

Supplementary Materials

Transcription Factors *Bcl11a* and *Bcl11b* Are Required for the Production and Differentiation of Cortical Projection Neurons

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Supplemental Figures S1-S5

Supplemental Tables S1-S5

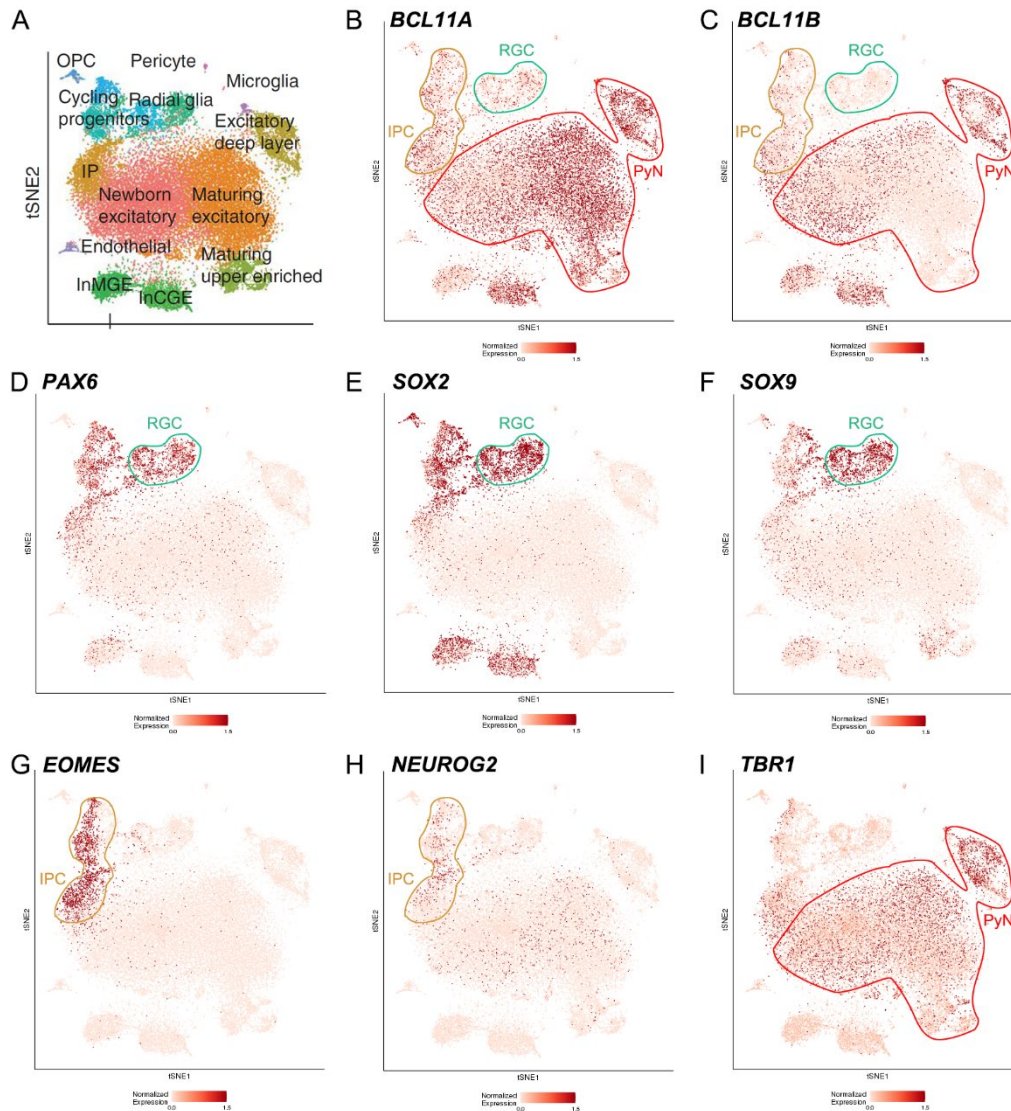


Figure S1. *BCL11A* is expressed in cortical RGCs in the human brain at GW17 and GW18.

(A) scRNA-seq analysis of 33,976 cortical cells from the mid-gestation human brain (GW17-GW18) (Polioudakis et al. 2019).

(B-F) Feature plots show that *BCL11A*, *PAX6*, *SOX2* and *SOX9* are expressed in the cortical RGCs (green circles), whereas *BCL11B* is mainly expressed in a few projection neuron intermediate progenitors (brown circles) and a large number of newly born projection neurons and deep layer projection neurons (red circles).

(G-I) Distributions of *EOMES*⁺, *NEUROG2*⁺ and *TBR1*⁺ cells.

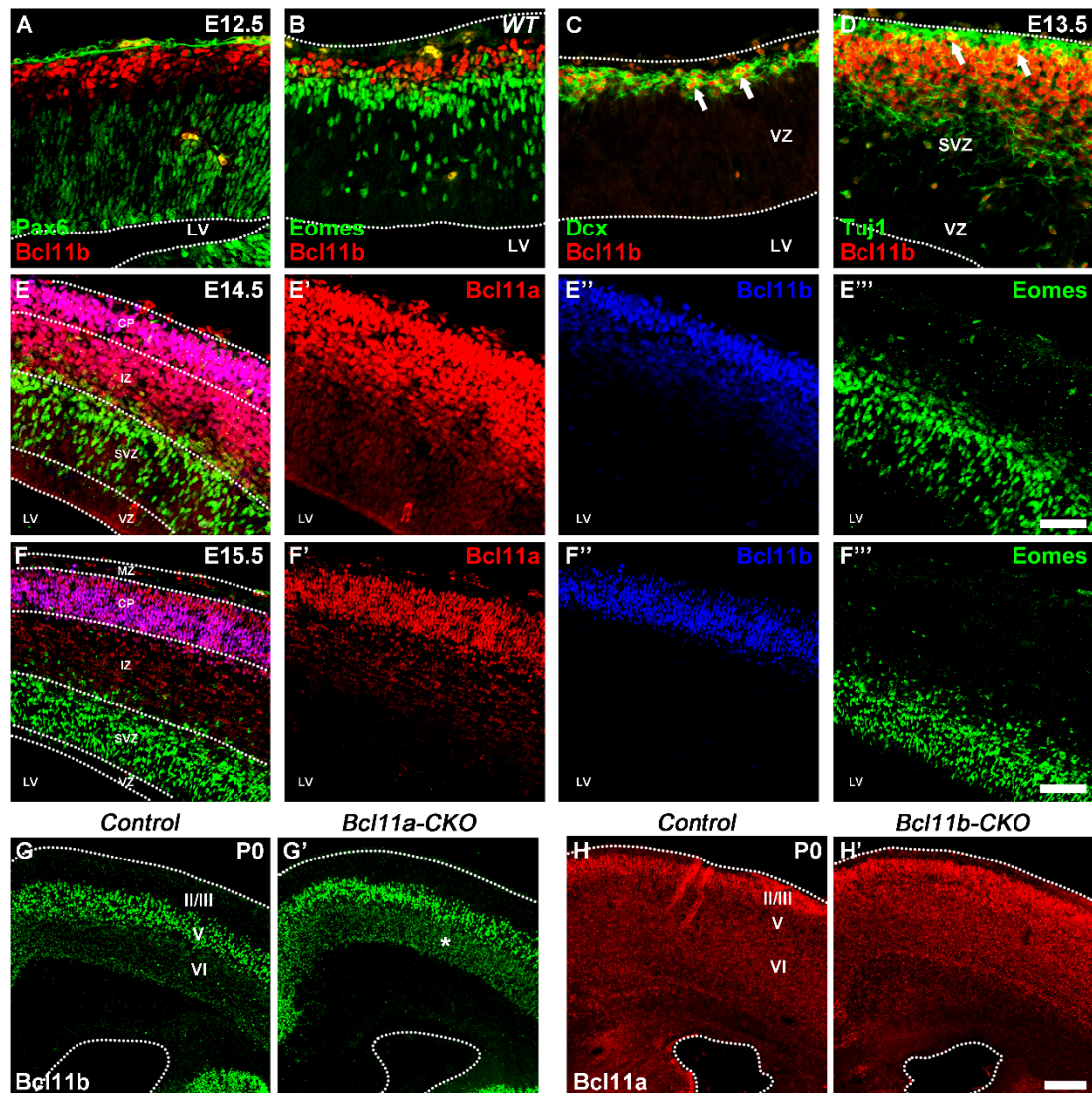


Figure S2. *Bcl11b* is mainly expressed in the postmitotic projection neurons and might have redundant function with *Bcl11a*.

(A-D) *Bcl11b* is expressed in *Dcx*⁺ and *Tuj1*⁺ postmitotic neurons at E12.5 and E13.5, respectively (arrows). It is not expressed in *Pax6*⁺ or *Eomes*⁺ progenitor cells in the VZ/SVZ.

(E-E''') *Bcl11a* and *Bcl11b* are co-expressed in migrating neurons in the upper IZ and CP of cortex at E14.5. Note that the *Bcl11a* expression in VZ and *Eomes*⁺ SVZ.

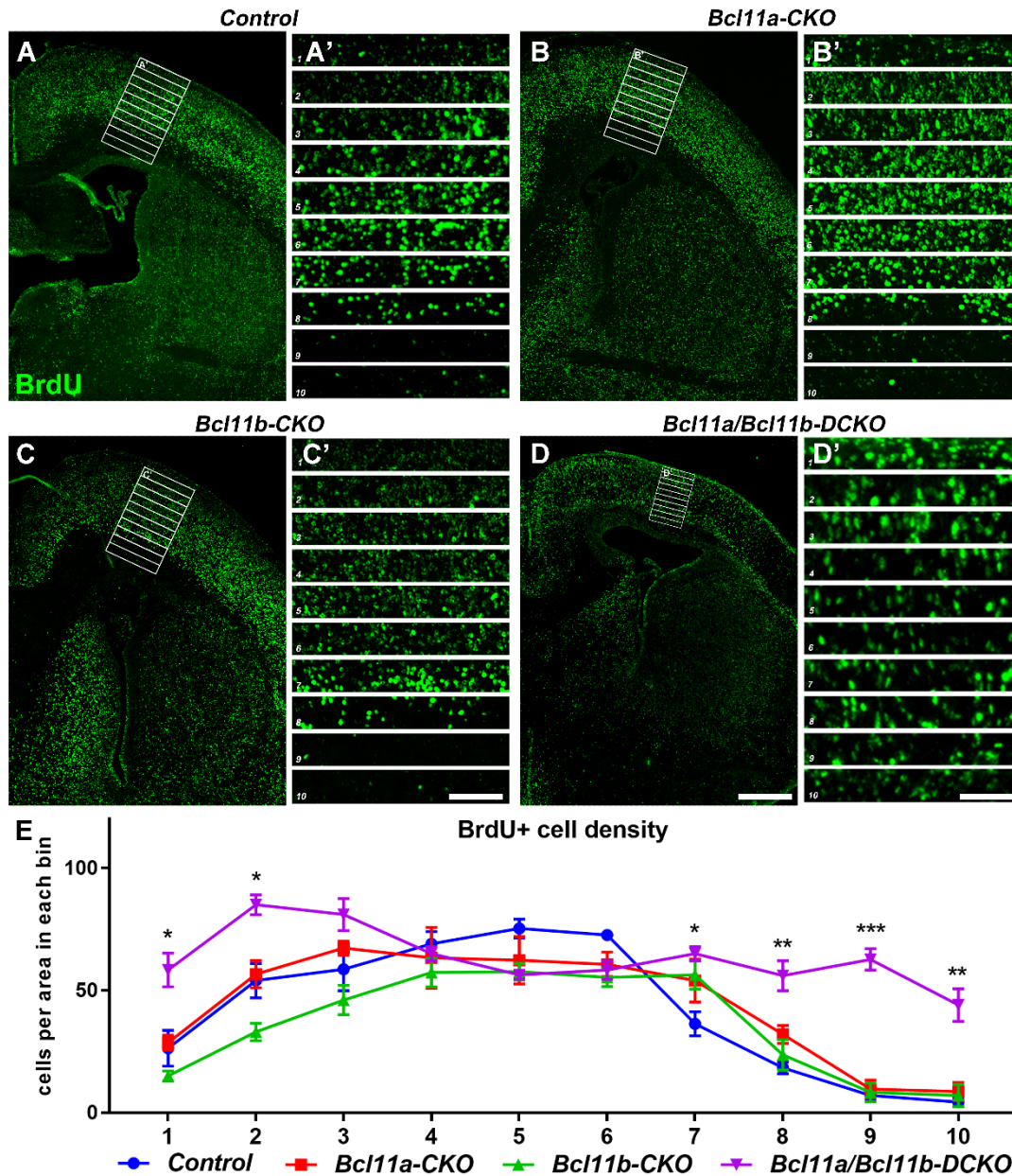
(F-F''') *Bcl11a* and *Bcl11b* are co-expressed in neurons in the cortical plate of cortex at E15.5.

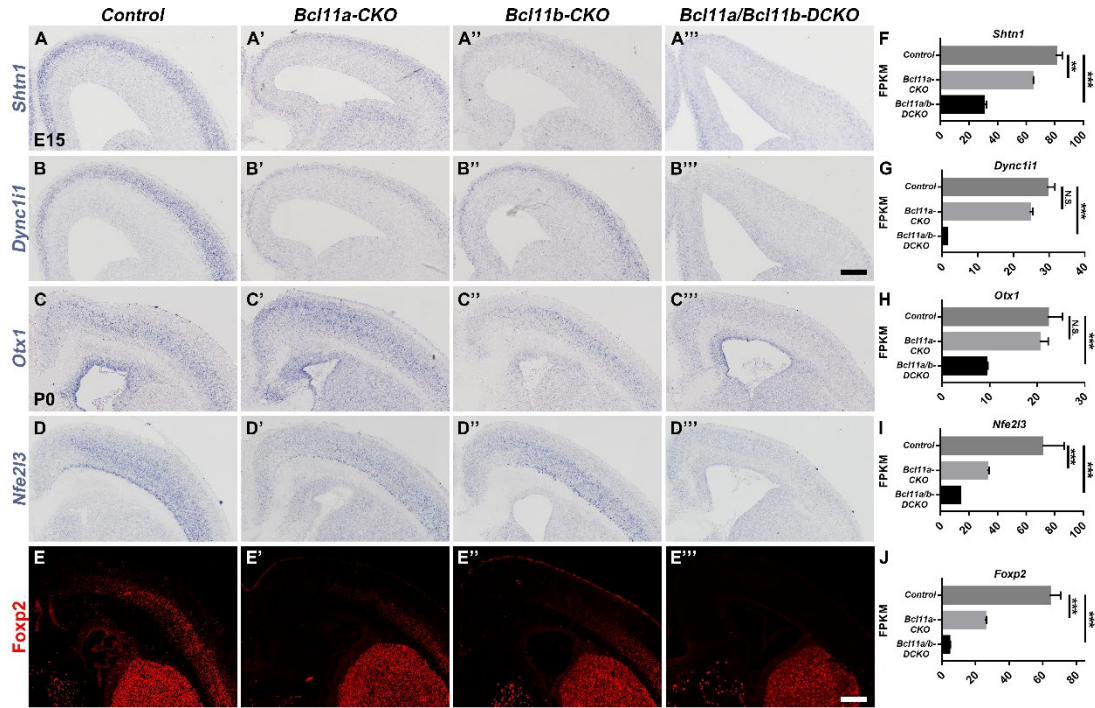
(G-G') Increased expression of *Bcl11b* in the layer VI of P0 *Bcl11a*-CKO cortices (asterisk in G').

(H-H') Expression of *Bcl11a* in all layers of the cortex is increased in *Bcl11b*-CKO cortices.

LV, Lateral Ventricle. VZ, Ventricular Zone. SVZ, Subventricular Zone. IZ, Intermediate Zone. CP, Cortical Plate. MZ, Marginal Zone. White dashed lines indicate the cortical layer boundaries.

Scale bars: 50 μ m in E''' for A-E'''; 100 μ m in F''' for F-F'''; 200 μ m in H' for G-H'.





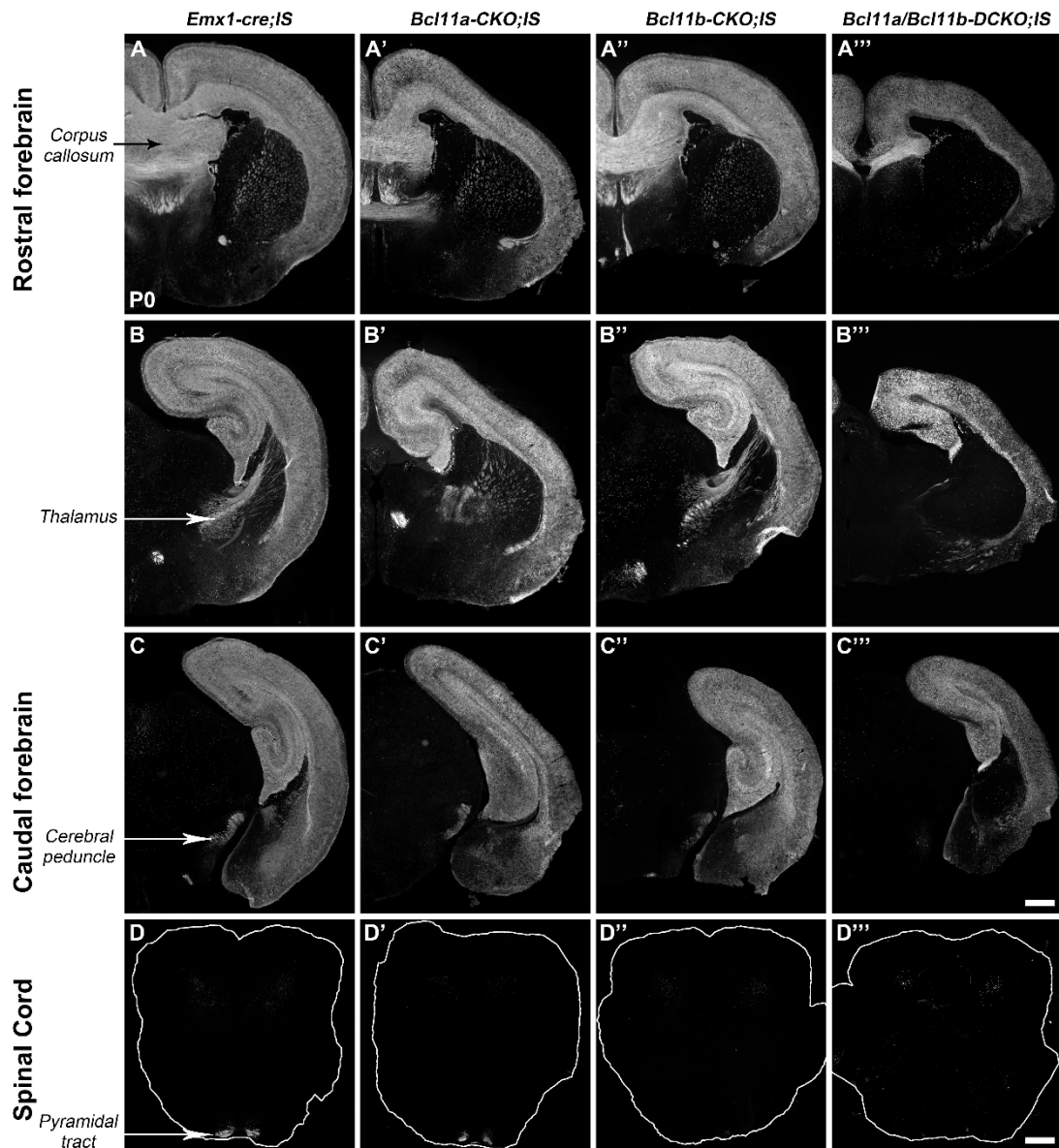


Figure S5. Defective axonal projections in *Bcl11a/b-DCKO* at P0.

(A–D''') Coronal sections show tdTomato staining in control (*Emx1-cre; IS*) brains (A–D), *Bcl11a-CKO; IS* brains (A'–D'), *Bcl11b-CKO; IS* brains (A''–D'') and *Bcl11a/b-DCKO; IS* brains (A'''–D''').

(A–A''') The corpus callosum is present in control (A, arrow), *Bcl11a-CKO; IS* (A') and *Bcl11b-CKO; IS* (A'') brains, but absent in *Bcl11a/b-DCKO* (A''') mice.

(B–C''') Decreased tdTomato labels of the thalamus and cerebral peduncle in the *Bcl11a/b-DCKO* mice (B''' and C'''), compared to the controls (B and C, arrow).

(D–D''') tdTomato labels axonal projection towards spinal cord in the control mice (arrow), but these axons are absent in the *Bcl11b-CKO* and *Bcl11a/b-DCKO* (D'' and D''') mice.

White lines indicate the spinal cord boundaries.

Scale bars: 400 μ m in C''' for A–C'''; 500 μ m in D''' for D–D'''.

Supplementary Table 1. Expression of genes that are related to the cortex development in the *control* and *Bcl11a-CKO* mice cortices at E15.5.

Gene name	Control FPKM	<i>Bcl11a-CKO</i> FPKM	Fold Change Mutant/Control	P-value	Up/Down Regulation
<i>Aldh111</i>	1.0312	6.1356	5.9503	6.30E-29	Up
<i>Bcl11a</i>	40.4253	30.9569	0.7658	0.000234	
<i>Bcl11b</i>	29.8266	33.1120	1.1101	0.118228	
<i>Ccnd2</i>	50.0772	31.0891	0.6208	1.71E-10	
<i>Dcx</i>	66.4680	76.9619	1.1579	0.027519	
<i>Dmrt3</i>	3.1753	0.4570	0.1439	1.54E-13	Down
<i>Egfr</i>	0.1307	0.4622	3.5369	4.24E-07	Up
<i>Eomes</i>	30.2043	45.3425	1.5012	1.79E-07	
<i>Fgfbp3</i>	9.7139	35.5890	3.6637	6.04E-27	Up
<i>Fgfr1</i>	11.4882	14.2032	1.2363	0.003394	
<i>Fgfr3</i>	5.2403	2.8005	0.5344	9.31E-09	
<i>Gfap</i>	0.1403	0.8771	6.2496	1.31E-07	Up
<i>Gli1</i>	0.7555	2.0729	2.7439	4.02E-06	Up
<i>Mdga1</i>	16.8022	22.4995	1.3391	2.78E-05	
<i>Mki67</i>	33.9124	26.8396	0.7914	0.002404	
<i>Neurog2</i>	82.0721	72.6492	0.8852	0.142635	
<i>Nr2f1</i>	32.5453	38.9908	1.1980	0.088315	
<i>Nr4a2</i>	4.7211	1.2588	0.2666	6.46E-22	Down
<i>Ntsr1</i>	11.3771	4.5980	0.4041	1.29E-13	Down
<i>Pax6</i>	3.7565	3.1458	0.8374	0.053872	
<i>Pou3f1</i>	23.0142	37.3520	1.6230	1.52E-08	
<i>Ppp1r14c</i>	2.9001	15.9259	5.4916	3.90E-38	Up
<i>Reln</i>	16.7732	7.1768	0.4279	1.09E-22	Down
<i>Sema3c</i>	3.1089	10.9470	3.5212	1.16E-29	Up
<i>Sox5</i>	21.7790	18.7828	0.8624	0.0643	
<i>Sox9</i>	13.9668	13.2056	0.9455	0.62468	
<i>Tbr1</i>	59.9832	59.3366	0.9892	0.969624	
<i>Tle4</i>	29.9653	12.8159	0.4277	5.03E-21	Down
<i>Zfpm2</i>	13.5080	8.3678	0.6195	2.25E-06	

Supplementary Table 2. Expression of genes that are related to the cortex development in the *control* and *Bcl11a/b-DCKO* mice cortices at E15.5.

Gene name	Control FPKM	<i>Bcl11a/b-DCKO</i> FPKM	Fold Change Mutant/Control	P-value	Up/Down Regulation
<i>Afap1</i>	11.3000	17.4572	1.5449	7.46E-09	
<i>Aldh111</i>	1.0312	8.2935	8.0429	5.78E-48	Up
<i>Bcl11a</i>	40.4253	37.4005	0.9252	0.3090279	
<i>Bcl11b</i>	29.8266	9.9527	0.3337	4.29E-44	Down
<i>Bcl2</i>	5.0985	2.1317	0.4181	1.94E-14	Down
<i>Bhlhe22</i>	77.9455	150.3423	1.9288	9.21E-17	
<i>Btbd17</i>	1.7325	2.2325	1.2886	0.0402416	
<i>Calb2</i>	4.9070	2.3370	0.4762	0.033736	Down
<i>Ccnd2</i>	50.0772	27.4090	0.5473	4.76E-16	
<i>Cdk1</i>	7.5492	5.3411	0.7075	0.0053469	
<i>Cdkn1a</i>	1.6232	3.1973	1.9697	0.0001689	
<i>Cdkn1c</i>	22.2832	135.4342	6.0779	1.60E-89	Up
<i>Cnr1</i>	23.3896	7.6092	0.3253	6.12E-40	Down
<i>Crym</i>	3.3955	0.0322	0.0095	2.87E-17	Down
<i>Dcx</i>	66.4680	107.5273	1.6177	3.77E-12	
<i>Dll3</i>	3.3921	6.7682	1.9953	3.86E-06	
<i>Dmrt3</i>	3.1753	0.4354	0.1371	4.76E-15	Down
<i>Drd1</i>	3.1416	0.6655	0.2118	5.90E-13	Down
<i>Dync1i1</i>	29.3735	1.3259	0.0451	7.28E-135	Down
<i>Egfr</i>	0.1307	0.3716	2.8437	0.0013802	Up
<i>Eomes</i>	30.2043	53.2434	1.7628	7.99E-12	
<i>Fezf2</i>	101.2119	40.2679	0.3979	3.47E-29	Down
<i>Fgf10</i>	0.1974	1.8669	9.4596	7.32E-13	Up
<i>Fgf9</i>	0.0780	1.1871	15.2090	5.56E-16	Up
<i>Fgfbp3</i>	9.7139	40.1972	4.1381	6.25E-41	Up
<i>Fgfr1</i>	11.4882	20.3873	1.7746	1.02E-13	
<i>Fgfr3</i>	5.2403	3.1705	0.6050	4.87E-05	
<i>Foxp1</i>	2.6184	0.7857	0.3001	1.31E-24	Down
<i>Foxp2</i>	1.1232	0.4402	0.3919	2.55E-12	Down
<i>Gfap</i>	0.1403	0.6406	4.5643	0.0001367	Up
<i>Gli1</i>	0.7555	2.9785	3.9426	1.06E-10	Up
<i>Grin2b</i>	8.6000	3.4758	0.4042	7.69E-26	Down
<i>Hes1</i>	4.7647	3.8553	0.8092	0.1741981	
<i>Hes5</i>	11.4375	10.0113	0.8753	0.3949257	
<i>Kcnip2</i>	2.5947	0.5199	0.2004	1.14E-15	Down

<i>Kitl</i>	13.1480	7.8357	0.5960	8.71E-08	
<i>Ldb2</i>	8.2274	15.3210	1.8622	7.08E-10	
<i>Lhx5</i>	2.3460	0.6783	0.2891	2.51E-07	Down
<i>Mcm2</i>	10.5935	8.5693	0.8089	0.0318085	
<i>Mdga1</i>	16.8022	31.4370	1.8710	6.63E-19	
<i>Mef2c</i>	3.4977	0.7358	0.2104	8.77E-35	Down
<i>Mfap4</i>	11.1832	18.4530	1.6501	8.60E-05	
<i>Mfng</i>	18.3552	28.6349	1.5600	8.69E-08	
<i>Mki67</i>	33.9124	26.9169	0.7937	0.0022885	
<i>Myt1</i>	8.4231	14.0197	1.6644	1.01E-10	
<i>Ndnf</i>	2.4464	0.4780	0.1954	1.98E-25	Down
<i>Neurod1</i>	15.8175	52.2984	3.3064	4.44E-30	Up
<i>Neurod2</i>	281.7421	336.2981	1.1936	0.0132214	
<i>Neurog1</i>	5.0904	2.4895	0.4891	0.0028718	Down
<i>Neurog2</i>	82.0721	73.2875	0.8930	0.1897317	
<i>Nfe2l3</i>	15.9578	1.8420	0.1154	7.70E-54	Down
<i>Nfia</i>	15.5346	5.4248	0.3492	1.37E-26	Down
<i>Nfib</i>	44.3172	29.5822	0.6675	1.57E-08	
<i>Ngfr</i>	5.5404	1.1132	0.2009	3.77E-17	Down
<i>Nkd1</i>	4.5828	39.8333	8.6920	6.30E-101	Up
<i>Npy</i>	18.1199	14.7368	0.8133	0.2058603	
<i>Nr2f1</i>	32.5453	65.8627	2.0237	1.19E-10	Up
<i>Nr4a2</i>	4.7211	1.4869	0.3150	1.86E-17	Down
<i>Nrn1</i>	33.6567	47.5920	1.4140	3.87E-05	
<i>Nrp1</i>	41.4263	45.3376	1.0944	0.3041812	
<i>Ntsr1</i>	11.3771	0.3801	0.0334	1.06E-103	Down
<i>Otx1</i>	8.1931	4.3395	0.5297	1.00E-10	
<i>Pax6</i>	3.7565	2.9533	0.7862	0.0082724	
<i>Plk2</i>	51.8646	10.8920	0.2100	4.34E-57	Down
<i>Ppp1r14c</i>	2.9001	48.4728	16.7144	3.64E-119	Up
<i>Ppp1r1b</i>	15.3680	2.9069	0.1892	2.72E-49	Down
<i>Ptgds</i>	0.1751	2.0172	11.5222	6.24E-12	Up
<i>Rbfox3</i>	10.5809	22.6728	2.1428	8.09E-23	Up
<i>Reln</i>	16.7732	5.1502	0.3071	2.51E-42	Down
<i>Rgs16</i>	23.1465	15.1468	0.6544	0.0001679	
<i>Rgs4</i>	4.4245	0.7844	0.1773	3.20E-26	Down
<i>Rorb</i>	2.1224	0.4825	0.2273	2.83E-21	Down
<i>Satb2</i>	36.8346	14.9631	0.4062	1.94E-22	Down
<i>Sema3c</i>	3.1089	28.5964	9.1983	2.48E-115	Up
<i>Shtn1</i>	80.7700	30.1365	0.3731	5.05E-27	Down
<i>Slc17a6</i>	10.7140	26.5073	2.4741	5.62E-24	Up

<i>Slc17a7</i>	26.5065	8.9046	0.3359	3.91E-23	Down
<i>Sorl1</i>	14.1777	45.4353	3.2047	9.85E-49	Up
<i>Sox2</i>	31.2417	34.3124	1.0983	0.2822599	
<i>Sox5</i>	21.7790	9.9107	0.4551	3.60E-21	Down
<i>Sox9</i>	13.9668	15.6395	1.1198	0.2096425	
<i>Sstr2</i>	14.0834	29.2136	2.0743	4.97E-16	Up
<i>Stat3</i>	1.1375	1.5717	1.3817	0.0108098	
<i>Tbr1</i>	59.9832	55.7837	0.9300	0.3913116	
<i>Tle4</i>	29.9653	5.4233	0.1810	3.86E-66	Down
<i>Top2a</i>	24.7892	18.7964	0.7582	0.0003678	
<i>Trp73</i>	2.3517	1.4684	0.6244	0.0052581	
<i>Tubb3</i>	1066.8663	779.8322	0.7310	3.03E-05	
<i>Unc5d</i>	15.3338	26.8387	1.7503	1.65E-13	
<i>Wnt7a</i>	10.6869	7.4993	0.7017	0.0009286	
<i>Wnt7b</i>	56.9553	116.4431	2.0445	1.40E-14	Up
<i>Zfpn2</i>	13.5080	1.2499	0.0925	2.08E-59	Down
<i>Zic1</i>	2.0900	1.4964	0.7160	0.0442943	
<i>Zic2</i>	4.3427	2.8843	0.6642	0.0086696	
<i>Zic5</i>	1.2664	0.7126	0.5627	0.0068358	

Supplementary Table 3. Expression of genes that are related to the cortex development in the *control* and *Bcl11a/b-DCKO* mice cortices at P0.

Gene name	Control FPKM	<i>Bcl11a/b-DCKO</i> FPKM	Fold Change Mutant/Control	P-value	Up/Down Regulation
<i>Aldh111</i>	46.2437	61.8143	1.3367	0.002774	
<i>Aldoc</i>	82.5117	159.5087	1.9332	4.52E-14	
<i>Bcl11a</i>	409.5873	592.1500	1.4457	4.48E-05	
<i>Bcl11b</i>	204.2823	38.5227	0.1886	6.31E-64	Down
<i>Bhlhe40</i>	26.8627	39.0717	1.4545	0.000887	
<i>Calb2</i>	5.4993	151.5227	27.5529	6.33E-218	Up
<i>Cxcr4</i>	17.1750	37.9720	2.2109	1.12E-08	Up
<i>Dab1</i>	286.5500	223.2330	0.7790	0.001089	
<i>Dcx</i>	1949.6447	1954.961	1.0027	0.950360	
<i>Eomes</i>	11.0030	74.1083	6.7353	3.67E-63	Up
<i>Etv1</i>	38.0783	17.0743	0.4484	1.55E-08	Down
<i>Foxg1</i>	747.6570	594.2537	0.7948	0.014782	
<i>Foxp1</i>	309.2393	39.9200	0.1291	1.07E-78	Down
<i>Foxp2</i>	64.0943	4.1770	0.0652	3.13E-64	Down
<i>Gfap</i>	12.0383	95.9200	7.9679	1.49E-17	Up
<i>Grin2d</i>	43.4693	162.8753	3.7469	4.13E-27	Up
<i>Kcnip2</i>	38.3540	13.8013	0.3598	7.48E-16	Down
<i>Kitl</i>	72.4863	21.6530	0.2987	3.84E-24	Down
<i>Lhx1</i>	1.1333	0.1980	0.1747	0.000196	Down
<i>Lhx2</i>	172.2050	242.9673	1.4109	3.04E-06	
<i>Lhx5</i>	2.2850	0.2817	0.1233	3.09E-08	Down
<i>Limch1</i>	351.1327	498.1790	1.4188	1.20E-07	
<i>Mapk1</i>	382.2553	253.6013	0.6634	2.84E-09	
<i>Mapk3</i>	113.0363	89.7153	0.7937	0.010098	
<i>Mef2c</i>	1261.6157	280.0517	0.2220	8.05E-127	Down
<i>Ndnf</i>	33.2557	7.2857	0.2191	6.61E-24	Down
<i>Nectin3</i>	83.7247	46.7260	0.5581	8.55E-11	
<i>Nes</i>	69.6680	139.4857	2.0021	2.80E-20	Up
<i>Neurod1</i>	26.1340	57.3560	2.1947	2.38E-12	Up
<i>Neurog2</i>	6.0633	11.4840	1.8940	0.000818	
<i>Nfe2l3</i>	71.2687	13.6113	0.1910	3.88E-22	Down
<i>Nfia</i>	79.2773	51.2337	0.6463	9.56E-07	
<i>Nfib</i>	461.1463	355.3367	0.7706	0.001193	
<i>Npy</i>	92.1963	8.9253	0.0968	1.46E-58	Down
<i>Nr2f1</i>	262.0877	229.9617	0.8774	0.106616	

<i>Nr4a2</i>	101.9373	1.3277	0.0130	2.38E-203	Down
<i>Nrgn</i>	148.6550	17.6927	0.1190	6.99E-94	Down
<i>Olig2</i>	34.6457	50.0673	1.4451	0.000472	
<i>Otx1</i>	22.2020	9.2867	0.4183	2.18E-07	Down
<i>Pax6</i>	17.4647	34.8653	1.9963	1.90E-09	
<i>Pou3f2</i>	248.6283	280.4107	1.1278	0.232851	
<i>Ppp1r1b</i>	82.9170	12.8493	0.1550	4.04E-54	Down
<i>Rbfox3</i>	148.5227	113.3613	0.7633	0.001503	
<i>Reln</i>	438.5267	121.2583	0.2765	8.95E-50	Down
<i>Rgs4</i>	42.6540	27.7073	0.6496	0.000862	
<i>Rorb</i>	69.8387	9.3097	0.1333	1.62E-63	Down
<i>Satb2</i>	552.6263	407.2697	0.7370	5.22E-05	
<i>Slc1a3</i>	167.0117	255.3190	1.5287	5.32E-06	
<i>Sox5</i>	210.5717	51.6850	0.2455	1.22E-56	Down
<i>Sox9</i>	34.8903	56.4387	1.6176	0.000129	
<i>Tbr1</i>	375.8343	220.2417	0.5860	5.73E-11	
<i>Tle4</i>	153.6600	20.3317	0.1323	3.52E-94	Down
<i>Trp73</i>	9.4113	2.6277	0.2792	1.09E-07	Down
<i>Vldlr</i>	157.2760	93.8580	0.5968	1.57E-08	
<i>Zbtb20</i>	135.5923	188.7323	1.3919	0.007166	
<i>Zbtb22</i>	43.2430	60.6777	1.4032	0.001384	
<i>Zbtb46</i>	11.7887	37.5260	3.1832	1.94E-17	Up
<i>Zfpm2</i>	28.9900	9.8067	0.3383	1.31E-14	Down

Supplementary Table 4. A list of genes that are related to the cortex development in the *Bcl11a/b-DCKO* mice compared to the *Bcl11a-CKO* mice at E15.5.

Gene name	<i>Bcl11a-CKO</i> FPKM	<i>Bcl11a/b-DCKO</i> FPKM	Fold Change <i>DCKO/CKO</i>	P-value	Up/Down Regulation
<i>Aldh1l1</i>	6.1356	8.2935	1.3517	0.006784	
<i>Bcl11a</i>	30.9569	37.4005	1.2081	0.010107	
<i>Bcl11b</i>	33.1120	9.9527	0.3006	1.85E-50	Down
<i>Bcl2</i>	5.1647	2.1317	0.4127	2.15E-13	Down
<i>Bhlhe22</i>	114.8573	150.3423	1.3089	0.001007	
<i>Calb2</i>	3.0075	2.3370	0.7771	0.557359	
<i>Ccnd2</i>	31.0891	27.4090	0.8816	0.099078	
<i>Cdkn1a</i>	1.9897	3.1973	1.6069	0.004780	
<i>Cdkn1c</i>	41.6815	135.4342	3.2493	4.29E-48	Up
<i>Cnr1</i>	21.6272	7.6092	0.3518	1.97E-38	Down
<i>Dcx</i>	76.9619	107.5273	1.3971	3.38E-06	
<i>Dync1i1</i>	24.5575	1.3259	0.0540	2.69E-141	Down
<i>Egfr</i>	0.4622	0.3716	0.8040	0.368309	
<i>Eomes</i>	45.3425	53.2434	1.1742	0.049063	
<i>Fezf2</i>	103.7060	40.2679	0.3883	9.12E-35	Down
<i>Fgf10</i>	0.7500	1.8669	2.4892	0.000616	Up
<i>Fgf9</i>	0.1241	1.1871	9.5667	9.38E-14	Up
<i>Fgfbp3</i>	35.5890	40.1972	1.1295	0.221015	
<i>Fgfr1</i>	14.2032	20.3873	1.4354	4.70E-06	
<i>Fgfr3</i>	2.8005	3.1705	1.1321	0.305878	
<i>Foxp1</i>	2.0510	0.7857	0.3831	1.42E-14	Down
<i>Foxp2</i>	1.2189	0.4402	0.3612	6.56E-16	Down
<i>Gfap</i>	0.8771	0.6406	0.7303	0.271329	
<i>Gli1</i>	2.0729	2.9785	1.4369	0.021040	
<i>Grin2b</i>	7.9068	3.4758	0.4396	1.26E-23	Down
<i>Hes1</i>	3.6152	3.8553	1.0664	0.674065	
<i>Hes5</i>	7.6778	10.0113	1.3039	0.079010	
<i>Kcnip2</i>	0.8897	0.5199	0.5843	0.052244	
<i>Kitl</i>	12.6109	7.8357	0.6213	1.23E-06	
<i>Ldb2</i>	10.3898	15.3210	1.4746	7.17E-05	
<i>Lhx5</i>	0.4260	0.6783	1.5923	0.173915	
<i>Mcm2</i>	8.7431	8.5693	0.9801	0.804755	
<i>Mdga1</i>	22.4995	31.4370	1.3972	3.74E-06	
<i>Mef2c</i>	2.3452	0.7358	0.3137	1.51E-32	Down

<i>Mfap4</i>	15.5459	18.4530	1.1870	0.150607	
<i>Mfng</i>	21.0708	28.6349	1.3590	0.000339	
<i>Mki67</i>	26.8396	26.9169	1.0029	1	
<i>Neurod1</i>	25.9647	52.2984	2.0142	3.19E-13	Up
<i>Neurod2</i>	308.0404	336.2981	1.0917	0.255699	
<i>Neurod6</i>	436.7113	394.0276	0.9023	0.161831	
<i>Neurog1</i>	1.4357	2.4895	1.7340	0.081906	
<i>Neurog2</i>	72.6492	73.2875	1.0088	0.944061	
<i>Nfe2l3</i>	8.5170	1.8420	0.2163	2.55E-25	Down
<i>Nfia</i>	9.6343	5.4248	0.5631	1.39E-13	
<i>Nfib</i>	34.5406	29.5822	0.8564	0.026532	
<i>Ngfr</i>	9.2637	1.1132	0.1202	9.52E-43	Down
<i>Nkd1</i>	9.4077	39.8333	4.2341	1.12E-54	Up
<i>Npy</i>	54.1403	14.7368	0.2722	3.93E-15	Down
<i>Nr2f1</i>	38.9908	65.8627	1.6892	1.65E-10	
<i>Nr4a2</i>	1.2588	1.4869	1.1813	0.375360	
<i>Nrn1</i>	37.6713	47.5920	1.2633	0.010108	
<i>Nrp1</i>	45.1718	45.3376	1.0037	0.992459	
<i>Ntsr1</i>	4.5980	0.3801	0.0827	2.21E-37	Down
<i>Otx1</i>	5.9092	4.3395	0.7344	0.003577	
<i>Pax6</i>	3.1458	2.9533	0.9388	0.456606	
<i>Plk2</i>	48.6992	10.8920	0.2237	10.8920	Down
<i>Ppp1r14c</i>	15.9259	48.4728	3.0436	1.41E-33	Up
<i>Ppp1r1b</i>	10.6667	2.9069	0.2725	1.41E-28	Down
<i>Ptgds</i>	1.2563	2.0172	1.6056	0.042194	
<i>Rbfox3</i>	14.1818	22.6728	1.5987	1.34E-09	
<i>Reln</i>	7.1768	5.1502	0.7176	0.000556	
<i>Rgs4</i>	1.9567	0.7844	0.4009	2.32E-06	Down
<i>Rorb</i>	1.8986	0.4825	0.2542	3.46E-20	Down
<i>Satb2</i>	30.1277	14.9631	0.4967	6.38E-08	Down
<i>Sema3c</i>	10.9470	28.5964	2.6123	2.93E-21	Up
<i>Shtn1</i>	64.4964	30.1365	0.4673	2.44E-19	Down
<i>Slc17a6</i>	15.4021	26.5073	1.7210	7.50E-09	
<i>Slc17a7</i>	17.6509	8.9046	0.5045	8.35E-10	
<i>Sorl1</i>	26.9017	45.4353	1.6889	4.53E-12	
<i>Sox5</i>	18.7828	9.9107	0.5276	3.99E-14	
<i>Sox9</i>	13.2056	15.6395	1.1843	0.073192	
<i>Sstr2</i>	20.0683	29.2136	1.4557	2.87E-05	
<i>Stat3</i>	1.4163	1.5717	1.1098	0.420291	
<i>Tbr1</i>	59.3366	55.7837	0.9401	0.430101	
<i>Tle4</i>	12.8159	5.4233	0.4232	2.49E-20	Down

<i>Top2a</i>	21.0646	18.7964	0.8923	0.127418	
<i>Trp73</i>	1.4182	1.4684	1.0354	0.884637	
<i>Tubb3</i>	1000.8402	779.8322	0.7792	0.000628	
<i>Unc5d</i>	21.7085	26.8387	1.2363	0.006095	
<i>Wnt7a</i>	8.7311	7.4993	0.8589	0.206613	
<i>Wnt7b</i>	105.5850	116.4431	1.1028	0.236269	
<i>Zfpm2</i>	8.3678	1.2499	0.1494	2.60E-38	Down
<i>Zic1</i>	2.3686	1.4964	0.6318	0.006706	
<i>Zic2</i>	3.4550	2.8843	0.8348	0.259248	
<i>Zic5</i>	0.8750	0.7126	0.8144	0.338064	

Supplementary Table 5. A list of genes that are related to the cortex development in the *Bcl11a/b-DCKO* mice compared to the *Bcl11a-CKO* mice at P0.

Gene name	<i>Bcl11a-CKO</i> FPKM	<i>Bcl11a/b-DCKO</i> FPKM	Fold Change <i>DCKO/CKO</i>	P-value	Up/Down Regulation
<i>Aldh111</i>	53.8570	61.8143	1.1477	0.087205	
<i>Aldoc</i>	98.5763	159.5087	1.6181	4.51E-09	
<i>Bcl11a</i>	468.8033	592.1500	1.2631	6.29E-05	
<i>Bcl11b</i>	114.9830	38.5227	0.3350	7.17E-61	Down
<i>Bhlhe40</i>	47.5950	39.0717	0.8209	0.005208	
<i>Calb2</i>	58.3213	151.5227	2.5981	2.08E-59	Up
<i>Cxcr4</i>	32.9077	37.9720	1.1539	0.087778	
<i>Dab1</i>	223.1493	223.2330	1.0004	0.994605	
<i>Dcx</i>	2015.0743	1954.9613	0.9702	0.693105	
<i>Eomes</i>	40.4727	74.1083	1.8311	2.15E-07	
<i>Etv1</i>	46.7903	17.0743	0.3649	1.02E-27	Down
<i>Foxg1</i>	361.7077	594.2537	1.6429	1.41E-17	
<i>Foxp1</i>	126.1057	39.9200	0.3166	2.71E-91	Down
<i>Foxp2</i>	25.5670	4.1770	0.1634	2.74E-32	Down
<i>Gfap</i>	35.6687	95.9200	2.6892	4.58E-13	Up
<i>Grin2b</i>	382.7713	290.9743	0.7602	3.78E-07	
<i>Kcnip2</i>	29.9910	13.8013	0.4602	5.81E-16	Down
<i>Kitl</i>	91.3730	21.6530	0.2370	6.36E-69	Down
<i>Lhx2</i>	191.2123	242.9673	1.2707	5.64E-05	
<i>Limch1</i>	492.5107	498.1790	1.0115	0.842152	
<i>Mapk1</i>	311.2707	253.6013	0.8147	6.13E-05	
<i>Mapk3</i>	102.3413	89.7153	0.8766	0.009089	
<i>Mef2c</i>	924.4717	280.0517	0.3029	3.30E-82	Down
<i>Ndnf</i>	14.4030	7.2857	0.5058	2.69E-07	
<i>Nectin3</i>	40.4463	46.7260	1.1553	0.040115	
<i>Nes</i>	154.0543	139.4857	0.9054	0.113309	
<i>Neurod1</i>	25.7937	57.3560	2.2236	3.24E-24	Up
<i>Neurog2</i>	8.0707	11.4840	1.4229	0.024105	
<i>Nfe2l3</i>	32.5893	13.6113	0.4177	1.37E-20	Down
<i>Nfia</i>	90.3220	51.2337	0.5672	1.08E-20	
<i>Nfib</i>	468.0543	355.3367	0.7592	4.57E-07	
<i>Npy</i>	85.7723	8.9253	0.1041	8.12E-68	Down
<i>Nr2f1</i>	143.1300	229.9617	1.6067	4.96E-12	
<i>Nr4a2</i>	1.9953	1.3277	0.6654	0.081463	

<i>Nrgn</i>	49.7640	17.6927	0.3555	6.78E-20	Down
<i>Olig2</i>	38.3457	50.0673	1.3057	0.000142	
<i>Otx1</i>	20.5597	9.2867	0.4517	5.07E-10	Down
<i>Pax6</i>	24.0463	34.8653	1.4499	3.94E-05	
<i>Pou3f2</i>	264.0683	280.4107	1.0619	0.337626	
<i>Ppp1r1b</i>	47.6270	12.8493	0.2698	1.03E-53	Down
<i>Rbfox3</i>	104.7737	113.3613	1.0820	0.188484	
<i>Reln</i>	174.1560	121.2583	0.6963	4.45E-13	
<i>Rgs4</i>	29.5603	27.7073	0.9373	0.554033	
<i>Rorb</i>	56.7790	9.3097	0.1640	3.92E-89	Down
<i>Satb2</i>	402.6917	407.2697	1.0114	0.838447	
<i>Slc1a3</i>	294.8673	255.3190	0.8659	0.030710	
<i>Sox5</i>	150.7883	51.6850	0.3428	9.69E-79	Down
<i>Sox9</i>	27.9057	56.4387	2.0225	5.07E-21	Up
<i>Tbr1</i>	218.1170	220.2417	1.0097	0.852625	
<i>Tle4</i>	122.0870	20.3317	0.1665	6.82E-189	Down
<i>Trp73</i>	3.9413	2.6277	0.6667	0.049168	
<i>Vldlr</i>	108.7620	93.8580	0.8630	0.032990	
<i>Zbtb20</i>	161.2430	188.7323	1.1705	0.091927	
<i>Zbtb22</i>	39.2477	60.6777	1.5460	1.38E-09	
<i>Zbtb46</i>	32.5373	37.5260	1.1533	0.086626	
<i>Zfpm2</i>	30.4113	9.8067	0.3225	3.27E-26	Down
