

Functional Annotation of CNVR in three horse breed

Table S2 KEGG pathway analysis

KEGG Pathway	Gene Count	P Value	Gene
ecb04612:Antigen processing and presentation	14	1.41E-04	MHCX1, KLRD1, HSPA4, HSPA1L, IFNG, CTSB, LRRC9, EQMCE1, DRB1, DQA3, DQB1, DQA1, DRB2, DQA2
ecb05321:Inflammatory bowel disease	12	3.89E-04	DRB1, IFNGR2, IL12RB2, IFNG, FRAS1, FRAS1, IL23R, DQB2, DQA1, DRB2, IL18RAP, DQA2
ecb04726:Serotonergic synapse	16	4.14E-04	ALOX12, HTR1E, ALOX5, GNAI2, KCNJ6, HTR7, HTR1A, CYP2C108, CYP4X1, HTR5A, GNAO1, PLA2G4A, HTR1F, KCND2, GNG11, ALOX15B
ecb05145:Toxoplasmosis	15	6.58E-04	MAP3K7, IFNGR2, CCR5, HSPA1L, ALOX5, IFNG, GNAI2, DQB2, DRB1, GNAO1, DQA3, DQB1, DQA1, DRB2, DQA2
ecb05150:Staphylococcus aureus infection	14	0.001589502	KRT10A, DEFA31L, DQB2, DEFA22, DEFA5L, DRB1, DQA3, DQB1, CFH, DQA1, DRB2, ITGB2, ECATH-3, DQA2
ecb05323:Rheumatoid arthritis	13	0.001979771	IFNG, DQB2, DRB1, DQA3, DQB1, CXCL6, ATP6V1H, CXCL8, DQA1, ACP5, DRB2, ITGB2, DQA2
ecb04514:Cell adhesion molecules	18	0.002371425	F11R, MHCX1, CDH2, CNTN1, VCAN, DQB2, VTCN1, PTPRC, EQMCE1, DRB1, ITGA8, DQA3, DQB1, ITGB8, DQA1, DRB2, ITGB2, DQA2
ecb05332:Graft-versus-host disease	11	0.002491976	EQMCE1, DRB1, MHCX1, KLRD1, IFNG, DQA3, DQB1, DQB2, DQA1, DRB2, DQA2
ecb05140:Leishmaniasis	11	0.004276101	MAP3K7, DRB1, IFNGR2, IFNG, FRAS1,

			FRAS1, LRRC9, DQA1, FRAS1, ITGB2, DQA2
ecb05330:Allograft rejection	10	0.00482715 2	EQMCE1, DRB1, MHCX1, IFNG, FRAS1, FRAS1, LRRC9, DQA1, FRAS1, DQA2
ecb04940:Type I diabetes mellitus	10	0.01027829 4	EQMCE1, DRB1, MHCX1, IFNG, FRAS1, FRAS1, LRRC9, DQA1, FRAS1, DQA2
ecb05416:Viral myocarditis	10	0.01027829 4	EQMCE1, DRB1, MHCX1, DQA3, DQB1, DQB2, DQA1, DRB2, ITGB2, DQA2
ecb04080:Neuroactive ligand-receptor interaction	28	0.01096637 3	UCN3, HTR1E, NPY, OPRM1, ADCYAP1, PTH2R, TACR3, PTGER3, DRD1, HTR5A, GABRG1, THRB, SST, HTR1F, CYSLTR2, EDN3, NMBR, GLRA3, HTR7, SSTR1, HTR1A, TRHR, GHR, QRFPR, GRID2, P2RX6, GABRR1, CHRM3
ecb04742:Taste transduction	10	0.01483062 7	SV2C, HTR1E, TAS1R2, TAS2R40, HTR1F, TAS2R14, PKD2L1, HTR1A, TAS2R42, CHRM3
ecb05320:Autoimmune thyroid disease	10	0.01701537 8	EQMCE1, DRB1, MHCX1, IFN-ALPHA2, FRAS1, FRAS1, LRRC9, DQA1, FRAS1, DQA2
ecb04921:Oxytocin signaling pathway	14	0.01768501	PRKAB2, CAMK2D, GNAI2, KCNJ6, EGFR, RGS2, GNAO1, PLA2G4A, MAP2K2, ROCK2, RYR2, CACNB2, ROCK1, TRPM2
ecb04640:Hematopoietic cell lineage	12	0.01964059 5	DRB1, CD1B2, DQA3, DQB1, CD1B1, DQB2, CD1E1, GYPA, DQA1, DRB2, TFRC, DQA2
ecb05166:Human T-cell leukemia virus 1 infection	19	0.02674625 6	MHCX1, MSX2, MAP3K1, ETS1, DQB2, EQMCE1, DRB1, MAP2K4, DQA3, DQB1, MAP2K2, DQA1, ANAPC5, BUB3, CCNE1, DRB2, ITGB2, DQA2, SLC25A4
ecb04658:Th1 and Th2 cell differentiation	10	0.02813509 8	DRB1, IFNGR2, IL12RB2, IFNG, FRAS1, FRAS1, LRRC9, DQA1, FRAS1, DQA2
ecb05152:Tuberculosis	16	0.02815620 1	CAMK2D, IFNGR2, KSR1, IFN-ALPHA2, IFNG, DQB2, DRB1, PIK3C3, DQA3, DQB1, ATP6V1H, DQA1, DRB2, ITGB2, ECATH-3,

			DQA2
ecb04530:Tight junction	15	0.03200504	PRKAB2, F11R, HSPA4, CTTN, CD1B2, MAP3K1, RAPGEF2, MICALL2, NEDD4, CD1B1, ACTR3B, ROCK2, CD1E1, TJP1, ROCK1
ecb04024:cAMP signaling pathway	17	0.04424371 8	CAMK2D, EDN3, HTR1E, GLI3, GNAI2, NPY, SSTR1, HTR1A, ADCYAP1, PTGER3, DRD1, SST, MAP2K2, HTR1F, ROCK2, RYR2, ROCK1
			GALNTL5, SGMS1, NANP, CARNMT1, ENO4, SELENBP1, PLOD2, ALOX5, MINPP1, POMK, B3GALT1, ADPGK, EHMT1, PLA2G4A, ATP6V1H, CYP3A96, TYRP1, CYP7A1, GALNT14, ST6GAL2, PLCz, AACS, NDST4, BCKDHB, SI, ST6GALNAC4, MOCS1, CYP11B1, HYAL4, EXTL3, KYNU, MGAT4C, LPCAT4, PIGB, PIP5KL1, GUCY2D, LBR, DSE, ALOX15B, MAN1A2, B3GALNT1, BLVRA, ADK, FAH, GCNT1, PLCZ1, CYP2B46, CNDP2, PIK3C3, ENPP3, PRXL2B, PDE5A, CNDP1, GSDMC, CHST10, FGGY, SORD, MAT2B, MTCL1, NT5E, ACP5, ACADSB, SGPL1, ALOX12, ACO1, ALG14, NAMPT, ENPP3, INPP4B, SEMA3E, ELOVL5, GNPDA2, C1GALT1, ABO, GLDC, CYP2C108, SPTLC3, SPAM1, GSTA3, CYP3A89, ENPP1, RRP1, ND5, GSTA1, UXS1, LTA4H
ecb01100:Metabolic pathways	86	0.04824421 4	

Table S3 GO pathway analysis

Category	Term	Gene Count	P Value	Gene
GOTERM _BP_DIR ECT	GO:0019882~antigen processing and presentation	10	2.39E-05	EQMCE1, DRB1, MHCX1, DQA3, DQB1, RAB4A, LRRC9, DQA1, FRAS1, DQA2
GOTERM _BP_DIR ECT	GO:0007268~chemical synaptic transmission	15	0.00368292	HTR1E, SNCA, GLRA3, HTR7, HTR1A, OR5T40, HTR5A, GABRG1, LRP6, SV2C, SDCBP, HTR1F, CACNB2, GABRR1, CHRM3
GOTERM _BP_DIR ECT	GO:0000902~cell morphogenesis	10	0.005961947	CDH8, CDH7, YAP1, CYFIP1, CDH12, CDH19, CDH11, ARHGEF28, AP3B1, EGFR
GOTERM _BP_DIR ECT	GO:0043066~negative regulation of apoptotic process	19	0.024972288	GLI3, BCL2A1, DAPK1, PREX1, PRAME, VTCN1, ZFAND6, CITED2, EGFR, HIPK3, RASA1, SPRY2, CDC73, PSEN1, TCL1A, WNT7A, CAPN13, TFRC, ASCL1
GOTERM _BP_DIR ECT	GO:0035556~intracellular signal transduction	24	0.041473254	CLNK, STK32A, PLCZ, PREX1, CAB39L, ASB18, DAPK1, ARHGEF28, TNS3, PLCZ1, SRPK1, STK39, DCDC2C, MARK2, RGS6, PSEN1, SGK1, DCDC2, SDCBP, RPS6KA1, SPB4, CXCL8, GUCY2D, TFRC
GOTERM _BP_DIR ECT	GO:0007156~homophilic cell adhesion via plasma membrane adhesion molecules	11	0.046559993	CDH8, CDH7, PCDH18, CDH2, CDH12, CDH19, KIRREL3, PCDH20, CDH11, CELSR3, PCDH10
GOTERM _CC_DIR ECT	GO:0005887~integral component of plasma membrane	55	0.00307342	SGMS1, IFNGR2, SLC26A8, SYNDIG1, PCDH20, OPRM1, SLC39A12, GABRG1, HTR1F, CYSLTR2, SEMA6D, SLC28A2, PCDH10, NMBR, TMPRSS11A, HTR7, HTR1A, CEMIP2, PROKR1, DCBLD2, KIRREL3, QRFPR, TRPM1, IYD, CHRM3, OR56A1, OR4E2, KLR

GOTERM _CC_DIR ECT	GO:0045202~synaps e	23	0.009198062	D1、HTR1E、MERTK、GYPA、OR5T40、DRD 1、HTR5A、PSEN1、SEMA3E、ABCA1、ALK 、PCDH18、SLC26A11、SLCO1B3、ADGRL3、 GLRA3、SSTR1、ABCB5、KCNK1、GHR、SLC 26A7、PKD2L1、SLCO4C1、KCNK2、P2RX6、 TFRC、TRPM2、GABRR1 CYFIP1、HTR1E、RIMS2、SNCA、GNAI2、GL RA3、HTR7、HTR1A、AP3B1、CBLN4、OR5T 40、HTR5A、PSEN1、CBLN2、GABRG1、LRP 6、SDCBP、HTR1F、LY6E、ACTBL2、CACNB 2、GABRR1、CHRM3 PRKAB2、TRIM45、SMAP1、ALOX5、AMPH 、PPP1R14C、PRUNE2、MAPKAP1、PDE4DIP 、CSRP1、ELP4、DUSP10、PRMT3、ACTBL2 、PPFIA1、LYPLA1、TACC3、CAPN2、TTK、 CARS1、SASH1、IRAK1BP1、PRAME、TDRD7 、ASPM、HOOK1、SRPK1、TNFAIP3、VWA8 、HIPK3、MOB1B、SKP1、MARCHF1、OAS1 、ARRDC1、KLHL25、TNK2、VRK2、ROPN1L 、FBXO4、NIFK、SIPA1L1、SNCA、MERTK、 SPHKAP、CXXC4、ARHGEF11、NOVA1、PIK3 C3、AGA、MAP2K2、CDIN1、SERPINB8、BT G1、ENAH、ZNF804A、CYFIP1、HTATIP2、M AP3K1、SERPINB5、DAPK1、WDPCP、DZIP3 、CHD1、NUDCD1、PLK2、PTPN22、UXS1、 ATXN7L3B、ARHGAP28、KCNIP4、KSR1、UF M1、PADI4、CDH2、UBASH3B、PRPF19、BA TF、ACVR2A、RWDD3、MYO5B、URI1、PLA 2G4A、ROCK2、ROCK1、DYRK2、PADI2、CA MK2D、UBR3、TBCA、GLI3、NOX3、KIF15、 TENT5A、KIZ、TRIM68、NEK1、RGS2、KYN
GOTERM _CC_DIR ECT	GO:0005737~cytopl asm	159	0.030272449	

				U, NEDD4, DOK5, SGK1, GARNL3, SDCBP 、 CDH11, PARP14, CCNE1, ALOX15B, DEU P1, MRTO4, RNF167, NAP1L4, CAPN8, BL VRA, TRIM21, TRIM26, STXBP5, ANXA10, CYP2B46, FTO, ARRDC4, MARK2, SAMD5 、 ELP3, CFAP221, LGALS3, SNTG1, CAPN1 3, YAP1, MAP3K7, ACO1, ASAP2, HSPA1L 、 NAMPT, CAPN9, ENC1, INPP4B, NR5A2, ARHGEF28, GNPDA2, PADI3, CYP2C108, SC GB1A1, PTPN11, RBFOX2, PMP2, ANXA5, PCMTD1, CPSF6, LRRCC1, DUSP22, FKBP1 A, LRRC9, RAP1GAP2, PLAAT1, PARP15, CDADC1, PSPC1, LTA4H TMX3, CDH2, GPC5, ACVR2A, HJV, RTP2 、 TFPI, SLC7A11, EGFR, ITGA8, HYAL4, L RFN2, TSPEAR, PSEN1, LRFN5, ADAMTS15 、 DCBLD2, LRP6, ENPP1, WNT7A, ITGB8, PKD2L1, SULF2, ZPLD1 TMX3, CDH2, GPC5, ACVR2A, HJV, RTP2 、 TFPI, SLC7A11, EGFR, ITGA8, HYAL4, L RFN2, TSPEAR, PSEN1, LRFN5, ADAMTS15 、 DCBLD2, LRP6, ENPP1, WNT7A, ITGB8, PKD2L1, SULF2, ZPLD1
GOTERM _CC_DIR ECT	GO:0009986~cell surface	24	0.041485424	OR5T40, HTR5A, HTR1E, GABRG1, GLRA3 、 HTR1F, HTR7, HTR1A, GABRR1, CHRM3 KCNP4, CAPN8, EYS, MAN1A2, CDH2, PA DI4, VCAN, CDH12, PCDH20, ANXA10, PL CZ1, CDH8, ENPP3 , PLA2G4A, THBS4, CD H19, EFCAB3, RYR2, CAPN13, SULF2, PCD H10, PADI2, VLDLR, PCDH18, PLCz, SPOC
GOTERM _MF_DIR ECT	GO:0030594~neurot ransmitter receptor activity	10	0.007542982	
GOTERM _MF_DIR ECT	GO:0005509~calciu m ion binding	41	0.011430849	

				K3、CAPN9、CAPN2、CETN1、MCTP2、PADI3、CELSR3、CDH7、CEMIP2、ANXA5、CRNN、MATN1、CDH11、PKD2L1、TRPM2、ALOX15B
GOTERM _MF_DIR ECT	GO:0004712~protein serine/threonine/tyrosine kinase activity	19	0.017675014	MAP3K7、CAMK2D、TTK、MERTK、DAPK1、STK39、EGFR、PLK2、MARK2、SGK1、RPS6KA1、EPHA6、TNK2、ALK、ROCK2、FRK、MAP3K21、ROCK1、DYRK2
GOTERM _MF_DIR ECT	GO:0004672~protein kinase activity	15	0.045718707	MYO3B、CAMK2D、KSR1、MAP3K1、NEK1、BUB1、SRPK1、POMK、HIPK3、PIK3C3、TRIB2、MAP2K4、TEX14、MAP3K21、GUCY2D
GOTERM _MF_DIR ECT	GO:0020037~heme binding	13	0.047036578	PXDNL、EPX、THAP4、CYP11B1、CYP2C108、CYP2B46、CYP4X1、CYP3A89、CYP3A96、CYP4F124、CYP7A1、CYB5R4、FLVCR2
GOTERM _MF_DIR ECT	GO:0004674~protein serine/threonine kinase activity	21	0.047891973	STK32A、OBSCN、TTK、DAPK1、ACVR2A、MAP3K1、NEK1、SRPK1、STK39、HIPK3、PLK2、MARK2、MAP2K4、PSKH2、SGK1、RPS6KA1、MAP2K2、ROCK2、VRK2、ROCK1、DYRK2