CHST2, DCBLD1, CDCA1, KIF23, ARL6, YPEL5</i>
GCM-104	<i>CD226</i>	
GCM-105	<i>CASP8</i>	<i>SLAMF8, ZIC1, C7, PTGDS</i>
GCM-106		
GCM-107		
GCM-108		
GCM-109		<i>NBN</i>
		<i>ZNF595</i>
GCM-110	<i>RELB</i>	
GCM-111	<i>MCM7</i>	
GCM-112		
GCM-113	<i>ZMYND11</i>	
GCM-114	<i>ILF3</i>	
GCM-115	<i>PP1A</i>	<i>POSTN, KCNJ13</i>
GCM-116	<i>TAP2</i>	<i>TAP2</i>
GCM-117		
GCM-118	<i>MIB2</i>	
GCM-119		

GCM-120	<i>COG6, NAV2</i>		<i>NAV2</i>
GCM-121		<i>SEZ6L2</i>	
GCM-122			
GCM-123		<i>TGFB2</i>	
GCM-124			
GCM-125			
GCM-126			
GCM-127			
GCM-128			
GCM-129	<i>ARL14</i>		
GCM-130		<i>GRPEL1</i>	
GCM-131		<i>FOXP1</i>	
GCM-132		<i>GMPR</i>	
GCM-133			
GCM-134	<i>PADI4</i>		
GCM-135	<i>TNFRSF9, DNASE1L3</i>	<i>GPD2</i>	
GCM-136	<i>UBE2L3, PADI2</i>	<i>ATP6V0A2, CATSPER3, FSCN1</i>	
GCM-137			
GCM-138			
GCM-139		<i>LTB</i>	
GCM-140		<i>PPP2R2B</i>	
GCM-141			
GCM-142	<i>ALS2CR12</i>	<i>TLE1, PDLIM5</i>	<i>CD84</i>
GCM-143		<i>FBP1</i>	
GCM-144	<i>SCT, ZPBP2</i>	<i>PCSK6, STMN1</i>	
GCM-145	<i>ICOSLG</i>		
GCM-146	<i>PTPN2</i>		
GCM-147	<i>C5</i>	<i>C5</i>	
GCM-148		<i>C15orf40</i>	<i>CDH18</i>
GCM-149			<i>ALPL</i>

Abbreviations: GCM, gene coexpression module.

1.4 Table-S4. Gene coexpression module associations with the clinical response to anti-TNF treatment at the genetic level

GCM¹	ANTI-TNF (P)	ADL (P)	IFX (P)	ETN (P)
GCM-1	1,67E-01	9,93E-01	9,16E-01	8,26E-02
GCM-2	6,82E-01	9,40E-01	7,09E-01	4,60E-01
GCM-3	3,21E-01	2,13E-01	6,52E-01	8,81E-01
GCM-4	8,31E-01	2,05E-01	2,96E-01	4,55E-01
GCM-5	8,18E-01	4,51E-01	8,12E-01	6,15E-01
GCM-6	5,90E-01	5,25E-01	9,79E-01	2,05E-01
GCM-7*	9,59E-01	1,60E-02	1,79E-01	1,06E-01
GCM-8	8,33E-01	5,87E-01	8,13E-01	1,33E-01
GCM-9	7,92E-01	9,26E-01	3,06E-01	9,76E-01
GCM-10*	5,18E-01	4,28E-01	2,12E-02	6,41E-01
GCM-11	9,90E-01	8,28E-01	8,99E-01	8,46E-01
GCM-12	8,94E-01	2,56E-01	5,81E-01	6,15E-01
GCM-13	5,54E-01	6,60E-01	8,30E-01	8,25E-01

Abbreviations: GCM, gene coexpression module; TNF, tumor necrosis factor; ADL, clinical response to adalimumab; IFX, clinical response to infliximab; ETN, clinical response to etanercept; P, p-value.

¹ Only the 13 gene coexpression modules that were significantly associated at the transcriptomic level were tested at the genetic level.

* Gene coexpression module showing a significant association with the clinical response to the indicated treatment

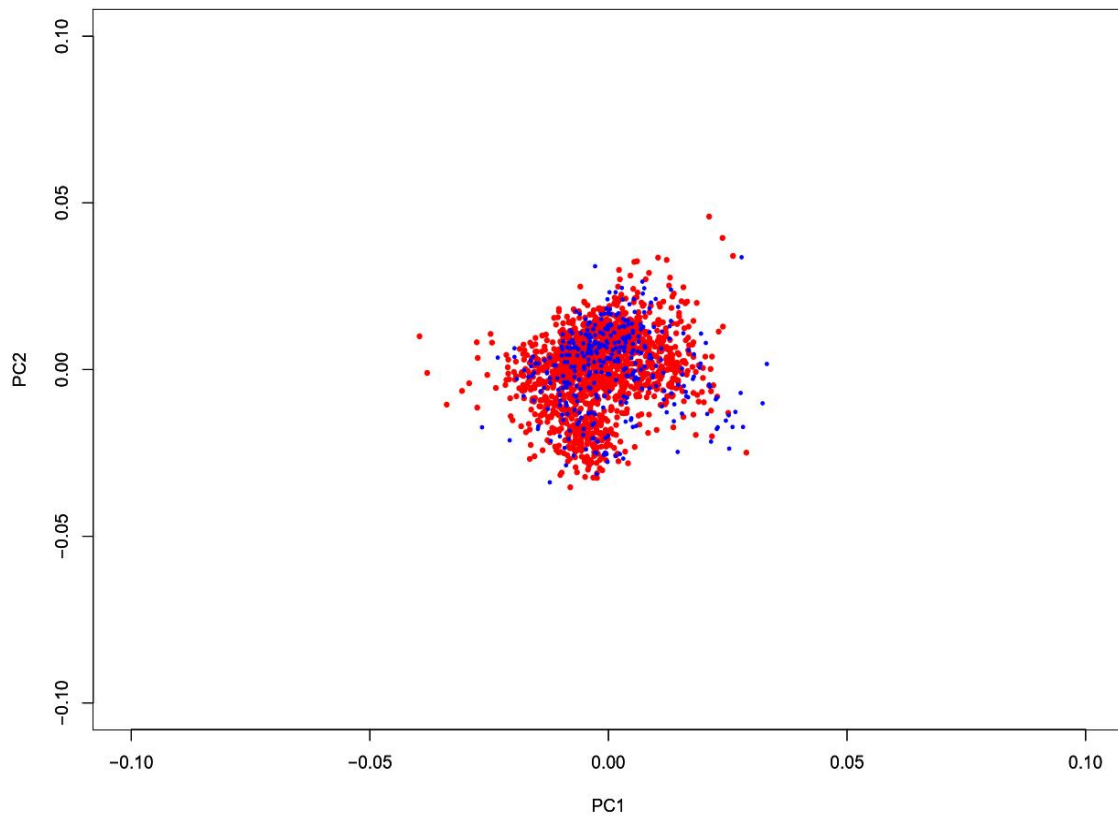
1.5 Table-S5. Genes mapping to the biological processes that are nominally enriched in genes from the adalimumab-associated module

BIOLOGICAL PATHWAY	DATABASE	GENES (N)	GENES
Metabolism of nucleotides	Reactome	70	ADA, PAICS, ADSSL1, ADK, CTPS1, UPP2, AD SL, ADSS, DCK, DCTD, DGUOK, DHODH, DP YD, DPYS, DTYMK, DUT, TYMP, AK1, AK2, NT 5C2, GART, AK5, AMPD1, AMPD2, AMPD3, G LRX, GMPR, GPX1, GSR, GUK1, NT5C, HPRT1 ,APRT, IMPDH1, IMPDH2, ATIC, NME1, NME 2, NME4, PNP, NT5E, RRM2B, NT5C3A, GMPR 2, CMPK1, UPB1, PFAS, PPAT, CTPS2, NT5M, RRM1, RRM2, AGXT2, TK1, TK2, TXN, TXNRD 1, TYMS, UCK2, UMPS, UPP1, XDH, CAD, UCK 1, NT5C1A, CAT, GMPS, NT5C1B, GDA, CDA
GP1b-IX-V activation signaling	Reactome	10	FLNA, GPI1BA, GPI1BB, GP5, GP9, PIK3R1, RA F1, SRC, VWF, YWHAZ
Interleukin-7 signaling	Reactome	11	HGF, IL2RG, IL7, IL7R, JAK1, JAK3, PIK3R1, P IK3R2, STAT5A, STAT5B, PIK3R3"
Pyrimidine catabolism	Reactome	12	UPP2, DPYD, DPYS, TYMP, NT5C, NT5E, NT5 C3A, UPB1, NT5M, AGXT2, UPP1, NT5C1A"
Regulation of signaling by CBL	Reactome	18	CRK, CRKL, FYN, GRB2, RAPGEF1, BLNK, HC K, LYN, PIK3CA, PIK3CB, PIK3CD, PIK3R1, PI K3R2, SYK, VAV1, YES1, PIK3R3, CBL
Synthesis and interconversion of nucleotide di- and triphosphates	Reactome	18	CTPS1, DTYMK, AK1, AK2, AK5, GLRX, GSR, G UK1, NME1, NME2, NME4, RRM2B, CMPK1, C TPS2, RRM1, RRM2, TXN, TXNRD1
Tie2 Signaling	Reactome	18	ANGPT1, ANGPT2, GRB2, GRB7, GRB14, HRA S, KRAS, NRAS, ANGPT4, PIK3CA, PIK3CB, PI K3R1, PIK3R2, PTPN11, SHC1, SOS1, TEK, DO K2
Signaling by constitutively active EGFR	Reactome	19	CDC37, EGF, EGFR, GAB1, GRB2, HRAS, HSP 90AA1, KRAS, NRAS, PIK3CA, PIK3R1, PLCG1 ,RPS27A, SHC1, SOS1, UBA52, UBB, UBC, CBL
Nephrin interactions	Reactome	22	CD2AP, FYN, NCK1, NPHS1, PIK3CA, PIK3CB ,PIK3R1, PIK3R2, KIRRELI, SPTAN1, SPTBN1 ,ACTN4, KIRREL2, NCK2, KIRREL3, CASK, A CTN1, ACTN2, IQGAP1, ACTN3, WASL, MAGI 2
Pyrimidine metabolism	Reactome	24	UPP2, DCK, DCTD, DHODH, DPYD, DPYS, D UT, TYMP, NT5C, NT5E, NT5C3A, UPB1, NT5 M, AGXT2, TK1, TK2, TYMS, UCK2, UMPS, UP PI, CAD, UCK1, NT5C1A, CDA
Interleukin receptor SHC signaling	Reactome	28	CSF2, CSF2RA, CSF2RB, GRB2, HRAS, IL2, IL2 RA, IL2RB, IL2RG, IL3, IL3RA, IL5, IL5RA, INP P5D, INPPL1, JAK1, JAK2, JAK3, PIK3CA, PIK 3CB, PIK3CD, PIK3R1, PIK3R2, PTPN6, SHC1 ,SOS1, PIK3R3, GAB2
CD28 co-stimulation	Reactome	31	AKT3, THEM4, MAP3K8, AKT1, AKT2, MTOR, RICTOR, FYN, GRB2, LCK, LYN, PAK1, PAK2, PDPK1, PIK3CA, PIK3R1, PIK3R2, TRIB3, RA C1, MLST8, SRC, VAV1, YES1, MAPKAP1, PIK3 R3, MAP3K14, CD28, GRAP2, CD80, CD86, CD C42
GPVI-mediated activation cascade	Reactome	33	AKT3, VAV3, COLIA1, COLIA2, PIK3R6, AKT 1, AKT2, FCER1G, PIK3R5, FYN, LAT, RHOA, R HOB, RHOG, LCK, LCP2, LYN, GP6, PDPK1, PI K3CA, PIK3CB, PIK3CG, PIK3R1, PIK3R2, PL CG2, PRKCZ, RAC1, RAC2, SYK, VAV1, VAV2, PIK3R3, CDC42

PI3K/AKT activation	Reactome	37	<i>AKT3, CDKN1A, CDKN1B, CHUK, THEM4, CREB1, AKT1, AKT2, FOXO1, FOXO3, PHLPP1, MTOR, RICTOR, GSK3A, GSK3B, NR4A1, IRS1, RHOA, MDM2, FOXO4, NGF, NTRK1, PDPK1, PIK3CA, PIK3CB, PIK3R1, PIK3R2, BAD, PTEN, TRIB3, RPS6KB2, MLST8, TSC2, MAPKAP1, CASP9, AKT1S1, IRS2</i>
PI3K events in ERBB4 signaling	Reactome	38	<i>AKT3, CDKN1A, CDKN1B, NRG3, CHUK, THEM4, CREB1, NRG4, HBEGF, ERBB4, EREG, AKT1, AKT2, FOXO1, FOXO3, PHLPP1, MTOR, RICTOR, GSK3A, GSK3B, NRG1, NR4A1, MDM2, FOXO4, PDPK1, PIK3CA, PIK3R1, BAD, PTEN, TRIB3, RPS6KB2, MLST8, BTC, TSC2, MAPKAP1, CASP9, AKT1S1, NRG2</i>
GAB1 signalosome	Reactome	39	<i>AKT3, CDKN1A, CDKN1B, CHUK, THEM4, CREB1, CSK, EGF, EGFR, AKT1, AKT2, FOXO1, FOXO3, PHLPP1, MTOR, RICTOR, GAB1, GRB2, GSK3A, GSK3B, NR4A1, MDM2, FOXO4, PDPK1, PIK3CA, PIK3R1, PAG1, BAD, PTEN, TRIB3, PTPN11, PXN, RPS6KB2, MLST8, SRC, TSC2, MAPKAP1, CASP9, AKT1S1</i>
Interleukin-2 signaling	Reactome	42	<i>CSF2, CSF2RA, CSF2RB, PTK2B, GRB2, HRAS, IL2, IL2RA, IL2RB, IL2RG, IL3, IL3RA, IL5, IL5RA, INPP5D, INPPL1, JAK1, JAK2, JAK3, KRAS, LCK, NRAS, PIK3CA, PIK3CB, PIK3CD, PIK3R1, PIK3R2, MAPK1, MAPK3, MAP2K1, MAP2K2, PTPN6, RAF1, SHC1, SOS1, STAT5A, STAT5B, SYK, YWHAB, PIK3R3, CDK1, GAB2</i>
PI3K events in ERBB2 signaling	Reactome	44	<i>AKT3, CDKN1A, CDKN1B, NRG3, CHUK, THEM4, CREB1, NRG4, HBEGF, EGF, EGFR, ERBB2, ERBB3, ERBB4, EREG, AKT1, AKT2, FOXO1, FOXO3, PHLPP1, MTOR, RICTOR, GAB1, GRB2, GSK3A, GSK3B, NRG1, NR4A1, MDM2, FOXO4, PDPK1, PIK3CA, PIK3R1, BAD, PTEN, TRIB3, RPS6KB2, MLST8, BTC, TSC2, MAPKAP1, CASP9, AKT1S1, NRG2</i>
Interleukin-3, 5 and GM-CSF signaling	Reactome	46	<i>TEC, CRK, CRKL, CSF2, CSF2RA, CSF2RB, FYN, GRB2, RAPGEF1, BLNK, HCK, HRAS, IL2, IL2RA, IL2RB, IL2RG, IL3, IL3RA, IL5, IL5RA, INPP5D, INPPL1, JAK1, JAK2, JAK3, LYN, PIK3CA, PIK3CB, PIK3CD, PIK3R1, PIK3R2, PRKACB, PTPN6, PTPN11, SHC1, SOS1, STAT5A, STAT5B, SYK, TEC, VAV1, YES1, YWHAZ, PIK3R3, CBL, GAB2</i>
Downstream TCR signaling	Reactome	50	<i>MALT1, CHUK, TAB2, TRBV12-3, TRBC1, TRAV19, TRAV8-4, TRAC, 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, IKBKB, INPP5D, LCK, NFKB1, NFKBIA, TRAF1, PDPK1, PIK3CA, PIK3CB, PIK3R1, PIK3R2, PRKCQ, PTEN, RELA, MAP3K7, TRAF6, UBE2N, UBE2V1, CARD11, IKBKG, RIPK2, BCL10, CD3D, CD3E, CD3G, CD247, CD4</i>
Mitochondrial Protein Import	Reactome	52	<i>TOMM6, TIMM23, COX17, SLC25A13, TIMM17B, TIMM17A, TOMM40, TIMM44, MTX2, DN AJC19, CHCHD4, GRPEL2, CS, HSCB, CYC1, TIMM8A, LDHD, PMPCA, FXN, SAMM50, TIMM10B, TIMM13, TIMM10, TIMM9, TIMM8B, GFER, COQ2, TIMM21, SLC25A4, SLC25A6, TIMM22, HSPA9, HSPD1, IDH3G, TOMM5, MTX1, ATP5F1A, ACO2, ATP5F1B, PAM16, ATP5MC1, TOMM7, TOMM22, BCS1L, TAZ, VDACL1, GRPEL1, SLC25A12, TIMM50, PMPCB, TOMM20, TOMM70</i>

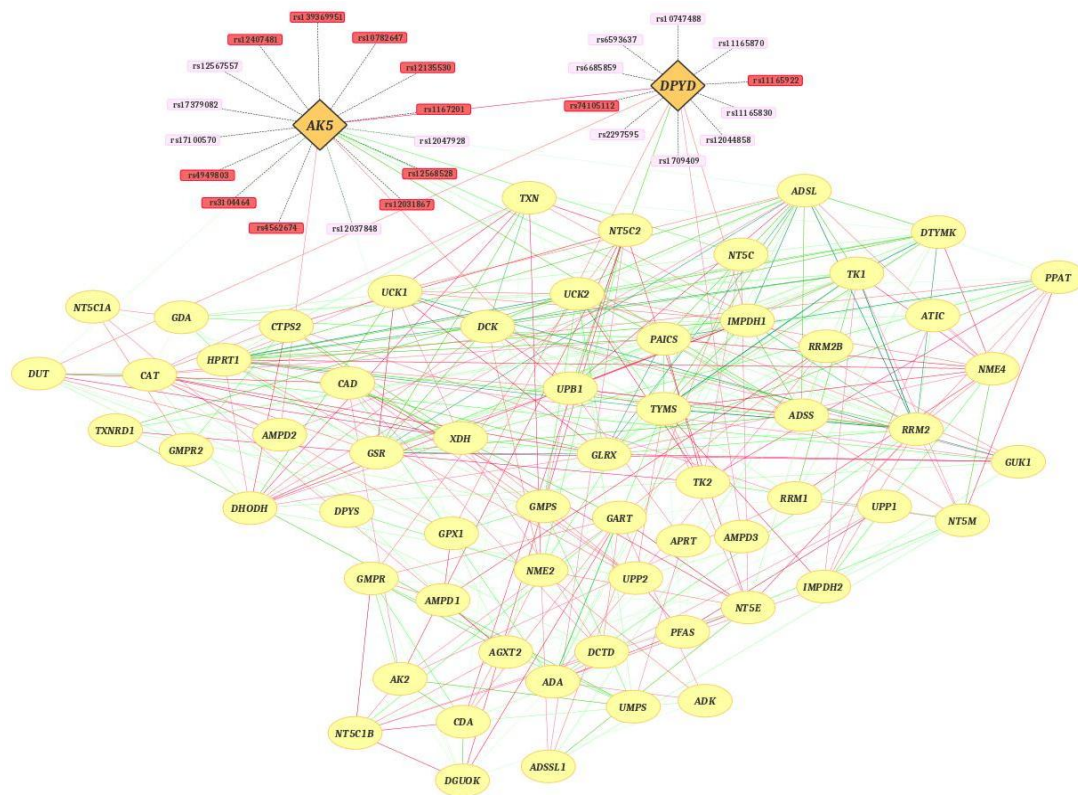
2. Supplementary Figures

2.1 Figure S1. Principal components of the RA cohort used in the discovery stage of the genetic association analysis



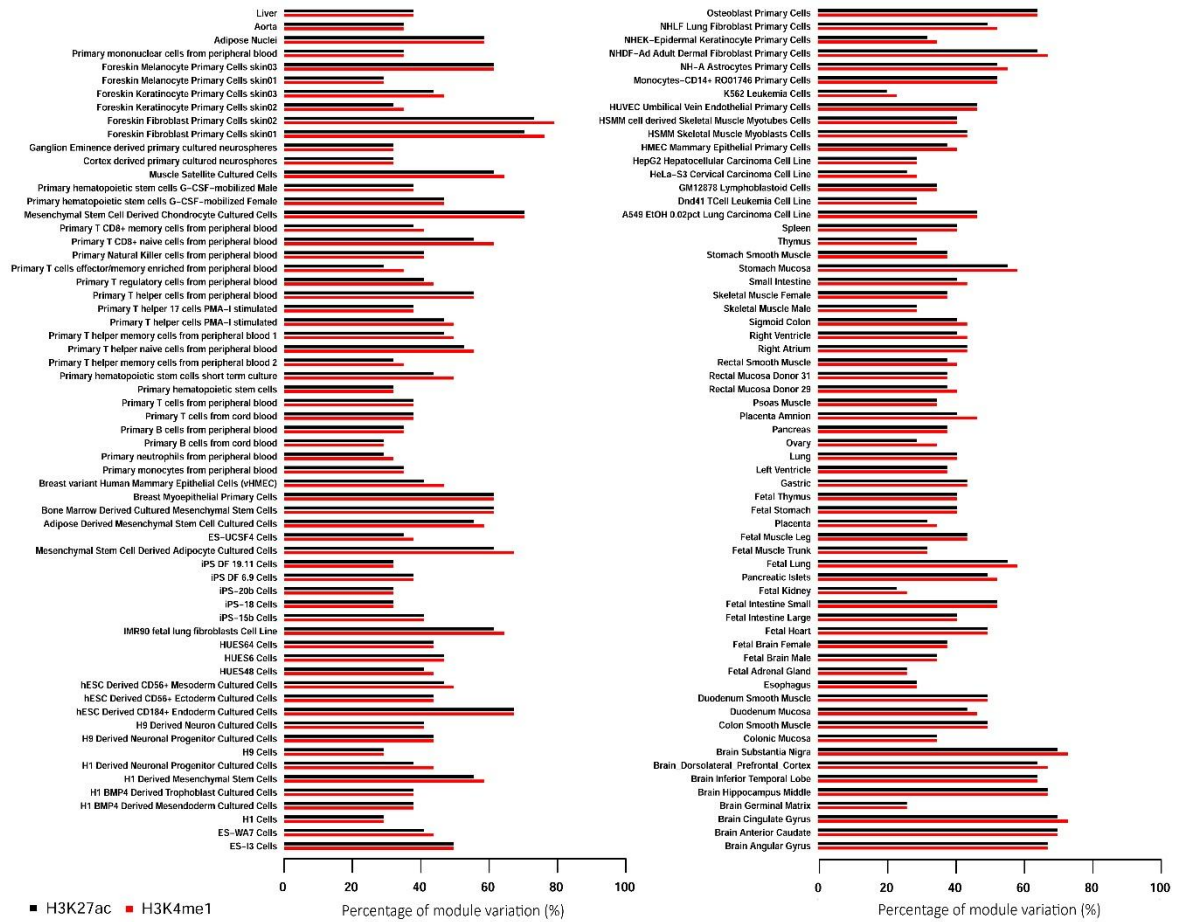
The anti-TNF treated rheumatoid arthritis patients (blue dots) and control patients (red dots) are plotted according to their first (PC1) and second (PC2) principal components estimated in EIGENSTRAT using the GWAS data.

2.2 Figure S2. Nucleotide metabolism pathway integrating GCM and SNP information



Gene co-expression network illustrating the nucleotide metabolism pathway in the RA synovium. In this network, genes are connected according to their gene expression correlation in the synovial tissue. Green and red lines indicate positive and negative correlation, respectively. The *AK5* and *DPYD* genes from the adalimumab-associated module (i.e. GCM-7) are represented as orange diamonds. The SNPs from the GCM-7 that were found to be associated with adalimumab response ($P < 0.05$) are connected to their assigned genes by a dashed black line. The associated SNPs that are not in linkage disequilibrium in the discovery and replication cohorts ($r^2 < 0.2$) are colored in red and pink, respectively.

2.3 Figure S3. Epigenetic fine-mapping of genetic variation from the GCM-7 and the cell-type specific H3K27ac and H3K4me1 marks.



Percentage of genetic variation from the GCM-7 mapping on cell-type specific enhancer histone marks. Following the same approach that we used to perform the cell-type epigenetic enrichment analysis on H3K4me3, the present epigenetic fine-mapping was focused on adalimumab-associated variants from the GCM-7 ($P < 0.05$ in either the discovery or replication cohorts) that are not in linkage disequilibrium ($r^2 < 0.2$). The cell-type specific epigenetic histone marks H3K27ac and H3K4me1 are colored in black and red, respectively.