

## **Supplementary Materials**

### **Maternal sleep deprivation disrupts glutamate metabolism in offspring rats**

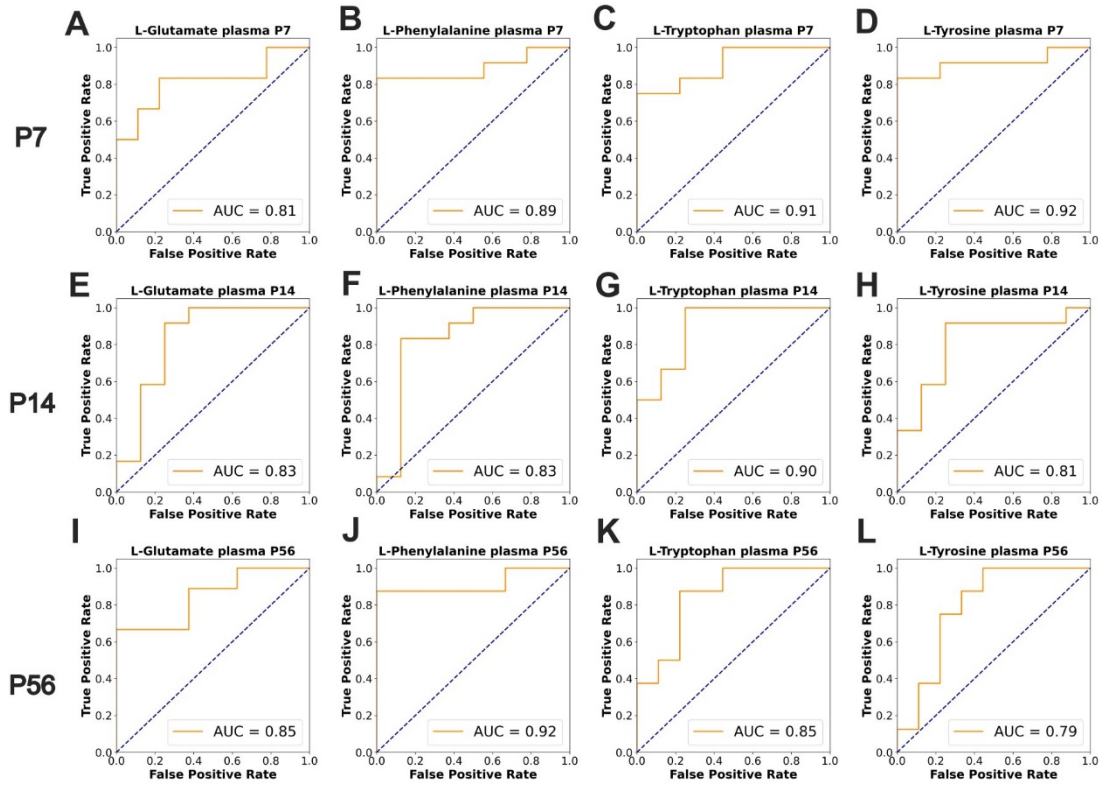
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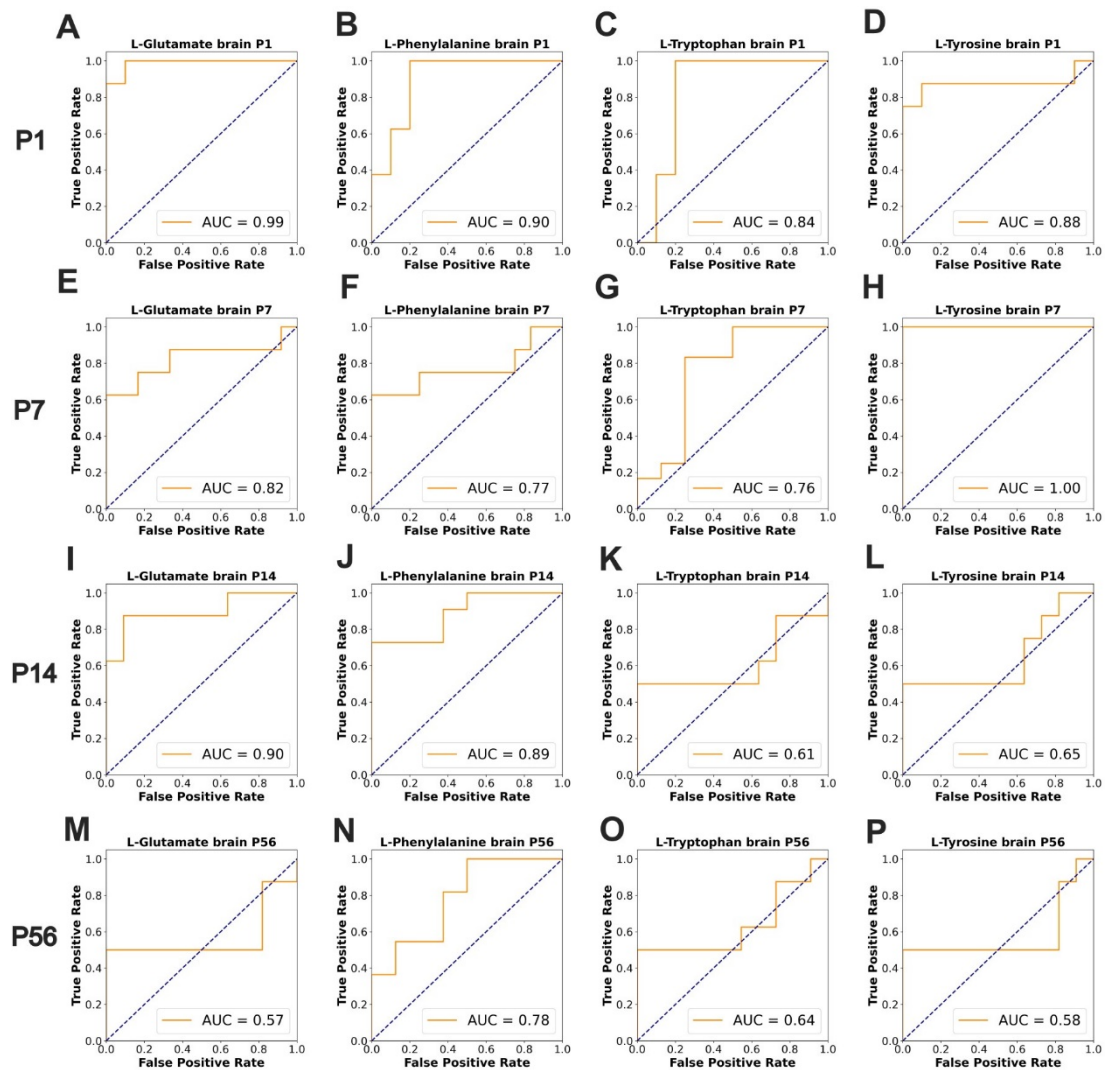
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**Supplementary Figure S3** The ROC curve of plasma metabolites in MSD offspring. A-D: ROC curve of L-glutamate (A), L-tryptophan (B), L-tyrosine (C), L-phenylalanine (D) at P7; E-H: ROC curve of L-glutamate (E), L-tryptophan (F), L-tyrosine (G), L-phenylalanine (H) at P14; I-L: ROC curve of L-glutamate (I), L-tryptophan (J), L-tyrosine (K), L-phenylalanine (L) at P56.



**Supplementary Figure S4** The ROC curve of brain metabolites in MSD offspring. A-D: ROC curve of L-glutamate (A), L-tryptophan (B), L-tyrosine (C), L-phenylalanine (D) at P1; E-H: ROC curve of L-glutamate (E), L-tryptophan (F), L-tyrosine (G), L-phenylalanine (H) at P7; I-L: ROC curve of L-glutamate (I), L-tryptophan (J), L-tyrosine (K), L-phenylalanine (L) at P14; M-P: ROC curve of L-glutamate (M), L-tryptophan (N), L-tyrosine (O), L-phenylalanine (P) at P56.

**Supplementary Table S1 The identified 26 metabolites in the brain that consistently showed alterations across three developmental stages (P < 0.05).**

compound.name	P7			P14			P56		
	P value	t	logFC	P value	t	logFC	P value	t	logFC
3-(4-Hydroxyphenyl)lactate	0.02563	-2.35134	-0.21315	0.009812	-2.93164	-2.43446	0.020944	2.620879	1.050587
3,6-Dihyronicotinic acid	0.004845	-3.22118	-0.76458	0.000154	-4.84536	-6.79811	0.032718	-2.39603	-2.81111
3'-AMP	0.027087	-2.39396	-0.34954	0.014657	-2.74376	-5.98428	0.004656	-3.38319	-16.2196
5-Oxoproline	0.001925	-3.63535	-0.88913	0.001662	-3.7541	-14.8424	0.004957	3.347142	1.791909
beta-Alanyl-N(pi)-methyl-L-histidine	0.010476	-2.74428	-0.23745	0.002499	-3.48116	-0.59751	0.041901	2.239208	0.423776
Betaine	4.69E-05	-5.32659	-11.5717	0.017262	-2.66557	-50.2744	0.001668	3.821127	0.579924
Creatine	0.001628	-3.72439	-1.52469	0.008532	-2.98718	-1.20106	0.012932	2.850944	0.672861
Cytidine	0.006095	-3.13689	-3.74791	0.005999	-3.16108	-2.50528	0.046453	2.189749	0.459792
Deoxycytidine	0.00981	-2.91078	-1.06661	0.001328	-3.85667	-40.1052	0.001655	3.894537	3.033066
Ergothioneine	0.005296	-3.17989	-0.73555	0.0302	-2.31613	-0.34981	0.017585	-2.60592	-0.26786
Hexadecanoic acid	0.00099	3.95336	4.756095	0.007302	3.072452	5.208667	0.014159	2.826968	9.806024
IMP	8.09E-06	-6.13063	-1.96704	3.13E-05	-5.57062	-2.09138	0.001906	-3.82681	-14.8541
L-Arginine	0.041742	-2.00939	-0.12726	0.00707	-3.08824	-40.6742	0.032107	2.111239	0.128016
L-Carnitine	0.009264	-2.94526	-72.1896	0.002361	-3.59399	-105.761	0.03948	-2.29777	-60.1883
L-Glutamate	0.036369	-2.27636	-0.56075	0.002342	-3.58824	-1.86795	0.020454	-2.63896	-2.79563
L-Histidine	0.002228	-3.59185	-7.59756	0.002138	-3.63918	-26.7594	0.000626	4.384152	4.519362
L-Kynurenine	0.000411	-4.23778	-0.51511	0.005857	-2.94236	-0.29426	0.010475	2.555195	0.144683
L-Phenylalanine	0.011231	-2.85537	-4.62248	0.007161	-3.08213	-10.6034	0.005297	3.318928	8.774903
L-Tryptophan	0.000224	-4.6179	-28.9186	0.001721	-3.73841	-18.1101	0.018339	2.695261	4.213427
L-Tyrosine	0.015407	-2.70709	-7.40992	0.024077	-2.50358	-11.4554	0.039116	2.30241	4.342356
N(pi)-Methyl-L-histidine	0.007766	-3.02579	-3.36457	0.011511	-2.85837	-4.37199	0.023175	2.57551	4.88066
NG,NG-Dimethyl-L-arginine	0.016824	-2.66481	-3.21966	0.014557	-2.74733	-10.9581	0.032918	2.39329	4.569581
Pantothenate	1.28E-06	-6.26947	-0.36737	0.010802	-2.88928	-30.207	0.006374	3.227034	12.75989
Phenethylamine	0.004893	-3.1975	-0.54856	0.00334	-3.43501	-35.4519	0.000603	-4.33162	-0.69545
Prostaglandin F2alpha	0.045294	2.179081	3.637205	0.000882	4.042942	9.99285	0.046284	2.098718	0.192542
Stearidonic acid	0.010222	2.89896	3.799684	0.029979	2.394754	4.525085	0.049642	1.764466	0.087802

**Supplementary Table S2 The identified 36 metabolites in the brain that consistently showed alterations across all developmental stages (P < 0.05).**

Compound name	P1			p7			p14			p56		
	P value	t	logFC	P value	t	logFC	P value	t	logFC	P value	t	logFC
5-L-Glutamyl-taurine	0.485203	0.71405	0.98182	0.007896	-2.9782	-22.8195	0.005573	3.159396	31.22529	0.019915	2.562526	15.40993
5'-Oxoinosine	0.002014	-3.66379	-0.39532	0.016833	-2.62765	-0.28459	0.153772	-1.49101	-0.28051	0.151999	-1.4981	-0.23196
Adenosine	0.038243	-2.25282	-13.3101	8.02E-05	-5.03266	-35.7494	0.007835	3.001861	12.12715	0.004743	-3.23518	-3246.06
CDP-ethanolamine	0.004325	3.30617	2.409943	1.08E-07	8.35767	0.396213	0.002313	3.561607	8.119759	0.018279	2.603731	11.3983
Choline phosphate	0.153278	1.4972	0.051243	0.011321	2.812696	177.5538	0.005657	3.152488	3706.369	0.01721	2.632605	2546.744
Cys-Gly	0.009877	2.916072	0.526975	0.014002	2.713972	1.997941	0.054549	2.060448	0.600903	0.00445	-3.26454	-13.5181
Cystathionine	0.000634	4.20599	1.218144	6.98E-06	6.178933	0.545586	0.009235	2.925329	109.9987	0.011746	2.813881	168.3329
Cytosine	0.036104	-2.28201	-0.3148	0.021108	-2.52046	-9.65468	0.024076	-2.46976	-12.3773	0.006893	-3.06271	-8.24487
Deoxyinosine	0.003456	-3.41137	-0.99412	0.304183	1.056905	0.56497	0.000245	-4.58738	-2.72038	0.001879	-3.6585	-1.53601
D-Fructose 6-phosphate	0.030059	-2.37421	-0.19126	0.027608	-2.39146	-0.19627	0.258748	1.167319	0.210846	0.244233	1.205206	0.194453
Ethanolamine phosphate	5.49E-06	6.581909	35.06695	1.61E-06	6.909222	29.63597	0.005939	3.13001	652.2745	0.025331	2.445826	29.40045
gamma-Glutamyl-beta-cyanoalanine	0.001446	3.81861	1.181188	0.00817	2.962659	0.585717	0.008682	2.954105	333.6659	0.021209	2.532123	150.6089
gamma-L-Glutamyl-L-cysteine	0.00044	4.378338	1.747025	0.2864	1.097793	1.020431	0.022077	-2.51182	-3.0453	0.019526	-2.57201	-23.0493
Glutathione	0.235078	1.232515	5.586009	0.015283	2.673032	29.64958	0.048822	-2.11751	-148.915	0.003172	-3.4196	-12.4541
Hypoxanthine	0.007237	3.063734	3.469607	0.044304	-2.1582	-68.2668	0.009666	-2.90405	-1286.95	0.009096	-2.93373	-1259.49
IMP	0.00083	-4.07906	-3963.66	0.003877	-3.29987	-629.944	0.002585	-3.51091	-75.0657	0.031403	-2.34019	-0.93933
Inosine	2.68E-06	-6.97465	-1642.07	2.79E-07	-7.8291	-2067.95	0.004217	-3.28745	-126.043	0.001188	-3.86739	-111.5
L-4-Hydroxyphenylglycyl-L-arginine	0.016054	2.682704	0.463663	0.031564	-2.32625	-0.51283	0.120261	-1.63336	-0.41569	0.370244	0.919779	0.137496
L-Aroenate	4.00E-05	5.545937	7.08649	0.000894	3.9529	8.486452	0.037227	-2.25476	-5.33219	0.005396	3.175826	1.989002
L-Citrulline	0.000303	4.555897	3.513209	0.000305	4.430541	3.002926	0.020866	2.539092	52.1185	0.012804	2.773172	123.4615
L-Glutamate	1.10E-06	7.479437	262.1437	0.024275	2.45356	55.76695	0.005363	3.177014	1190.083	0.025395	2.444603	821.9884
L-Mimosine	0.003144	-3.45562	-1.16225	4.63E-06	-6.37935	-1.60027	0.007546	3.019313	9.026436	0.016375	2.656372	11.2943
L-Phenylalanine	0.000819	4.085151	62.52109	0.00626	3.083847	0.461639	0.006744	-3.07134	-42.7484	0.020727	-2.54323	-17.6847
L-Pipecolate	0.001449	3.817837	3.048756	0.038549	2.227717	0.128102	0.011259	2.83256	3.534177	0.010775	2.854446	4.935534
L-Tryptophan	0.055327	2.062382	49.04349	0.038843	-2.22394	-11.1307	0.008407	2.969081	26.03088	0.015376	2.6864	741.7931
L-Tyrosine	0.002122	3.639538	49.11239	2.55E-06	-6.67616	-45.7181	0.007323	3.033179	77.318	0.007959	2.995961	118.6154
myo-Inositol	0.000504	-4.31401	-2.07903	0.008475	-2.94587	-24.2089	0.028098	-2.39425	-16.489	0.026316	-2.42718	-0.78217
N-Acetyl-L-aspartate	0.002669	3.532241	454.5641	0.000888	-3.95558	-442.099	0.005298	3.18269	507.0297	0.009542	2.911387	430.5971

S-(L-Histidin-5-yl)-L-cysteine S-oxide	2.77E-05	5.732528	2.960318	0.000233	-4.55103	-11.377	0.014054	2.728003	12.72649	7.87E-05	-5.12233	-3.67646
S-Adenosyl-L-homocysteine	0.281583	1.113293	0.625961	0.000907	-3.94643	-2.05531	0.012112	2.798223	30.59979	0.01378	2.738429	3.820118
S-Adenosyl-L-methionine	0.178856	1.404193	15.38328	3.44E-05	-5.42234	-4.18968	0.001014	-3.93647	-5.64249	0.01145	-2.82589	-35.2931
sn-Glycero-3-phosphoethanolamine	1.81E-12	18.5744	23.33371	1.88E-09	10.85453	15.36954	0.010316	2.873598	8.420765	0.10869	1.69074	0.30695
Thiamin monophosphate	6.25E-07	-7.81321	-1.79389	0.007682	-2.99077	-6.33953	0.015645	-2.67709	-14.2008	0.000247	-4.58692	-4.42234
UMP	0.000138	4.932507	516.5186	0.00596	-3.1061	-408.78	0.019377	2.574769	115.3493	0.113026	1.668773	0.299336
Uridine	5.41E-05	5.395125	6.606661	1.12E-05	5.949743	10.01232	0.031954	-2.33082	-3.48413	0.000491	-4.27069	-3.63534
Xanthine	0.001607	-3.76941	-67.5384	0.000135	-4.79672	-132.315	0.022521	-2.50218	-20.9223	0.044227	2.168511	220.358



**Supplementary Table S3 Metabolic pathway analysis of MSD offspring at different stages in blood (FDR<0.1)**

<b>P7</b>	<b>P14</b>	<b>P56</b>
Arginine and proline metabolism	Aminoacyl-tRNA biosynthesis	Aminoacyl-tRNA biosynthesis
Aminoacyl-tRNA biosynthesis	Arginine biosynthesis	Histidine metabolism
D-Glutamine and D-glutamate metabolism	Histidine metabolism	Phenylalanine metabolism
Arginine biosynthesis	D-Glutamine and D-glutamate metabolism	
Histidine metabolism	Arginine and proline metabolism	
Purine metabolism	Glycine, serine and threonine metabolism	
Glutathione metabolism	Phenylalanine metabolism	
Phenylalanine metabolism	Phenylalanine, tyrosine and tryptophan biosynthesis	
beta-Alanine metabolism		
Phenylalanine, tyrosine and tryptophan biosynthesis		

**Supplementary Table S4 Metabolic pathway analysis of MSD offspring at different stages in brain (FDR<0.1).**

<b>P1</b>	<b>P7</b>	<b>P14</b>	<b>P56</b>
Purine metabolism	Taurine and hypotaurine metabolism	Alanine, aspartate and glutamate metabolism	Alanine, aspartate and glutamate metabolism
Alanine, aspartate and glutamate metabolism	Alanine, aspartate and glutamate metabolism	Aminoacyl-tRNA biosynthesis	Glutathione metabolism
Amino sugar and nucleotide sugar metabolism	Arginine biosynthesis	Histidine metabolism	Arginine biosynthesis
Glutathione metabolism	Purine metabolism	Taurine and hypotaurine metabolism	Arginine and proline metabolism
Arginine biosynthesis	Aminoacyl-tRNA biosynthesis	Arginine biosynthesis	Aminoacyl-tRNA biosynthesis
Aminoacyl-tRNA biosynthesis	Cysteine and methionine metabolism	Arginine and proline metabolism	Lysine degradation
Arginine and proline metabolism	Glutathione metabolism	Glycine, serine and threonine metabolism	Histidine metabolism
Taurine and hypotaurine metabolism	Glycine, serine and threonine metabolism	Cysteine and methionine metabolism	
Riboflavin metabolism	Ascorbate and aldarate metabolism	Phenylalanine, tyrosine and tryptophan biosynthesis	
Ascorbate and aldarate metabolism	Amino sugar and nucleotide sugar metabolism	Purine metabolism	
Histidine metabolism	Pyrimidine metabolism	Glycerophospholipid metabolism	
Pyrimidine metabolism	Glyoxylate and dicarboxylate metabolism	Thiamine metabolism	
Glyoxylate and dicarboxylate metabolism	Fructose and mannose metabolism		
Thiamine metabolism			
Cysteine and methionine metabolism			