**Supplementary materials**

**Supplementary Table 1 Metabolites in plasma (FC＞2 or FC＜0.5)**

| Metabolites in plasma | $log_2$ (FoldChange) | *P* Value |
|---|---|---|
| Octadecylamine | -1.1236 | 6.73E-20 |
| Glycocholic acid | 7.7544 | 4.71E-19 |
| Taurocholic acid | 9.0798 | 5.51E-19 |
| Tauroursodeoxycholic acid | 9.1773 | 3.10E-15 |
| LysoPE(16:0/0:0) | 3.9044 | 3.98E-15 |
| Androsterone sulfate | -2.4849 | 2.72E-12 |
| PC(18:1(11Z)/14:0) | 1.7723 | 4.84E-12 |
| Hydroxyphenyllactic acid | 2.1547 | 2.20E-11 |
| Norcapsaicin | 3.0551 | 3.00E-11 |
| D-Glucuronic acid | 2.7887 | 4.04E-11 |
| 7-Methylguanine | 1.4255 | 1.59E-10 |
| I-Urobilin | 5.343 | 2.35E-09 |
| 2-Hydroxystearic acid | 1.1937 | 1.20E-08 |
| Biliverdin | 2.2687 | 1.39E-08 |
| Hypoxanthine | 2.059 | 2.32E-08 |
| Glycylleucine | -1.5641 | 3.96E-08 |
| 1-Methylhypoxanthine | 1.8918 | 4.58E-08 |
| Harderoporphyrinogen | 4.8417 | 1.35E-07 |
| Dehydroepiandrosterone sulfate | -1.3956 | 1.43E-07 |
| Inosine | 6.5062 | 7.26E-07 |
| d-Tocotrienol | 2.2897 | 1.29E-06 |
| 1,1'-[1,12-Dodecanediylbis(oxy)]bisbenzene | 6.3418 | 2.53E-06 |

| | | |
|---|---|---|
| 9,10-DHOME | 1.3146 | 3.13E-06 |
| 3-Methoxy-4-hydroxyphenylethyleneglycol sulfate | 1.5184 | 3.64E-06 |
| Cholic acid | 5.1095 | 3.82E-06 |
| Hypogeic acid | 1.6247 | 6.58E-06 |
| 5'-Methylthioadenosine | 4.878 | 9.69E-06 |
| Deoxyuridine | 1.3533 | 1.72E-05 |
| Rhamnose | -1.3925 | 1.88E-05 |
| Hexadecanedioic acid | 1.4357 | 2.17E-05 |
| 5-Aminopentanoic acid | 1.0609 | 2.57E-05 |
| 2-Piperidinone | 1.8801 | 3.73E-05 |
| gamma-CEHC | -1.1352 | 4.13E-05 |
| 12-Hydroxydodecanoic acid | 1.8869 | 4.94E-05 |
| LysoPE(16:1(9Z)/0:0) | 1.5583 | 5.89E-05 |
| 3-Sulfinato-L-alaninate | -2.4938 | 6.22E-05 |
| 2-Hydroxyvaleric acid | 2.0837 | 6.35E-05 |
| trans-Hexadec-2-enoyl carnitine | 1.1346 | 7.57E-05 |
| Oxytetracycline | 2.3795 | 7.71E-05 |
| Zymonic acid | 3.1621 | 8.93E-05 |
| Formylanthranilic acid | -1.0944 | 0.00012629 |
| Pseudouridine | -1.3018 | 0.00019135 |
| L-Methionine | 1.313 | 0.00022471 |
| Ethyl glucuronide | 4.9803 | 0.00029619 |
| Mesobilirubinogen | 4.186 | 0.00032124 |
| Acetylcholine | -1.795 | 0.0013778 |
| Eugenol | -1.1725 | 0.0013963 |

| | | |
|---|---|---|
| Sedoheptulose | -1.6545 | 0.0023222 |
| 3-Oxo-12,18-ursadien-28-oic acid | 9.7028 | 0.0035188 |
| Deoxycholic acid | 2.3126 | 0.0042276 |
| Indole-3-propionic acid | -3.0274 | 0.0056932 |
| p-Cresol | -1.193 | 0.0074999 |
| Caffeine | 4.4357 | 0.0075074 |
| L-Urobilin | 3.1599 | 0.0086131 |
| o-Xylene | 2.2762 | 0.0090339 |
| Caffeic acid | 1.0972 | 0.012756 |
| Oleoyl glycine | 1.1149 | 0.01528 |
| Bilirubin | 1.3705 | 0.016789 |
| Quinic acid | 2.6186 | 0.020141 |
| (3beta,17alpha,23S)-17,23-Epoxy-3,29-dihydroxy-27-norlanosta-7,9(11)-diene-15,24-dione | -1.2506 | 0.02095 |
| Hippuric acid | -1.2475 | 0.02164 |
| Oxoamide | 1.2265 | 0.036107 |
| Isolithocholic acid | 2.8026 | 0.074255 |
| 6beta-Hydroxyasiatic acid | 1.097 | 0.097823 |
| Cyclohexanecarboxylic acid | 1.794 | 0.11305 |
| Thiomorpholine 3-carboxylate | 1.5278 | 0.21238 |
| L-trans-4-Methyl-2-pyrrolidinecarboxylic acid | -2.0996 | 0.26518 |
| Betonicine | 2.1491 | 0.33901 |
| beta-Glycyrrhetinic acid | 2.3198 | 0.3521 |

| | | |
|---|---|---|
| Trigonelline | 1.1953 | 0.36667 |
| 2-benzylbutanedioic acid | -2.6668 | 0.38404 |
| Saccharin | 1.0961 | 0.68337 |
| Genistein | 1.6751 | 0.9063 |
| 5,6-DHET | -1.0176 | 0.91875 |

Fold change (FC): the quantitative ratio of the two groups of experimental substances by comparing ALC with HC, and marked them as ALC/HC.

**Supplementary Table 2 Metabolites in feces (FC＞2 or FC＜0.5)**

| Metabolites in feces | $log_2$ (FoldChange) | *P*-Value |
|---|---|---|
| Bilirubin | 2.8726 | 7.14E-06 |
| (9xi,10xi,12xi)-9,10-Dihydroxy-12-octadecenoic acid | -2.2933 | 4.38E-05 |
| Alanyl-Aspartic acid | 1.8237 | 0.00013889 |
| Glycine | 2.6777 | 0.00017677 |
| N2,N2-Dimethylguanosine | 4.6025 | 0.00020478 |
| Biliverdin | 1.4844 | 0.00025344 |
| Eugenol | -1.72 | 0.00040328 |
| 3-Aminopropionaldehyde | 1.4559 | 0.00074761 |
| Indole | -1.0595 | 0.0010811 |
| L-Phenylalanine | 1.4668 | 0.0011458 |
| N-Acetyl-L-alanine | 1.0995 | 0.0013279 |
| 6-Chloro-N-(1-methylethyl)-1,3,5-triazine-2,4-diamine | 1.7112 | 0.0015494 |
| D-Glucuronic acid | 1.5344 | 0.0015982 |
| L-Urobilin | -1.0711 | 0.001644 |
| Alpha-dimorphecolic acid | -1.0139 | 0.0020828 |
| (A)-Tryptophan | 1.6799 | 0.0023715 |
| Cytidine | 2.1211 | 0.0028499 |
| 5-Aminopentanoic acid | 1.1416 | 0.0036069 |
| Indolelactic acid | 2.3239 | 0.0037646 |
| Adipic acid | 1.6067 | 0.004304 |
| 1H-Indole-2,3-dione | 1.4779 | 0.0047284 |
| L-Valine | 1.2157 | 0.0050647 |
| Acetylcholine | 1.0656 | 0.0052897 |

| | | |
|---|---|---|
| 2-Hydroxybutyric acid | 1.1727 | 0.0053087 |
| Nandrolone | -1.2563 | 0.006145 |
| Decanoylcarnitine | 1.913 | 0.0066278 |
| L-Tyrosine | 1.3042 | 0.0070915 |
| Androsterone sulfate | -1.1839 | 0.0077379 |
| L-Threonine | 1.3229 | 0.0088284 |
| 3-Methoxy-4-hydroxyphenylethyleneglycol sulfate | 2.2797 | 0.011248 |
| Phenylacetic acid | 1.8881 | 0.013035 |
| 6,10,14-Trimethyl-5,9,13-pentadecatrien-2-one | 1.055 | 0.013217 |
| Ketoleucine | 1.8731 | 0.016267 |
| D-Alanyl-D-alanine | -1.5692 | 0.016446 |
| Xanthoxylin | 1.7839 | 0.017346 |
| Glutaric acid | -1.7658 | 0.018282 |
| Beta-Guanidinopropionic acid | 3.1298 | 0.019193 |
| L-Norleucine | 1.2654 | 0.019812 |
| PC(16:0/16:0) | 1.6543 | 0.021222 |
| 3b-Hydroxy-5-cholenoic acid | -1.3701 | 0.021258 |
| Dexchlorpheniramine | 3.5979 | 0.022783 |
| PC(18:2(9Z,12Z)/P-18:1(11Z)) | -1.6763 | 0.028132 |
| Tetradecanoylcarnitine | 1.7083 | 0.029629 |
| Furcelleran | 1.4399 | 0.033851 |
| Linoleamide | 1.0933 | 0.03646 |
| Citraconic acid | 1.0232 | 0.036566 |
| 3-Methyl-2-oxovaleric acid | 1.3424 | 0.037511 |
| 3-Methylxanthine | 1.6844 | 0.038474 |

| | | |
|---|---|---|
| 5-Acetylamino-6-formylamino-3-methyluracil | 1.1666 | 0.046412 |
| 5,6:8,9-Diepoxyergost-22-ene-3,7beta-diol | -2.034 | 0.046523 |
| Diethanolamine | -4.3614 | 0.04763 |
| Betaine | -1.5256 | 0.049565 |

Fold change (FC): the quantitative ratio of the two groups of experimental substances by comparing ALC with HC, and marked them as ALC/HC.

**Supplementary Table 3 Metabolite set and relevant metabolites in plasma**

| **Metabolite Set in Plasma** | **Total** | **Hits** | **Statistic** | **Expected** | ***P*-value** | **Metabolites** |
|---|---|---|---|---|---|---|
| Bile Acid Biosynthesis | 65 | 6 | 70.073 | 2 | 4.08E-20 | **Taurocholic acid; Glycine; Glycocholic acid;Taurine; Cholic acid; Deoxycholic acid** |
| Phospholipid Biosynthesis | 29 | 5 | 39.472 | 2 | 9.96E-12 | **Choline; PC(16:0/16:0); Acetylcholine; LysoPC(16:0); LysoPE(16:0/0:0)** |
| Androgen and Estrogen Metabolism | 33 | 2 | 56.092 | 2 | 1.92E-11 | **Dehydroepiandrosterone; Androsterone sulfate** |
| Inositol Metabolism | 33 | 1 | 59.266 | 2 | 4.04E-11 | **D-Glucuronic acid** |
| Starch and Sucrose Metabolism | 31 | 1 | 59.266 | 2 | 4.04E-11 | **D-Glucuronic acid** |
| Catecholamine Biosynthesis | 20 | 1 | 47.095 | 2 | 2.72E-08 | **L-Tyrosine** |

| | | | | | | |
|---|---|---|---|---|---|---|
| Thyroid hormone synthesis | 13 | 1 | 47.095 | 2 | 2.72E-08 | **L-Tyrosine** |
| Purine Metabolism | 74 | 7 | 33.439 | 2 | 2.65E-07 | **Adenine; Deoxyadenosine; Glycine; L-Glutamic acid; Hypoxanthine; Inosine; Xanthine** |
| Methionine Metabolism | 43 | 7 | 28.828 | 2 | 2.26E-06 | **Betaine; Choline; Glycine; L-Serine; Sarcosine; L-Methionine** |
| Spermidine and Spermine Biosynthesis | 18 | 2 | 31.846 | 2 | 3.27E-06 | **L-Methionine; 5'-Methylthioadenosine** |
| Pyrimidine Metabolism | 59 | 6 | 14.838 | 2 | 2.81E-05 | **Deoxyuridine; Beta-Alanine; Cytidine;Thymine; Uridine; Uracil** |
| Fatty Acid Biosynthesis | 35 | 4 | 18.623 | 2 | 4.75E-05 | **Dodecanoic acid; Malonic acid; Myristic acid** |

| | | | | | | |
|---|---|---|---|---|---|---|
| Betaine Metabolism | 21 | 4 | 21.744 | 2 | 4.83E-05 | **Betaine; Choline; L-Methionine; Betaine aldehyde** |
| Tryptophan Metabolism | 60 | 6 | 13.095 | 2 | 2.43E-04 | **L-Glutamic acid; Indoleacetic acid; 5-Hydroxy-L-tryptophan; Kynurenic acid; Indoleacetaldehyde; Formylanthranilic acid** |
| Taurine and Hypotaurine Metabolism | 12 | 1 | 24.167 | 2 | 2.49E-04 | **Taurine** |
| Porphyrin Metabolism | 40 | 3 | 21.629 | 2 | 2.79E-04 | **Bilirubin; GlycineBiliverdin** |
| Phenylalanine and Tyrosine Metabolism | 28 | 3 | 15.476 | 2 | 5.45E-04 | **L-Glutamic acid; L-Tyrosine; L-Phenylalanine** |

| | | | | | | |
|---|---|---|---|---|---|---|
| Phosphatidylcholine Biosynthesis | 14 | 1 | 19.517 | 2 | 0.0011724 | **Choline** |
| Tyrosine Metabolism | 72 | 2 | 13.888 | 2 | 0.0018348 | **L-Glutamic acid; L-Tyrosine** |
| Mitochondrial Beta-Oxidation of Medium Chain Saturated Fatty Acids | 27 | 1 | 17.839 | 2 | 0.0020196 | **Dodecanoic acid** |
| Beta Oxidation of Very Long Chain Fatty Acids | 17 | 2 | 16.479 | 2 | 0.002081 | **L-Carnitine; Dodecanoic acid** |
| Fatty acid Metabolism | 43 | 2 | 15.462 | 2 | 0.0020875 | **L-Carnitine; L-Palmitoylcarnitine;** |
| Glycine and Serine Metabolism | 59 | 12 | 7.1585 | 2 | 0.0053115 | **Betaine; Glycine; Guanidoacetic acid; Glyceric acid; L-Glutamic acid; L-Threonine; L-Serine;** |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | **Sarcosine; L-Arginine; L-Methionine; (R)-lipoic acid; Dihydrolipoate;** |
| Caffeine Metabolism | 24 | 2 | 13.13 | 2 | 0.0077185 | **Caffeine; 5-Acetylamino-6-formylamino-3-methyluracil** |
| D-Arginine and D-Ornithine Metabolism | 11 | 1 | 9.1174 | 2 | 0.031285 | **2-Oxoarginine** |

**Supplementary Table 4 Metabolite set and relevant metabolites in feces**

| Metabolite Set in Feces | Total | Hits | Statistic | Expected | *P* value | Metabolites |
|---|---|---|---|---|---|---|
| Porphyrin Metabolism | 40 | 3 | 34.92 | 1.7857 | 4.64E-08 | **Bilirubin; Glycine; Biliverdin** |
| Carnitine Synthesis | 22 | 3 | 14.171 | 1.7857 | 4.74E-05 | **L-Carnitine; Glycine; L-Lysine** |
| Alanine Metabolism | 17 | 2 | 17.589 | 1.7857 | 5.82E-05 | **Glycine; L-Glutamic acid** |
| Glutathione Metabolism | 21 | 3 | 14.239 | 1.7857 | 9.40E-05 | **Glycine; L-Glutamic acid; Pyroglutamic acid** |
| Propanoate Metabolism | 42 | 4 | 11.215 | 1.7857 | 1.81E-04 | **2-Hydroxybutyric acid; Beta-Alanine; L-Glutamic acid; L-Valine** |
| Inositol Metabolism | 33 | 1 | 22.594 | 1.7857 | 1.87E-04 | **D-Glucuronic acid** |
| Starch and Sucrose Metabolism | 31 | 1 | 22.594 | 1.7857 | 1.87E-04 | **D-Glucuronic acid** |
| Arginine and Proline Metabolism | 53 | 6 | 8.819 | 1.7857 | 7.21E-04 | **Glycine; Guanidoacetic acid; L-Glutamic** |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | **acid; L-Proline; L-Arginine; D-Proline** |
| Fatty acid Metabolism | 43 | 2 | 14.235 | 1.7857 | 0.0013053 | **L-Carnitine; L-Palmitoylcarnitine** |
| Ammonia Recycling | 32 | 5 | 8.6216 | 1.7857 | 0.0015717 | **Glycine; L-Glutamic acid; L-Serine; Dihydrolipoate** |
| Phospholipid Biosynthesis | 29 | 5 | 12.082 | 1.7857 | 0.0038086 | **Choline; Acetylcholine; PC(16:0/16:0); LysoPC(16:0); LysoPE(16:0/0:0）** |
| Glycine and Serine Metabolism | 59 | 12 | 8.002 | 1.7857 | 0.0058257 | **Betaine; Glycine; Guanidoacetic acid; Glyceric acid; L-Glutamic acid; L-Threonine; L-Serine; Sarcosine; L-Arginine; L-Methionine; (R)-lipoic acid; Dihydrolipoate** |

| | | | | | | |
|---|---|---|---|---|---|---|
| Phenylalanine and Tyrosine Metabolism | 28 | 3 | 9.9351 | 1.7857 | 0.0078268 | **L-Glutamic acid; L-Tyrosine; L-Phenylalanine** |
| Methionine Metabolism | 43 | 7 | 7.7396 | 1.7857 | 0.0092111 | **Betaine; Choline; Glycine; L-Serine; Sarcosine; L-Methionine; 5'-Methylthioadenosine** |
| Phosphatidylcholine Biosynthesis | 14 | 1 | 11.241 | 1.7857 | 0.010791 | **Choline** |
| Threonine and 2-Oxobutanoate Degradation | 20 | 1 | 11.037 | 1.7857 | 0.011578 | **L-Threonine** |
| Betaine Metabolism | 21 | 4 | 8.3598 | 1.7857 | 0.018201 | **Betaine; Choline; L-Methionine; Betaine aldehyde** |
| Catecholamine | 20 | 1 | 9.2398 | 1.7857 | 0.021518 | **L-Tyrosine** |

| | | | | | | |
|---|---|---|---|---|---|---|
| Biosynthesis | | | | | | |
| Thyroid hormone synthesis | 13 | 1 | 9.2398 | 1.7857 | 0.021518 | **L-Tyrosine** |
| Valine, Leucine and Isoleucine Degradation | 60 | 4 | 7.2245 | 1.7857 | 0.022594 | **L-Glutamic acid; L-Isoleucine; Methylmalonic acid; Oxoglutaric acid; Succinic acid; 3-Methyl-2-oxovaleric acid; Adenosine triphosphate; Hydrogen carbonate; L-Leucine; Ketoleucine; L-Valine** |
| Estrone Metabolism | 24 | 1 | 8.1059 | 1.7857 | 0.031831 | **Estrone glucuronide** |
| Beta Oxidation of Very Long Chain Fatty Acids | 17 | 2 | 6.259 | 1.7857 | 0.034027 | **L-Carnitine; Dodecanoic acid** |
| Tyrosine Metabolism | 72 | 2 | 6.2242 | 1.7857 | 0.03823 | **L-Glutamic acid; L-Tyrosine** |

| | | | | | | |
|---|---|---|---|---|---|---|
| Caffeine Metabolism | 24 | 2 | 5.8986 | 1.7857 | 0.039239 | **Caffeine; 5-Acetylamino-6-formylamino-3-methyluracil** |

**Supplementary Table 5 Metabolite set and relevant metabolites in feces**

| **Metabolites in plasma** | **Metabolites in feces** |
|---|---|
| Androsterone sulfate | 2-Hydroxybutyric acid |
| Cholic acid | 3-Methyl-2-oxovaleric acid |
| Deoxycholic acid | 5-Acetylamino-6-formylamino-3-methyluracil |
| Taurocholic acid | Acetylcholine |
| L-Methionine | Biliverdin |
| Acetylcholine | D-Glucuronic acid |
| LysoPE(16:0/0:0) | Glycine |

| | |
|---|---|
| Hypoxanthine | Ketoleucine |
| Inosine | L-Phenylalanine |
| 5'-Methylthioadenosine | L-Threonine |
| Formylanthranilic acid | L-Tyrosine |
| | L-Valine |
| | PC(16:0/16:0) |
| | Betaine |

Metabolites in plasma with significant changes in the enriched pathways were screened by combining Supplementary Table 1 with Supplementary Table 3. Metabolites feces with significant changes in the enriched pathways were screened by combining Supplementary Table 2 with Supplementary Table 4.