

TABLE S1. Summary of developmental cohort used for experiments

Group	Age (years)	Gender	PMI (hours)	pH	RIN	#
Samples for microarray analysis						
Neonate	0.11 – 0.24	5 M 2F	22.7 ± 6.34	6.6 ± 0.13	8.96 ± 0.32	7
Infant	0.25 – 0.91	6M 2F	17.63 ± 7.69	6.69 ± 0.14	8.6 ± 0.65	8
Toddler	1.58 – 4.86	3M 3F	25.67 ± 9.56	6.74 ± 0.17	8.18 ± 0.56	6
School age	5.39 – 12.98	3M 3F	14.67 ± 5.43	6.73 ± 0.15	8.65 ± 0.40	6
Teenage	15 - 17.82	5M 1F	16.83 ± 4.71	6.79 ± 0.06	7.97 ± 1.06	6
Young adult	20.14 – 25.38	4M 2F	12.0 ± 5.4	6.75 ± 0.19	9.03 ± 0.35	6
Adult	35.99 – 49.22	4M 2F	13.83 ± 5.34	6.68 ± 0.22	8.38 ± 0.33	6
Samples for quantitative real time PCR analysis						
Neonate	0.11 – 0.24	7M 4F	22.45 ± 5.11	6.6 ± 0.19	6.37 ± 1.64	11
Infant	0.25 – 0.91	8M 6F	16.93 ± 6.4	6.58 ± 0.20	6.93 ± 1.18	14
Toddler	1.58 – 4.86	5M 4F	18.67 ± 5.29	6.70 ± 0.26	6.51 ± 1.21	9
School age	5.39 – 12.98	5M 4F	15.11 ± 4.68	6.63 ± 0.27	6.66 ± 1.14	9
Teenage	15 - 17.82	6M 2F	17.13 ± 4.16	6.75 ± 0.09	6.34 ± 1.01	8
Young adult	20.14 – 25.38	6M 3F	13.67 ± 8.26	6.67 ± 0.23	6.73 ± 0.67	9
Adult	35.99 – 49.22	5M 3F	13.38 ± 4.60	6.60 ± 0.27	6.53 ± 0.76	8
Samples for Western blot analysis						
Neonate	0.15 – 0.21	5M 2F	21.0 ± 5.56	6.49 ± 0.24	6.02 ± 1.99	7
Infant	0.25 – 0.91	8M 5F	17.0 ± 6.5	6.58 ± 0.20	6.92 ± 1.22	13
Toddler	1.58 – 4.86	5M 3F	20.0 ± 4.75	6.68 ± 0.26	6.4 ± 1.24	8
School age	5.39 – 12.97	5M 4F	15.0 ± 4.68	6.63 ± 0.27	6.66 ± 1.14	9
Teenage	15 - 17.82	6M 2F	17.0 ± 4.16	6.75 ± 0.09	6.34 ± 1.01	8
Young adult	20.14 – 25.38	6M 2F	14.0 ± 8.83	6.69 ± 0.24	6.70 ± 0.71	8
Adult	35.99 – 49.22	5M 2F	14.0 ± 4.93	6.67 ± 0.21	6.72 ± 0.60	7

TABLE S2. TaqMan gene expression assay details and average efficiency from developmental and control vs schizophrenia cohorts

Gene	Gene Name	TaqMan Gene Expression Assay	Average Primer Efficiency (%)	Slope
PV	Parvalbumin	Hs00161045_m1	84	-3.79
CCK	Cholecystokinin	Hs00174937_m1	76	-4.09
CB	Calbindin	Hs01077191_g1	86	-3.73
VIP	Vasoactive intestinal peptide	Hs00929575_m1	88	-3.66
SST	Somatostatin	Hs00356144_m1	82	-3.83
CR	Calretinin	Hs00242372_m1	93	-3.52
NPY	Neuropeptide Y	Hs00173470_m1	94	-3.48

Supplementary Results

Correlation of sample variables with gene expression

Pearson correlation analysis was performed to determine the effect of age, postmortem interval, pH, and RNA integrity number on interneuron marker mRNA expression in the schizophrenia cohort. Significant negative correlations were found between age and expression of calbindin ($r=-0.57$, $p=1.99 \times 10^{-7}$), vasoactive intestinal peptide ($r=-0.34$, $p=4.06 \times 10^{-3}$), somatostatin ($r=-0.46$, $p=4.63 \times 10^{-5}$) and neuropeptide Y ($r=-0.30$, $p=9.43 \times 10^{-3}$). Tissue pH significantly positively correlated with parvalbumin ($r=0.28$, $p=0.022$), calbindin ($r=0.38$, $p=9.59 \times 10^{-9}$), somatostatin ($r=0.62$, $p=6.18 \times 10^{-9}$), and neuropeptide Y expression ($r=0.64$, $p=1.36 \times 10^{-9}$); while RNA quality, measured by RNA integrity number, was positively correlated to calbindin ($r=0.54$, $p=7.71 \times 10^{-7}$), vasoactive intestinal peptide ($r=0.36$, $p=1.97 \times 10^{-3}$), somatostatin ($r=0.33$, $p=5.64 \times 10^{-3}$) and neuropeptide Y ($r=0.40$, $p=5.54 \times 10^{-4}$). Postmortem interval did not show significant correlation to any of the interneuron marker mRNAs or calretinin protein (Table S3).

TABLE S3. Statistical analyses of interneuron gene expression in schizophrenia with and without inclusion of group outliers (+/- 2 standard deviations of the mean)

Statistics based on all cases										
	Unpaired t-test (n=74)				Variables covaried for			ANOVA/ANCOVA		
	t	df	p	% diff				F	df	p
PV	2.03	72	0.047	-13.3		pH		3.6	71	0.061
CCK	2.56	72	0.012	-10.1	age	pH		6.3	70	0.015
CB	-1.34	72	0.183	14.9	age	pH	RIN	4.5	69	0.038
VIP	2.85	72	0.076	-15.0	age		RIN	3.4	70	0.071
SST	2.85	72	0.006	-24.6	age	pH	RIN	12.2	69	0.001
CR	1.30	72	0.198	-8.7				1.7	72	0.198
NPY	1.53	72	0.131	-15.8	age	pH	RIN	2.1	69	0.157
Statistics based on all cases with group outliers for individual genes removed										
	Unpaired t-test (n=67-72)				Variables covaried for			ANOVA/ANCOVA		
	t	df	p	% diff				F	df	p
PV	3.20	66	0.002	-17.0		pH		9.2	65	0.0035
CCK	2.40	69	0.019	-8.5				5.7	69	0.019
CB	-1.36	70	0.178	12.0	age	pH	RIN	5.2	67	0.026
VIP	3.10	68	0.003	-21.3	age		RIN	9.8	66	0.0026
SST	4.00	69	0.000143	-31.1	age	pH	RIN	22.7	66	0.000011
CR	2.40	69	0.021	-14.1				5.6	69	0.021
NPY	2.10	70	0.036	-21.1	age	pH	RIN	5.3	67	0.024

Effect of clinical characteristics on gene expression in schizophrenia

Correlations of interneuron marker expression with clinical characteristics and medications showed significant correlations between calbindin and neuropeptide Y mRNA expression and duration of illness ($r=-0.43$, $p=8.7 \times 10^{-3}$ and $r=-0.36$, $p=0.035$, respectively). The significance was lost when partial correlation was performed to account for the correlation to age (calbindin $r=0.24$, $p=0.165$; neuropeptide Y $r=-0.20$, $p=0.246$) (Table S4).

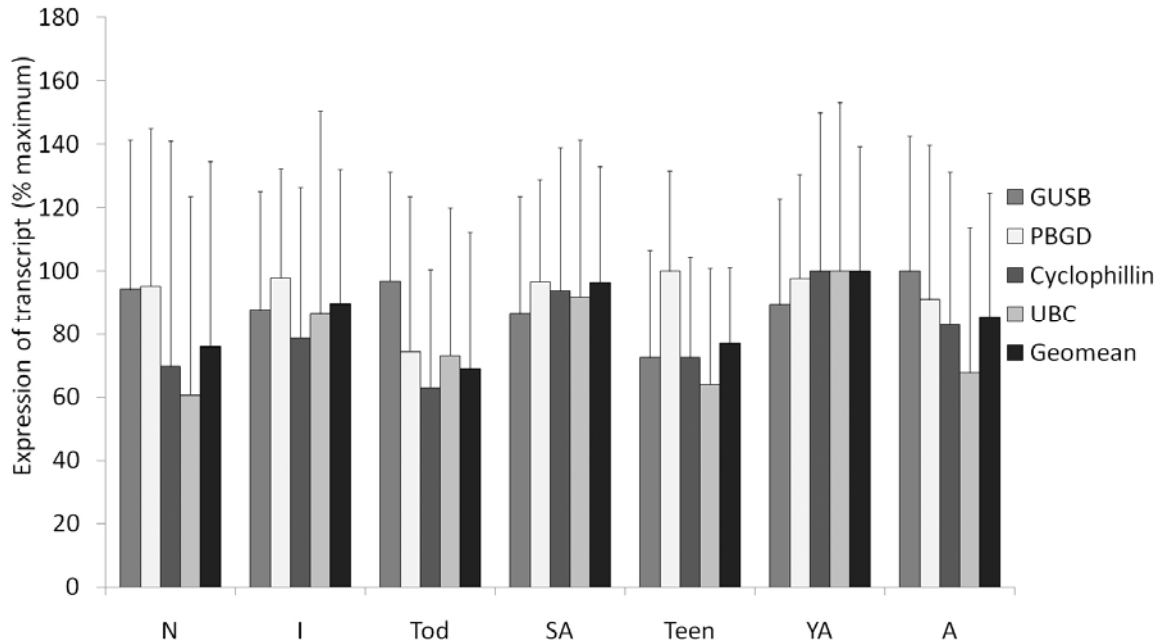
TABLE S4. Correlation of gene expression with demographic variables in control vs schizophrenia cohort with outliers removed

		Age		pH (PFC)		PMI		RIN	
		r	p	r	p	r	p	r	p
mRNA (all cases included)	whole cohort								
	parvalbumin	-0.13	0.269	0.27	0.019	-0.07	0.560	0.17	0.156
	cholecystokinin	-0.23	0.050	0.29	0.014	0.12	0.318	-0.02	0.858
	calbindin	-0.61	9.34×10^{-9}	0.36	1.83×10^{-3}	0.11	0.353	0.49	1.03×10^{-5}
	vasoactive intestinal peptide	-0.28	0.017	0.16	0.176	-0.04	0.723	0.30	8.46×10^{-3}
	somatostatin	-0.48	1.49×10^{-5}	0.62	3.41×10^{-9}	0.09	0.425	0.31	7.18×10^{-3}
	calretinin	-0.18	0.119	-0.10	0.402	-0.02	0.888	0.13	0.270
	neuropeptide Y	-0.26	0.026	0.61	1.02×10^{-8}	-0.03	0.777	0.36	1.48×10^{-3}
	controls								
	parvalbumin	-0.27	0.101	0.19	0.249	-0.05	0.778	0.01	0.976
cholecystokinin	-0.41	0.011	0.21	0.209	0.11	0.515	-0.22	0.190	
calbindin	-0.72	6.08×10^{-7}	0.28	0.098	0.08	0.630	0.41	0.012	
vasoactive intestinal peptide	-0.33	0.044	-0.02	0.921	-0.06	0.732	0.22	0.185	
somatostatin	-0.62	3.73×10^{-5}	0.63	2.54×10^{-5}	0.15	0.366	0.19	0.260	
calretinin	-0.21	0.203	-0.22	0.186	-0.21	0.206	0.09	0.598	
neuropeptide Y	-0.27	0.103	0.63	3.37×10^{-5}	0.04	0.794	0.22	0.193	

schizophrenics									
	parvalbumin	0.03	0.858	0.34	0.041	-0.03	0.876	0.34	0.040
	cholecystokinin	-0.05	0.783	0.34	0.037	0.22	0.188	0.16	0.332
	calbindin	-0.55	4.01 x 10⁻⁴	0.45	0.005	0.09	0.586	0.57	2.08 x 10⁻⁴
	vasoactive intestinal peptide	-0.24	0.157	0.29	0.084	0.02	0.902	0.38	0.022
	somatostatin	-0.38	0.020	0.63	2.86 x 10⁻⁵	0.15	0.375	0.44	6.06 x 10⁻³
	calretinin	-0.15	0.366	0.00	0.978	0.18	0.289	0.16	0.334
	neuropeptide Y	-0.25	0.136	0.58	1.53 x 10⁻⁴	-0.05	0.769	0.51	1.31 x 10⁻³
mRNA	whole cohort								
(group outliers >2SD from the mean removed)	parvalbumin	-0.13	0.302	0.28	0.022	0.01	0.924	0.15	0.222
	cholecystokinin	-0.17	0.152	0.18	0.140	0.00	0.976	-0.07	0.552
	calbindin	-0.57	1.99 x 10⁻⁷	0.38	9.59 x 10⁻⁴	0.04	0.743	0.54	7.71 x 10⁻⁷
	vasoactive intestinal peptide	-0.34	4.06 x 10⁻³	0.12	0.319	-0.10	0.430	0.36	1.97 x 10⁻³
	somatostatin	-0.46	4.63 x 10⁻⁵	0.62	6.18 x 10⁻⁹	0.09	0.443	0.33	5.64 x 10⁻³
	calretinin	-0.18	0.138	-0.01	0.919	-0.03	0.774	0.16	0.191
	neuropeptide Y	-0.30	9.43 x 10⁻³	0.64	1.36 x 10⁻⁹	-0.02	0.898	0.40	5.54 x 10⁻⁴
controls									
	parvalbumin	-0.33	0.058	0.11	0.542	0.14	0.427	-0.10	0.573
	cholecystokinin	-0.31	0.063	0.15	0.377	-0.03	0.871	-0.22	0.201
	calbindin	-0.66	1.36 x 10⁻⁵	0.27	0.105	0.02	0.897	0.52	1.08 x 10⁻³
	vasoactive intestinal peptide	-0.40	0.017	-0.10	0.583	-0.08	0.630	0.33	0.051
	somatostatin	-0.64	2.72 x 10⁻⁵	0.57	2.70 x 10⁻⁴	0.17	0.327	0.18	0.290
	calretinin	-0.23	0.180	-0.14	0.415	-0.16	0.356	0.14	0.418
	neuropeptide Y	-0.27	0.103	0.63	3.37 x 10⁻⁵	0.04	0.794	0.22	0.193

schizophrenics									
	parvalbumin	0.10	0.582	0.40	0.018	0.00	0.978	0.43	0.012
	cholecystokinin	-0.05	0.783	0.18	0.293	0.13	0.463	0.07	0.692
	calbindin	-0.50	1.73 x 10⁻³	0.51	1.49 x 10⁻³	0.01	0.943	0.60	1.2 x 10⁻⁵
	vasoactive intestinal peptide	-0.30	0.083	0.24	0.160	-0.02	0.909	0.40	0.018
	somatostatin	-0.33	0.052	0.71	1.45 x 10⁻⁶	0.19	0.284	0.52	1.31 x 10⁻³
	calretinin	-0.12	0.485	0.11	0.540	0.16	0.353	0.18	0.305
	neuropeptide Y	-0.37	0.028	0.67	1.10 x 10⁻⁵	0.01	0.960	0.63	5.90 x 10⁻⁵
protein	whole cohort								
(outliers removed)									
	calretinin	0.11	0.363	-0.05	0.654	-0.06	0.646	0.09	0.456
	controls								
	calretinin	-0.09	0.577	0.02	0.904	-0.12	0.482	0.41	0.012
	schizophrenics								
	calretinin	-0.22	0.199	0.11	0.513	0.04	0.819	0.15	0.367

FIGURE S1. Expression of housekeeping gene transcripts and geometric mean is not altered across development.



The expression of four housekeeping genes (glucuronidase, β (GUSB), hydroxymethylbilane synthase (PBGD), peptidylprolyl isomerase A (cyclophilin) and ubiquitin C (UBC) was measured in each developmental sample. These genes were used to determine the geometric mean (Geomean) that was used to normalize expression of target transcripts. The housekeeping genes and Geomean showed no significant difference in expression across development by one way ANOVA. N=neonate; I=infant; Tod=toddler; SA=school age; Teen=teenage; YA=young adult; A=adult. Error bars represent standard deviation.

TABLE S5. Correlation of gene expression with clinical characteristics in schizophrenia with group outliers >2SD from the mean removed

		age of onset		duration of illness		daily mean chlor		last recorded chlor		lifetime chlor	
		r	p	r	p	r	p	r	p	r	p
mRNA (group outliers included)	parvalbumin	(-)1.22 x 10 ⁻³	0.994	0.03	0.853	(-)4.86 x 10 ⁻³	0.977	0.06	0.721	-0.03	0.865
	cholecystokinin	0.05	0.756	-0.07	0.675	0.11	0.515	-0.26	0.146	0.04	0.799
	calbindin	-0.15	0.380	-0.50	0.002	-0.02	0.928	-0.25	0.166	-0.15	0.390
	vasoactive intestinal peptide	-0.15	0.381	-0.18	0.292	-0.07	0.670	-0.11	0.536	-0.15	0.373
	somatostatin	-0.14	0.411	-0.33	0.047	-0.26	0.115	-0.17	0.332	-0.28	0.098
	calretinin	-0.29	0.081	-0.03	0.866	0.26	0.116	-0.06	0.738	0.17	0.322
	neuropeptide Y	-0.04	0.792	-0.24	0.160	-0.22	0.193	-0.04	0.816	-0.22	0.187
mRNA (group outliers >2SD from the mean removed)	parvalbumin	0.06	0.743	0.07	0.676	0.05	0.795	-0.06	0.751	0.05	0.780
	cholecystokinin	0.02	0.915	-0.06	0.741	0.13	0.451	-0.35	0.052	0.06	0.750
	calbindin	-0.18	0.283	-0.43	8.73 x 10⁻³	0.11	0.541	-0.19	0.304	-0.05	0.763
	vasoactive intestinal peptide	-0.10	0.560	-0.26	0.135	-0.08	0.654	-0.31	0.088	-0.16	0.371
	somatostatin	-0.26	0.139	-0.23	0.187	-0.23	0.189	-0.14	0.457	-0.22	0.205
	calretinin	-0.20	0.255	-0.04	0.822	0.29	0.092	-0.19	0.300	0.21	0.223
	neuropeptide Y	-0.06	0.715	-0.36	0.035	-0.23	0.179	-0.01	0.975	-0.26	0.135
protein	calretinin	0.02	0.915	0.22	0.213	0.05	0.763	0.20	0.270	0.11	0.532

chlor=chlorpromazine equivalent