

Figure S1. Purkinje cell Atrophy in ATXN1 Mice with Age. Purkinje Cell atrophy was assessed by measuring thickness of the cerebellar molecular layer. n>6 per group Two-way ANOVA, tukey post-hoc test. *p<0.05 **p<0.01.

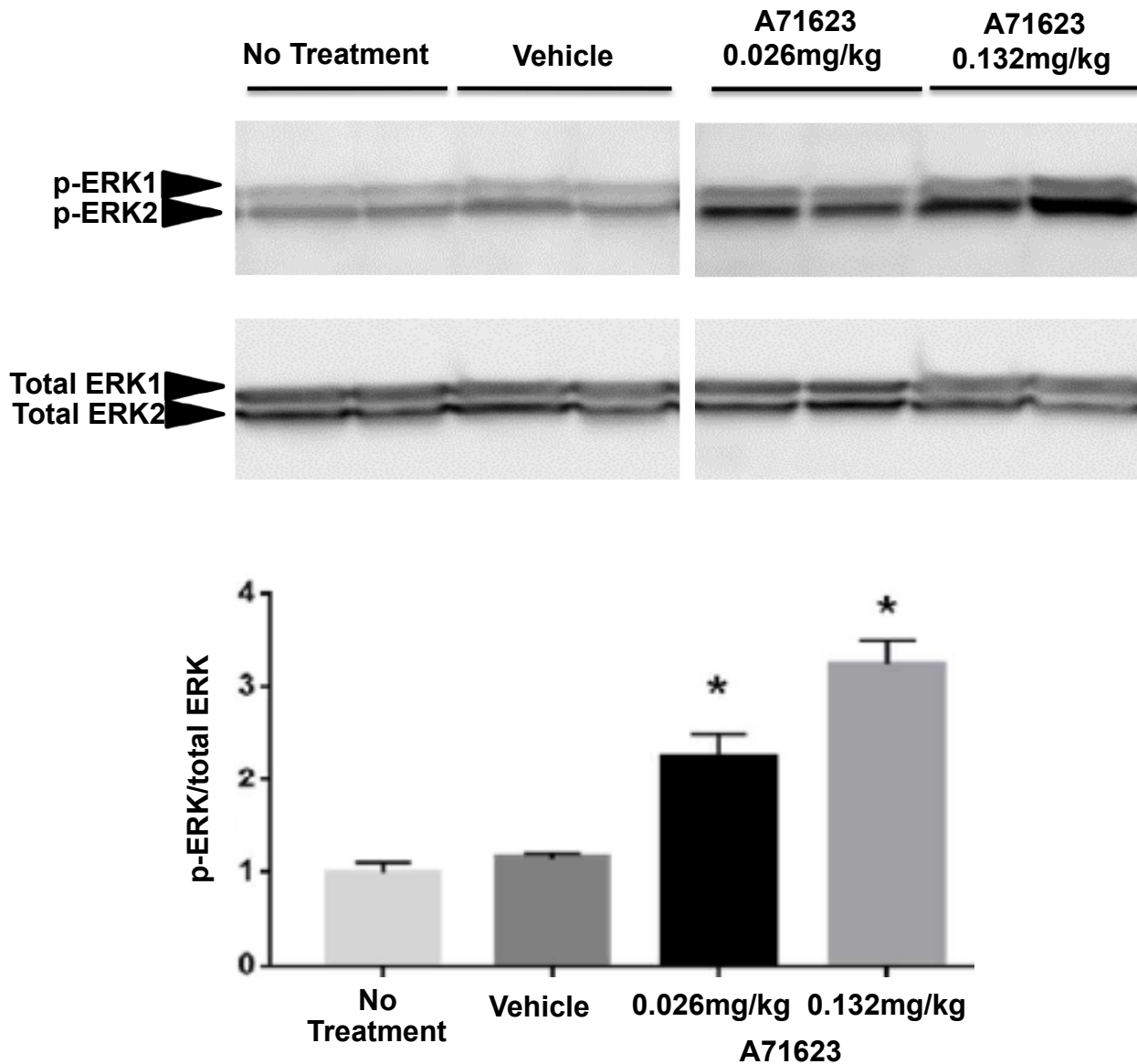


Figure S2. IP Injection of Cck1R agonist A71623 Increases cerebellar phospho-ERK1/2 - Related to Figure 1. A) Western blot of phospho-ERK1/2 (P-ERK) and total ERK1/2. Two doses were administered i.p. to WT/FVB mice. Cerebella were harvested 24 hours post-injection. B) Quantification of (A). n=2 per group. One-Way ANOVA, tukey post-hoc test, *p<0.05.

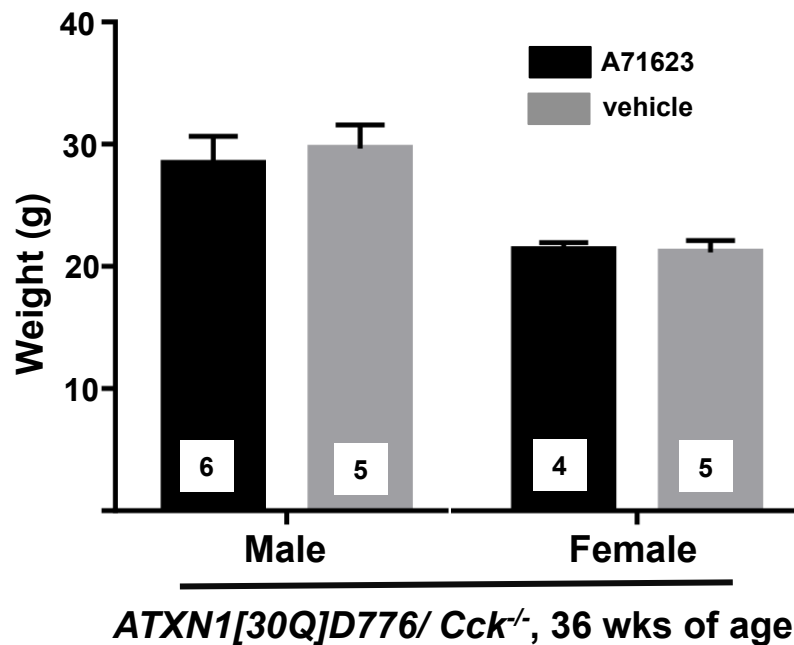


Figure S3. Administration of Cck1R agonist A71623 Does not Alter Weight of *ATXN1[30Q]-D776/Cck^{-/-}* Mice. Male and female *ATXN1[30Q]-D776/Cck^{-/-}* mice weighed following IP administration of A71623 (0.026mg, 30nmoles/Kg/day) or vehicle via osmotic pumps for 36 weeks.

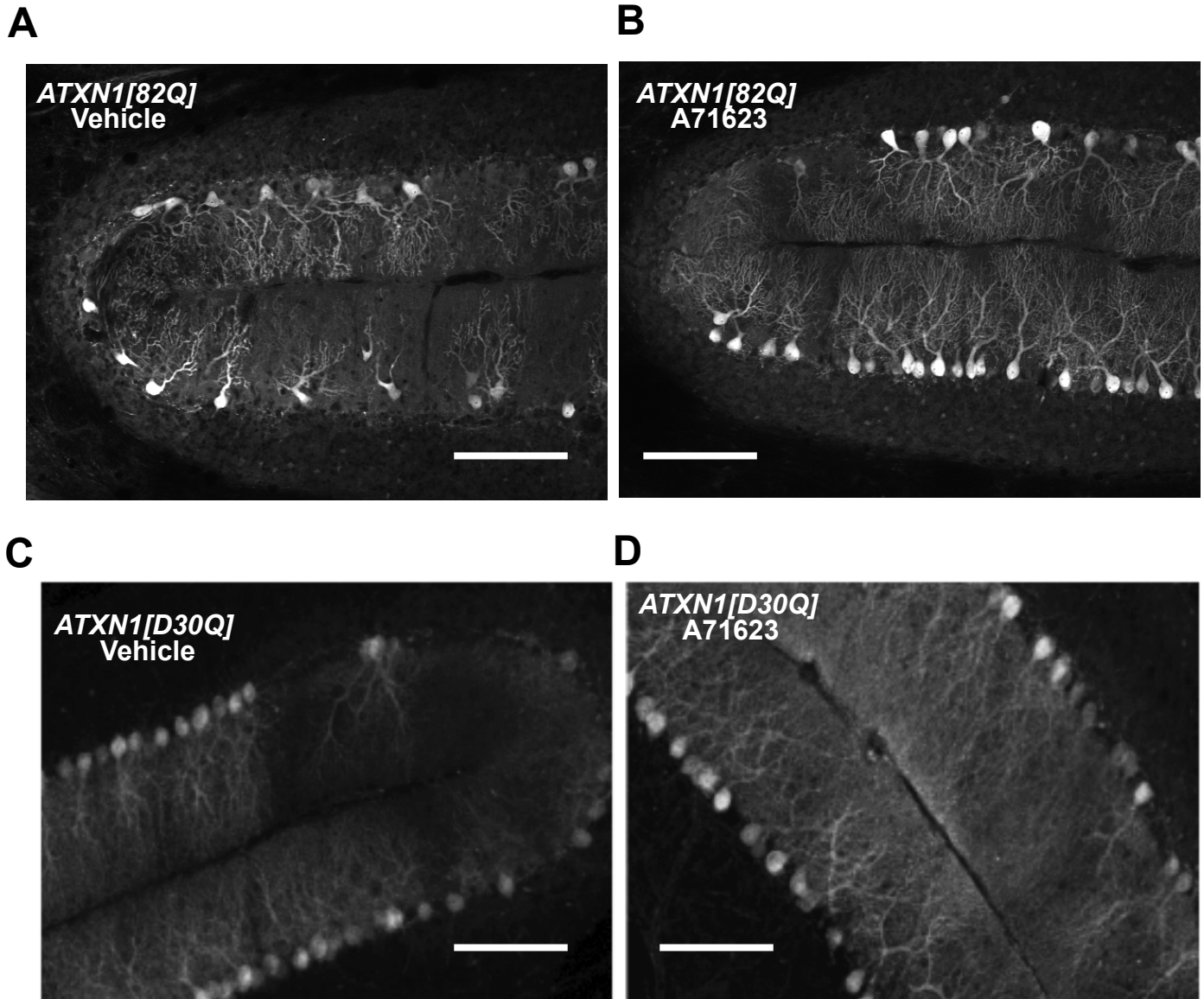


Figure S4. Administration of Cck1R agonist A71623 improves cerebellar molecular thickness in ATXN1[82Q] and ATXN1[30Q]D776/Cck^{-/-} mice - Related to Figures 1 and 3. Immunohistochemical staining of calbindin a Purkinje cell-specific marker. (A) A71623 (0.026mg, 30nmoles/Kg/day) or (B) vehicle was administered for 12 weeks via IP osmotic pumps to ATXN1[82Q] mice. (C) A71623 (0.026mg, 30nmoles/Kg/day) or (D) vehicle was administered for 36 weeks via IP osmotic pumps to ATXN1[30Q]D776/Cck^{-/-} mice. Scale bar = 100μM.

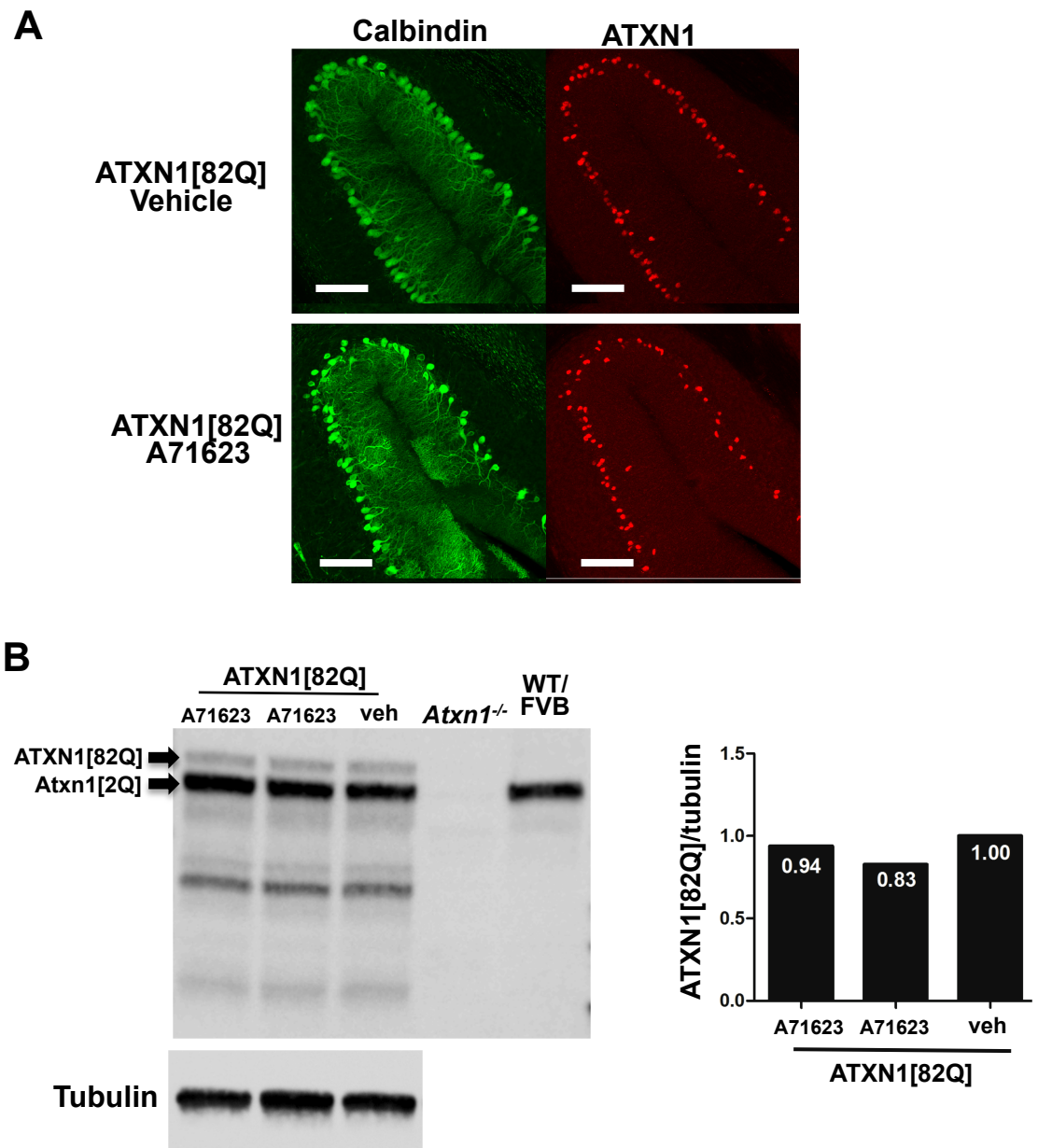
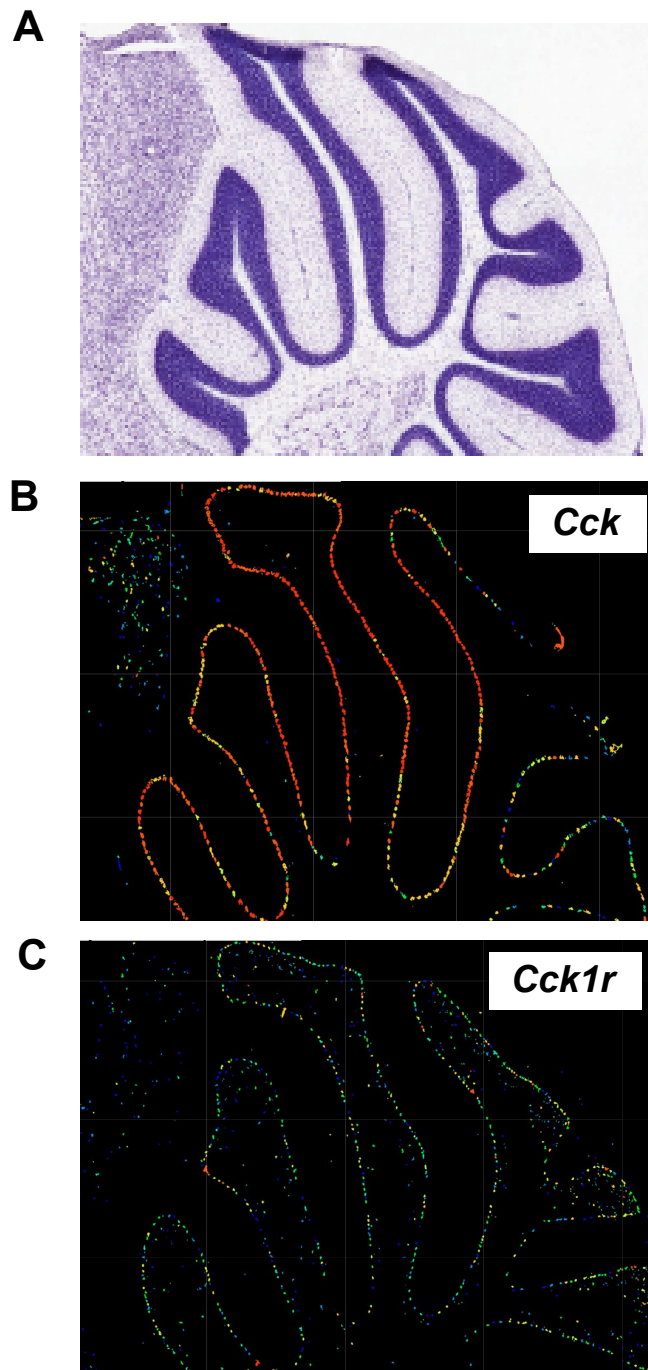


Figure S5. Administration of Cck1R agonist A71623 does not effect expression of ATXN1[82Q] protein in cerebella of ATXN1[82Q] mice – Related to Figure 3. A71623 (0.026mg, 30nmoles/Kg/day) or vehicle was Administered for 12 weeks via IP osmotic pumps. A) Immunohistochemical Staining of calbindin (Purkinje cell specific marker) and ATXN1 in Purkinje Cells. B) Western blot analysis of cerebellar ATXN1 expression. Scale bar = 100µM.



Allen Brain Atlas

Figure S6. Purkinje cells express Cck and Cck1r – Related to Figure 7. A) Nissel stained sagittal vermal section. B) In situ hybridization for Cck RNA expression on a sagittal cerebellar vermal section. C) In situ hybridization for Cck1r RNA expression on a sagittal cerebellar vermal section. All images are from Allen Brain Atlas; <http://www.brain-map.org>.

Supplemental Table 1: Magenta WGCNA Module Gene List - Related to Figure 2.

1700018L02Rik	Ccni	Fam117a	Id2	Nab2	Prpf3	Slc7a11	Vwa7
2310003H01Rik	Cd70	Fam174b	Igfbp5	Nadsyn1	Psd2	Slc9a3	Wee1
2610203C20Rik	Cdh1	Fam21	Iltifb	Nek2	Ptpm	Snx9	Wiz
2700070H01Rik	Cdk16	Fam222a	Imp4	Nell1	Rab3d	Soat1	Wsb2
2810459M11Rik	Cemip	Far2	Inpp4a	Neurod2	Rab43	Spag5	Ypel4
4930413G21Rik	Cep104	Fbxl22	Inpp5a	Nexn	Rabl6	Spns2	Ywhah
6030419C18Rik	Cep72	Fgd3	Ipo5	Nkain1	Rasal1	Sppl2b	Zbtb40
A330050F15Rik	Cep76	Fgf11	Irgb1bp1	Nkd1	Rbm19	St3gal5	Zdhhc14
AK129341	Cerk	Fgf13	Itpka	Nlgn2	Rbm22	St6gal1	Zfp346
Ablim2	Chst8	Fgf7	Itp1	Nog	Rdh11	Stac	Zfp385c
Adamts3	Clmn	Gabbr1	Jun	Npr1	Reep2	Stap2	Zfp512
Adsl	Cmtm3	Galr1	Kalrn	Npy	Rel1	Stk17b	Zfp830
Agfg2	Cnm4	Garnl3	Kcna6	Nr2f2	Rgma	Strip2	
Aif1	Cntnap5b	Gchfr	Kcnab1	Nsg1	Rgs8	Sulf1	
Aldh7a1	Colq	Gfap	Kcng4	Ntng1	Rhobtb2	Susd4	
Aldh9a1	Cox6b2	Gja1	Kcnip1	Ntng2	Rhod	Synj2	
Aldoc	Cpeb1	Gjb2	Kcnmb4	Nup54	Rian	Syt13	
Ankrd33b	Creg1	Gla	Kcnq4	Nup93	Rmdn3	Taok3	
Anks1b	Csad	Gli1	Kctd12	Ociad2	Rnf145	Tbpl1	
Ano6	Cthrc1	Gm10190	Kdelc2	Opn3	Rnf157	Tcf7l1	
Antxr1	Ctnbp2	Gm13944	Kif1c	Orai2	Rnf19b	Tex261	
Ap4m1	Cx3cr1	Gm16740	Kif5a	Otud1	Rps6kc1	Tm6sf1	
Arap1	Cyth3	Gm4285	Klf10	Padi2	Rpsd3	Tmem200b	
Arhgef2	Dagla	Gm9866	Lancl1	Papss2	Rspo3	Tmem231	
Arhgef33	Dand5	Gng13	Lhfpl2	Pcdhgb5	Rtel1	Tmem255a	
Atf1	Dap	Golt1b	Lhpp	Pcp4	Ryr1	Tmem41a	
Atl2	Dbn1d1	Gp1bb	Lhx1os	Pcsk6	Samd8	Tmod1	
Atp2a3	Ddx49	Gpatch1	Lhx5	Pde5a	Sbk1	Tmtc1	
B330016D10Rik	Dgkz	Gprc5b	Lix1	Pex26	Scn1b	Tnc	
B3gnt2	Dlg2	Gria3	Lnx2	Phactr3	Sdc1	Tob1	
Baiap2	Dner	Grid2	Lpcat1	Pkp3	Sec61a1	Tprkb	
Bcar1	Doc2b	Grid2ip	Lrrfip1	Plcb3	Sema7a	Trabd2b	
Bcl10	Dyrk3	Grik1	Lynx1	Plekhd1	Sept5	Trim9b	
Bcl11a	Ebf2	Grm8	Mapk4	Plxdc1	Sfxn1	Trmt61a	
Bcl2l11	Efna3	Gsg1l	Mdfi	Poc1b	Sh3glb2	Trp53bp2	
Bean1	Eif1a	Gskip	Medag	Polr3k	Sh3pxd2b	Trpc3	
Cacna1g	Eif2ak1	H2-D1	Mex3b	Pou3f4	Shank2	Tshz1	
Cacnb2	Eif2ak3	Hdc	Mfsd12	Ppapdc2	Shisa6	Tspan11	
Cacng4	Elfn2	Heatr5a	Mmp23	Ppm1j	Slc16a10	Ttll3	
Calb1	Enpp4	Hk2	Mpeg1	Ppp1r16b	Slc1a6	Ttll5	
Capn2	Ephb2	Homer3	Mrps25	Ppp1r17	Slc20a1	Tuba8	
Car7	Eps8l2	Hpca	Mthfd1l	Ppp1r1b	Slc35c1	Ubash3b	
Casp3	Etv4	Hpcal1	Mthfsd	Ppp1r3c	Slc35f4	Uspl1	
Casq2	Exosc1	Hrh3	Mtss1	Ppp2r2a	Slc39a6	Utp23	
Ccdc120	Exosc10	Hrk	Mxi1	Ppp4r4	Slc41a3	Vgll4	
Ccdc64	F2r	Hs6st1	Mxra7	Prdm8	Slc5a1	Vimp	
Ccnd1	Fam107b	Icmt	Myliip	Prkcg	Slc6a6	Vopp1	

Supplemental Table 2: Pink (plus *ATXN1/82Q*) data) WGCNA Module Gene List - Related to Figure 2.

0610007P14Rik	Axl	Coro1a	Fxyd1	Kcnma1	Nkain1	Ptn	Strip2
0610009O20Rik	B3gat1	Cpne2	Gab1	Kcnmb4	Nog	Ptplb	Strn3
1110002L01Rik	B3gnt2	Creg1	Gabbr1	Kctd12	Nptn	Ptprm	Susd4
1700052N19Rik	Baiap2	Csad	Gabbr2	Kif3b	Nptx1	Ptpr	Syndig1
3632451O06Rik	Bbc3	Csdc2	Garnl3	Kif3c	Npy	Pvalb	Syt7
4930506M07Rik	Bcar1	Cthrc1	Gdpd1	Kif5a	Nsg1	Rab43	Tex261
5031425E22Rik	Bcas1	Ctnna1	Gfod1	Kitl	Nup93	Rasgrp1	Tlcd1
6030419C18Rik	Bmp1	Ctsa	Gja1	Lancl1	Ociad2	R2bm2	Tm6sf1
A330050F15Rik	Bok	Cttnbp2	Glud1	Large	Ogfod1	Rdh11	Tmem164
AI593442	Btbd10	Cyp2j9	Gm10190	Lgi3	Ola1	Rell1	Tmem184b
AK129341	Cacna1g	Cyth3	Gm13944	Lhfp12	Opn3	Rgma	Tmem200b
Acadl	Cacnb2	Dagla	Gm5083	Lhpp	Orai2	Rgs8	Tmem255a
Acadm	Cacng7	Dap	Gnao1	Lhx1	Otud1	Rhob	Tmem38a
Actr3b	Calb1	Dbn1d1	Gng13	Lhx1os	Paqr4	Rhobtb2	Tmem41a
Adam23	Camk1d	Ddx49	Gp1bb	Limd2	Parp1	Rhog	Tmem64
Adamts1	Camk2a	Derl1	Gpr180	Lingo3	Parva	Rimk1a	Tmod1
Adcy	Cap2	Dgkz	Gpr63	Lix1	Pccb	Rmdn3	Tnfsf12
Agfg2	Car7	Dhx32	Grid2	Lmo2	Pcdhac2	Rnf145	Tnpo2
Ajap1	Car8	Dis3l	Grid2ip	Lmo4	Pcp2	Rnf19b	Tollip
Akap2	Casp3	Dlg2	Gskip	Lpgat1	Pcp4	Rpl14	Tom111
Aldh1l1	Casq2	Dner	Gtf2h5	Lrp8	Pcsk6	Rtel1	Trappc5
Aldoc	Ccar1	Doc2b	Hepacam	Lrrfip1	Pde5a	Rundc3a	Trim9
Amotl2	Ccdc107	Dpp10	Hey1	Lrrn2	Pde9a	Sbk1	Trp53bp2
Ankmy2	Ccnd1	Dpy19l3	Hmgn1	Man1c1	Pebp1	Scn4b	Trpc3
Ankrd13a	Cd59a	Dusp16	Homer3	Mbd2	Pepd	Sdc4	Tstd2
Ankrd50	Cd81	Eif2ak3	Hpcal1	Mdfi	Pi4k2a	Sec61a1	Ttll5
Anks1b	Cdc42ep1	Ephb2	Hrk	Mdk	Pkd2	Sema7a	Tuba4a
Ano3	Cdc42ep4	Eps15l1	Hs6st2	Medag	Plcb3	Sept11	Tuba8
Ap1ar	Cdon	Eps8l2	Hspa12a	Mfhas1	Plekhd1	Sept5	Ubash3b
Apip	Cds1	Erp29	lcmt	Mif4gd	Plxdc1	Shank2	Ube2i
Apoc1	Celf3	Etv5	ld2	Mmd2	Pogk	Shisa6	Unc13c
Apoe	Cep104	Exosc10	Igfbp3	Mprip	Poldip2	Sipa1l1	Unc5b
Arap1	Cep19	Fabp3	Igfbp5	Mt1	Polr3k	Slc1a6	Usp39
Arap2	Cep76	Fam107b	Ikbkb	Mthfsd	Pou3f3	Slc20a1	Vimp
Arhgap20	Cerk	Fam174b	Itt1fb	Mtss1	Ppapdc2	Slc39a6	Vwa7
Arhgap31	Chchd7	Fam20a	Imp4	Mturn	Ppp1r16b	Slc41a3	Wiz
Arhgef2	Chn1	Fam21	Inpp5a	Mtus2	Ppp1r17	Slc6a6	Wsb2
Arhgef33	Chrn2	Fam222a	Inpp5e	Mxra7	Ppp1r1b	Smad3	Ypel4
Arvcf	Chst8	Fam69b	Ipo5	Mybpc1	Ppp4r4	Snapin	Ywhah
Astn2	Cldn12	Fbxo2	Itgb1bp1	Myliip	Pqlc2	Snta1	Zbtb46
At12	Clec2l	Fcgrt	Itpka	N4bp2l1	Prkab2	Spns2	Zdhhc14
Atp2a2	Clmn	Fez2	Itpr1	Naaa	Prkag2	Sptbn2	Zdhhc5
Atp2a3	Clstn2	Fgf11	Jund	Nanp	Prkcg	Srsf2	Zfp346
Atp2b2	Clta	Fgf13	Kcna6	Ncald	Prmt8	St6galnac6	Zfp385c
Atp6ap1l	Cml1	Fgf7	Kcnab1	Ndn	Psd2	Steap2	
Atp6v0a2	Cntfr	Fgfr1	Kcng4	Ndr2	Ptdss2	Stim1	
Atrnl1	Col18a1	Foxk2	Kcnp1	Nell1	Ptgr2	Stk17b	

Supplemental Table 3: Pink (Minus *ATXN1*[82Q] data) WGCNA Module Gene List - Related to Figure 2.

0610007P14Rik	Cap2	Dner	Gpd1	Kifap3	Ociad2	Rnf145	Tmem35
3632451O06Rik	Capns1	Dnm2	Gpr180	Kitl	Ola1	Rnf19b	Tmem38a
4930506M07Rik	Car7	Doc2b	Gpr3711	L1cam	Opn3	Rora	Tmem41a
5031425E22Rik	Car8	Dolpp1	Gpr63	Lancl1	Otud1	Rpl36	Tmem50b
6030419C18Rik	Casp3	Dpp10	Gria1	Large	Paqr4	Rprd1a	Tmem59l
A330050F15Rik	Casq2	Dpy19l3	Grid2	Lgalsl	Parm1	Rrbp1	Tmem64
AK129341	Ccar1	Dusp1	Grid2ip	Lgi3	Pccb	Rtel1	Tnfsf12
Abat	Ccdc107	Dync1li2	Grm1	Lhpp	Pcdhac2	Rybp	Tollip
Abcd2	Ccnd1	Ehd3	Gskip	Lhx1os	Pcp4	Sbk1	Tom11l
Acadl	Ccny	Eif2ak3	Gtf2h5	Limd2	Pcsk6	Sdc4	Trim9
Acadvl	Cd59a	Elavl2	H2-Ke6	Lix1	Pde5a	Sdf2	Trp53bp2
Actr3b	Cd81	Ephb1	H2afv	Lmna	Pde9a	Sec61a1	Trpc3
Adcy8	Cdc42ep1	Eps15l1	Hadha	Lmo2	Pebp1	Sept4	Ttc4
Agt	Cdc42ep4	Eps8l2	Hbegf	Lpgat1	Peptd	Sepw1	Ttll5
Ak6	Cdk20	Erp29	Herc3	Lrp11	Pgd	Serp1b1a	Ttyh2
Amotl2	Cdon	Fah	Hes3	Lrrc73	Pip4k2a	Shank2	Tub
Ank	Cds1	Fam107b	Homer3	Lrrn2	Pkd2	Shisa	Tuba4a
Ankrd50	Celf3	Fam174b	Hopx	Ltbp3	Plekhd1	Sipa1l1	Tuba8
Anks1b	Cep76	Fam20a	Hpcal1	MacroD2	Plxdc1	Sirt7	Tubb2b
Anxa6	Chn2	Fam21	Hrk	Man1a2	Pnrc1	Slc1a3	Ubash3b
Apip	Chst2	Fam222a	Hsd11b1	Map2k1	Pogk	Slc1a6	Ube3c
Apoc1	Chst8	Fam69a	Hspa12a	Map2k4	Polr3k	Slc38a3	Ubl4
Apoe	Cldn12	Fam69b	Icmt	Mdfi	Ppapdc1b	Slc41a3	Ubxn1
Arap1	Cldn25	Farp1	Id2	Mdk	Ppp1r16b	Smad3	Uchl1
Arap2	Clec2l	Fbl	Igfbp3	Medag	Ppp1r17	Smc5	Unc13c
Arhgap20	Clmn	Fbxo2	Ikbkb	Mpi	Ppp1r1b	Snta1	Unc5b
Arhgap23	Clstn2	Fbxo27	Iltifb	Mpp2	Ppp1r8	Spg7	Usp45
Arhgap31	Clu	Fez2	Impa1	Mpp6	Ppp4r4	Spns2	Vcpkmt
Arhgdia	Cml1	Fgf11	Inpp1	Mpv17l2	Pqlc2	Ss18	Vwa7
Arhgef2	Cntfr	Fgfr1	Inpp5a	Mt1	Prkab2	Steap2	Wdr45
Arhgef33	Cox7a1	Fgfr3	Inpp5e	Mthfsd	Prkcg	Stk17b	Wiz
Atat1	Cpne2	Fjx1	Insig2	Mtss1	Prmt8	Stmn2	Wwp1
Atl2	Csad	Flt3	Ipo5	Mturn	Ptch1	Stmn3	Ywhah
Atp2a2	Csdc2	Fstl5	Irf2bp2	Mtus2	Ptdss2	Strip2	Zbtb46
Atp2a3	Cst3	Gadd45b	Isca1	Mxra7	Ptn	Strn3	Zdhhc14
Atp6ap1l	Ctdsp1	Gadd45g	Itpka	Mybpc1	Ptprr	Susd4	Zfp346
Atrnl1	Cthrc1	Gal3st3	Itpr1	Mylip	Rab43	Tab2	Zfp385c
Axl	Ctsa	Garnl3	Jund	N6amt2	Rab5c	Tdrkh	
Bai1	Cttnbp2	Gdpd1	Kbtbd4	Naa35	Rbm22	Tex261	
Bcl2l2	Cxcl14	Gja1	Kcnab1	Ndn	Rdh11	Tlcd1	
Bmp1	Cyp2j9	Glr3	Kcng4	Ndufb3	Rell1	Tm6sf	
Bok	Cyth3	Gm10190	Kcnip1	Nell1	Rgma	Tmbim6	
Btbd10	Dap	Gm5083	Kcnip4	Neo1	Rgs7bp	Tmem184b	
Btg2	Ddx49	Gmppa	Kcnj16	Nptn	Rgs8	Tmem200b	
C1qa	Derl1	Gnal	Kcnma1	Nptxr	Rhbdl1	Tmem25	
C1ql3	Dgkz	Gng13	Kctd12	Npy	Rmdn3	Tmem255a	
Calb1	Dlg2	Gp1bb	Kif1c	Nup93	Rmnd5b	Tmem30a	