

Table S7: Result of GO analysis. Significant clusters in the category 'molecular function' are listed according to ascending p-values.

No.	Cluster name	Gene symbols	p-value	FDR
1	Catalytic activity	<i>Riok2, Folh1, Cbs, Atp8b1, Dcxr, Mthfd1, Gstz1, Aldh1l1, G6pc3, Masp2, Eya4, Acaa2, Papss2, Ccbl2</i>	1.0×10^{-4}	0.010
2	Formyltetrahydrofolate dehydrogenase activity	<i>Mthfd1, Aldh1l1</i>	1.0×10^{-4}	0.010
3	Nucleotide binding	<i>Ehd3, Riok2, Abcc10, Stk32a, Arl16, Abcb1b, Atp8b1, Hsp90ab1, Tyms, Mthfd1, Acta1, Spast, Chd3, Msi2, Ddx6, Myo1f, Bmp2k, Ttbk1, Papss2, Pank3, Pex6, Aars, Chd9</i>	2.0×10^{-4}	0.010
4	ATP binding	<i>Ehd3, Riok2, Abcc10, Stk32a, Abcb1b, Atp8b1, Hsp90ab1, Mthfd1, Acta1, Spast, Chd3, Ddx6, Myo1f, Bmp2k, Ttbk1, Papss2, Pank3, Pex6, Aars, Chd9</i>	2.0×10^{-4}	0.010
5	Glutathione transferase activity	<i>Gstm1, Gstz1, Gstk1</i>	5.0×10^{-4}	0.023
6	Aldehyde dehydrogenase	<i>Aldh1a3, Aldh1l1</i>	1.1×10^{-3}	0.039
7	Hydrolase activity	<i>Adat1, Usp38, Abcb1b, Folh1, Atp8b1, Mthfd1, Elac2, Acy1, Spast, Chd3, G6pc3, Masp2, Ddx6, Eya4, Nt5dc3, Chd9, Acot11</i>	1.5×10^{-3}	0.047
8	Glutathione peroxidase activity	<i>Gstz1, Gstk1</i>	2.3×10^{-3}	0.061
9	Transferase activity	<i>Riok2, Stk32a, Gstm1, Tyms, Gstz1, Myst2, Ash1l, Acaa2, Bmp2k, Gstk1, Ttbk1, Papss2, Pank3, Ccbl2, Chst10</i>	4.0×10^{-3}	0.061
10	tRNA-specific adenosine deaminase activity	<i>Adat1</i>	4.5×10^{-3}	0.061
11	HNK-1 sulfotransferase activity	<i>Chst10</i>	4.5×10^{-3}	0.061
12	Thymidylate synthase activity	<i>Tyms</i>	4.5×10^{-3}	0.061
13	Glutaryl-CoA dehydrogenase activity	<i>Gcdh</i>	4.5×10^{-3}	0.061
14	Aminoacyl-tRNA editing activity	<i>Aars</i>	4.5×10^{-3}	0.061
15	Cystathionine beta-synthase activity	<i>Cbs</i>	4.5×10^{-3}	0.061
16	3'-Phosphoadenosine 5'-phosphosulfate transmembrane transporter activity	<i>Slc35b2</i>	4.5×10^{-3}	0.061
17	Transferase activity, transferring acyl groups	<i>Myst2, Acaa2</i>	6.1×10^{-3}	0.069

	other than amino-acyl groups			
18	Cofactor binding	<i>Tyms, Aldh1l1</i>	7.6×10^{-3}	0.069
19	Protein homodimerization activity	<i>Cbs, Alox5ap, Aldh1a3, Als2, Pvr13, Cebpg, Ccbl2</i>	8.0×10^{-3}	0.069
20	ATPase activity	<i>Abcc10, Abcb1b, Atp8b1, Pex6</i>	8.7×10^{-3}	0.069
21	Kynurenine-glyoxylate transaminase activity	<i>Ccbl2</i>	9.0×10^{-3}	0.069
22	L-Xylulose reductase (NADP+) activity	<i>Dcxr</i>	9.0×10^{-3}	0.069
23	Arachidonate 5-lipoxygenase activity	<i>Alox5ap</i>	9.0×10^{-3}	0.069
24	Formate-tetrahydrofolate ligase activity	<i>Mthfd1</i>	9.0×10^{-3}	0.069
25	Ral guanyl-nucleotide exchange factor activity	<i>Rgl1</i>	9.0×10^{-3}	0.069
26	Maleylacetoacetate isomerase activity	<i>Gstz1</i>	9.0×10^{-3}	0.069
27	High-affinity glutamate transmembrane transporter activity	<i>Slc1a2</i>	9.0×10^{-3}	0.069
28	Glutamate:sodium symporter activity	<i>Slc1a2</i>	9.0×10^{-3}	0.069
29	Carbohydrate binding	<i>Fbxo2, Fbxo6</i>	9.7×10^{-3}	0.071
30	Amino acid binding	<i>Prodh, Aars</i>	1.2×10^{-2}	0.071
31	TPR domain binding	<i>Hsp90ab1</i>	1.4×10^{-2}	0.071
32	Adenylylsulfate kinase activity	<i>Papss2</i>	1.4×10^{-2}	0.071
33	Sulfate adenylyltransferase (ATP) activity	<i>Papss2</i>	1.4×10^{-2}	0.071
34	Proline dehydrogenase activity	<i>Prodh</i>	1.4×10^{-2}	0.071
35	Methylenetetrahydrofolate dehydrogenase activity	<i>Mthfd1</i>	1.4×10^{-2}	0.071
36	Methylenetetrahydrofolate dehydrogenase (NADP+) activity	<i>Mthfd1</i>	1.4×10^{-2}	0.071
37	Alanine-tRNA ligase activity	<i>Aars</i>	1.4×10^{-2}	0.071
38	Glucose-6-phosphatase activity	<i>G6pc3</i>	1.4×10^{-2}	0.071
39	Methenyltetrahydrofolate cyclohydrolase activity	<i>Mthfd1</i>	1.4×10^{-2}	0.071
40	Cysteine-S-conjugate beta-lyase activity	<i>Ccbl2</i>	1.4×10^{-2}	0.071
41	Glucagon receptor activity	<i>Glp2r</i>	1.4×10^{-2}	0.071
42	glycoprotein binding	<i>Fbxo2, Fbxo6</i>	1.4×10^{-2}	0.072
43	RNA binding	<i>Krr1, Mrpl3, Adat1, Rpl10a, Cdc5l, Msi2, Ddx6, Fxr2, Aars</i>	1.4×10^{-2}	0.072
44	Thyroid hormone binding	<i>Aldh1a3</i>	1.8×10^{-2}	0.084
45	Kynurenine-oxoglutarate transaminase activity	<i>Ccbl2</i>	1.8×10^{-2}	0.084
46	Protein serine-threonine kinase activator activity	<i>Als2</i>	1.8×10^{-2}	0.084
47	Histone acetyltransferase	<i>Sap130, Myst2</i>	2.2×10^{-2}	0.093

	activity			
48	ATPase activity, coupled to transmembrane movement of substances	<i>Abcc10, Abcb1b</i>	2.2×10^{-2}	0.093
49	Pantothenate kinase activity	<i>Pank3</i>	2.2×10^{-2}	0.093
50	Acetyl-CoA C-acyltransferase activity	<i>Acaa2</i>	2.2×10^{-2}	0.093
51	Aminoacylase activity	<i>Acy1</i>	2.2×10^{-2}	0.093
52	Rab guanyl-nucleotide exchange factor activity	<i>Als2</i>	2.2×10^{-2}	0.093
53	Phosphatase regulator activity	<i>Bmp2k</i>	2.7×10^{-2}	0.098
54	Poly(U) RNA binding	<i>Msi2</i>	2.7×10^{-2}	0.098
55	Arachidonic acid binding	<i>Alox5ap</i>	2.7×10^{-2}	0.098
56	Microtubule-severing ATPase activity	<i>Spast</i>	2.7×10^{-2}	0.098
57	Xenobiotic-transporting ATPase activity	<i>Abcb1b</i>	2.7×10^{-2}	0.098
58	Adenosine receptor activity, G-protein coupled	<i>Adora2b</i>	2.7×10^{-2}	0.098
59	Inhibitory extracellular ligand-gated ion channel activity	<i>Gabrg2</i>	2.7×10^{-2}	0.098
60	Nucleoside-triphosphatase activity	<i>Abcc10, Spast, Pex6</i>	3.0×10^{-2}	0.104
61	Nitric-oxide synthase regulator activity	<i>Hsp90ab1</i>	3.1×10^{-2}	0.104
62	Galactose binding	<i>Lgals9</i>	3.1×10^{-2}	0.104
63	Benzodiazepine receptor activity	<i>Gabrg2</i>	3.1×10^{-2}	0.104
64	Rac guanyl-nucleotide exchange factor activity	<i>Als2</i>	3.1×10^{-2}	0.104
65	1-Aminocyclopropane-1-carboxylate synthase activity	<i>Ccbl2</i>	3.1×10^{-2}	0.104
66	Pyridoxal phosphate binding	<i>Cbs, Ccbl2</i>	3.4×10^{-2}	0.111
67	RNA polymerase II transcription factor activity	<i>Hey2, Tmf1, Ash1l</i>	3.5×10^{-2}	0.113
68	Acyl carrier activity	<i>Aldh1l1</i>	3.6×10^{-2}	0.113
69	Helicase activity	<i>Chd3, Ddx6, Chd9</i>	3.9×10^{-2}	0.118
70	Hydroxymethyl-, Formyl- and related transferase activity	<i>Aldh1l1</i>	4.0×10^{-2}	0.118
71	3-Chloroallyl aldehyde dehydrogenase activity	<i>Aldh1a3</i>	4.0×10^{-2}	0.118
72	Ligase activity, forming aminoacyl-tRNA and related compounds	<i>Aars</i>	4.0×10^{-2}	0.118
73	Ran guanyl-nucleotide exchange factor activity	<i>Als2</i>	4.0×10^{-2}	0.118
74	Rab GTPase activator activity	<i>Tbc1d9b, Als2</i>	4.1×10^{-2}	0.120
75	Guanyl-nucleotide exchange factor activity	<i>4930474N05Rik, Als2, Rgl1</i>	4.2×10^{-2}	0.121

76	Ubiquitin protein ligase binding	<i>Cbs, Stx8</i>	4.3×10^{-2}	0.121
77	Aldehyde dehydrogenase (NAD) activity	<i>Aldh1a3</i>	4.4×10^{-2}	0.121
78	Metalloendopeptidase inhibitor activity	<i>Timp4</i>	4.4×10^{-2}	0.121
79	Bile acid transmembrane transporter activity	<i>Slco1c1</i>	4.4×10^{-2}	0.121
80	Sodium dicarboxylate symporter activity	<i>Slc1a2</i>	4.9×10^{-2}	0.131