SUPPLEMENTARY FOR

miRNA analysis reveals novel dysregulated pathways in amyotrophic lateral sclerosis

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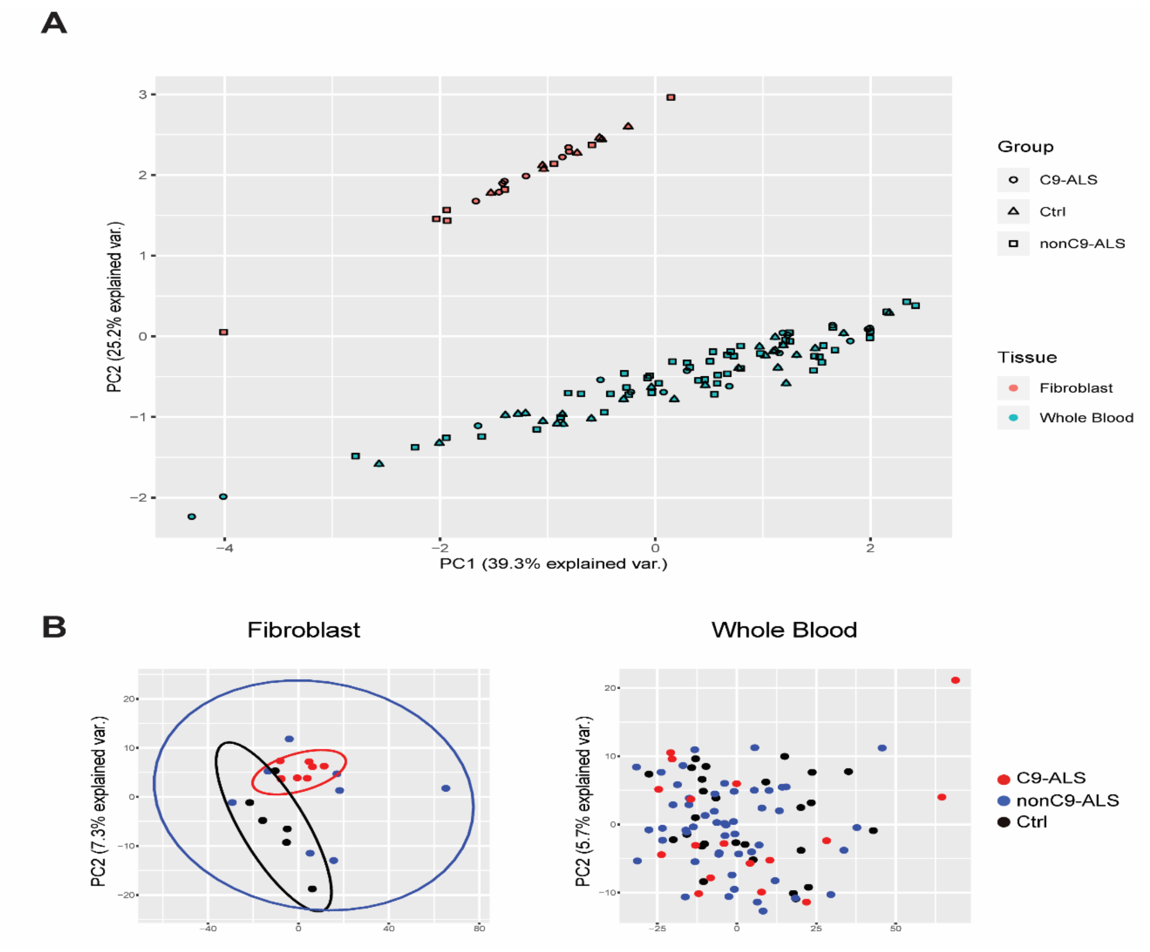
Supplementary Figures

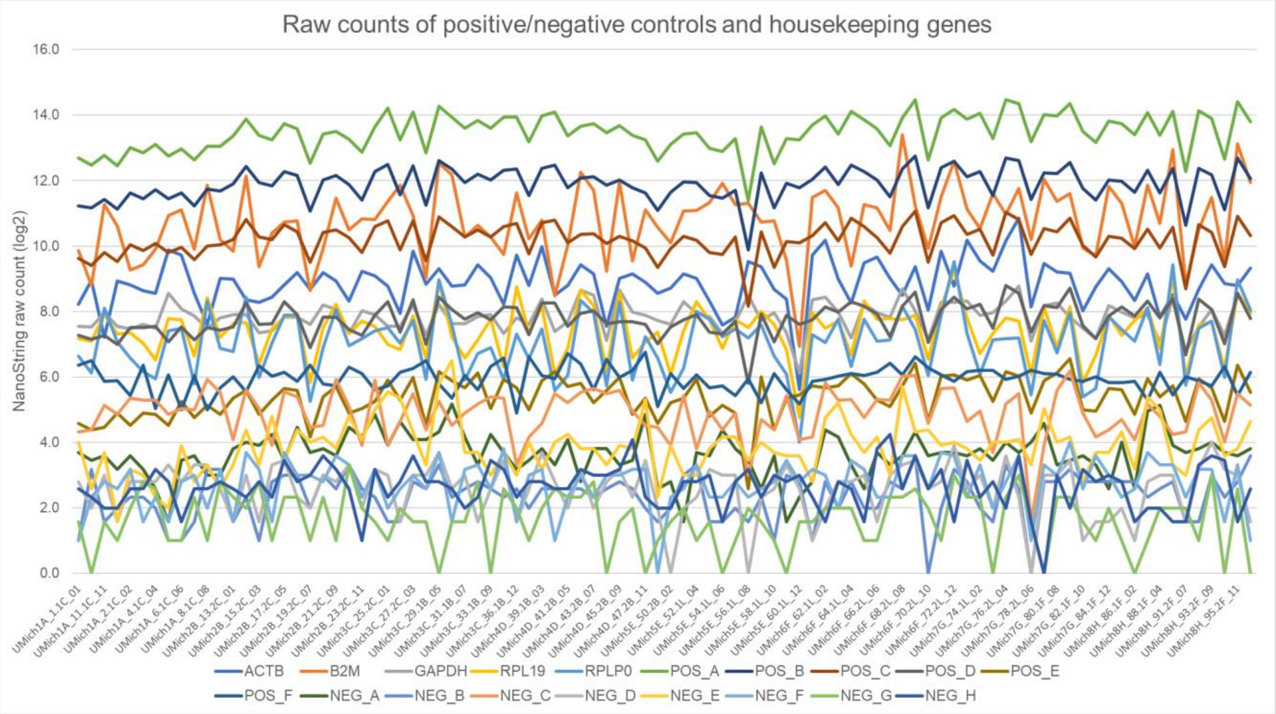
Supplementary Figure S1. Trends of miRNA levels in fibroblasts and whole blood from C9-ALS and nonC9-ALS versus controls

(**A**) Principal component analysis of overall miRNA distribution in fibroblasts (red) and whole blood (cyan). Groups are represented by node shape, C9-ALS (circles, nonC9-ALS (squares), and controls (triangles). (**B**) Principal component analysis of miRNA distribution by tissue (fibroblasts, left; whole blood, right) in C9-ALS (red), nonC9-ALS (blue), and control (black) samples.



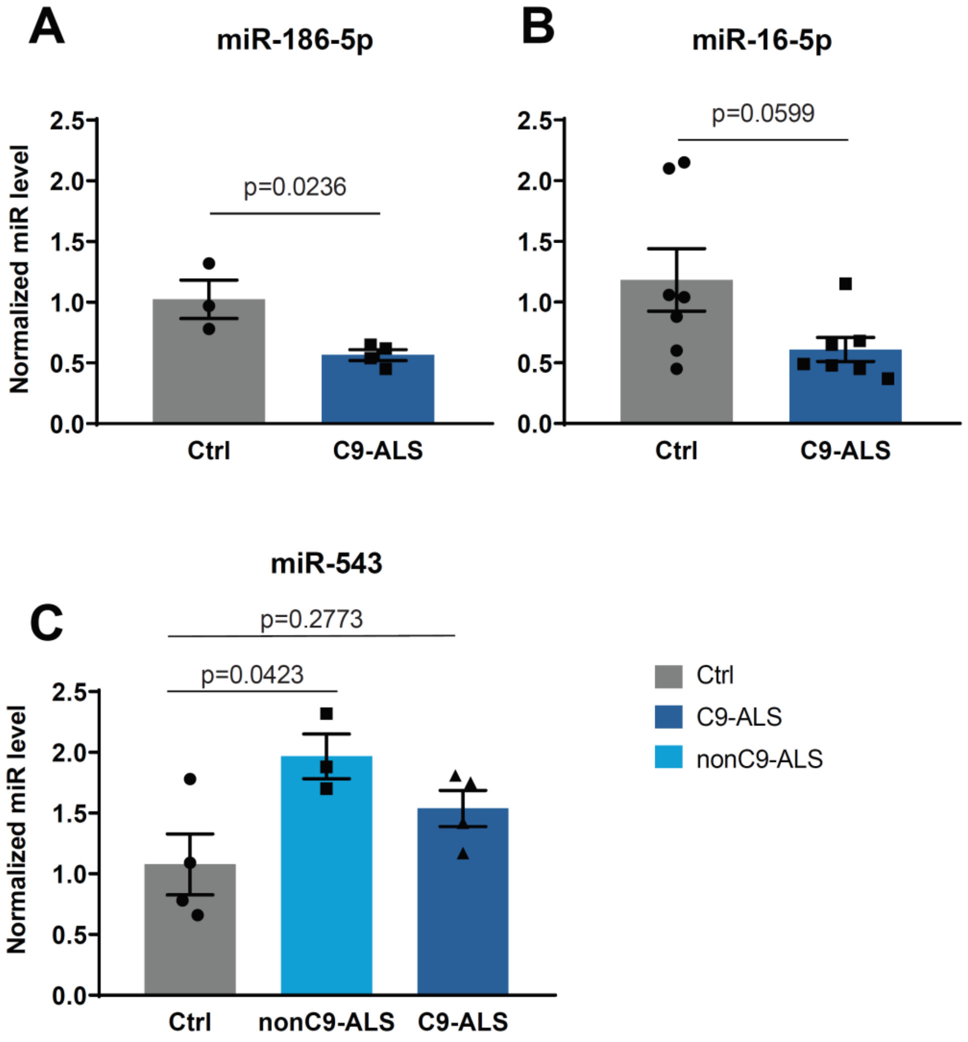
Supplementary Figure S2. Trends of positive and negative control and reference (housekeeping gene) probes

The log2-transfored raw counts of the positive control, negative control, and reference gene probes, that are embedded in the NanoString nCount system, are depicted in line plots. The normalization of the raw count data was done by NanoStringDiff based on these quality control probes, which showed relatively consistent patterns across samples.



Supplementary Figure S3. qPCR validation of differential miRNAs in fibroblasts

Dysregulated differential miRNAs in fibroblasts were validated by qPCR. Results were normalized to RNU48 and presented as fold-change calculated by the $2^{-\Delta\Delta C_T}$ method for (**A**) miR-186-5p [C9-ALS, n=4; Control (Ctrl), n=3], (**B**) miR-165p (C9-ALS, n=7; Ctrl, n=7), (**C**) miR-543 (C9-ALS, n=4; nonC9-ALS, n=3; Ctrl, n=4). Analysis by Student's t-test in panels A and B and one-way ANOVA in panel C; data are represented as mean ± standard error of the mean.



Supplementary Tables

Supplementary Table S1. Differential miRNAs in fibroblasts

All differential miRNAs (DmiRNAs) in fibroblasts were identified by NanoStringDiff between C9-ALS and nonC9-ALS versus controls and were deemed significant with p-value < 0.05. DmiRNAs are ordered based on the sharing between C9-ALS and nonC9-ALS and then by log(fold-change) within each subgroup.

Fibroblast					
miRNA ID	Subgroup	C9-ALS versus Control		nonC9-ALS versus Control	
		logFC	p-value	logFC	p-value
hsa-miR-516a-3p	Shared	28.02	2.56E-03	27.52	2.55E-02
hsa-miR-153	Shared	27.73	1.05E-02	27.75	9.86E-03
hsa-miR-548ak	Shared	26.21	8.11E-09	26.01	7.55E-08
hsa-miR-663b	Shared	24.71	2.33E-03	25.92	5.15E-07
hsa-miR-141-3p	Shared	22.73	9.95E-05	22.07	3.12E-03
hsa-miR-217	Shared	21.90	2.18E-03	21.91	3.29E-03
hsa-miR-1260b	Shared	18.45	1.30E-02	19.60	2.70E-05
hsa-miR-302b-3p	Shared	3.35	1.07E-05	2.53	5.14E-03
hsa-miR-548ah-5p	Shared	2.97	4.69E-04	2.66	4.12E-03
hsa-miR-942	Shared	2.58	2.55E-03	3.14	7.25E-05
hsa-miR-1180	Shared	2.11	3.72E-06	1.80	1.79E-04
hsa-miR-542-5p	Shared	1.95	2.42E-02	1.82	4.28E-02
hsa-miR-4443	Shared	1.28	1.90E-03	1.38	8.84E-04
hsa-miR-7-5p	Shared	1.17	3.41E-02	1.79	4.88E-04
hsa-miR-216a	Shared	0.95	1.69E-02	1.15	3.98E-03
hsa-miR-1183	Shared	0.93	3.75E-02	1.05	2.02E-02
hsa-miR-128	Shared	-0.87	9.45E-03	-0.76	2.38E-02
hsa-miR-197-3p	Shared	-0.88	3.41E-03	-1.09	3.35E-04
hsa-miR-92a-3p	Shared	-1.00	2.71E-03	-0.91	6.16E-03
hsa-let-7f-5p	Shared	-1.15	4.75E-04	-0.67	4.11E-02
hsa-miR-30b-5p	Shared	-1.24	1.73E-04	-0.92	5.38E-03
hsa-miR-30c-5p	Shared	-1.33	9.29E-05	-0.88	9.71E-03
hsa-miR-484	Shared	-1.53	8.64E-05	-0.76	4.02E-02
hsa-miR-3195	Shared	-1.54	1.08E-04	-2.06	1.32E-06
hsa-miR-92b-3p	Shared	-1.55	2.75E-05	-0.75	3.46E-02
hsa-miR-138-5p	Shared	-1.57	5.73E-03	-1.19	3.52E-02
hsa-miR-593-3p	Shared	-1.67	1.74E-05	-1.00	7.64E-03
hsa-miR-4516	Shared	-3.41	4.56E-11	-3.02	3.40E-09
hsa-miR-1234	Shared	-3.50	9.49E-07	-1.57	2.87E-03

Fibroblast					
miRNA ID	**Subgroup**	**C9-ALS versus Control**		**nonC9-ALS versus Control**	
		logFC	**p-value**	**logFC**	**p-value**
hsa-miR-4488	Shared	-23.75	6.22E-15	-5.85	4.02E-10
hsa-miR-1246	C9-unique	40.41	0.00E+00		
hsa-miR-369-5p	C9-unique	30.93	6.52E-04		
hsa-miR-515-5p	C9-unique	29.00	2.20E-03		
hsa-miR-524-3p	C9-unique	28.00	3.70E-02		
hsa-miR-4458	C9-unique	27.69	1.14E-02		
hsa-miR-922	C9-unique	25.79	9.40E-03		
hsa-miR-3180	C9-unique	25.53	2.33E-02		
hsa-miR-105-5p	C9-unique	25.35	2.42E-02		
hsa-miR-215	C9-unique	22.38	2.72E-03		
hsa-miR-550b-3p	C9-unique	2.14	4.49E-05		
hsa-miR-33a-5p	C9-unique	1.75	2.57E-02		
hsa-miR-761	C9-unique	1.59	2.36E-02		
hsa-miR-369-3p	C9-unique	1.43	4.27E-02		
hsa-miR-548a-5p	C9-unique	1.36	6.38E-03		
hsa-miR-34c-3p	C9-unique	1.07	4.95E-02		
hsa-miR-193a-5p	C9-unique	-0.62	4.84E-02		
hsa-miR-409-3p	C9-unique	-0.66	4.54E-02		
hsa-miR-139-5p	C9-unique	-0.70	3.51E-02		
hsa-miR-579	C9-unique	-0.70	3.12E-02		
hsa-miR-16-5p	C9-unique	-0.72	1.65E-02		
hsa-miR-29a-3p	C9-unique	-0.73	3.08E-02		
hsa-miR-145-5p	C9-unique	-0.78	2.17E-02		
hsa-miR-489	C9-unique	-0.80	3.23E-02		
hsa-miR-365a-3p	C9-unique	-0.83	7.87E-03		
hsa-miR-137	C9-unique	-0.84	1.98E-02		
hsa-miR-107	C9-unique	-0.89	1.57E-03		
hsa-miR-455-3p	C9-unique	-0.92	1.21E-02		
hsa-miR-26a-5p	C9-unique	-0.94	6.15E-03		
hsa-miR-376b	C9-unique	-0.95	1.76E-02		
hsa-miR-186-5p	C9-unique	-1.06	6.14E-03		
hsa-miR-214-3p	C9-unique	-1.20	8.55E-05		
hsa-miR-204-5p	C9-unique	-1.41	1.01E-02		
hsa-miR-597	nonC9-unique			26.49	5.31E-03
hsa-miR-378f	nonC9-unique			25.55	1.42E-03
hsa-miR-133b	nonC9-unique			25.37	3.23E-03
hsa-miR-548n	nonC9-unique			25.27	9.71E-03
hsa-miR-1323	nonC9-unique			24.76	7.53E-03

Fibroblast					
miRNA ID	**Subgroup**	**C9-ALS versus Control**		**nonC9-ALS versus Control**	
		logFC	**p-value**	**logFC**	**p-value**
hsa-miR-548ae	nonC9-unique			23.62	1.19E-02
hsa-miR-367-3p	nonC9-unique			21.40	3.86E-02
hsa-miR-627	nonC9-unique			20.75	3.19E-02
hsa-miR-142-3p	nonC9-unique			15.94	6.98E-04
hsa-miR-518b	nonC9-unique			4.40	4.00E-03
hsa-miR-769-5p	nonC9-unique			3.16	1.05E-02
hsa-miR-412	nonC9-unique			3.08	1.38E-02
hsa-miR-514b-5p	nonC9-unique			2.01	3.80E-04
hsa-miR-95	nonC9-unique			1.62	6.28E-03
hsa-miR-1290	nonC9-unique			1.25	2.36E-03
hsa-miR-1233	nonC9-unique			1.23	3.33E-03
hsa-miR-4455	nonC9-unique			0.96	6.37E-03
hsa-miR-338-3p	nonC9-unique			0.96	1.97E-02
hsa-miR-612	nonC9-unique			0.92	2.68E-02
hsa-miR-548ai	nonC9-unique			0.91	3.16E-02
hsa-miR-135b-5p	nonC9-unique			0.89	3.78E-02
hsa-miR-543	nonC9-unique			0.59	4.44E-02
hsa-miR-27a-3p	nonC9-unique			-0.91	1.04E-02
hsa-miR-3161	nonC9-unique			-1.15	4.00E-02
hsa-miR-362-3p	nonC9-unique			-1.81	6.80E-03

Supplementary Table S2. Differential miRNAs in whole blood

All differential miRNAs (DmiRNAs) in whole blood were identified by NanoStringDiff between C9-ALS and nonC9-ALS versus controls and were deemed significant with p-value < 0.05. DmiRNAs are ordered based on the sharing between C9-ALS and nonC9-ALS and then by log(fold-change) within each subgroup.

Whole Blood					
miRNA ID	**Subgroup**	**C9-ALS versus Control**		**nonC9-ALS versus Control**	
		logFC	**p-value**	**logFC**	**p-value**
hsa-miR-96-5p	Shared	30.35	1.53E-03	28.71	1.75E-02
hsa-miR-483-3p	Shared	27.49	2.47E-04	26.85	6.67E-04
hsa-miR-515-3p	Shared	25.76	5.01E-08	23.48	9.49E-05
hsa-miR-215-5p	Shared	25.43	7.25E-04	25.70	1.43E-05
hsa-miR-665	Shared	25.41	2.64E-05	25.33	2.52E-06
hsa-miR-575	Shared	24.39	3.35E-04	23.78	7.39E-04
hsa-miR-877-5p	Shared	23.96	1.04E-04	23.54	1.29E-05
hsa-miR-154-5p	Shared	22.89	4.12E-05	22.18	2.15E-04
hsa-miR-574-5p	Shared	20.16	4.02E-03	21.99	2.98E-06
hsa-miR-548j-3p	Shared	20.03	2.77E-02	19.62	3.57E-02
hsa-miR-339-5p	Shared	2.74	2.56E-03	3.24	2.14E-05
hsa-miR-1290	Shared	2.18	2.64E-02	2.16	1.02E-02
hsa-miR-128-3p	Shared	2.14	1.86E-02	1.85	1.47E-02
hsa-miR-30b-5p	Shared	1.28	2.70E-03	0.82	1.53E-02
hsa-miR-28-3p	Shared	1.26	7.06E-03	0.95	1.09E-02
hsa-miR-26a-5p	Shared	1.19	9.21E-03	0.96	7.97E-03
hsa-miR-324-3p	Shared	1.17	4.46E-02	1.56	5.72E-04
hsa-miR-30c-5p	Shared	1.10	4.58E-03	0.78	1.02E-02
hsa-miR-361-5p	Shared	0.93	8.30E-03	0.58	3.32E-02
hsa-miR-484	Shared	0.90	1.34E-02	0.79	5.59E-03
hsa-miR-92a-3p	Shared	0.69	3.21E-02	0.55	2.60E-02
hsa-let-7b-5p	Shared	-0.82	4.13E-02	-0.75	7.55E-03
hsa-miR-2110	Shared	-1.52	3.77E-04	-0.63	2.73E-02
hsa-miR-671-3p	Shared	-6.48	1.60E-02	-3.65	1.10E-02
hsa-miR-885-5p	C9-unique	31.60	4.19E-03		
hsa-miR-146b-5p	C9-unique	27.69	1.65E-02		
hsa-miR-3614-3p	C9-unique	26.29	4.00E-11		
hsa-miR-501-3p	C9-unique	25.59	1.59E-08		
hsa-miR-4536-5p	C9-unique	25.35	4.88E-03		
hsa-miR-1197	C9-unique	24.38	1.79E-03		
hsa-miR-345-3p	C9-unique	23.84	4.56E-11		

Whole Blood					
miRNA ID	**Subgroup**	**C9-ALS versus Control**		**nonC9-ALS versus Control**	
		logFC	**p-value**	**logFC**	**p-value**
hsa-miR-587	C9-unique	23.69	7.75E-03		
hsa-miR-548g-3p	C9-unique	23.25	1.44E-03		
hsa-miR-10b-5p	C9-unique	22.60	4.72E-02		
hsa-miR-200a-3p	C9-unique	21.88	1.41E-02		
hsa-miR-2682-5p	C9-unique	16.83	1.80E-02		
hsa-miR-556-5p	C9-unique	3.32	3.16E-04		
hsa-miR-330-5p	C9-unique	2.61	1.71E-02		
hsa-miR-208b-5p	C9-unique	2.28	2.34E-03		
hsa-miR-128-1-5p	C9-unique	1.73	7.48E-04		
hsa-miR-1285-5p	C9-unique	1.73	5.21E-03		
hsa-miR-1183	C9-unique	1.53	2.28E-03		
hsa-miR-30e-3p	C9-unique	1.52	9.49E-03		
hsa-miR-337-3p	C9-unique	1.35	1.96E-02		
hsa-miR-186-5p	C9-unique	1.04	1.00E-02		
hsa-miR-150-5p	C9-unique	-0.54	4.06E-02		
hsa-miR-125a-5p	C9-unique	-0.62	4.65E-02		
hsa-miR-378i	C9-unique	-1.00	1.64E-02		
hsa-miR-1226-3p	C9-unique	-1.21	1.25E-02		
hsa-miR-320a	C9-unique	-1.23	2.88E-02		
hsa-miR-7-5p	C9-unique	-1.40	3.69E-02		
hsa-miR-378g	C9-unique	-2.93	7.41E-03		
hsa-miR-3065-5p	C9-unique	-3.16	4.00E-04		
hsa-miR-516b-5p	C9-unique	-19.70	9.48E-03		
hsa-miR-498	C9-unique	-19.80	2.94E-03		
hsa-miR-6511a-3p	C9-unique	-20.22	1.27E-03		
hsa-miR-1248	C9-unique	-20.74	8.44E-03		
hsa-miR-548ak	C9-unique	-21.32	1.29E-03		
hsa-miR-122-5p	C9-unique	-22.76	6.69E-05		
hsa-miR-3127-5p	C9-unique	-23.40	2.43E-05		
hsa-miR-3195	C9-unique	-23.61	6.18E-04		
hsa-miR-494-3p	C9-unique	-30.09	2.67E-05		
hsa-miR-642a-5p	nonC9-unique			29.98	7.05E-03
hsa-miR-1306-3p	nonC9-unique			29.49	2.17E-02
hsa-miR-875-3p	nonC9-unique			29.44	6.66E-04
hsa-miR-3918	nonC9-unique			26.78	3.49E-02
hsa-miR-543	nonC9-unique			25.36	3.63E-02
hsa-miR-944	nonC9-unique			24.59	1.08E-02
hsa-miR-371a-5p	nonC9-unique			20.09	6.89E-03

Whole Blood					
miRNA ID	**Subgroup**	**C9-ALS versus Control**		**nonC9-ALS versus Control**	
		logFC	**p-value**	**logFC**	**p-value**
hsa-miR-151b	nonC9-unique			19.94	9.03E-03
hsa-miR-320b	nonC9-unique			18.93	3.89E-02
hsa-miR-597-5p	nonC9-unique			5.69	2.41E-03
hsa-miR-548al	nonC9-unique			4.26	4.31E-02
hsa-miR-2117	nonC9-unique			1.20	4.59E-02
hsa-miR-4516	nonC9-unique			1.02	7.65E-03
hsa-miR-99a-5p	nonC9-unique			1.01	3.14E-02
hsa-miR-182-5p	nonC9-unique			0.75	1.77E-02
hsa-miR-197-3p	nonC9-unique			0.60	2.07E-02
hsa-miR-145-5p	nonC9-unique			0.60	2.63E-02
hsa-miR-331-3p	nonC9-unique			0.59	2.97E-02
hsa-miR-423-3p	nonC9-unique			0.54	4.57E-02
hsa-miR-1180-3p	nonC9-unique			-0.46	2.65E-02

Supplementary Table S3. Significant KEGG pathways among the miRNA targets

mirPath enrichment analysis of all differential miRNAs (DmiRNAs) and their significantly enriched pathways. FB, fibroblasts; WB, whole blood.

Group	Count	Group	Count	Group	Count	Group	Count
FB-Shared	54	WB-Shared	56	C9-Shared	49	nonC9-Shared	56
FB-C9-only	20	WB-C9-only	10	C9-FB-only	20	nonC9-FB-only	18
FB-nonC9-only	15	WB-nonC9-only	17	C9-WB-only	24	nonC9-WB-only	10

Pathway name	**Set count**	**FB-C9**	**FB-nonC9**	**WB-C9**	**WB-nonC9**	**FB-Group**	**WB-Group**	**C9-Group**	**nonC9-Group**
# of significant pathways		**69**	**74**	**73**	**66**				
Proteoglycans in cancer	4	2.81E-10	3.43E-07	1.74E-08	4.15E-11	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
ErbB signaling pathway	4	1.18E-06	9.17E-07	3.40E-06	4.79E-08	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
AMPK signaling pathway	4	1.30E-06	2.33E-05	8.21E-03	4.07E-03	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Hippo signaling pathway	4	6.24E-06	5.00E-04	7.86E-06	4.79E-08	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Pathways in cancer	4	7.77E-06	3.13E-04	2.39E-05	6.01E-07	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Mucin type O-Glycan biosynthesis	4	7.77E-06	3.43E-07	6.57E-05	1.39E-05	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Signaling pathways regulating pluripotency of stem cells	4	1.23E-05	2.59E-03	6.82E-03	2.12E-04	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Adrenergic signaling in cardiomyocytes	4	2.94E-05	9.34E-05	9.65E-04	1.14E-03	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Axon guidance	4	5.11E-05	4.44E-06	6.49E-05	4.79E-08	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Estrogen signaling pathway	4	5.11E-05	3.85E-05	6.35E-03	7.18E-04	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Rap1 signaling pathway	4	5.87E-05	2.84E-04	9.85E-05	1.87E-07	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Focal adhesion	4	5.87E-05	9.18E-03	8.62E-04	3.52E-05	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Glioma	4	6.26E-05	4.56E-03	7.18E-04	9.21E-05	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
mTOR signaling pathway	4	6.26E-05	1.31E-03	2.70E-02	5.60E-03	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Adherens junction	4	7.58E-05	6.67E-06	9.14E-05	3.98E-04	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
TGF-beta signaling pathway	4	7.58E-05	3.71E-04	1.28E-04	1.47E-04	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Prostate cancer	4	1.22E-04	1.31E-03	6.35E-03	8.39E-04	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
PI3K-Akt signaling pathway	4	1.34E-04	8.46E-04	1.61E-02	3.77E-03	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Oxytocin signaling pathway	4	1.58E-04	1.04E-02	2.69E-03	3.82E-03	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Prolactin signaling pathway	4	6.65E-04	1.97E-03	6.66E-03	1.83E-02	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Pancreatic cancer	4	6.65E-04	2.08E-04	1.62E-02	1.45E-02	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Glutamatergic synapse	4	6.86E-04	3.85E-05	2.75E-04	3.45E-05	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
FoxO signaling pathway	4	7.29E-04	8.08E-04	1.40E-04	1.47E-04	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Endocytosis	4	9.46E-04	2.59E-03	4.64E-02	1.42E-02	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Gap junction	4	9.48E-04	8.08E-04	2.69E-03	5.09E-03	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Thyroid hormone signaling pathway	4	1.67E-03	3.36E-02	2.28E-04	4.76E-05	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
GABAergic synapse	4	1.70E-03	3.85E-05	9.30E-06	3.95E-08	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Ras signaling pathway	4	1.70E-03	2.79E-05	2.93E-04	1.33E-06	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Long-term potentiation	4	1.70E-03	7.15E-03	1.01E-02	1.13E-02	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Regulation of actin cytoskeleton	4	2.38E-03	1.06E-03	7.50E-03	1.68E-03	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
MAPK signaling pathway	4	2.53E-03	3.35E-03	8.09E-04	1.85E-03	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Melanoma	4	2.83E-03	2.78E-02	9.37E-03	3.09E-03	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Platelet activation	4	3.18E-03	9.18E-03	4.93E-02	9.95E-03	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Prion diseases	4	3.73E-03	5.91E-03	1.07E-03	1.06E-03	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Renal cell carcinoma	4	4.17E-03	1.43E-04	9.14E-05	7.22E-05	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Neurotrophin signaling pathway	4	1.63E-02	5.08E-04	2.31E-03	1.42E-02	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Endometrial cancer	4	1.64E-02	3.28E-02	1.27E-02	3.15E-02	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Colorectal cancer	4	2.94E-02	5.91E-03	1.03E-02	4.49E-03	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Chronic myeloid leukemia	4	2.99E-02	1.89E-02	1.34E-02	4.13E-02	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Lysine degradation	4	3.37E-02	1.29E-04	2.28E-04	3.86E-02	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Morphine addiction	4	3.43E-02	5.11E-06	3.40E-06	1.57E-11	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
HIF-1 signaling pathway	4	4.12E-02	6.69E-03	9.37E-03	1.60E-02	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
Arrhythmogenic right ventricular cardiomyopathy (ARVC)	4	4.31E-02	4.01E-04	7.86E-04	1.13E-02	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
cAMP signaling pathway	4	4.31E-02	5.48E-03	1.13E-02	3.22E-02	FB-Shared	WB-Shared	C9-Shared	nonC9-Shared
ECM-receptor interaction	3	5.98E-06		1.71E-02	5.02E-05	FB-nonC9-only	WB-Shared	C9-Shared	nonC9-WB-only
Choline metabolism in cancer	3	1.58E-04	7.47E-05		2.52E-02	FB-Shared	WB-C9-only	C9-FB-only	nonC9-Shared
Long-term depression	3	6.65E-04	1.97E-03		3.77E-03	FB-Shared	WB-C9-only	C9-FB-only	nonC9-Shared
cGMP-PKG signaling pathway	3	1.03E-03	7.67E-03	3.58E-02		FB-Shared	WB-nonC9-only	C9-Shared	nonC9-FB-only
Wnt signaling pathway	3	1.74E-03	2.86E-02		6.99E-03	FB-Shared	WB-C9-only	C9-FB-only	nonC9-Shared
Sphingolipid signaling pathway	3	2.30E-02	1.97E-03	3.20E-02		FB-Shared	WB-nonC9-only	C9-Shared	nonC9-FB-only
Hepatitis B	3	2.81E-02	3.36E-02	1.36E-02		FB-Shared	WB-nonC9-only	C9-Shared	nonC9-FB-only
Nicotine addiction	3		8.08E-04	2.13E-04	9.72E-04	FB-C9-only	WB-Shared	C9-WB-only	nonC9-Shared
Retrograde endocannabinoid signaling	3		5.91E-03	6.39E-04	4.59E-04	FB-C9-only	WB-Shared	C9-WB-only	nonC9-Shared
Amphetamine addiction	3		2.33E-05	8.53E-04	1.06E-03	FB-C9-only	WB-Shared	C9-WB-only	nonC9-Shared
Cocaine addiction	3		5.82E-04	4.89E-03	1.47E-04	FB-C9-only	WB-Shared	C9-WB-only	nonC9-Shared
Dopaminergic synapse	3		8.66E-03	8.21E-03	5.60E-03	FB-C9-only	WB-Shared	C9-WB-only	nonC9-Shared
Cholinergic synapse	3		8.08E-04	1.03E-02	8.39E-04	FB-C9-only	WB-Shared	C9-WB-only	nonC9-Shared
Circadian entrainment	3		5.82E-04	1.03E-02	2.00E-03	FB-C9-only	WB-Shared	C9-WB-only	nonC9-Shared
Phosphatidylinositol signaling system	3		2.59E-03	1.05E-02	1.93E-03	FB-C9-only	WB-Shared	C9-WB-only	nonC9-Shared
Acute myeloid leukemia	2	9.48E-04	4.72E-04			FB-Shared		C9-FB-only	nonC9-FB-only
Inflammatory mediator regulation of TRP channels	2	9.44E-03	4.40E-02			FB-Shared		C9-FB-only	nonC9-FB-only
Glycosaminoglycan biosynthesis - chondroitin sulfate / dermatan sulfate	2	9.53E-03			1.85E-03	FB-nonC9-only	WB-C9-only	C9-FB-only	nonC9-WB-only
Insulin signaling pathway	2	1.64E-02			4.03E-02	FB-nonC9-only	WB-C9-only	C9-FB-only	nonC9-WB-only
Non-small cell lung cancer	2	1.73E-02			5.09E-03	FB-nonC9-only	WB-C9-only	C9-FB-only	nonC9-WB-only
T cell receptor signaling pathway	2	2.33E-02	3.98E-02			FB-Shared		C9-FB-only	nonC9-FB-only
Dorso-ventral axis formation	2	2.81E-02	2.93E-02			FB-Shared		C9-FB-only	nonC9-FB-only
Melanogenesis	2	2.90E-02			9.95E-03	FB-nonC9-only	WB-C9-only	C9-FB-only	nonC9-WB-only
Apoptosis	2	3.37E-02		6.80E-03		FB-nonC9-only	WB-nonC9-only	C9-Shared	
Glycosaminoglycan biosynthesis - keratan sulfate	2			8.38E-05	1.42E-02		WB-Shared	C9-WB-only	nonC9-WB-only
Bacterial invasion of epithelial cells	2			8.95E-05	1.49E-04		WB-Shared	C9-WB-only	nonC9-WB-only
Ubiquitin mediated proteolysis	2		1.89E-02	9.14E-05		FB-C9-only	WB-nonC9-only	C9-WB-only	nonC9-FB-only
Circadian rhythm	2		8.87E-03	1.78E-03		FB-C9-only	WB-nonC9-only	C9-WB-only	nonC9-FB-only
p53 signaling pathway	2			2.07E-03	4.13E-02		WB-Shared	C9-WB-only	nonC9-WB-only
mRNA surveillance pathway	2		1.89E-02	1.03E-02		FB-C9-only	WB-nonC9-only	C9-WB-only	nonC9-FB-only
Aldosterone-regulated sodium reabsorption	2		4.70E-02	1.34E-02		FB-C9-only	WB-nonC9-only	C9-WB-only	nonC9-FB-only
Glycosaminoglycan biosynthesis - heparan sulfate / heparin	2		1.12E-03	1.86E-02		FB-C9-only	WB-nonC9-only	C9-WB-only	nonC9-FB-only
Transcriptional misregulation in cancer	2		4.71E-02		1.62E-03	FB-C9-only	WB-C9-only		nonC9-Shared
Fatty acid biosynthesis	1	1.12E-05				FB-nonC9-only		C9-FB-only	
Small cell lung cancer	1	1.64E-02				FB-nonC9-only		C9-FB-only	
Amoebiasis	1	2.79E-02				FB-nonC9-only		C9-FB-only	
HTLV-I infection	1	2.94E-02				FB-nonC9-only		C9-FB-only	
Tight junction	1	2.99E-02				FB-nonC9-only		C9-FB-only	
Gastric acid secretion	1	3.13E-02				FB-nonC9-only		C9-FB-only	
Hedgehog signaling pathway	1	3.13E-02				FB-nonC9-only		C9-FB-only	
Glycosphingolipid biosynthesis - lacto and neolacto series	1	3.43E-02				FB-nonC9-only		C9-FB-only	
Glycerophospholipid metabolism	1	3.65E-02				FB-nonC9-only		C9-FB-only	
N-Glycan biosynthesis	1			3.14E-04			WB-nonC9-only	C9-WB-only	
Endocrine and other factor-regulated calcium reabsorption	1			7.18E-04			WB-nonC9-only	C9-WB-only	
Cell cycle	1			8.21E-03			WB-nonC9-only	C9-WB-only	
Oocyte meiosis	1			1.62E-02			WB-nonC9-only	C9-WB-only	
Other types of O-glycan biosynthesis	1			1.72E-02			WB-nonC9-only	C9-WB-only	
Protein processing in endoplasmic reticulum	1			1.83E-02			WB-nonC9-only	C9-WB-only	
Shigellosis	1			1.83E-02			WB-nonC9-only	C9-WB-only	
Progesterone-mediated oocyte maturation	1			4.25E-02			WB-nonC9-only	C9-WB-only	
RNA degradation	1				9.57E-03		WB-C9-only		nonC9-WB-only
Amino sugar and nucleotide sugar metabolism	1				9.95E-03		WB-C9-only		nonC9-WB-only
B cell receptor signaling pathway	1		4.15E-02			FB-C9-only			nonC9-FB-only
Biosynthesis of unsaturated fatty acids	1		1.01E-02			FB-C9-only			nonC9-FB-only
Biotin metabolism	1		3.94E-02			FB-C9-only			nonC9-FB-only
Central carbon metabolism in cancer	1		1.07E-02			FB-C9-only			nonC9-FB-only
SNARE interactions in vesicular transport	1		1.18E-02			FB-C9-only			nonC9-FB-only
Vasopressin-regulated water reabsorption	1		2.87E-03			FB-C9-only			nonC9-FB-only