Proteomic Investigations of Autism Brain Identify Known and Novel Pathogenetic Processes

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Supplementary Tables and Figures

Supplementary Table 1. Individual subject characteristics. PMI, postmortem interval; COD, cause of death.

Subject ID:	Subject ATP ID:	Diagnosis	Regions	Age (years)	PMI (hours)	COD	Ethnicity	Medications
6399	**AN03345**	Autism	Cerebellum, BA19	2	4	Hypoxia	White	None reported
7078	**AN17678**	Autism	Cerebellum	11		Other	White	None reported
6677	**AN11989**	Autism	Cerebellum, BA19	30	16	Cardiac	White	None reported
6337	**AN09730**	Autism	Cerebellum, BA19	22	25	Hypoxia	White	Aripiprazole, lamotrigine, fish oil, multivitamin, zonisamide
6994	**AN08166**	Autism	Cerebellum, BA19	28	43	Other	Unknown	Ziprasidone, cambamazepine, fexofenadine
5666	**AN19511**	Autism	Cerebellum, BA19	8	22.2	Cancer	White	None reported
6401	**AN06420**	Autism	Cerebellum, BA19	39	14	Cardiac	White	None reported
5569	**AN08873**	Autism	Cerebellum, BA19	5	25.5	Hypoxia	White	Fluoxetine
7090	**AN09714**	Autism	Cerebellum, BA19	60	26.5	Cancer	Unknown	Omeprazole, docusate, diazepam, phenobarbital, carbamazepine, guaifenesin
5334	**AN15622**	Control	Cerebellum, BA19	30	15	Hypoxia	White	None reported
6200	**AN10723**	Control	Cerebellum, BA19	60	24.2	Unknown	Unknown	None reported
7561	**AN05475**	Control	Cerebellum, BA19	39		Cardiac	Unknown	None reported
5718	**AN10833**	Control	Cerebellum, BA19	22	21.5	Unknown	Unknown	None reported
4678	**UMB4670**	Control	Cerebellum, BA19	4	17	Cardiac	White	None reported
1453	**BTB1453**	Control	Cerebellum, BA19	1	19	Unknown	Black	None reported
3328	**BTB3228**	Control	Cerebellum	11	20	Other	Unknown	None reported
4543	**UMB4543**	Control	Cerebellum, BA19	28	13	Other	White	None reported
1860	**UMB1860**	Control	Cerebellum, BA19	8	5	Cardiac	White	None reported

Supplementary Table 2. List of all differentially expressed proteins by brain region with p-value, adjusted p-value, and % expression in ASD (A) vs controls (C).

BA19 Differentially Expressed Proteins

Accession ID	Protein symbol	P-values	Adjusted p-value	% Expression (A vs C)
P46821	MAP1B	1.86E-09	2.54E-06	84.1
P49327	FAS	9.91E-08	6.76E-05	88.6
P02787	TF	5.95E-07	2.71E-04	67.8
P14136	GFAP	5.36E-06	1.83E-03	55.2
P02675	FGB	6.84E-06	1.87E-03	296.3
O75955	FLOT1	1.03E-05	2.34E-03	147.8
Q92561	PHYHIP	3.78E-05	7.37E-03	128.0
P02679	FGG	5.90E-05	1.01E-02	302.8
Q99961	SH3GL1	1.12E-04	1.39E-02	133.0
P08107	HSPA1A	1.30E-04	1.48E-02	149.4
Q9P1U1	ACTR3B	1.66E-04	1.67E-02	82.2
O00571	DDX3X	1.71E-04	1.67E-02	121.4
Q9NZN3	EHD3	1.92E-04	1.75E-02	120.2
P01024	C3	3.20E-04	2.73E-02	173.5
P35222	CTNNB1	3.67E-04	2.78E-02	83.5
P11766	ADH5	3.70E-04	2.78E-02	114.9
P78352	DLG4	3.87E-04	2.78E-02	118.6
Q93050	ATP6V0A1	4.36E-04	2.97E-02	118.9
Q14011	CIRBP	5.03E-04	3.27E-02	50.5
Q9Y6K8	AK5	5.52E-04	3.43E-02	80.3
P21266	GSTM3	6.39E-04	3.78E-02	69.1
Q92823	NRCAM	6.64E-04	3.78E-02	85.3
P13693	TPT1	7.61E-04	4.11E-02	81.6
P07197	NEFM	9.19E-04	4.60E-02	81.8
Q59EK9	RUNDC3A	9.43E-04	4.60E-02	126.5
Q16352	INA	1.04E-03	4.84E-02	78.7
P02671	FGA	1.06E-03	4.84E-02	325.1
P09497	CLTB	1.19E-03	5.14E-02	63.6
O00533	CHL1	1.21E-03	5.14E-02	121.1
Q16698	DECR1	1.34E-03	5.54E-02	121.1
P12814	ACTN1	1.49E-03	5.98E-02	111.0
Q9HB71	CACYBP	1.64E-03	6.39E-02	117.9
Q8IXJ6	SIRT2	2.11E-03	7.34E-02	78.3
Q02878	RPL6	2.14E-03	7.34E-02	86.7
Q14254	FLOT2	2.15E-03	7.34E-02	141.3
Q14204	DYNC1H1	2.50E-03	8.32E-02	93.4

P12955	PEPD	2.70E-03	8.77E-02	83.4
P53396	ACLY	2.93E-03	9.09E-02	121.0
O14994	SYN3	2.95E-03	9.09E-02	83.9
P23471	PTPRZ1	3.00E-03	9.09E-02	88.5
P02768	ALB	3.26E-03	9.54E-02	84.5
P11137	MTAP2	3.28E-03	9.54E-02	85.4
P43003	SLC1A3	3.56E-03	9.92E-02	194.7
O14936	CASK	4.09E-03	1.09E-01	113.1
Q15700	DLG2	4.17E-03	1.10E-01	111.8
P38646	HSPA9	4.69E-03	1.19E-01	162.4
P0C0L4	C4A	5.17E-03	1.22E-01	85.2
Q99963	SH3GL3	5.20E-03	9.93E-02	114.8
P46439	GSTM5	5.38E-03	1.22E-01	116.6
Q6YN16	HSDL2	5.54E-03	1.22E-01	30.4
P00387	CYB5R3	5.55E-03	1.22E-01	80.5
Q08209	PPP3CA	5.84E-03	1.27E-01	112.4
P49773	HINT1	6.48E-03	1.36E-01	81.5
P43007	SLC1A4	6.63E-03	1.36E-01	122.0
O75396	SEC22B	6.68E-03	1.36E-01	133.5
P31937	HIBADH	7.26E-03	1.36E-01	139.6
P55786	NPEPPS	7.46E-03	1.36E-01	91.1
P07196	NEFL	8.14E-03	1.44E-01	84.9
O43865	AHCYL1	8.59E-03	1.50E-01	112.8
O94985	CLSTN1	8.98E-03	1.55E-01	78.3
P31943	HNRNPH1	9.36E-03	1.57E-01	116.3
P13611	VCAN	9.84E-03	1.60E-01	68.5
Q9BPU6	DPYSL5	1.00E-02	1.60E-01	78.9
Q9NQC3	RTN4	1.02E-02	1.60E-01	83.6
Q9Y3F4	STRAP	1.07E-02	1.64E-01	74.5
P23634	ATP2B4	1.09E-02	1.65E-01	76.9
Q6PCE3	PGM2L1	1.10E-02	1.65E-01	113.5
O43776	SYNC	1.12E-02	1.67E-01	89.9
P01034	CST3	1.16E-02	1.71E-01	66.2
Q9UH03	SEPT3	1.18E-02	1.71E-01	112.3
P51452	DUSP3	1.30E-02	1.82E-01	76.7
Q14832	GRM3	1.31E-02	1.83E-01	129.8
Q99719	SEPT5	1.34E-02	1.84E-01	121.2
P42704	LRPPRC	1.39E-02	1.88E-01	90.7
Q9BRX8	FAM213A	1.43E-02	1.91E-01	82.7
O60763	USO1	1.50E-02	1.97E-01	125.8
O60282	KIF5C	1.53E-02	1.97E-01	79.6

P01871	IGHM	1.58E-02	2.00E-01	72.0
P45974	USP5	1.58E-02	2.00E-01	85.7
P49591	SARS	1.62E-02	2.01E-01	82.7
Q9Y2A7	NCKAP1	1.78E-02	2.17E-01	112.1
P30041	PRDX6	1.83E-02	2.20E-01	116.5
P07305	H1F0	1.86E-02	2.20E-01	74.9
P30519	HMOX2	1.88E-02	2.20E-01	86.4
Q9UMF0	ICAM5	1.89E-02	2.20E-01	126.0
Q9NYU2	UGGT1	1.98E-02	2.21E-01	109.2
P62701	RPS4X	1.99E-02	2.21E-01	112.4
Q00610	CLTC	1.99E-02	2.21E-01	89.3
P30048	PRDX3	2.05E-02	2.26E-01	110.7
O95299	NDUFA10	2.13E-02	2.29E-01	110.6
O00154	ACOT7	2.30E-02	2.45E-01	86.0
P42262	GRIA2	2.32E-02	2.45E-01	115.3
P31153	MAT2A	2.46E-02	2.51E-01	73.4
Q13509	TUBB3	2.47E-02	2.51E-01	86.5
Q01082	SPTBN1	2.48E-02	2.51E-01	94.6
P27797	CALR	2.49E-02	2.51E-01	111.9
P30085	CMPK1	2.55E-02	2.54E-01	112.6
Q9NSE4	IARS2	2.55E-02	2.54E-01	109.6
P60880	SNAP25	2.57E-02	2.54E-01	85.3
P68104	EEF1A1	2.61E-02	2.54E-01	86.2
Q9NVA2	SEP11	2.64E-02	2.54E-01	94.1
O15020	SPTBN2	2.64E-02	2.54E-01	117.5
P78417	GSTO1	2.69E-02	2.54E-01	82.8
P45985	MAP2K4	2.69E-02	2.54E-01	108.7
P00338	LDHA	2.77E-02	2.54E-01	112.4
P02649	APOE	2.80E-02	2.57E-01	85.6
O15075	DCLK1	2.88E-02	2.57E-01	119.4
P01023	A2M	2.91E-02	2.57E-01	123.3
Q9Y2Q0	ATP8A1	2.95E-02	2.57E-01	75.8
Q7L099	RUFY3	2.95E-02	2.57E-01	89.5
P62424	RPL7A	2.96E-02	2.57E-01	92.5
P31689	DNAJA1	2.97E-02	2.57E-01	88.0
Q9NUQ9	FAM49B	3.00E-02	2.57E-01	131.6
Q9BSJ8	ESYT1	3.00E-02	2.57E-01	78.7
Q9Y617	PSAT1	3.01E-02	2.63E-01	78.8
P08133	ANXA6	3.03E-02	2.63E-01	77.9
Q9UNM6	PSMD13	3.08E-02	2.63E-01	112.6
P62081	RPS7	3.19E-02	2.63E-01	116.3

P04181	OAT	3.22E-02	2.63E-01	82.5
Q9H0B6	KLC2	3.26E-02	2.63E-01	88.8
Q9BYB0	SHANK3	3.31E-02	2.63E-01	121.6
Q9UPR5	SLC8A2	3.32E-02	2.63E-01	81.6
P30043	BLVRB	3.37E-02	2.63E-01	86.8
P32969	RPL9	3.41E-02	2.63E-01	118.3
P09429	HMGB1	3.42E-02	2.63E-01	89.5
Q9BPX5	ARPC5L	3.42E-02	2.63E-01	106.6
P37837	TALDO1	3.45E-02	2.63E-01	88.6
P24752	ACAT1	3.48E-02	2.63E-01	79.6
Q02790	FKBP4	3.50E-02	2.63E-01	88.2
P52209	PGD	3.50E-02	2.63E-01	121.3
Q13554	CAMK2B	3.58E-02	2.67E-01	87.3
P62244	RPS15A	3.61E-02	2.68E-01	83.3
P13645	KRT10	3.81E-02	2.81E-01	76.3
P50914	RPL14	3.90E-02	2.83E-01	88.6
Q15149	PLEC	4.05E-02	2.87E-01	64.5
Q7Z3D6	DGLUCY	4.06E-02	2.87E-01	93.9
P19105	MYL12A	4.13E-02	2.89E-01	125.4
P63092	GNAS	4.20E-02	2.92E-01	113.1
P22695	UQCRC2	4.23E-02	2.92E-01	83.9
O60861	GAS7	4.23E-02	2.92E-01	89.8
P13637	ATP1A3	4.29E-02	2.92E-01	88.7
P14866	HNRNPL	4.33E-02	2.93E-01	107.9
P07900	HSP90AA1	4.61E-02	3.06E-01	168.1
Q14318	FKBP8	4.64E-02	3.06E-01	82.3
O75569	PRKRA	4.64E-02	3.06E-01	110.0
P49006	MARCKSL1	4.85E-02	3.15E-01	71.2

CB Differentially Expressed Proteins

Accession ID	Protein symbol	P-value	Adjusted p-value	% Expression (A vs C)
P02768	ALBU	7.03E-13	1.01E-09	67
Q14643	ITPR1	2.31E-12	1.65E-09	136
P02042	HBD	4.64E-11	2.21E-08	57
Q01814	AT2B2	3.32E-09	1.19E-06	125
Q9NYI0	PSD3	1.35E-08	3.86E-06	156
P02787	TRFE	7.82E-08	1.86E-05	64
P07196	NFL	2.18E-07	4.46E-05	75
P19367	HXK1	6.88E-07	1.23E-04	117
Q7Z3D6	GLUCM	1.21E-06	1.92E-04	59
P12036	NFH	2.36E-06	3.38E-04	74
P17600	SYN1	6.30E-06	8.19E-04	137

P16152	CBR1	7.63E-06	9.10E-04	80
Q01484	ANK2	1.17E-05	1.24E-03	116
P07197	NFM	1.21E-05	1.24E-03	71
O15020	SPTN2	1.32E-05	1.26E-03	116
Q9H4G0	E41L1	1.89E-05	1.69E-03	133
Q02790	FKBP4	2.48E-05	2.03E-03	127
Q13554	KCC2B	2.56E-05	2.03E-03	124
P05091	ALDH2	3.17E-05	2.39E-03	74
P06396	GELS	3.86E-05	2.76E-03	84
Q9Y2J2	E41L3	4.56E-05	3.11E-03	117
P69905	HBA	5.09E-05	3.31E-03	62
Q14204	DYHC1	5.39E-05	3.33E-03	109
Q99719	SEPT5	5.58E-05	3.33E-03	125
Q14168	MPP2	2.26E-04	1.29E-02	124
Q15149	PLEC	2.37E-04	1.30E-02	87
P04040	CATA	2.76E-04	1.46E-02	68
P07900	HS90A	3.23E-04	1.65E-02	118
Q9P2U7	VGLU1	4.47E-04	2.18E-02	131
P00918	CAH2	4.56E-04	2.18E-02	76
Q9NSC5	HOME3	4.77E-04	2.20E-02	130
Q9Y6R1	S4A4	4.95E-04	2.21E-02	125
Q9UPA5	BSN	9.40E-04	3.96E-02	171
P04264	K2C1	1.01E-03	4.14E-02	133
P10636	TAU	1.07E-03	4.24E-02	138
P35219	CAH8	1.24E-03	4.81E-02	132
Q8N9I0	SYT2	1.32E-03	4.95E-02	127
Q9Y3E1	HDGR3	1.35E-03	4.95E-02	124
Q9ULP0	NDRG4	1.45E-03	5.18E-02	127
O75746	CMC1	1.65E-03	5.77E-02	114
Q08209	PP2BA	1.81E-03	5.97E-02	118
P35908	K22E	1.82E-03	5.97E-02	139
Q9P2R7	SUCB1	1.84E-03	5.97E-02	114
P07954	FUMH	1.92E-03	6.10E-02	88
P07339	CATD	2.18E-03	6.79E-02	76
P16615	AT2A2	2.29E-03	6.97E-02	114
P28482	MK01	2.43E-03	7.23E-02	115
P48664	EAA4	2.52E-03	7.33E-02	151
P37837	TALDO	2.56E-03	7.33E-02	117
Q96FC7	PHIPL	2.77E-03	7.48E-02	126
P02730	B3AT	2.81E-03	7.48E-02	61
P63027	VAMP2	2.82E-03	7.48E-02	173

O14531	DPYL4	2.84E-03	7.48E-02	128
Q15700	DLG2	2.88E-03	7.48E-02	126
Q13557	KCC2D	2.97E-03	7.48E-02	117
Q9Y2A7	NCKP1	2.98E-03	7.48E-02	115
P30048	PRDX3	3.52E-03	8.69E-02	79
P38646	GRP75	3.78E-03	9.15E-02	87
Q08722	CD47	3.97E-03	9.41E-02	121
P24752	THIL	4.01E-03	9.41E-02	79
Q13885	TBB2A	4.21E-03	9.49E-02	113
P21926	CD9	4.24E-03	9.49E-02	68
Q92598	HS105	4.60E-03	1.01E-01	128
P00915	CAH1	4.69E-03	1.01E-01	70
P08237	PFKAM	4.74E-03	1.01E-01	114
Q86VP6	CAND1	5.40E-03	1.14E-01	109
P13637	AT1A3	5.64E-03	1.16E-01	119
Q9UM19	HPCL4	5.69E-03	1.16E-01	119
Q9UKA9	PTBP2	5.93E-03	1.18E-01	118
Q969P0	IGSF8	6.01E-03	1.18E-01	120
P15531	NDKA	6.25E-03	1.21E-01	82
P14415	AT1B2	6.37E-03	1.21E-01	125
Q02252	MMSA	6.53E-03	1.23E-01	87
Q7Z6L0	PRRT2	6.81E-03	1.25E-01	148
P05026	AT1B1	6.89E-03	1.25E-01	112
Q06830	PRDX1	6.96E-03	1.25E-01	86
P00352	AL1A1	7.54E-03	1.31E-01	123
P21283	VATC1	7.59E-03	1.31E-01	113
P02545	LMNA	7.95E-03	1.33E-01	80
P01857	IGHG1	7.99E-03	1.33E-01	75
P30043	BLVRB	8.56E-03	1.40E-01	54
P52306	GDS1	8.64E-03	1.40E-01	113
P23634	AT2B4	8.88E-03	1.42E-01	116
P98179	RBM3	9.02E-03	1.42E-01	67
Q99714	HCD2	9.07E-03	1.42E-01	88
P40939	ECHA	9.13E-03	1.42E-01	87
Q9BWM7	SFXN3	9.39E-03	1.44E-01	118
P22748	CAH4	9.46E-03	1.44E-01	139
Q9HB71	CYBP	9.59E-03	1.44E-01	113
P51674	GPM6A	1.04E-02	1.49E-01	143
P60880	SNP25	1.05E-02	1.49E-01	125
Q92823	NRCAM	1.05E-02	1.49E-01	111
Q9NZ45	CISD1	1.07E-02	1.49E-01	114

Q9UI12	VATH	1.08E-02	1.49E-01	116
P17844	DDX5	1.08E-02	1.49E-01	83
P17677	NEUM	1.09E-02	1.49E-01	127
P08247	SYPH	1.09E-02	1.49E-01	132
P00568	KAD1	1.10E-02	1.49E-01	76
P02675	FIBB	1.16E-02	1.54E-01	155
Q9UPR5	NAC2	1.20E-02	1.57E-01	121
Q9UH03	SEPT3	1.21E-02	1.57E-01	117
Q14576	ELAV3	1.28E-02	1.63E-01	124
Q8IV01	SYT12	1.37E-02	1.72E-01	112
P37235	HPCL1	1.47E-02	1.82E-01	120
P08670	VIME	1.50E-02	1.83E-01	60
P09211	GSTP1	1.52E-02	1.85E-01	74
Q9NS86	LANC2	1.54E-02	1.85E-01	135
P49327	FAS	1.58E-02	1.88E-01	108
P14136	GFAP	1.60E-02	1.88E-01	75
P55084	ECHB	1.65E-02	1.89E-01	88
O43424	GRID2	1.66E-02	1.89E-01	125
P68871	HBB	1.67E-02	1.89E-01	56
Q9HDB5	NRX3B	1.68E-02	1.89E-01	120
Q9UQ03	COR2B	1.70E-02	1.90E-01	119
P08865	RSSA	1.72E-02	1.90E-01	88
Q92561	PHYIP	1.74E-02	1.90E-01	120
O14745	NHRF1	1.75E-02	1.90E-01	81
Q86UW7	CAPS2	1.75E-02	1.90E-01	132
P07099	HYEP	1.78E-02	1.92E-01	68
P02765	FETUA	1.80E-02	1.93E-01	54
Q9C005	DPY30	1.87E-02	1.98E-01	70
P08133	ANXA6	1.88E-02	1.98E-01	88
Q7Z3B1	NEGR1	1.91E-02	1.98E-01	120
P22392	NDKB	1.91E-02	1.98E-01	84
P02647	APOA1	1.92E-02	1.98E-01	49
Q8TB36	GDAP1	1.99E-02	2.04E-01	120
O75122	CLAP2	2.01E-02	2.04E-01	116
P35527	K1C9	2.10E-02	2.10E-01	126
P22061	PIMT	2.11E-02	2.10E-01	76
O43426	SYNJ1	2.11E-02	2.10E-01	121
Q9H2X9	S12A5	2.24E-02	2.17E-01	119
P43304	GPDM	2.25E-02	2.17E-01	112
Q9NY65	TBA8	2.25E-02	2.17E-01	121
P55809	SCOT1	2.26E-02	2.17E-01	108

P17655	CAN2	2.28E-02	2.17E-01	86
O95865	DDAH2	2.34E-02	2.21E-01	81
Q92597	NDRG1	2.36E-02	2.21E-01	77
Q9P2K5	MYEF2	2.40E-02	2.23E-01	116
P20472	PRVA	2.44E-02	2.23E-01	119
P28161	GSTM2	2.50E-02	2.27E-01	88
Q9ULU8	CAPS1	2.57E-02	2.31E-01	119
Q13367	AP3B2	2.67E-02	2.37E-01	119
Q96E17	RAB3C	2.67E-02	2.37E-01	133
O60268	K0513	2.69E-02	2.38E-01	150
Q96ID5	IGS21	2.73E-02	2.40E-01	133
P07237	PDIA1	2.82E-02	2.45E-01	88
P42126	ECI1	2.87E-02	2.47E-01	79
P05023	AT1A1	2.98E-02	2.54E-01	108
P00738	HPT	3.05E-02	2.56E-01	181
Q9UBQ7	GRHPR	3.05E-02	2.56E-01	88
P14550	AK1A1	3.15E-02	2.61E-01	93
O14594	NCAN	3.18E-02	2.61E-01	152
Q9NZN3	EHD3	3.18E-02	2.61E-01	120
Q14318	FKBP8	3.20E-02	2.61E-01	136
P31937	3HIDH	3.23E-02	2.61E-01	83
Q9UBB6	NCDN	3.32E-02	2.64E-01	110
P07602	SAP	3.32E-02	2.64E-01	77
Q9UKU0	ACSL6	3.36E-02	2.66E-01	120
Q92522	H1X	3.42E-02	2.69E-01	114
P52757	CHIO	3.48E-02	2.71E-01	137
A6NE02	BTBDH	3.50E-02	2.71E-01	144
O95831	AIFM1	3.53E-02	2.72E-01	85
P09960	LKHA4	3.57E-02	2.73E-01	114
O14979	HNRDL	3.60E-02	2.74E-01	85
Q8TCU6	PREX1	3.71E-02	2.79E-01	126
P05937	CALB1	3.76E-02	2.82E-01	120
P13591	NCAM1	3.81E-02	2.82E-01	108
Q96JE9	MAP6	3.83E-02	2.82E-01	124
Q9H6S3	ES8L2	3.84E-02	2.82E-01	124
P23471	PTPRZ	3.86E-02	2.82E-01	113
Q09666	AHNK	3.87E-02	2.82E-01	74
Q05193	DYN1	3.96E-02	2.87E-01	114
Q96FJ2	DYL2	3.97E-02	2.87E-01	121
Q99497	PARK7	4.01E-02	2.89E-01	84
Q9UK22	FBX2	4.09E-02	2.91E-01	119
P21266	GSTM3	4.20E-02	2.96E-01	78

P30101	PDIA3	4.23E-02	2.97E-01	89
Q92777	SYN2	4.32E-02	3.00E-01	116
P09471	GNAO	4.34E-02	3.00E-01	116
Q16836	HCDH	4.39E-02	3.00E-01	89
P30084	ECHM	4.40E-02	3.00E-01	86
P48735	IDHP	4.41E-02	3.00E-01	86
P42765	THIM	4.45E-02	3.02E-01	76
Q14194	DPYL1	4.50E-02	3.03E-01	110
Q9H2U2	IPYR2	4.65E-02	3.08E-01	81
Q92752	TENR	4.67E-02	3.08E-01	117
O75363	BCAS1	4.68E-02	3.08E-01	65
Q96F07	CYFP2	4.78E-02	3.14E-01	113
P02679	FIBG	4.84E-02	3.16E-01	149
P16401	HIST1H1B	0.048936	3.18E-01	67
O00567	NOP56	0.049988	3.20E-01	117

Supplementary Table 3. List of proteins differentially expressed regionally in both ASD and Control datasets. Bolded proteins represent the 3 of 547 proteins that did not show directionality concordance in regional expression.

UniProt Protein	Log Expr ASD	Log Expr Controls	P-value ASD	P-value Controls	UniProt Protein	Log Expr ASD	Log Expr Controls	P-value ASD	P-value Controls
O00154	-0.71	-1.02	5.85E-11	2.76E-11	P50395	-0.40	-0.51	7.86E-10	6.93E-18
O00429	-1.28	-1.44	1.55E-24	1.82E-27	P50897	0.45	0.83	9.41E-03	8.06E-06
O00483	-0.88	-0.54	7.41E-11	2.63E-04	P50991	-0.13	-0.21	4.04E-02	1.26E-03
O00499	-0.79	-1.14	4.43E-13	9.71E-16	P50993	-0.65	-0.68	6.01E-22	3.53E-27
O00764	-0.87	-1.02	4.29E-07	1.54E-12	P51148	-0.68	-0.66	4.18E-12	3.95E-12
O14531	-1.87	-2.33	1.78E-18	3.48E-16	P51649	-0.44	-0.47	1.29E-04	1.12E-05
O14561	-0.51	-0.32	1.69E-03	9.57E-04	P51970	-0.35	-0.27	1.42E-03	2.09E-02
O14594	-1.71	-2.50	5.08E-14	5.62E-08	P51991	2.03	2.20	1.89E-19	1.86E-22
O14745	0.75	0.98	8.09E-05	4.73E-06	P52209	-0.41	-0.54	5.30E-05	2.40E-09
O14818	-0.34	-0.32	7.55E-03	6.04E-06	P52272	1.58	1.62	1.47E-25	6.44E-24
O14979	0.96	1.14	5.85E-10	1.13E-14	P52306	-0.35	-0.62	7.56E-07	2.10E-14
O14980	0.82	0.58	5.47E-10	1.88E-09	P52565	-1.10	-0.65	1.38E-06	3.44E-04
O15020	0.93	0.79	1.60E-12	8.94E-11	P53396	0.23	0.18	8.51E-03	3.71E-02
O15144	-0.32	-0.24	3.89E-04	8.92E-03	P53680	-1.09	-1.15	1.73E-08	1.33E-10
O15540	1.97	1.99	1.55E-06	3.31E-07	P54289	-1.40	-1.44	3.23E-16	3.19E-15
O43236	0.99	0.51	5.06E-08	9.96E-03	P54578	-1.26	-1.15	4.21E-10	7.04E-10
O43301	-1.69	-1.74	2.16E-40	1.92E-54	P55084	0.45	0.63	3.11E-05	2.92E-05
O43390	1.80	1.68	6.29E-26	1.98E-20	P55087	-1.04	-1.01	4.46E-03	1.70E-03
O43426	-0.94	-1.34	2.87E-08	6.03E-12	P55209	-0.97	-0.85	4.01E-10	1.04E-08
O43491	-0.82	-0.79	2.59E-09	2.18E-04	P55786	-0.32	-0.47	4.87E-08	8.88E-15
O43676	-0.89	-0.71	8.29E-05	3.31E-03	P55795	2.04	2.28	6.39E-10	5.20E-11
O43678	-0.86	-0.54	1.91E-03	9.73E-04	P55809	-0.85	-0.78	3.52E-23	3.83E-18
O43681	-0.45	-0.49	8.72E-06	7.98E-06	P56134	-0.37	-0.27	2.42E-05	1.62E-02
O43707	-0.70	-0.43	2.94E-06	1.27E-02	P59998	-0.58	-0.72	5.44E-06	8.04E-05
O43776	-0.44	-0.48	5.85E-03	1.20E-05	P60033	1.13	0.98	1.63E-06	2.52E-04
O43813	-0.37	-0.62	1.32E-03	5.63E-09	P60174	0.60	0.36	3.88E-21	1.92E-06
O43837	-0.45	-0.40	2.90E-05	3.42E-06	P60201	-0.61	-1.51	2.78E-03	8.42E-13
O43865	0.49	0.76	1.00E-05	4.10E-11	P60660	0.71	0.85	8.29E-06	1.39E-04
O43920	-0.78	-0.56	1.24E-04	2.01E-04	P60709	-0.76	-0.62	6.33E-11	5.91E-10
O60262	-1.01	-1.46	4.00E-05	6.30E-05	P60880	-0.71	-1.36	1.87E-11	4.62E-29
O60313	-0.71	-0.61	4.74E-08	4.16E-05	P60953	-0.67	-0.70	4.19E-06	3.67E-09
O60506	0.50	0.67	1.05E-05	1.09E-07	P60981	-0.30	-0.31	1.40E-02	8.24E-04
O60641	-0.95	-0.88	1.75E-14	1.90E-10	P61019	-0.72	-0.74	9.77E-07	3.00E-06
O60814	2.93	3.07	6.66E-39	1.73E-45	P61088	-0.53	-0.62	2.28E-03	2.32E-04
O60888	0.67	0.82	3.64E-02	1.35E-02	P61106	-0.51	-0.45	8.06E-06	1.73E-08
O75061	-1.15	-1.32	1.62E-14	1.53E-15	P61158	-0.52	-0.66	2.67E-02	2.45E-04
O75083	-0.75	-0.63	1.03E-18	2.45E-15	P61163	-1.30	-1.41	5.79E-07	8.50E-06

O75122	-0.71	-0.91	2.06E-05	7.12E-08	P61201	-0.80	-0.85	3.41E-08	3.28E-07
O75251	-0.69	-0.55	8.67E-06	1.06E-03	P61204	-0.61	-0.73	2.94E-06	3.78E-08
O75306	-1.00	-0.48	8.77E-09	4.60E-04	P61421	-0.84	-0.89	1.05E-09	2.60E-10
O75323	-0.53	-0.35	1.11E-03	3.70E-03	P61586	-0.83	-0.89	4.89E-04	2.15E-08
O75367	3.25	3.32	5.98E-29	2.19E-28	P61764	-0.66	-0.76	7.35E-17	7.18E-25
O75390	-0.38	-0.33	2.61E-05	3.92E-05	P61978	1.18	1.31	2.53E-15	5.13E-19
O75475	2.77	2.59	1.41E-12	7.39E-13	P61981	-0.93	-1.01	4.70E-26	2.94E-27
O75489	-1.12	-0.76	3.73E-09	1.00E-09	P62140	-0.75	-0.77	1.34E-10	1.16E-06
O75506	0.43	0.48	8.14E-03	6.13E-03	P62158	-1.16	-0.78	1.95E-11	3.07E-08
O75508	-1.39	-2.33	1.90E-04	2.41E-06	P62258	-0.37	-0.43	2.11E-07	1.83E-09
O75746	-0.41	-0.55	3.00E-10	8.66E-15	P62714	-0.60	-0.59	6.66E-05	3.54E-07
O75781	-2.15	-1.88	2.04E-05	3.56E-06	P62745	-1.28	-1.52	4.88E-12	4.23E-15
O75947	0.69	0.72	8.21E-07	8.09E-07	P62760	-1.15	-1.19	6.35E-13	9.91E-17
O94760	0.36	0.15	8.32E-06	2.32E-02	P62805	2.73	2.70	1.89E-24	1.60E-36
O94811	-2.19	-2.46	7.98E-34	3.14E-27	P62820	-0.41	-0.44	6.75E-04	2.57E-04
O94819	-0.92	-1.39	1.84E-05	1.17E-05	P62834	-0.49	-0.63	4.90E-05	3.86E-06
O94826	-1.20	-1.20	1.17E-12	4.54E-12	P62873	-0.35	-0.54	1.39E-07	9.60E-14
O94856	-0.65	-1.10	1.14E-11	4.09E-18	P62879	-0.54	-0.48	2.42E-04	8.23E-06
O94925	-1.21	-1.10	1.12E-25	3.41E-24	P63000	-0.88	-1.31	1.42E-03	9.66E-08
O94973	-0.94	-0.81	4.72E-39	3.39E-37	P63010	-1.20	-1.00	2.91E-27	6.35E-32
O95292	-0.89	-1.23	2.61E-06	9.74E-12	P63027	-0.81	-1.42	1.53E-02	3.04E-06
O95299	-0.72	-0.32	8.20E-11	6.81E-06	P63096	-0.77	-1.04	2.60E-05	3.72E-10
O95319	-0.67	-0.48	3.31E-03	3.00E-02	P63098	-0.74	-0.82	8.52E-09	4.38E-12
O95670	-0.68	-1.23	9.77E-04	6.90E-04	P63104	-1.04	-0.93	6.03E-12	4.42E-12
O95674	0.58	0.56	1.59E-05	2.13E-07	P63215	-1.40	-1.58	2.64E-04	3.07E-05
O95782	-1.41	-1.37	2.95E-40	2.14E-37	P67936	0.52	0.61	3.53E-02	2.00E-02
O96000	-1.01	-0.72	2.83E-07	6.46E-06	P68366	-1.38	-1.63	1.15E-27	1.64E-30
P00338	-0.35	-0.44	1.92E-11	5.11E-11	P68400	-0.45	-0.24	9.59E-03	2.24E-03
P00352	3.04	2.55	1.70E-49	3.56E-32	P68402	0.30	0.37	1.73E-02	2.95E-05
P00367	-1.23	-1.08	1.33E-37	6.97E-34	P68431	2.60	2.69	1.01E-29	3.31E-26
P00395	-0.62	-0.54	2.60E-06	2.85E-04	**P68871**	-0.34	0.64	1.79E-02	4.66E-04
P00492	-0.92	-1.01	3.37E-24	7.52E-29	**P69905**	-0.44	0.41	4.31E-04	3.29E-03
P00505	-0.51	-0.28	2.78E-07	1.52E-05	P78324	-1.55	-1.67	1.14E-23	2.20E-17
P00558	-0.10	-0.14	3.34E-02	2.46E-05	P78352	-1.60	-1.52	1.85E-11	2.01E-11
P00918	-1.13	-0.55	2.72E-11	1.64E-02	P78357	-1.46	-1.68	8.80E-13	2.70E-13
P01834	0.92	1.43	7.79E-06	2.33E-05	P78371	-0.14	-0.18	3.92E-02	1.31E-03
P01857	0.43	1.05	1.71E-02	9.00E-05	P78417	-0.31	-0.39	6.62E-04	5.22E-05
P02545	0.78	0.97	1.16E-05	3.55E-03	P78559	-1.35	-1.44	1.29E-29	3.67E-47
P02647	1.73	2.30	3.82E-04	9.93E-04	P80723	-1.87	-2.14	2.18E-30	2.95E-33
P02686	-0.90	-1.02	4.87E-03	1.50E-07	P84085	-0.33	-0.38	6.05E-04	1.39E-04
P02730	0.50	1.49	4.23E-02	1.11E-05	P99999	-0.39	-0.37	4.36E-03	1.27E-02
P02768	0.30	0.84	1.86E-03	1.41E-17	Q00610	-0.84	-0.70	1.21E-83	4.10E-85
P02787	-0.59	-0.33	8.25E-06	1.25E-02	Q00765	-1.72	-1.58	2.09E-12	1.59E-13

P03905	-0.75	-0.61	9.94E-04	1.26E-04	Q00839	1.60	1.77	4.50E-20	3.72E-37
P04075	-0.88	-0.93	3.04E-20	1.51E-28	Q01082	-0.63	-0.66	5.73E-56	2.69E-73
P04179	-0.58	-0.32	7.01E-05	2.29E-02	Q01105	0.80	1.24	2.84E-02	6.68E-06
P04216	-3.27	-3.16	5.73E-20	5.96E-25	Q01469	1.33	1.72	1.51E-07	9.30E-12
P04264	1.07	0.56	1.27E-09	7.21E-03	Q01484	-0.37	-0.65	1.54E-10	3.05E-23
P04271	3.00	2.84	2.45E-16	7.02E-15	Q01518	-0.59	-0.49	2.59E-13	1.31E-08
P04350	-0.58	-0.93	2.56E-13	1.50E-27	Q01813	-0.83	-1.16	3.29E-24	2.12E-34
P04406	-0.41	-0.52	4.81E-08	3.02E-12	Q01814	-0.33	-0.50	5.25E-10	3.69E-14
P04632	0.77	0.53	5.40E-07	1.03E-02	Q02218	-0.59	-0.43	3.09E-11	5.39E-05
P04899	-0.40	-0.54	2.83E-04	6.51E-05	Q02750	-0.97	-0.82	1.02E-04	1.83E-05
P04908	2.90	2.84	3.21E-21	4.68E-21	Q02790	0.91	0.58	1.87E-06	4.56E-04
P05023	-0.74	-0.85	1.33E-20	3.18E-31	Q02978	-0.56	-0.49	1.10E-06	1.78E-04
P05026	-1.13	-1.29	1.11E-22	1.16E-23	Q03252	2.31	2.35	1.02E-22	3.24E-23
P05091	-0.68	-0.30	1.15E-11	5.53E-05	Q04837	0.53	0.58	4.54E-02	6.87E-03
P05141	-0.52	-0.47	7.02E-09	2.94E-09	Q04917	-0.72	-0.65	1.53E-07	2.94E-05
P05166	0.68	1.01	7.78E-10	1.12E-06	Q05193	-0.94	-1.11	2.89E-26	7.89E-29
P06748	1.74	2.01	2.16E-20	1.99E-21	Q05329	-1.26	-1.37	1.49E-05	4.90E-04
P07108	1.73	1.49	1.74E-17	1.89E-16	Q05639	-0.40	-0.29	9.26E-07	1.34E-03
P07195	-0.22	-0.32	3.03E-04	3.29E-06	Q06124	-0.74	-0.90	5.94E-05	1.40E-08
P07196	-0.85	-0.94	2.18E-18	2.44E-21	Q07960	-0.93	-0.97	8.90E-06	1.97E-05
P07197	-0.98	-1.02	4.29E-16	4.35E-21	Q08209	-1.23	-1.40	6.09E-21	2.48E-24
P07237	0.97	1.57	3.13E-06	3.05E-13	Q08211	1.44	1.63	2.67E-23	5.19E-29
P07305	3.20	3.23	5.79E-29	2.20E-28	Q08722	-0.74	-1.11	3.06E-09	1.92E-09
P07437	-1.56	-1.80	1.20E-36	3.26E-44	Q10567	-0.88	-0.78	4.69E-42	1.56E-35
P07737	0.76	0.76	2.80E-07	3.31E-08	Q12860	-0.80	-1.01	3.46E-23	5.85E-33
P07814	-0.54	-0.46	3.07E-05	1.14E-04	Q12905	1.35	1.48	8.05E-18	1.02E-24
P07900	-0.17	-0.47	2.54E-04	3.09E-26	Q13200	-1.11	-0.90	3.49E-10	2.55E-12
P07910	1.85	2.02	1.34E-21	4.73E-24	Q13303	-2.04	-2.23	1.83E-12	8.44E-13
P08107	0.28	0.56	7.42E-03	4.42E-09	Q13367	-0.53	-0.71	1.91E-05	1.83E-04
P08133	-1.19	-1.04	3.02E-25	8.12E-21	Q13423	-1.67	-1.41	1.19E-34	3.45E-27
P08195	-0.85	-0.70	7.10E-15	7.09E-16	Q13509	-1.52	-1.59	6.93E-26	4.96E-32
P08237	-0.33	-0.46	3.04E-04	8.57E-08	Q13526	-1.06	-1.11	2.66E-03	4.12E-05
P08238	-0.29	-0.49	1.05E-04	7.58E-14	Q13555	-1.66	-2.01	1.50E-15	2.84E-20
P08247	-1.30	-1.45	1.30E-09	9.26E-09	Q13557	0.63	0.25	4.67E-05	4.52E-02
P08559	-0.99	-0.98	1.51E-06	6.64E-09	Q13642	0.42	0.29	5.76E-04	7.30E-03
P08574	-0.22	-0.27	1.25E-02	1.69E-02	Q13813	-0.24	-0.28	1.51E-09	9.89E-17
P08758	0.40	0.81	3.84E-04	1.18E-06	Q13825	-0.75	-0.41	2.31E-06	2.44E-02
P08865	0.29	0.46	1.99E-03	2.17E-03	Q13838	1.55	1.55	1.31E-13	8.01E-14
P09104	0.45	0.19	1.56E-06	3.29E-02	Q13885	-1.12	-1.31	8.09E-15	1.59E-14
P09382	0.32	0.63	3.08E-02	4.50E-04	Q14011	2.44	1.99	1.80E-07	8.05E-10
P09417	-0.65	-1.17	1.24E-04	5.89E-10	Q14019	0.40	0.51	4.93E-03	2.32E-03
P09429	2.88	2.85	4.13E-15	1.58E-16	Q14103	1.47	1.21	1.22E-05	1.64E-05
P09471	-0.85	-1.03	6.47E-36	1.29E-33	Q14141	-0.71	-0.66	1.54E-08	7.04E-04

P09496	-0.49	-0.35	1.07E-03	1.29E-02	Q14194	-0.85	-0.97	3.04E-21	2.27E-23
P09497	-0.90	-0.62	3.18E-08	6.04E-04	Q14195	-0.78	-0.82	4.91E-13	4.83E-09
P09543	-1.06	-1.65	1.52E-16	1.15E-40	Q14203	-0.73	-0.96	1.80E-03	1.63E-06
P09622	-0.61	-0.37	5.48E-07	7.29E-05	Q14204	-0.15	-0.37	4.34E-06	1.37E-31
P09651	2.00	2.23	3.95E-19	9.65E-26	Q14643	3.72	3.66	1.61E-36	1.62E-28
P09669	-1.30	-0.82	7.17E-06	3.84E-04	Q14847	-1.30	-1.22	4.59E-11	3.27E-11
P09936	-0.89	-0.93	2.10E-15	2.13E-18	Q14894	-0.65	-0.46	2.22E-06	1.06E-04
P09972	1.33	1.03	1.49E-39	1.18E-30	Q15019	-1.77	-1.69	3.28E-22	1.82E-13
P0CG47	0.80	0.37	4.14E-06	4.24E-03	Q15056	0.86	0.89	2.17E-03	4.05E-04
P10412	3.44	3.31	4.65E-29	4.50E-30	Q15102	1.95	2.17	5.84E-10	6.47E-11
P10515	-0.40	-0.30	6.71E-03	4.65E-03	Q15149	-0.36	-0.22	1.09E-08	6.08E-03
P10636	-1.57	-2.10	1.33E-20	8.62E-26	Q15181	-1.10	-1.35	3.68E-04	1.53E-04
P10915	-1.88	-2.06	8.42E-09	2.72E-09	Q15185	0.33	0.36	1.77E-02	1.04E-03
P11021	0.27	0.47	1.09E-04	9.91E-07	Q15257	-0.50	-0.41	5.73E-03	7.38E-06
P11137	-2.51	-2.68	8.95E-48	2.23E-48	Q15365	0.22	0.34	1.84E-05	2.93E-06
P11142	-0.34	-0.46	1.11E-11	5.28E-20	Q15366	0.28	0.45	2.68E-03	1.73E-10
P11177	-0.46	-0.48	9.42E-07	3.33E-07	Q15435	-0.58	-0.73	1.23E-13	3.59E-16
P11216	0.61	0.45	1.33E-09	6.86E-08	Q15555	-1.19	-1.40	1.22E-09	3.36E-10
P11217	-0.30	-0.31	3.73E-02	3.88E-02	Q15700	-0.73	-0.93	1.27E-10	1.13E-12
P11233	-0.80	-1.07	5.89E-11	1.03E-14	Q15717	3.01	2.97	1.10E-12	6.80E-15
P11586	-1.47	-1.25	2.45E-09	4.17E-05	Q16143	-0.88	-1.53	6.86E-04	3.84E-08
P11766	-0.37	-0.34	4.25E-04	6.01E-04	Q16181	-0.91	-0.93	3.21E-07	4.11E-09
P11940	0.35	0.43	1.00E-02	2.13E-03	Q16352	-0.77	-1.29	3.02E-12	1.23E-29
P12111	0.88	1.29	1.54E-02	3.03E-02	Q16531	0.39	0.22	2.92E-05	4.53E-02
P12236	0.73	0.85	3.28E-03	2.63E-07	Q16543	-0.47	-0.48	1.90E-03	6.23E-04
P12532	0.45	0.42	4.96E-06	1.65E-05	Q16555	-0.47	-0.81	3.42E-13	5.24E-31
P12956	1.75	1.83	1.31E-21	2.30E-22	Q16566	1.65	1.22	6.69E-06	2.49E-04
P13010	1.82	1.91	2.71E-20	5.35E-23	Q16623	-3.22	-2.82	7.89E-13	5.28E-10
P13073	-1.02	-1.05	2.24E-09	1.86E-13	Q16658	-2.51	-2.50	3.44E-36	5.94E-32
P13489	0.32	0.39	8.35E-04	2.26E-06	Q16774	-0.27	-0.27	7.70E-03	3.66E-02
P13591	-0.55	-0.65	6.24E-14	9.21E-14	Q16795	-0.61	-0.41	9.61E-07	1.55E-05
P13611	0.53	-0.71	1.18E-03	9.23E-04	Q16798	-0.65	-0.95	2.40E-04	1.75E-05
P13637	-0.56	-0.92	3.04E-15	7.75E-20	Q16799	-0.92	-1.03	3.39E-07	3.75E-15
P13639	-0.30	-0.23	1.18E-07	2.85E-05	Q16864	-0.95	-1.22	2.66E-05	6.67E-08
P13693	-0.77	-0.83	2.83E-04	5.51E-08	Q16891	-0.49	-0.36	1.72E-08	1.73E-05
P13804	0.37	0.73	7.45E-03	6.04E-06	Q53GQ0	0.38	0.38	4.44E-03	4.60E-02
P14136	1.38	0.79	1.04E-12	5.27E-05	Q5SSJ5	1.97	1.96	1.12E-13	7.48E-15
P14314	0.56	0.82	1.79E-03	5.34E-04	Q6P587	-0.54	-0.45	3.98E-08	2.08E-04
P14415	0.74	0.58	1.44E-06	8.70E-03	Q6UWR7	-1.03	-1.48	1.94E-05	4.15E-12
P14618	-0.31	-0.41	1.54E-06	5.36E-14	Q71U36	-0.58	-0.91	3.17E-15	1.27E-42
P14625	-0.43	-0.29	9.44E-05	2.98E-02	Q7L0J3	-1.62	-1.58	7.05E-13	4.60E-11
P14866	1.49	1.79	9.41E-20	1.32E-27	Q7Z3B1	-1.37	-1.78	5.99E-10	9.48E-08
P15104	-1.49	-1.24	1.02E-20	3.36E-13	Q7Z3D6	0.57	0.67	3.99E-02	1.54E-02

P16298	-1.44	-1.53	9.75E-10	5.51E-08	Q7Z4S6	-0.76	-0.59	2.57E-02	1.45E-02
P16615	-0.60	-0.69	2.95E-14	1.90E-22	Q7Z6L0	-0.55	-1.28	2.09E-03	4.07E-06
P17174	-1.02	-1.15	8.40E-33	2.11E-34	Q86Y82	-0.53	-0.58	2.23E-03	2.53E-04
P17600	-1.13	-1.49	1.19E-50	6.37E-48	Q8IXJ6	-1.10	-1.63	5.21E-10	3.55E-20
P17655	0.34	0.58	6.67E-04	1.25E-05	Q8N111	-0.70	-0.58	9.46E-07	1.79E-08
P17677	-1.41	-1.91	2.34E-10	7.79E-11	Q8N126	0.73	0.48	6.86E-07	9.10E-07
P17858	-0.55	-0.47	4.87E-06	9.07E-05	Q8N3J6	-1.43	-1.70	1.09E-08	3.89E-10
P18669	-0.26	-0.28	4.80E-05	1.49E-06	Q8N573	-1.51	-1.79	1.68E-11	1.35E-12
P18859	0.94	0.96	1.33E-02	2.58E-03	Q8NCW5	-0.53	-0.34	3.13E-09	2.36E-05
P19086	-0.68	-0.82	1.56E-03	7.10E-03	Q8WUM4	-1.23	-0.91	2.70E-03	8.59E-06
P19338	0.62	0.98	3.84E-02	5.50E-05	Q8WXF7	-1.62	-1.70	4.30E-21	1.44E-31
P19367	-0.53	-0.72	9.41E-29	6.24E-40	Q92499	0.73	0.77	5.53E-10	8.62E-11
P20020	-1.86	-1.84	5.54E-38	1.98E-24	Q92561	-0.33	-0.26	1.52E-04	4.37E-02
P21281	-1.07	-1.16	6.69E-24	5.53E-30	Q92597	-1.69	-1.44	5.98E-17	7.48E-08
P21283	-0.84	-1.05	1.16E-09	1.44E-12	Q92598	-1.97	-2.45	6.90E-25	2.37E-21
P21579	-1.19	-1.07	1.59E-24	3.51E-33	Q92777	-0.91	-0.99	6.43E-26	5.55E-19
P21796	-0.94	-0.91	1.05E-15	1.01E-22	Q92823	-0.83	-1.15	2.08E-32	4.31E-29
P21926	-1.10	-0.86	7.18E-04	3.72E-03	Q92841	1.83	1.65	5.40E-11	4.81E-10
P21964	0.36	0.64	6.87E-03	2.39E-03	Q92945	1.59	1.79	2.82E-04	9.93E-10
P22061	-0.77	-0.52	1.51E-02	1.52E-08	Q93050	-1.07	-1.00	9.53E-17	2.03E-16
P22392	-0.82	-0.55	4.15E-10	8.63E-07	Q96AB3	-0.87	-0.41	8.97E-14	9.83E-03
P22626	1.76	1.69	7.38E-18	1.04E-25	Q96BM9	-1.38	-1.30	1.28E-05	1.40E-11
P22676	5.12	5.24	9.19E-11	3.72E-15	Q96C19	-0.62	-0.52	4.55E-02	1.36E-02
P23246	2.23	2.24	9.52E-16	1.43E-16	Q96CW1	-1.01	-0.98	8.22E-24	3.47E-32
P23381	-0.82	-0.66	3.26E-03	1.85E-03	Q96E17	-1.64	-1.82	1.37E-10	5.12E-09
P23526	-1.04	-1.17	1.36E-10	1.13E-08	Q96F07	-0.84	-0.83	1.81E-10	1.28E-16
P23528	-0.27	-0.47	3.37E-02	1.59E-04	Q96FC7	-0.39	-0.93	2.21E-06	1.48E-08
P23634	-0.97	-1.17	9.20E-14	4.18E-13	Q96GD0	-1.22	-1.12	7.83E-04	3.42E-03
P24534	0.28	0.31	1.39E-02	2.01E-03	Q96GW7	-1.26	-1.57	2.09E-12	2.76E-11
P24539	-0.30	-0.31	4.78E-03	2.19E-03	Q96JE9	-1.35	-1.56	5.80E-11	2.94E-11
P25398	0.61	0.61	2.05E-04	1.12E-03	Q96KP4	-0.54	-0.59	6.44E-05	1.09E-04
P25705	-0.39	-0.27	3.80E-14	2.01E-08	Q96QK1	-0.59	-0.54	6.54E-11	1.61E-08
P25789	-0.47	-0.28	5.16E-07	7.08E-04	Q99497	0.34	0.61	1.10E-02	1.82E-07
P26038	0.70	0.93	4.14E-02	1.63E-02	Q99623	-0.77	-0.59	4.64E-15	1.72E-10
P26232	-1.45	-1.53	3.74E-15	3.05E-14	Q99714	0.45	0.73	7.41E-08	1.87E-13
P26641	0.45	0.41	1.79E-02	2.53E-02	Q99719	-1.50	-1.64	1.26E-30	5.69E-25
P27338	-0.90	-0.80	1.79E-06	3.68E-03	Q99747	-0.46	-0.78	4.73E-06	2.02E-06
P27361	-0.57	-0.89	4.49E-03	7.88E-06	Q99798	-0.27	-0.27	7.34E-06	5.36E-09
P27449	-0.86	-0.66	3.44E-06	5.62E-05	Q99961	-1.49	-1.31	1.84E-06	2.75E-04
P27695	1.82	1.84	6.33E-22	9.80E-23	Q99963	-1.04	-1.01	1.14E-09	5.56E-09
P27797	0.79	1.09	7.97E-11	3.19E-13	Q9BPU6	-0.66	-0.95	9.03E-05	4.44E-07
P28331	-0.57	-0.24	1.30E-11	4.74E-05	Q9BRX8	-1.13	-0.99	9.19E-11	2.86E-06
P29401	0.70	0.55	1.24E-31	1.60E-21	Q9BT78	-0.22	-0.23	2.77E-02	9.87E-04

P29966	0.87	0.91	5.15E-07	4.31E-11	Q9BWM7	0.94	0.60	6.68E-10	6.61E-05
P30042	-0.81	-0.53	1.08E-09	1.58E-06	Q9BY11	-1.71	-1.83	1.09E-20	1.89E-19
P30044	0.45	0.51	2.40E-07	4.10E-08	Q9C040	-0.39	-0.56	7.04E-05	4.51E-07
P30084	-0.95	-0.37	3.83E-09	2.42E-02	Q9H115	-0.30	-0.69	9.08E-04	2.74E-09
P30101	0.48	0.81	4.01E-10	1.43E-14	Q9H492	-1.24	-1.03	2.45E-07	6.49E-05
P30153	-0.55	-0.67	5.88E-15	1.16E-20	Q9H4G0	-1.04	-1.33	5.33E-12	5.86E-18
P30531	-1.51	-1.59	3.33E-06	8.40E-06	Q9H7Z7	-0.47	-0.29	1.39E-02	3.82E-02
P31040	-1.49	-1.17	2.07E-12	3.58E-11	Q9H8H3	0.69	0.95	2.24E-04	4.91E-03
P31146	-1.90	-1.69	4.85E-16	4.64E-11	Q9H936	-1.05	-1.02	3.28E-10	5.55E-08
P31150	-0.34	-0.51	1.61E-05	7.14E-12	Q9H9B4	-0.53	-0.52	1.46E-07	9.11E-08
P31153	0.48	0.36	9.68E-05	1.42E-03	Q9HCJ6	4.69	3.81	7.66E-10	1.12E-19
P31689	-0.74	-0.84	1.22E-06	1.01E-07	Q9HDC9	0.70	0.75	8.07E-07	1.91E-07
P31930	-0.34	-0.22	4.71E-05	5.86E-03	Q9NP72	-0.33	-0.45	8.09E-03	6.91E-04
P31937	0.41	0.96	8.85E-04	1.18E-06	Q9NP97	0.38	0.42	2.05E-02	4.25E-03
P31943	1.30	1.47	5.86E-10	1.88E-09	Q9NPJ3	-1.30	-1.14	1.18E-10	2.98E-06
P31946	-0.49	-0.49	1.09E-03	1.08E-04	Q9NQC3	-1.06	-1.21	1.28E-12	2.25E-17
P31948	0.48	0.31	5.95E-06	2.40E-08	Q9NQX3	-1.13	-0.66	1.44E-06	8.13E-04
P32004	0.54	0.61	4.08E-09	5.94E-09	Q9NS86	-0.95	-1.49	6.29E-04	7.46E-06
P32119	0.32	0.57	2.96E-03	1.23E-07	Q9NSD9	-0.67	-0.74	1.58E-10	1.46E-09
P34932	-0.75	-0.79	5.16E-15	5.69E-17	Q9NTK5	-0.22	-0.32	2.95E-02	3.10E-04
P35222	-0.39	-0.22	6.57E-05	6.97E-03	Q9NVA2	-1.40	-1.23	1.19E-28	5.29E-26
P35232	-0.94	-0.43	1.11E-06	7.15E-04	Q9NX63	-0.37	-0.26	2.31E-03	9.40E-03
P35527	0.69	0.49	1.19E-03	4.31E-02	Q9NYI0	1.38	0.81	9.06E-14	3.96E-05
P35580	-0.81	-0.44	8.93E-09	1.29E-03	Q9NZ45	-0.82	-0.91	1.41E-11	1.53E-14
P35611	-0.69	-0.70	1.34E-10	2.50E-10	Q9NZJ7	-0.86	-0.40	1.46E-03	4.61E-03
P35612	-1.13	-1.13	4.61E-13	3.16E-18	Q9NZN3	-1.77	-1.85	1.24E-17	3.00E-10
P35613	-0.82	-0.75	7.34E-10	1.01E-05	Q9NZR1	-0.43	-0.49	3.72E-06	1.33E-07
P36542	-0.42	-0.31	1.21E-06	5.29E-06	Q9P0L0	-0.41	-0.45	1.35E-04	1.20E-03
P36543	-0.94	-0.92	7.18E-08	8.48E-12	Q9P2R7	-0.30	-0.46	1.53E-04	6.48E-07
P37837	1.83	1.20	1.06E-22	8.09E-17	Q9P2U7	-0.92	-1.19	1.19E-11	1.11E-09
P37840	-0.66	-0.96	8.32E-04	8.58E-06	Q9UBB6	-1.51	-1.55	3.87E-48	6.30E-37
P38117	-0.63	-0.49	6.09E-05	1.37E-04	Q9UEY8	0.52	0.31	2.52E-06	1.17E-02
P38606	-0.76	-0.89	1.50E-16	2.74E-23	Q9UH03	-1.06	-1.17	2.90E-20	8.49E-17
P39687	1.72	1.75	2.72E-07	4.05E-08	Q9UI12	-0.96	-1.15	7.57E-18	8.15E-19
P40123	-2.41	-2.24	3.66E-12	1.18E-13	Q9UI15	-0.93	-1.07	5.79E-08	5.52E-13
P40925	-0.90	-1.06	5.23E-19	1.09E-20	Q9UKA9	1.46	1.19	7.99E-13	4.07E-09
P40926	-1.01	-0.92	8.44E-49	1.73E-42	Q9UKU0	-0.54	-0.73	8.52E-06	9.17E-05
P40939	0.46	0.70	6.94E-08	4.37E-12	Q9ULD0	-0.48	-0.42	8.29E-05	1.46E-03
P41250	-0.31	-0.50	2.83E-05	9.99E-12	Q9ULU8	-0.74	-0.84	7.74E-09	3.65E-05
P42025	-0.85	-1.08	1.86E-11	3.40E-13	Q9UM19	0.67	0.56	5.75E-06	1.72E-03
P42658	-1.01	-0.93	1.94E-07	1.01E-02	Q9UN36	1.18	1.01	6.19E-16	5.64E-12
P43003	0.73	1.21	1.55E-03	7.86E-07	Q9UN86	-1.16	-0.99	4.50E-09	2.86E-10
P43004	-3.49	-3.46	1.83E-20	2.98E-15	Q9UPA5	-1.70	-2.37	6.62E-09	2.52E-07

P43034	-0.31	-0.40	6.40E-04	6.73E-05	Q9UPN3	0.36	0.62	1.06E-02	2.89E-03
P43121	2.85	2.61	1.69E-10	9.20E-10	Q9UPR5	0.63	0.55	6.38E-08	2.21E-04
P43243	1.81	1.80	2.37E-39	4.46E-37	Q9UPY8	-0.86	-0.90	4.84E-07	1.77E-09
P43304	0.56	0.41	2.49E-06	2.85E-03	Q9UQ16	0.65	0.21	3.03E-11	3.99E-02
P46459	-0.96	-1.07	3.27E-43	1.01E-53	Q9UQ80	0.55	0.47	8.75E-07	5.77E-05
P46821	-0.42	-0.76	5.96E-09	3.54E-25	Q9UQB3	-0.97	-1.16	3.57E-06	4.61E-07
P47755	-0.43	-0.42	3.72E-05	3.82E-08	Q9UQM7	-3.64	-3.77	5.13E-36	4.21E-34
P47756	-0.49	-0.58	9.23E-06	4.29E-08	Q9Y224	1.25	1.45	2.52E-10	4.09E-10
P48047	-0.41	-0.24	2.77E-06	1.38E-03	Q9Y266	-0.74	-0.64	1.04E-05	9.02E-05
P48147	-1.50	-1.50	2.34E-09	8.54E-09	Q9Y277	-0.51	-0.51	1.13E-13	2.57E-19
P48556	-0.43	-0.47	1.18E-03	4.36E-04	Q9Y281	-0.35	-0.47	5.13E-03	1.23E-03
P48643	-0.36	-0.35	2.10E-06	2.60E-06	Q9Y285	-0.97	-1.14	2.12E-06	3.58E-08
P48735	-1.20	-0.74	2.76E-36	4.28E-12	Q9Y2A7	-0.61	-0.76	1.55E-04	1.17E-07
P49189	0.41	0.43	1.98E-05	5.41E-06	Q9Y2J2	-0.70	-1.02	6.69E-25	1.61E-31
P49368	-0.21	-0.20	1.95E-03	1.85E-03	Q9Y2J8	-0.84	-1.00	5.44E-07	1.72E-07
P49411	-0.25	-0.17	2.27E-02	3.57E-02	Q9Y4I1	-0.93	-1.04	2.91E-11	1.29E-12
P49418	-1.03	-1.37	2.32E-10	3.23E-15	Q9Y5K8	-1.06	-1.26	1.93E-10	4.69E-08
P49419	-0.75	-0.73	1.31E-18	2.60E-12	Q9Y617	-0.31	-0.63	1.25E-04	5.02E-06
P49588	-0.40	-0.55	5.49E-07	2.54E-17	Q9Y639	-0.86	-0.56	3.11E-05	1.58E-04
P49758	-1.67	-1.65	6.47E-11	1.57E-07	Q9Y6I3	-1.15	-0.98	7.57E-06	4.99E-08
P49821	-0.57	-0.41	8.90E-11	1.80E-06	Q9Y6R1	1.00	0.65	1.16E-05	1.71E-02
P50213	-0.52	-0.44	2.89E-05	1.38E-05	-	-	-	-	-

Supplementary Table 4**.** Non-FDR adjusted enriched IPA-generated canonical pathways for BA19 and Cerebellum. An enrichment of 1.3 or greater represents a p-value < 0.05.

CANONICAL PATHWAYS - BA19	**Enrichment**
FXR/RXR Activation	3.81
Glutamate Receptor Signaling	3.72
Clathrin-mediated Endocytosis Signaling	3.59
Heme Degradation	3.28
Sertoli Cell-Sertoli Cell Junction Signaling	3.17
Glutathione-mediated Detoxification	3.09
Phagosome Maturation	2.9
LXR/RXR Activation	2.82
Signaling by Rho Family GTPases	2.76
Acute Phase Response Signaling	2.67
Remodeling of Epithelial Adherens Junctions	2.54
Pentose Phosphate Pathway	2.52
EIF2 Signaling	2.47
Calcium Signaling	2.44
RhoA Signaling	2.37
tRNA Charging	2.24
Pyrimidine Ribonucleotides Interconversion	2.24
Glucocorticoid Receptor Signaling	2.23
Pyrimidine Ribonucleotides De Novo Biosynthesis	2.18
Huntington's Disease Signaling	2.17
nNOS Signaling in Neurons	2.09
Acetyl-CoA Biosynthesis III (from Citrate)	2.03
Pyrimidine Deoxyribonucleotides De Novo Biosynthesis I	1.83
Methionine Degradation I (to Homocysteine)	1.83
Protein Kinase A Signaling	1.82
Mitochondrial Dysfunction	1.78
Germ Cell-Sertoli Cell Junction Signaling	1.78
Amyotrophic Lateral Sclerosis Signaling	1.75
Cysteine Biosynthesis III (mammalia)	1.75
Palmitate Biosynthesis I (Animals)	1.73
Ascorbate Recycling (Cytosolic)	1.73
Fatty Acid Biosynthesis Initiation II	1.73
Arginine Degradation I (Arginase Pathway)	1.73
Formaldehyde Oxidation II (Glutathione-dependent)	1.73
Synaptic Long Term Potentiation	1.67
LPS/IL-1 Mediated Inhibition of RXR Function	1.65
Xenobiotic Metabolism Signaling	1.64
Gap Junction Signaling	1.61
NRF2-mediated Oxidative Stress Response	1.59

Complement System	1.58
Protein Ubiquitination Pathway	1.57
Pyruvate Fermentation to Lactate	1.55
S-adenosyl-L-methionine Biosynthesis	1.55
Role of NFAT in Cardiac Hypertrophy	1.55
Sirtuin Signaling Pathway	1.48
Aryl Hydrocarbon Receptor Signaling	1.48
Epithelial Adherens Junction Signaling	1.47
Arsenate Detoxification I (Glutaredoxin)	1.43
Proline Biosynthesis II (from Arginine)	1.43
Pentose Phosphate Pathway (Oxidative Branch)	1.43
Arginine Degradation VI (Arginase 2 Pathway)	1.43
Stearate Biosynthesis I (Animals)	1.42
Superpathway of Methionine Degradation	1.42
Salvage Pathways of Pyrimidine Ribonucleotides	1.36
Arginine Biosynthesis IV	1.34
Serine Biosynthesis	1.34
Pentose Phosphate Pathway (Non-oxidative Branch)	1.34
Citrulline Biosynthesis	1.34
CANONICAL PATHWAYS - Cerebellum	**Enrichment**
Fatty Acid β-oxidation I	9.47
Glutaryl-CoA Degradation	8.35
Tryptophan Degradation III (Eukaryotic)	7.51
Isoleucine Degradation I	6.75
Valine Degradation I	6.19
Ketolysis	6.16
Aryl Hydrocarbon Receptor Signaling	4.59
Calcium Signaling	3.93
Xenobiotic Metabolism Signaling	3.9
Calcium Transport I	3.87
Phagosome Maturation	3.83
Ketogenesis	3.71
Amyotrophic Lateral Sclerosis Signaling	3.54
NRF2-mediated Oxidative Stress Response	3.53
Ethanol Degradation II	3.48
Mevalonate Pathway I	3.46
Noradrenaline and Adrenaline Degradation	3.31
14-3-3-mediated Signaling	3.21
Superpathway of Geranylgeranyldiphosphate Biosynthesis I (via Mevalonate)	3.15
LXR/RXR Activation	3.15
Parkinson's Signaling	3.07
LPS/IL-1 Mediated Inhibition of RXR Function	2.96

Melatonin Signaling	2.93
Pyrimidine Deoxyribonucleotides De Novo Biosynthesis I	2.78
Tryptophan Degradation X (Mammalian, via Tryptamine)	2.78
Glutathione-mediated Detoxification	2.78
nNOS Signaling in Neurons	2.72
Ethanol Degradation IV	2.71
Serotonin Degradation	2.69
Synaptic Long Term Potentiation	2.63
PI3K Signaling in B Lymphocytes	2.56
PPARα/RXRα Activation	2.49
Calcium-induced T Lymphocyte Apoptosis	2.49
Superpathway of Cholesterol Biosynthesis	2.39
Glutamate Receptor Signaling	2.31
CREB Signaling in Neurons	2.25
Role of NFAT in Cardiac Hypertrophy	2.2
Remodeling of Epithelial Adherens Junctions	2.16
Granzyme A Signaling	2.13
Neuropathic Pain Signaling In Dorsal Horn Neurons	2.01
Aldosterone Signaling in Epithelial Cells	1.99
GM-CSF Signaling	1.98
Pyrimidine Ribonucleotides Interconversion	1.94
Mitochondrial Dysfunction	1.91
Pyrimidine Ribonucleotides De Novo Biosynthesis	1.88
Histamine Degradation	1.81
B Cell Receptor Signaling	1.81
Lipid Antigen Presentation by CD1	1.76
Oxidative Ethanol Degradation III	1.76
Salvage Pathways of Pyrimidine Ribonucleotides	1.75
Apoptosis Signaling	1.73
Amyloid Processing	1.72
Gap Junction Signaling	1.72
Synaptic Long Term Depression	1.72
FXR/RXR Activation	1.7
Glutathione Redox Reactions I	1.67
Putrescine Degradation III	1.67
Fatty Acid α-oxidation	1.67
Semaphorin Signaling in Neurons	1.65
Unfolded protein response	1.63
Huntington's Disease Signaling	1.63
TCA Cycle II (Eukaryotic)	1.62
β-alanine Degradation I	1.62
Phenylethylamine Degradation I	1.62
Palmitate Biosynthesis I (Animals)	1.62

Thyroid Hormone Biosynthesis	1.62
Fatty Acid Biosynthesis Initiation II	1.62
Fatty Acid β-oxidation III (Unsaturated, Odd Number)	1.62
GNRH Signaling	1.61
Thrombin Signaling	1.61
TR/RXR Activation	1.57
Acute Phase Response Signaling	1.56
Breast Cancer Regulation by Stathmin1	1.51
Dopamine Degradation	1.48
Trehalose Degradation II (Trehalase)	1.45
D-glucuronate Degradation I	1.45
Glycerol-3-phosphate Shuttle	1.45
Lactose Degradation III	1.45
Nitric Oxide Signaling in the Cardiovascular System	1.45
iCOS-iCOSL Signaling in T Helper Cells	1.42
Chemokine Signaling	1.38
PKCθ Signaling in T Lymphocytes	1.36
Heme Degradation	1.33
Glutathione Redox Reactions II	1.33
Glioma Signaling	1.32
Role of Macrophages, Fibroblasts and Endothelial Cells in Rheumatoid Arthritis	1.3

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Supplementary Table 5. Reactome-generated canonical pathways for each brain region. P-values were generated from overrepresentation analysis.

Reactome Pathway Analysis					
BA19			Cerebellum		
Pathway name	**p-value**	**FDR-adjusted p-value**	**Pathway name**	**p-value**	**FDR-adjusted p-value**
Unblocking of NMDA receptors, glutamate binding and activation	1.10E-05	2.62E-03	Ion homeostasis	4.59E-09	3.00E-06
Influenza Life Cycle	1.23E-05	2.62E-03	Erythrocytes take up oxygen and release carbon dioxide	8.77E-09	3.00E-06
HSP90 chaperone cycle for steroid hormone receptors (SHR)	1.39E-05	2.62E-03	Erythrocytes take up carbon dioxide and release oxygen	9.42E-08	1.61E-05
Post-translational protein phosphorylation	1.66E-05	2.62E-03	O2/CO2 exchange in erythrocytes	9.42E-08	1.61E-05
HSF1-dependent transactivation	2.08E-05	2.62E-03	Ion transport by P-type ATPases	7.28E-07	9.90E-05
Influenza Infection	2.26E-05	2.62E-03	Beta oxidation of hexanoyl-CoA to butanoyl-CoA	2.24E-06	1.90E-04
Long-term potentiation	2.52E-05	2.62E-03	Beta oxidation of lauroyl-CoA to decanoyl-CoA-CoA	2.24E-06	1.90E-04
Peptide chain elongation	3.35E-05	3.05E-03	Beta oxidation of octanoyl-CoA to hexanoyl-CoA	2.24E-06	1.90E-04
Attenuation phase	4.30E-05	3.09E-03	Beta oxidation of decanoyl-CoA to octanoyl-CoA-CoA	4.58E-06	3.33E-04
Selenocysteine synthesis	4.54E-05	3.09E-03	Neuronal System	4.89E-06	3.33E-04
Eukaryotic Translation Elongation	4.89E-05	3.09E-03	Neurexins and neuroligins	1.33E-05	8.22E-04
Regulation of Insulin-like Growth Factor (IGF) transport and uptake by Insulin-like Growth Factor Binding Proteins (IGFBPs)	5.15E-05	3.09E-03	Transmission across Chemical Synapses	2.70E-05	1.54E-03
Axon guidance	6.09E-05	3.41E-03	Cardiac conduction	4.45E-05	2.31E-03
Regulation of TLR by endogenous ligand	1.38E-04	7.20E-03	mitochondrial fatty acid beta-oxidation of saturated fatty acids	4.83E-05	2.32E-03
Infectious disease	1.70E-04	8.14E-03	Mitochondrial Fatty Acid Beta-Oxidation	6.52E-05	2.56E-03
Negative regulation of NMDA receptor-mediated neuronal transmission	2.02E-04	9.11E-03	L1CAM interactions	6.56E-05	2.56E-03

Selenoamino acid metabolism	2.14E-04	9.21E-03	Reduction of cytosolic Ca++ levels	6.74E-05	2.56E-03
Neutrophil degranulation	2.64E-04	1.06E-02	Caspase-mediated cleavage of cytoskeletal proteins	6.74E-05	2.56E-03
Eukaryotic Translation Termination	3.06E-04	1.16E-02	Muscle contraction	9.69E-05	3.49E-03
Cellular response to heat stress	3.26E-04	1.17E-02	Post NMDA receptor activation events	1.26E-04	4.30E-03
Nonsense Mediated Decay (NMD) independent of the Exon Junction Complex (EJC)	3.47E-04	1.18E-02	Platelet calcium homeostasis	1.53E-04	4.88E-03
Platelet degranulation	3.67E-04	1.21E-02	Activation of NMDA receptors and postsynaptic events	1.74E-04	5.14E-03
Cellular responses to stress	4.20E-04	1.30E-02	mitochondrial fatty acid beta-oxidation of unsaturated fatty acids	1.77E-04	5.14E-03
Viral mRNA Translation	4.68E-04	1.37E-02	Transport of small molecules	1.92E-04	5.37E-03
Response to elevated platelet cytosolic Ca2+	4.72E-04	1.37E-02	Protein-protein interactions at synapses	2.35E-04	6.33E-03
Formation of a pool of free 40S subunits	4.96E-04	1.39E-02	Serotonin Neurotransmitter Release Cycle	3.15E-04	7.89E-03
Integration of energy metabolism	8.11E-04	2.07E-02	Neurotransmitter release cycle	3.16E-04	7.89E-03
L13a-mediated translational silencing of Ceruloplasmin expression	8.55E-04	2.07E-02	Apoptotic execution phase	3.50E-04	8.39E-03
Ion homeostasis	8.69E-04	2.07E-02	Ion channel transport	4.63E-04	1.07E-02
SRP-dependent cotranslational protein targeting to membrane	8.99E-04	2.07E-02	Unblocking of NMDA receptors, glutamate binding and activation	5.59E-04	1.19E-02
GTP hydrolysis and joining of the 60S ribosomal subunit	8.99E-04	2.07E-02	Negative regulation of NMDA receptor-mediated neuronal transmission	5.59E-04	1.19E-02
Post NMDA receptor activation events	9.61E-04	2.07E-02	HSP90 chaperone cycle for steroid hormone receptors (SHR)	5.64E-04	1.19E-02
Influenza Viral RNA Transcription and Replication	1.07E-03	2.07E-02	Apoptotic cleavage of cellular proteins	6.10E-04	1.22E-02
Nonsense-Mediated Decay (NMD)	1.10E-03	2.07E-02	Detoxification of Reactive Oxygen Species	6.85E-04	1.37E-02

Nonsense Mediated Decay (NMD) enhanced by the Exon Junction Complex (EJC)	1.10E-03	2.07E-02	Dopamine Neurotransmitter Release Cycle	7.83E-04	1.49E-02
p130Cas linkage to MAPK signaling for integrins	1.15E-03	2.07E-02	Branched-chain amino acid catabolism	7.83E-04	1.49E-02
GRB2:SOS provides linkage to MAPK signaling for Integrins	1.15E-03	2.07E-02	Glutamate Neurotransmitter Release Cycle	9.16E-04	1.61E-02
Activation of NMDA receptors and postsynaptic events	1.22E-03	2.16E-02	HSF1-dependent transactivation	9.16E-04	1.61E-02
Eukaryotic Translation Initiation	1.27E-03	2.16E-02	Cellular responses to stress	9.48E-04	1.61E-02
Cap-dependent Translation Initiation	1.27E-03	2.16E-02	Long-term potentiation	1.06E-03	1.77E-02
L1CAM interactions	1.33E-03	2.21E-02	Signaling by BRAF and RAF fusions	1.11E-03	1.77E-02
Ras activation upon Ca2+ influx through NMDA receptor	1.38E-03	2.21E-02	Signaling by moderate kinase activity BRAF mutants	1.29E-03	1.87E-02
Protein-protein interactions at synapses	1.53E-03	2.35E-02	Paradoxical activation of RAF signaling by kinase inactive BRAF	1.29E-03	1.87E-02
Metabolism of amino acids and derivatives	1.57E-03	2.35E-02	Reversible hydration of carbon dioxide	1.31E-03	1.87E-02
Formation of Fibrin Clot (Clotting Cascade)	2.00E-03	3.00E-02	Beta oxidation of myristoyl-CoA to lauroyl-CoA	1.33E-03	1.87E-02
Translation	2.18E-03	3.26E-02	Beta oxidation of palmitoyl-CoA to myristoyl-CoA	1.33E-03	1.87E-02
Cellular responses to external stimuli	2.33E-03	3.26E-02	Fatty acid metabolism	1.38E-03	1.93E-02
Regulation of expression of SLITs and ROBOs	2.39E-03	3.35E-02	Interleukin-12 signaling	1.42E-03	1.98E-02
Metabolism	2.50E-03	3.50E-02	Cellular response to heat stress	1.58E-03	2.06E-02
RAF/MAP kinase cascade	2.75E-03	3.85E-02	Uptake and actions of bacterial toxins	1.70E-03	2.22E-02
Synaptic adhesion-like molecules	2.97E-03	3.86E-02	Platelet degranulation	2.08E-03	2.71E-02
Heme degradation	3.05E-03	3.97E-02	Utilization of Ketone Bodies	2.34E-03	2.89E-02
MAPK1/MAPK3 signaling	3.32E-03	4.00E-02	PLC beta mediated events	2.40E-03	2.89E-02
Signaling by moderate kinase activity BRAF mutants	3.33E-03	4.00E-02	G-protein mediated events	2.61E-03	3.13E-02

Paradoxical activation of RAF signaling by kinase inactive BRAF	3.33E-03	4.00E-02	Response to elevated platelet cytosolic Ca2+	2.63E-03	3.16E-02
Listeria monocytogenes entry into host cells	3.38E-03	4.06E-02	Interleukin-12 family signaling	3.29E-03	3.95E-02
Common Pathway of Fibrin Clot Formation	3.38E-03	4.06E-02	Oncogenic MAPK signaling	3.30E-03	3.96E-02
Transmission across Chemical Synapses	3.69E-03	4.18E-02	Beta oxidation of butanoyl-CoA to acetyl-CoA	3.62E-03	3.98E-02
Dopamine Neurotransmitter Release Cycle	3.83E-03	4.18E-02	Signaling by RAS mutants	3.82E-03	4.20E-02
Nephrin family interactions	3.83E-03	4.18E-02	Glutathione conjugation	4.34E-03	4.77E-02
NrCAM interactions	4.12E-03	4.18E-02	Gene and protein expression by JAK-STAT signaling after Interleukin-12 stimulation	4.34E-03	4.77E-02
Activation of C3 and C5	4.12E-03	4.18E-02			
Scavenging by Class F Receptors	4.12E-03	4.18E-02			
Neuronal System	4.16E-03	4.18E-02			
Innate Immune System	4.18E-03	4.18E-02			
CREB1 phosphorylation through NMDA receptor-mediated activation of RAS signaling	4.31E-03	4.31E-02			

Supplementary Table 6. Full upstream regulator list for each brain region.

BA19			
Protein	**p-value**	**Protein**	**p-value**
MAPT	6.54E-09	C1QA	0.0186
APP	8.85E-08	OLIG2	0.0186
RTN4	1.1E-07	mir-181	0.0186
PSEN1	2.35E-07	mir-485	0.0186
HTT	2.22E-06	KCNQ2	0.0186
MTOR	5.72E-06	ANGPT2	0.0186
ROR1	0.0000868	Dst	0.0186
ROR2	0.0000868	JAK2	0.0186
Inosine	0.000242	NEURL1	0.0186
LPIN1	0.000259	EEF2K	0.0186
AGRN	0.000259	NFIC	0.0186
GALNS	0.000259	RAB3B	0.0186
PRNP	0.00041	EIF4EBP2	0.0186
PPP3CA	0.000422	ST8SIA2	0.0186
SLC6A3	0.000494	QKI	0.0186
S100B	0.000514	melatonin	0.0186
SLC6A2	0.000852	SLC16A2	0.0244
DIO2	0.00094	IL6	0.0244
ATN1	0.000955	CREBBP	0.0261
ADORA2A	0.00126	BSCL2	0.0278
PPP1R15A	0.00127	UBA6	0.0278
REST	0.00158	ST8SIA4	0.0278
SLC30A3	0.00177	PLCE1	0.0278
MKNK1	0.00187	NPTX1	0.0278
SOD1	0.00225	KRAS	0.0278
PMP22	0.00234	ARRB2	0.0278
DKK1	0.00234	DCX	0.0278
GAST	0.0027	TP63	0.0278
TENM1	0.00299	GRM2	0.0278
SLC18A2	0.00299	GABBR2	0.0278
ESR2	0.00299	KCNIP3	0.0278
GFAP	0.00299	RANBP9	0.0278
HDAC4	0.00301	HEPH	0.0278
CEBPB	0.00372	NCAM1	0.0278
L-dopa	0.00452	MME	0.0278
Ethanol	0.00508	DYRK1A	0.0278
TOR1A	0.00633	PLD2	0.0278
BDNF	0.00645	ADAM10	0.0288

FGF1	0.00734	STAT3	0.0299
NFE2L2	0.00734	beta-estradiol	0.0305
APOE	0.00792	JUN	0.0338
D-glucose	0.00841	ATP	0.0369
FMR1	0.00852	SOX17	0.0369
SIRT1	0.00905	SLITRK5	0.0369
SLC4A5	0.00935	VIP	0.0369
PDCD10	0.00935	SOD2	0.0369
MYO5A	0.00935	ITGB1	0.0369
GMNN	0.00935	mir-29	0.0369
JAK1	0.00935	TGFA	0.0369
TFAP4	0.00935	FGFR3	0.0369
SEMA3A	0.00935	RETN	0.0369
CX3CL1	0.00935	SPTBN2	0.0369
LDLR	0.00935	GRM3	0.0369
TNR	0.00935	ABCA1	0.0369
TEK	0.00935	SGK1	0.0369
CDON	0.00935	CAMK2A	0.0369
LIFR	0.00935	cholesterol	0.0369
Mt3	0.00935	CREB1	0.0417
DOPEG	0.00935	ZNF106	0.0422
PPARG	0.00956	ESR1	0.0422
NFASC	0.0108	PRKCD	0.0459
LEPR	0.012	ZFP36L2	0.0459
PRKN	0.012	NGFR	0.0459
EGR2	0.0125	PKM	0.0459
TSC2	0.0162	TP73	0.0459
CPEB3	0.0186	THRA	0.0459
SV2A	0.0186	-	-

Cerebellum

Protein	**p-value**	**Protein**	**p-value**
MAPT	3.39E-15	NAGLU	0.012
APP	7.45E-13	SIX5	0.012
PSEN1	3.36E-12	GPX4	0.012
HTT	5.17E-12	LIFR	0.012
HDAC4	1.12E-11	Mt3	0.012
MKNK1	1.2E-09	BNIP3	0.012
BDNF	3.18E-09	IGF1	0.0146
ATN1	2.14E-07	PPARG	0.0153
PPP3CA	2.86E-07	FMR1	0.0165
PPARGC1A	6.29E-07	SLC6A3	0.0172

NTRK2	0.0000101	EGF	0.0172
MTOR	0.0000284	ADORA2A	0.0196
RTN4	0.000137	NPAS4	0.0238
RAB3B	0.000142	CLASP2	0.0238
NFE2L2	0.000159	C1QA	0.0238
Sucrose	0.000341	OLIG2	0.0238
REST	0.000371	SNCB	0.0238
SNCA	0.000371	CAST	0.0238
S100B	0.000839	ATF1	0.0238
TRPM2	0.000839	KCNQ2	0.0238
SOD2	0.000839	LCAT	0.0238
TGFA	0.000839	Dst	0.0238
SPTBN2	0.000839	PIK3CB	0.0238
LEP	0.000861	NFIC	0.0238
ZFP36L2	0.00139	ST8SIA2	0.0238
LEPR	0.00141	melatonin	0.0238
PRNP	0.00165	DIO2	0.0257
SETDB1	0.00191	CTNNB1	0.0305
NTF4	0.00207	LPIN1	0.0354
FBXO2	0.00207	AGRN	0.0354
Dihydrotestosterone	0.00249	GALNS	0.0354
MECP2	0.00255	PURA	0.0354
APOE	0.0035	ST8SIA4	0.0354
SHANK3	0.0038	SERPINE1	0.0354
IL6	0.00398	PLCE1	0.0354
TSC2	0.00476	NPTX1	0.0354
TAC1	0.00484	KRAS	0.0354
GFAP	0.00484	P2RY2	0.0354
L-dopa	0.00625	ATF3	0.0354
FGF2	0.00704	KCNIP3	0.0354
DNAJC3	0.00728	RANBP9	0.0354
SOD1	0.00769	NCAM1	0.0354
CREB1	0.00831	MME	0.0354
TOR1A	0.0102	PLD2	0.0354
ADAM10	0.0103	NTRK3	0.0354
FOXQ1	0.012	SLC16A2	0.0383
NFATC3	0.012	CREBBP	0.041
HTR2A	0.012	CNTF	0.0438
MYO5A	0.012	STAT3	0.0467
GMNN	0.012	SLCO1C1	0.047
NRF1	0.012	SLC6A4	0.047
SYP	0.012	ITGB1	0.047

TFAP4	0.012	FGFR3	0.047
CHRNA7	0.012	RETN	0.047
CX3CL1	0.012	ABCA1	0.047
MARK2	0.012	cholesterol	0.047
DNAJC5	0.012	GAST	0.0497

Supplementary Table 7. Summary of targeted MS validation analysis using one-sided Wilcoxon signed rank tests to generate SRM p-values. Directionality concordance assessed whether differential expression aligned with global proteomic findings at the peptide and protein levels. Global p-value refers to the p-value calculated from the global proteomic MS analysis for the associated protein. P-values for one peptide cannot be meaningfully determined for paired analysis.

BA19						
Protein	Peptide	Directionality concordance	% Expression A vs C (global)	% Expression A vs C (SRM)	Global p-value	SRM p-value
GFAP	-	✓	55.2	56	5.36E-06	0.1377
	ALAAELNQLR	✓	-	54	-	0.2188
	EAASYQEALAR	✓	-	60	-	0.3125
MAP1B	-	✓	84	87	1.86E-09	0.058
	DLSTPGLEK	✓	-	87	-	0.1563
	PQLELIEDEEK	✓	-	86	-	0.1875
INA	-	✓	79	75	0.001041	0.0088
	DVDGATLAR	✓	-	81	-	0.093
	FAVFIEK	✓	-	66	-	0.0625
GSTM3	-	✓	69	67	6.39E-04	0.0654
	LDLDFPNLPYLLDGK	✓	-	72	-	0.1563
	LTFVDFLTYDILDQNR	✓	-	65	-	0.1563
RNAbp	-	✓	51	88	0.000503	0.1973
	LFVGGLSFDTNEQSLEQVFSK	✗	-	117	-	0.406
	YGQISEVVVVK	✓	-	67	-	0.0313
CHL1	VIAVNEVGR	✓	63.6	83	0.001206241	0.125
CB						
Protein	Peptide	Directionality concordance	% Expression A vs C (global)	% Expression A vs C (SRM)	Global p-value	SRM p-value
PSD3	-	✓	156	135	1.35E-08	0.0011
	NAVSVHHALASK	✓	-	141	-	0.0234
	DHYLEFEK	✓	-	130	-	0.0059
SYN1	-	✓	136	129	6.30E-06	0.021
	QASQAGPVPR	✓	-	129	-	0.0762
	QTSVSGPAPPK	✓	-	129	-	0.043
NEFM	-	✓	70	48	1.21E-05	0.0009
	FVEEIIEETK	✓	-	75	-	0.0352
	SEMEEALTAITEELAVSMK	✓	-	24	-	0.0059
HBD	-	✓	56.8	72.8	4.64E-11	0.0634
	EFTPQMQAAYQK	✓	-	63	-	0.0781
	VHLTPEEK	✓	-	73	-	0.1504
VAMP2	-	✓	173	121	0.002818185	0.0122
	ADALQAGASQFETSAAK	✓	-	149	-	0.0508
	LQQTQAQVDEVVDIMR	✓	-	117	-	0.1016
MAPT	-	✓	138	113	0.001067	0.1931
	IGSLDNITHVPGGGNK	✓	-	115	-	0.2129
	SPVVSGDTSPR	✓	-	105	-	0.3965

Supplementary Table 8. Cell type-specific markers in BA19 and CB. 'Yes' and 'No' indicate whether the specified protein is quantified in BA19 or CB. A single asterisk indicates $p < 0.05$ between ASD and Control from the regression model, while two astericks indicate $q < 0.05$. Proteins with multiple isoforms are denoted in parentheses.

CELL SPECIFIC MARKERS

CELL TYPE	Marker	BA19	CB
ASTROCYTES	GFAP	Yes**	Yes*
	S100	Yes	Yes *
	SLC1A3	Yes*	Yes
NEURONS	NEFH/NEFL/NEFM	Yes (/*/**)	Yes (**/**/**)
	RFOX3	No	No
	ELAVL4	Yes	Yes
	ELAVL1	Yes	Yes
	TUBB3	Yes*	Yes
GABAERGIC[1,2]	GAD2	Yes	Yes
	GAD1	No	No
	ABAT	Yes	Yes
	GAT1	No	No
	GABRB	Yes	Yes*
GLUTAMATERGIC[1,3]	SLC17A7	Yes	Yes**
	SLC17A6	No	No
	GLS	Yes	Yes
	GLUL	Yes	Yes
	GRIN1	No	No
PURKINJE CELLS[4,5]	CBLN	No	Yes
	CALB	Yes*	Yes*
	ITPR1	Yes	Yes**
PYRAMIDAL CELLS[6,7,8,9]	CAMK2(A/B/C/D)	Yes (A/B*/C/D)	Yes (A/B**/C*/D)
	MAP2	Yes*	Yes
	DLG4	Yes**	Yes
	EMX1	No	No
MICROGLIA	PTPRC	No	No
	AIF1	No	No
	CD68	No	No
	CIITA	Yes	No
	ITGAM	No	No
	P2RY12	No	No
OLIGODENDROCYTES	MBP	Yes	Yes
	PLP	Yes	Yes
	MOG	Yes	Yes
	OLIG2	No	No
MAST CELLS[19]	KIT	No	No
	FCER1	No	No
	CD2	No	No
	IL2RA	No	No
	CR1	No	No
ENDOTHELIAL CELLS[11]	F8C	No	No
	PECAM1	No	No
	ACE	No	No
	THBD	No	No
	ATXN1	No	No
	HEMCAM	No	No
RED BLOOD CELLS[12]	CAT	Yes	Yes**
	HBA/HBB/HBD	Yes	Yes (**/*/**)

[1]The Brain-specific Proteome. The Human Protein Atlas.
http://www.proteinatlas.org/humanproteome/brain
[2] GABAergic neuron markers and their functions.
http://www.abcam.com/neuroscience/gabaergic-neuron-markers-and-their-functions
[3]Glutamatergic neuron markers and their functions.
http://www.abcam.com/neuroscience/glutamatergic-neuron-markers-and-their-functions
[4] Fernandez-Pol, A. A novel marker for Purkinje cells, ribosomal protein MPS1/S27: expression of MPS1 in human cerebellum. *Cancer Genomics Proteomics* 13, 47-53 (2016).
[5] Slemmon, J.R. *et al*. Cerebellin: a quantifiable marker for Purkinje cell maturation. *Proc Natl Acad Sci USA* 82, 7145-7148 (1985).
[6] Muller, J.F., Mascagni, F. & McDonald, A.J. Pyramidal cells of the rat basolateral amygdala: synaptology and innervation by parvalbumin-immunoreactive interneurons. *J Comp Neurol* 494, 635-650 (2006).
[7] Hayashi, N., Oohira, A. & Miyata, S. Synaptic localization of receptor-type protein tyrosine phosphatase ζ/β in the cerebral and hippocampal neurons of adult rats. *Brain Res* 1050, 163-169 (2005).
[8] Kawachi, H. *et al*. Protein tyrosine phosphatase ζ/RPTPβ interacts with PSD-95/SAP90 family. *Molec Brain Res* 72, 47-54 (1999).
[9] Chan, C-H. *et al*. Emx1 is a marker for pyramidal neurons of the cerebral cortex. *Cereb Cortex* 11, 1191-1198 (2001).
[10] Hauswirth, A. *et al*. Expression of cell surface antigens on mast cells. Mast Cells: Methods and Protocols 77-90 (2005).
[11] Garlanda, C. & Dejana, E. Heterogeneity of endothelial cells specific markers. *Arterioscl Thromb Vasc Biol* 17, 1193-1202 (1997).
[12] You, J.S. *et al*. The impact of blood contamination on the proteome of cerebrospinal fluid. *Proteomics* 5, 290-296 (2005).

Supplementary Figure 1. Representative box plots of cell type-specific marker analysis for red blood cells (HBB), neurons (NEFM), astrocytes (GFAP), and oligodendrocytes (MBP) for matched pairs in each brain region. All paired t-test analyses were non-significant ($p > 0.05$).