

Supplementary information

**DHA-enriched egg yolk lipids alleviate cognitive impairment in 5×FAD mice by
restoring neuronal and synaptic damage and regulating gut microbiota**

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Table S1. Statistics of the serum differential metabolites.

Metabolite	Average relative expression level				VIP
	5×FAD	NOR-H	DHA-L	DHA-H	
N-Acetylserotonin	28009.20963	71255.23643	70377.26053	110992.3917	2.2038
PS(14:0/18:2)	13710.42015	41601.43934	24188.54042	52064.18719	1.807325
TG(22:6/22:6/22:6)	152367.6582	228252.0813	210375.0401	271446.7928	1.745819
Prostaglandin F1a	56194.11918	45643.21833	65572.49552	88584.9555	1.70609
Neuroprotectin D1	62915.23771	262749.9096	294870.3802	450280.9392	1.654595
SM(d18:1/18:1)	106196.6455	262178.1279	184041.9406	231933.1247	1.634263
PC(14:0/P-16:0)	572481.5723	836218.1658	750514.8693	832434.6431	1.59632
PE(16:0/P-18:1)	194793.3825	95736.98235	293904.9865	426870.011	1.588988
DG(18:2/22:6)	17599.59277	20939.2498	25622.78942	29988.94485	1.586656
Gallic acid	1120563.418	1036276.626	1128172.659	1020860.407	1.578963
PC(38:5)	110584.1224	1325292.107	2656350.429	1843591.982	1.569175
DG(16:0/22:5/0:0)	68603.99382	27461.28653	109783.7098	172252.2175	1.565237
PS(18:0/18:1)	7664.530624	137223.6099	20024.61347	151958.8869	1.547975
PC(14:0/15:0)	57300.75978	6277.982705	84179.26253	128462.2421	1.543475
DG(18:0/22:5/0:0)	478568.3135	795818.9001	673464.9044	756235.9392	1.537623
PC(28:1)	204458.5932	303920.4254	253715.1506	304308.8851	1.533238
LysoPC(26:1/0:0)	106582.7527	81806.03618	152958.3185	181276.0598	1.5167
PC(20:2/22:6)	13351.69922	26079.12605	67573.45502	125846.3927	1.504394
PE(14:0/P-18:0)	530965.9658	695965.3672	702817.0868	766181.509	1.471825
2-Phosphoglyceric acid	3963648.937	3625226.543	3857279.672	3688020.846	1.333013
Orotic acid	3298789.303	2722224.651	3089431.761	2952848.636	1.272563
Oxalosuccinic acid	4704601.637	5464940.036	5064513.3	5248136.367	1.200813
3-hydroxypentadecanoyl carnitine	82352.88746	157833.3678	45342.57167	56497.22224	1.19515
MG(0:0/20:2/0:0)	2744518.014	1362036.262	1961863.481	1835016.285	1.19065
3b,12a-Dihydroxy-5a- cholanoic acid	58924.24278	11331.56808	32692.72604	34698.97803	1.15795
LysoPC(16:1/0:0)	608498.8917	452644.8803	685074.3282	951140.8437	1.14835
L-Carnitine	399199.4494	817039.1074	383050.5337	237803.2899	1.130625
Alanyltryptophan	167085.4988	48176.52106	123098.0191	223303.8162	1.0905
Lysyltyrosine	158088.1278	157918.8014	174383.6884	169253.319	1.090025
Hexadecanedioic acid mono-L-carnitine ester	307756.384	240001.5996	232610.2899	246124.6948	1.06725
Methionyl- Phenylalanine	56066.0452	43258.76179	39249.70588	43964.18767	1.05405
PS(18:0/20:3)	47715.64212	39150.02731	53337.11017	71075.50588	1.02595
DG(14:1/15:0/0:0)	624739.0914	600546.9399	645891.6283	657419.985	1.014175
Sphinganine	200127.0173	163690.0296	218581.7387	266261.888	0.985543

1beta-Hydroxycholic acid	48776.3052	15073.08795	26984.12144	34003.6604	0.926748
LysoPE(0:0/20:1)	48041.7023	36781.48062	52663.34138	81801.88281	0.857563
Vitamin D2 3-glucuronide	354508.4099	375179.7433	379299.1328	412665.6568	0.856438
Docosa-4,7,10,13,16-pentaenoyl carnitine	563260.8898	456434.1745	444350.5434	479601.1713	0.835668
Homo-L-arginine	188953.4642	117533.2923	142843.1807	87376.80177	0.82518
LysoPC(20:2/0:0)	1620358.2	793416.9174	1697881.645	2015025.334	0.808978

Table S2. Statistics of the fecal differential metabolites.

Metabolite	Average relative expression level				VIP
	5×FAD	NOR-H	DHA-L	DHA-H	
DG(18:2/22:6/0:0)	42936.9075 3	251229.220 8	209989.414 6	814339.049 9	2.3261
TG(8:0/8:0/8:0)	1288388.26 1	1114270.37 9	1140489.64 7	1129015.88 8	2.1525
PS(14:0/14:1)	71112.523	29344.8353 6	23164.9832 8	23997.9970 9	2.05305
PC(O-30:0)	41140.7755 8	1263044.37 4	145341.120 9	243988.801 3	1.922975
DG(14:0/18:1)	396513.847 7	340111.224 7	323324.890 4	328255.107 7	1.900025
PE(15:0/P-16:0)	183578.031 8	167817.122 7	170390.591 5	180412.044 3	1.8146875
PC(20:0/22:6)	36277.8646 6	59665.5729 4	79980.1285 4	134464.761 1	1.5376232 3
PE(20:0/P-18:1)	95450.2597 3	128778.208 2	97649.4303	109803.703 6	1.4812625
Prolyl-Tryptophan	584062.811	505822.712 1	536915.445 4	583721.568 3	1.39775
PC(38:3)	79859.8872 3	46886.4367 3	58786.4154 4	45257.8971 4	1.377725
LysoPE(P-16:0/0:0)	145516.014 2	33739.7544 2	246121.083	106764.532 2	1.3720637 5
Cysteinyl-Serine	613873.354	304635.398 8	425689.461 3	300101.695 8	1.3662125
12-Ketodeoxycholic acid	65100.9555 2	60091.0404 1	110031.645 4	65638.5119 5	1.3493337 5
Lysyltyrosine	326026.425 4	159048.210 4	244094.315 1	244796.331 3	1.346575
Neuroprotectin D1	20645.6014 5	26816.0712 9	28610.8778 9	37950.4808 9	1.2563375
LysoPC(24:0/0:0)	83799.2868 2	124528.351 2	150296.717 7	196726.565	1.252875
PC(32:0)	127597.465 7	103232.890 6	111924.583 7	123557.563	1.2257
Methionine	30592.0482 3	5685.01385 1	25274.3322 9	31355.8253 9	1.2037875
Lysylserine	302047.437 6	1103285.94 5	737394.739 2	321148.172 5	1.1880625
Inosine	105156.629 7	53046.2571 9	31927.6414 1	38350.6918 1	1.1870875
Glutamic acid	32482.1225	31398.3768	35926.074	33501.9019	1.099625

		9		8	
LysoPC(14:0/0:0)	474965.498	478431.887	484395.618	504655.086	1.0473525
	7	8	8	8	
LysoPC(22:4/0:0)	185194.486	89690.8786	204169.124	211483.081	1.0399137
	5	6	3	5	
3b,12a-Dihydroxy-5a-cholanoic acid	74182985.9	46977683.5	69027957.0	67344952.8	1.0336
	8	6	2	2	
7b-Hydroxy-3-oxo-5b-cholanoic acid	241328.153	154730.800	202208.370	126047.006	1.0186337
	7	1	6	1	5
3-hydroxyundecanoyl carnitine	923509.554	471503.677	957227.157	1081510.25	1.0076512
	9	4	3	6	5
MG(0:0/18:3/0:0)	198430.073	63853.6846	55781.2651	89397.9427	0.9989225
	9	4	2	8	
5-Hydroxytryptophol	188893.932	132777.107	197722.914	201346.972	0.9622087
	8	3	7	4	5
Deoxyinosine	94609.4814	233932.797	134418.584	64988.6896	0.947265
	7	8	8	7	
PG(16:0/16:0)	93265.3252	54115.1298	87392.4461	90767.5341	0.9406112
	4	9	7	5	
DG(15:0/22:5/0:0)	460953.059	463545.911	476339.023	483230.619	0.9374625
	8	4	4	8	
LysoPC(20:5/0:0)	29823.1016	17797.6963	27802.1906	20226.6456	0.8853462
	6	9	8	8	5
PC(15:0/18:1)	550853.027	426747.786	515105.708	469834.098	0.8534137
		9	9	3	5
16-Hydroxyhexadecanoic acid	196690.070	105429.920	44344.8597	56155.6902	0.8372137
	2	3	5	9	5
Glycocholic acid	182873.786	188629.986	183553.381	177297.917	0.803245
	9	7	2	1	
Isoleucyl-Lysine	726330.693	550326.939	336573.210	422560.622	0.7766875
	8	6	4	2	
7-Ketodeoxycholic acid	224383.775	135465.238	147777.700	158408.976	0.76626
	6	7	4	8	
LysoPC(20:0/0:0)	234440.179	141015.019	144807.296	179189.123	0.7273687
	5	2	7	4	5
4,8-Dimethylnonanoyl carnitine	460652.697	426870.245	173710.477	154909.655	0.7107162
	4	6	2	5	
CerP(d18:1/18:0)	112932.011	92813.2195	46792.0475	42217.0641	0.6421437
	1	1	9	7	5