

**Fig. 1H - CHD7+ P4****Specific**

Abr  
Atoh1  
Cadps2  
Ccnd2  
Cdk5r1  
Cxcr4  
Dcx  
Dner  
Egfr  
Gli1  
Gli2  
Kcnj6  
Lama1  
Lhx1  
Neurod1  
Npas3  
Nrcam  
Pax6  
Plxnb2  
Pou3f2  
Pou3f3  
Ptch1  
Ptk2  
Scn8a  
Sema4c  
Thra  
Zic4

**Fig. 1H - CHD7+ P22 Specific**

Sep5  
Actg1  
Adarb1  
Adcy1  
Adcy5  
Adcyap1r1  
Adora1  
Adra1d  
Ank3  
Arntl  
Arpp21  
Asic1  
Atp2b2  
Baiap2  
Bcl11a  
Cacna1a  
Cacna1c  
Cacna1e  
Cacna1g  
Cacnb4  
Cacng2  
Calb2  
Camk2b  
Camk4  
Cck  
Chrna2  
Chst3  
Cnr1  
Col13a1  
Cplx3  
Creb1  
Crhr1  
Crmp1  
Cspg5  
Dact1  
Dclk2  
Disc1  
Dll1  
Dnmt3a  
Doc2b  
Dpp6  
Dpysl4  
Elmod1  
En2  
Eps8  
Trib2  
Trp53  
Utrn  
Vat1l

Esr2  
Fam83g  
Fgf14  
Fos  
Foxo6  
Git1  
Gnao1  
Gnas  
Gprc5b  
Gria2  
Grik2  
Grin2a  
Grin2c  
Grip2  
Grm1  
Grm4  
Grn  
Hbegf  
Hcn2  
Hspg2  
Inpp4a  
Iqsec1  
Itga5  
Itgb5  
Jph3  
Kalrn  
Kcna1  
Kcnb2  
Kcnip3  
Kcnk3  
Kcnk9  
Kdm8  
Kif13a  
Kif1a  
Kl  
Ksr1  
Lep  
Lin7a  
Lmna  
Lmx1b  
Lphn1  
Lrp1  
Lrp4  
Mbp  
Mkks  
Vdac1  
Zdhhc13  
Zdhhc17  
Zic1

Mpi  
Mtm1  
Ncam1  
Negr1  
Nlgn1  
Nos1  
Npas4  
Nr3c1  
Ntrk2  
Park2  
Pax6  
Pclo  
Pdyn  
Plcb4  
Ppargc1b  
Prkar1b  
Psp1  
Ptpra  
Ptprd  
Rab3b  
Rarb  
Rasgrf1  
Reln  
Rnd3  
Rptor  
Rtn4r  
Sez6  
Sez6l  
Sgcg  
Sh3gl2  
Shank2  
Shh  
Slc17a7  
Slc1a3  
Slc4a3  
Slc6a1  
Slc8a2  
Slitrk1  
Snap25  
Srgap3  
Stx1a  
Stx1b  
Sv2b  
Syt1  
Syt2  
Thy1  
Timp2  
Tnc  
Tnik

**Fig. S1E - CHD7+ P4/P22 Shared**

Abcd2  
Abl2  
Adam11  
Adcy1  
Adcyap1r1  
Adra2c  
Aff1  
Amph  
Ank  
Ankrd11  
Apba1  
Apba2  
App  
Arntl  
Arpc3  
Arse  
Asic1  
Atp1a1  
Atp2b2  
Bahcc1  
Baiap2  
Bcr  
Bsn  
Btd  
Cacna1c  
Cacng2  
Cadps2  
Camk2b  
Camkk1  
Camkk2  
Cd47  
Cdk5r1  
Chd7  
Chl1  
Chst10  
Clip2  
Cnr1  
Cntnap1  
Cplx1  
Cplx2  
Creb1  
Csk  
Ctnnd2  
Dab1  
Disc1  
Syt2  
Timp3  
Tnik  
Trak1

Dlg3  
Dlg4  
Dnmt3a  
Dock3  
Dst  
En2  
Epb4.1l3  
Ercc1  
Fa2h  
Fez1  
Fig4  
Fos  
Fxn  
Fxyd6  
Fyn  
Gabbr2  
Gal  
Gpm6b  
Hcn1  
Hip1  
Hipk2  
Idua  
Inpp4a  
Itga7  
Itgav  
Itm2b  
Jam3  
Kcna1  
Kcna2  
Kcnb2  
Kcnc1  
Kcnc3  
Kcnj11  
Kcnj6  
Kif1a  
Ky  
Lrpap1  
Lrrn1  
Map2  
Mapt  
Mbp  
Msra  
Myh10  
Napa  
Nav2  
Trio  
Tuba1a  
Unc13c  
Utrn

Ncam1  
Nck2  
Neurl1a  
Neurod2  
Nfasc  
Nos1  
Npc2  
Nrn1  
Ntrk2  
Nxph3  
Pak7  
Park2  
Pbx3  
Pde1b  
Pemt  
Plcb4  
Plxna2  
Pomc  
Ppp1r14c  
Prex1  
Prkcb  
Prom1  
Ptch1  
Ptpra  
Qk  
Rbfox2  
Reln  
Rgs9  
Robo3  
Rps6ka5  
Scn8a  
Sez6  
Shank2  
Sil1  
Slc41a3  
Slc6a1  
Slc9a1  
Smad2  
Snap25  
Snca  
Sptbn4  
Srgap3  
Sstr2  
Stxbp1  
Synpo  
Vac14  
Vdac1  
Vdac3  
Vldlr

Wwc1  
Zdhhc13  
Zic1  
Zic4  
Zic5

**Fig. S1F - CHD7- P4 Specific**

Aatk	Fbln1	Nr2f1	Zeb2
Abcd2	Flnb	Nrcam	Zfp423
Aff1	Foxj1	Nrd1	Zic4
Ago2	Fyn	Otc	Zic5
Akt1	Gad1	Park2	
Als2	Gadd45a	Pax3	
Ank3	Ghrh	Pcdh10	
Apbb1	Gli2	Pdgfra	
Apc	Gpm6b	Phf2	
Atoh1	Gpr3711	Phgdh	
Atxn2	Gpr6	Plxna3	
Atxn7	Hdac4	Pou3f2	
B4galt1	Id2	Pou3f3	
Bid	Insc	Ppargc1a	
Bmper	Itga6	Ppp1r9b	
Bmpr1a	Itpr1	Prex1	
Boc	Kcnj10	Psmc1	
Ccnd2	Kit	Ptk2	
Cd81	Kl	Ptprs	
Cdk5r1	Lamc1	Qk	
Cdk5rap2	Lats2	Rfx4	
Celsr2	Lhx1	Rgma	
Cep41	Lhx5	Rgs9	
Cga	Lpar1	Rheb	
Chd7	Lrp5	Robo1	
Chl1	Lrp8	Robo2	
Clip2	Macf1	Ror1	
Cntnap1	Map2	Rpl27a	
Cplx2	Map3k4	S1pr1	
Cxcr4	Mdk	Sall1	
D3Bwg0562e	Mkl2	Sema4c	
Dab2ip	Mllt4	Sema6a	
Dclk1	Msx2	Shh	
Dclk2	Mthfd1l	Slc1a2	
Dlx2	Ncoa1	Slc1a3	
Draxin	Ncor2	Slc25a12	
Dyrk1a	Ndp	Slc4a10	
E2f1	Ndst3	Smurf1	
Ebf3	Neurod2	Sox2	
Ednrb	Nfia	Sptan1	
Efnb2	Nfib	Srgap3	
Egfr	Nfix	Sufu	
En1	Nme7	Sumf1	
Erf	Notch1	Syngap1	
Fabp7	Npas3	Tbr1	
Tcf7l1	Tnfrsf21	Vav2	
Tead1	Tsku	Zbtb20	
Tfap2a	Tulp3	Zdhhc17	
Tgif1	Unc5c	Zeb1	

**Fig. S1F - CHD7- P4/22 Shared**

Abca1	Capn7	Dyrk1a	Kcnq2	Nedd4	Rai1	Ubr4
Actn4	Ccm2	E2f8	Kdm4b	Nedd4l	Rapgef1	Ucp1
Adcy8	Ccnk	Eef1a1	Keap1	Nfasc	Rapgef2	Unc5b
Adora2a	Cd74	Elk3	Kidins220	Nfib	Rara	Unc5c
Adrbk1	Cd81	Ell	Kif1b	Nfic	Rasa3	Usp46
Ago2	Cd8a	En2	Kif3b	Nfix	Rbfox3	Vac14
Agpat3	Cdh2	Epb4.1l3	Klc1	Nlgn3	Reln	Vdac1
Akap6	Cdk5r1	Eps8	Klf7	Notch2	Rgma	Vdac3
Akt1	Cebpe	Erf	Krt10	Nr1d1	Rheb	Wdr19
Akt2	Cecr2	Esrrg	L1cam	Nr2f2	Rims2	Wfs1
Amph	Celf4	Ext1	Lats2	Nrcam	Rnf165	Wnt7b
Ank	Chd2	Fbxw8	Ldha	Nrep	Rnf7	Yap1
Ank3	Chd7	Fdft1	Lin7a	Nrxn2	Satb1	Ybx3
Anp32a	Chd8	Fez1	Lpar5	Nsd1	Satb2	Zbtb20
Anp32b	Chmp4b	Fgf9	Lpp	Nuak1	Scgb1a1	Zdhhc13
Apba2	Chrm4	Foxo1	Lrp1	Pacs2	Scn2a1	Zfand5
Aplp2	Chrn2	Foxo3	Lrpap1	Pak7	Scn8a	Zfp3611
App	Cldn11	Fxn	Lrrc4	Park2	Scyl1	Zic1
Arg1	Clip2	Fyn	Ltbp4	Park7	Sec22b	Zic3
Arhgef11	Cnr1	Fzd7	M6pr	Parva	Selplg	Zic4
Arhgef4	Cntfr	Gab1	Macf1	Pax6	Sema3a	Zic5
Arrb1	Cntn1	Gamt	Maml3	Paxip1	Sepn1	Zmiz1
Asxl1	Cog2	Gclc	Map3k1	Pdcd4	Serpinh1	Znrf3
Atf1	Cox4i2	Glce	Map3k4	Pde1b	Setd7	
Atp2a2	Cpe	Gna13	Map4k4	Pde4b	Sez6l	
Atp2b2	Cplx2	Gnai2	Map6	Peg3	Sgms1	
Atp6v0d1	Crtc1	Gnao1	Mbp	Pfdn1	Sh3gl2	
Atp8a1	Ctbp2	Gpm6b	Mcf2l	Pgd	Shank2	
Atpif1	Ctc1	Gse1	Mgl1	Phf2	Ski	
Atxn2	Ctnnd1	Hbp1	Mitf	Pik3c3	Slc41a3	
Axin2	Cul1	Hic1	Mllt4	Pisd	Slc7a1	
B9d1	Cux1	Hipk2	Morc3	Pla2g3	Slc8a1	
Bace1	Cyfp1	Hrh2	Mthfd1l	Plcb4	Slc9a1	
Bad	Cyp17a1	Ift122	Mthfr	Plcg1	Smad3	
Baiap2	D430041D05Rik	Ift57	Mtmr2	Pomc	Smo	
Bcar1	Dab1	Igf2r	Mtss1	Ppia	Smurf1	
Bmpr1b	Dact1	Ikzf2	Mxi1	Ppp1r14c	Snap25	
Boc	Dclk2	Inpp4a	Mycbp2	Prkdc	Snca	
Btd	Dctn1	Inpp5a	Myocd	Psap	Sort1	
Cacna1c	Dner	Insig1	Naglu	Ptpn1	Sox5	
Cacna1e	Dnmt3a	Irf2	Nav2	Ptpn11	Sp2	
Cacna1g	Dst	Its1n1	Ncoa3	Ptprj	Sparc	
Cacna2d3	Dtna	Kcnh2	Ncor2	Ptprz1	Spn	
Cacng2	Dync1i2	Kcnj10	Ndfip1	Qk	Sphk1	
Cacng4	Dync1li1	Kcnj11	Ndst1	Rag2	Sptb	
Src	Strap	Tab1	Tmod1	Tph2	Trp53bp2	
Sreb1	Suv420h1	Tapt1	Tom1l2	Traf3ip2	Trp73	
Srgap3	Sv2b	Tbc1d4	Tor1aip1	Trak1	Ttc7	
Stam2	Syt7	Tcf4	Tpcn2	Trio	Ubp1	

**Fig. S1F - CHD7- P22 Specific**

Adarb1 Grin2c Rpl27a  
 Adcy5 Grn Rps6ka3  
 Akap5 Gtf2ird1 Rtn4r  
 App Hcn2 Scn8a  
 Arsa Herc1 Sez6l  
 Astn1 Hipk2 Sh3gl1  
 Atg5 Idua Sh3gl2  
 Atp1b2 Il10 Shank1  
 Avil Itpr1 Sirt2  
 Barhl2 Itsn1 Slc25a12  
 Bcr Jph3 Slc2a1  
 Cacna1a Kcna2 Slc7a8  
 Cacna1c Kcnc1 Snap25  
 Cacna2d2 Kcnc3 Snca  
 Cacnb4 Kcne1 Syne1  
 Cadps2 Kcnj11 Syt2  
 Camk2b Kcnma1 Syt4  
 Camk4 Kcnq1 Tcap  
 Chd6 Kif1b Tgm2  
 Clip2 Klcl1 Trak1  
 Cnr1 Klf9 Trim32  
 Cntn6 Lnpep Vegfa  
 Ctnnd2 Lrp1 Wasf1  
 Dbh Maf Xpa  
 Dbnl Mapk10 Zdhhc17  
 Dnmt3a Mapt  
 Dock3 Mbp  
 Dscam Musk  
 Dst Myh10  
 Dtna Myo7a  
 Dtnb Naglu  
 Ebf2 Neurod2  
 Elavl3 Nfasc  
 Elavl4 Nkx6-2  
 En2 Nlgn3  
 Epg5 Nrcam  
 Fa2h Nrd1  
 Fgf14 Ntrk3  
 Fgfr1 Nxph3  
 Frzb Pik3c3  
 Fzd5 Plcb4  
 Gabra1 Psap  
 Gdf15 Ptpg  
 Gnao1 Rasd2  
 Gnaq Rbfox1  
 Gnb5 Rbfox2  
 Gria2 Rnf103  
 Grin1 Robo3  
 Grin2a Rora

**Fig. S3A - CHD7- Activated**

Acsl3 Sema6c  
 Arhgap44 Slitrk1  
 Arhgef2 Srrm4  
 Bend6 Ss18l1  
 Bmi1 Stmn1  
 Brsk2 Stmn3  
 Casp3 Stmn4  
 Dbn1 Tiam2  
 Disc1 Tnik  
 Efn2 Trak2  
 Emb Tubb2a  
 Enah Tubb2b  
 Epha7 Ulk2  
 Ephb2 Zswim5  
 Gpm6a  
 Gprin1  
 Gprin3  
 Gsk3b  
 H2afz  
 Hist1h1c  
 Hist1h1e  
 Hist1h2ad  
 Hist1h2af  
 Hist1h2ag  
 Hist1h2ah  
 Hist1h2ai  
 Insm1  
 Kif5a  
 Kif5c  
 Lgr4  
 Lhx1  
 Lzts1  
 Map1a  
 Map1b  
 Map2  
 Mapt  
 Neurod1  
 Neurod2  
 Neurod4  
 Nrcam  
 Ptpro  
 Rtn4r  
 Sdccag8  
 Sema3a  
 Sema3d  
 Sema3e  
 Sema3g  
 Sema4f  
 Sema4g

**Fig. S3A - CHD7-Repressed**

Abhd2 Errfi1 Prkch  
 Adamts10 Fbln1 Prkcq  
 Adamts14 Fgf12 Ptch1  
 Adamts2 Fzd4 Pxn  
 Adamts9 Gdf10 Ralb  
 Adcy7 Gli1 Rhbdf1  
 Adcyap1r1 Glp2r Ror1  
 Adra2c Gng7 Rps6ka1  
 Afap1l2 Gpc1 Rps6ka4  
 Amer2 Gpr26 Rxra  
 Anxa6 Gpr37 S1pr3  
 Apcdd1 Gucy1b2 Samd14  
 Aplnr Icosl Sema3f  
 Arhgap18 Ifnar2 Sema4a  
 Arhgap31 Ifngr1 Sema4b  
 Arhgef3 Igfbp2 Sema7a  
 Bambi Igfbp4 Serpinh1  
 Bmp6 Igfbp5 Sesn1  
 Cacna1g Impa2 Sesn2  
 Cacng5 Inpp5a Sgk1  
 Cav2 Ksr1 Sh2b3  
 Cd93 Lamb1 Shank2  
 Cers1 Lfng Slc27a1  
 Cflar Ly6h Smad3  
 Chrn4 Lyn Spry1  
 Cntfr Lypd6 Sstr3  
 Col13a1 Map2k3 St5  
 Col15a1 Mertk Stard13  
 Col16a1 Mmp14 Stat5b  
 Col18a1 Mmp15 Stk17b  
 Col1a1 Mmp2 Sulf2  
 Col27a1 Nbl1 Syk  
 Col4a1 Ndr2 Tle2  
 Col9a3 Nfat5 Tmem117  
 Crtap Nfatc4 Tmem198b  
 Dact1 Nkd1 Tnfrsf19  
 Dennd3 Nnat Trabd2b  
 Dkk3 Nos1 Tril  
 Dll4 Notch1 Wnt4  
 Dtnbp1 Notch3 Wnt5a  
 Dtx1 Nr1d2 Wtip  
 Dtx4 Pde1b Wwtr1  
 Dusp22 Pde2a  
 Dusp5 Pecam1  
 Dusp6 Pgf  
 Efnb3 Plce1  
 Ephb6 Plxna1  
 Eps8l3 Plxnd1  
 Erlin1 Ppp1r1a

**Fig. 4A - Mouse Phenotypes**

Abcd2 Pax6  
 Akap12 Ppt1  
 Als2 Ptch1  
 Atf2 Pten  
 Atp1b2 Rb1  
 B4galnt1 Rbfox2  
 Bcr Rnf2  
 Bmi1 Scn8a  
 Cacna1g Sema4g  
 Cadps2 Serpine2  
 Camk4 Slc1a3  
 Cbln3 Sparcl1  
 Ccnd1 Sptbn2  
 Cdk5r1 St8sia2  
 Cdk5r2 Stxbp1  
 Cers2 Tnik  
 Cntn1 Trio  
 Cp Tyro3  
 Ctsl Unc5c  
 Cxcr4 Wnt5a  
 Disc1 Zbtb18  
 Dpysl5 Zdhhc13  
 Ebf2  
 Egfr  
 En1  
 Fzd4  
 Gli1  
 Glrb  
 Id2  
 Id3  
 Il17rd  
 Inpp4a  
 Jun  
 Khlh1  
 Lama1  
 Lhx1  
 Lynx1  
 Map1b  
 Map2  
 Mapk8ip2  
 Mertk  
 Myo5a  
 Naglu  
 Neurod1  
 Neurod2  
 Neurod4  
 Nfasc  
 Nrcam  
 Pafah1b1

**Fig. 6D - Panther pathways/PMG**

Actn1  
 Arhgap26  
 Asap1  
 Col13a1  
 Col16a1  
 Col27a1  
 Col6a1  
 Enah  
 Evi  
 Fyn  
 Itga5  
 Itga6  
 Itga9  
 Kif5c  
 Kras  
 Lama4  
 Lamb1  
 Limk1  
 Map1b  
 Map2k3  
 Map3k5  
 Mapk6  
 Mapk8  
 Megf9  
 Myh14  
 Myh7b  
 Myh9  
 Pak7  
 Parva  
 Parvb  
 Pax6  
 Pfn2  
 Pik3r3  
 Srd5a3  
 Ssh2  
 Stmn1  
 Stmn4  
 Tuba1a  
 Tubb2a  
 Tubb2b  
 Tubb3  
 Vcl