

Table S1. Primer sequences for qPCR.

| Gene Name | Forward Primer | Reverse Primer |
|----------------------|--------------------------|--------------------------|
| <i>18S</i> | TCCGATAACGAACGAGAC | CTAAGGGCATCACAGACC |
| <i>Acc1 (Acaca)</i> | TAACAGAATCGACACTGGCTGGCT | ATGCTGTTCCTCAGGCTCACATCT |
| <i>Acta2</i> | AGCCATCTTTCATTGGGATGG | CCCCTGACAGGACGTTGTTA |
| <i>Ccl2 (Mcp1)</i> | TCACCTGCTGCTACTCATTACCA | AGCACAGACCTCTCTCTTGAGCTT |
| <i>Cd11b (Itgam)</i> | TGGACACTGAACATCCCATGACCT | TCTGGTTAACAGCCTTTGCCTCCT |
| <i>Col1a1</i> | CGATGGATTCCCGTTTCGAGT | GAGGCCTCGGTGGACATTAG |
| <i>Col1a2</i> | ATCCGGTAACAAGGGTGAGC | GAACCAGGGCTGCCTCTAAG |
| <i>Col3a1</i> | TGACTGTCCACGTAAGCAC | GAGGGCCATAGCTGAACTGA |
| <i>Cyp1a1</i> | CATTTGAGAAGGGCCACATCC | TGTGTCAAACCCAGCTCCAA |
| <i>Il1b</i> | GCCTTGGGCCTCAAAGGAAAGAAT | ATTGCTTGGGATCCACACTCTCCA |
| <i>Il10</i> | GCTCTTGCACTACCAAAGCC | CTGCTGATCCTCATGCCAGT |
| <i>Il6</i> | CTCTGCAAGAGACTTCCATCCA | GACAGGTCTGTTGGGAGTGG |
| <i>Nlrp3</i> | TCAGATTGCTGTGTGTGGGACTGA | AGCTCAGAACCAATGCGAGATCCT |
| <i>Rn18s</i> | GTAACCCGTTGAACCCCAT | CCATCCAATCGGTAGTAGCG |
| <i>Scd1</i> | CAGGTTTCCAAGCGCAGTTC | ACTGGAGATCTCTTGGAGCA |
| <i>Srebp1c</i> | GGAGCCATGGATTGCACATT | GGCCCGGGAAGTCACTGT |
| <i>Tgfb1</i> | TAAAGAGGTCACCCGCGTGCTAAT | ACTGCTTCCCGAATGTCTGACGTA |
| <i>Timp1</i> | AGATACCATGATGGCCCCCT | GCCCTTATGACCAGGTCCG |
| <i>Tnf</i> | TAGCCACGTCGTAGCAAAC | ACAAGGTACAACCCATCGGC |

Table S2. Volcano plot analysis of serum metabolites differing between conventionally raised weanlings from CH- or WD-fed dams.

| Metabolite | FC | Log2(FC) | Raw <i>p</i> value | -Log10(<i>p</i>) |
|----------------------------------|-------|----------|--------------------|--------------------|
| beta-Butoxyethyl nicotinate | 0.019 | -5.709 | 1.1E-05 | 4.978 |
| 5-Hydroxyindoleacetate | 0.033 | -4.911 | 0.0019 | 2.720 |
| 3-Methyleneoxindole | 0.034 | -4.868 | 5.9E-06 | 5.227 |
| Anthranilate | 0.044 | -4.514 | 1.1E-06 | 5.964 |
| 3-Indolepropionic acid | 0.067 | -3.894 | 0.0006 | 3.245 |
| 4-Aminobenzoate | 0.073 | -3.776 | 3.2E-05 | 4.496 |
| CAR 6:0 | 0.127 | -2.982 | 1.6E-06 | 5.786 |
| Indole | 0.200 | -2.322 | 0.0022 | 2.662 |
| Linoleoyl-CoA | 0.211 | -2.247 | 0.0008 | 3.112 |
| CAR 4:0 | 0.216 | -2.212 | 2.7E-05 | 4.571 |
| CAR 5:0 | 0.265 | -1.914 | 0.0002 | 3.726 |
| CAR 8:0 | 0.299 | -1.742 | 0.0010 | 3.011 |
| Linolenic acid | 0.313 | -1.678 | 0.0042 | 2.377 |
| Linoleate | 0.352 | -1.507 | 0.0002 | 3.729 |
| CAR 5:0;O | 0.356 | -1.491 | 8.3E-05 | 4.081 |
| cis-p-Coumarate | 0.371 | -1.429 | 0.0312 | 1.506 |
| CAR 8:1 | 0.384 | -1.379 | 0.0104 | 1.984 |
| 13(S)-HODE | 0.429 | -1.222 | 0.0107 | 1.969 |
| CAR 3:0 | 0.433 | -1.208 | 0.0036 | 2.439 |
| Indoxyl | 0.506 | -0.984 | 0.0573 | 1.242 |
| TMAO | 0.509 | -0.975 | 0.0373 | 1.428 |
| Arachidonic acid | 0.535 | -0.901 | 0.0016 | 2.795 |
| Docosahexaenoic acid | 0.553 | -0.855 | 0.0037 | 2.429 |
| Indole-3-acetate | 0.555 | -0.850 | 0.0042 | 2.381 |
| N-Acetylmethionine | 0.570 | -0.812 | 0.0651 | 1.186 |
| Triacanthine | 0.580 | -0.786 | 0.0052 | 2.287 |
| N6-Methyl-L-lysine | 0.626 | -0.675 | 0.0136 | 1.867 |
| 4-Pyridoxate | 0.642 | -0.639 | 0.0242 | 1.617 |
| Docosapentaenoic acid | 0.646 | -0.631 | 0.0014 | 2.868 |
| 2-Oxo-7-methylthioheptanoic acid | 1.511 | 0.595 | 0.0119 | 1.923 |
| L-Formylkynurenine | 1.538 | 0.621 | 0.0713 | 1.147 |
| 3-Oxalomalate | 1.548 | 0.630 | 0.0145 | 1.840 |
| Pyridoxamine | 1.569 | 0.649 | 0.0022 | 2.659 |
| Oleic acid | 1.607 | 0.684 | 0.0412 | 1.386 |
| Pyridoxal | 1.612 | 0.689 | 0.0159 | 1.799 |
| Butanoic acid | 1.629 | 0.704 | 0.0731 | 1.136 |
| kynurenine | 1.633 | 0.707 | 0.0005 | 3.294 |
| Dehydroascorbate | 1.638 | 0.712 | 0.0013 | 2.896 |
| Lysine | 1.670 | 0.739 | 0.0015 | 2.826 |
| L-Homocysteine | 1.696 | 0.762 | 0.0171 | 1.768 |
| 10-Hydroxydecanoic acid | 1.810 | 0.856 | 0.0480 | 1.319 |
| Malate | 1.816 | 0.861 | 0.0037 | 2.428 |
| Glutathione disulfide | 1.875 | 0.907 | 0.0247 | 1.607 |
| Cytosine | 1.913 | 0.936 | 0.0220 | 1.658 |
| Glycerol 3-phosphate | 1.957 | 0.968 | 0.0363 | 1.440 |
| Aspartate | 1.962 | 0.972 | 0.0090 | 2.044 |
| Methionine | 1.972 | 0.980 | 0.0071 | 2.149 |
| Leucocyanidin | 1.998 | 0.999 | 0.0406 | 1.391 |
| Fumarate | 2.047 | 1.034 | 0.0022 | 2.662 |
| CAR 12:0 | 2.061 | 1.043 | 0.0532 | 1.274 |
| CAR 16:1 | 2.124 | 1.087 | 0.0452 | 1.345 |
| Glutathione | 2.170 | 1.117 | 0.0417 | 1.380 |

| | | | | |
|------------------------------------|-------|-------|---------|-------|
| Homomethionine | 2.342 | 1.228 | 1.3E-05 | 4.903 |
| Nicotinamide | 2.344 | 1.229 | 0.0170 | 1.769 |
| CAR 12:1 | 2.359 | 1.238 | 0.0092 | 2.035 |
| CAR 14:0 | 2.374 | 1.247 | 0.0154 | 1.812 |
| Hexadecenoic acid | 2.383 | 1.253 | 0.0200 | 1.699 |
| 6-Lactoyltetrahydropterin | 2.403 | 1.265 | 0.0021 | 2.676 |
| Deoxycholic acid | 2.446 | 1.290 | 0.0377 | 1.424 |
| CAR 16:0 | 2.472 | 1.306 | 0.0341 | 1.468 |
| 5-Oxoproline | 2.547 | 1.349 | 0.0103 | 1.986 |
| gamma-Glutamyl-gamma-aminobutyrate | 3.046 | 1.607 | 0.0098 | 2.009 |
| N-Acyl-D-glutamate | 3.116 | 1.640 | 0.0066 | 2.180 |
| Glutamate | 3.148 | 1.654 | 0.0299 | 1.524 |
| L-Homocitrulline | 3.388 | 1.761 | 0.0004 | 3.391 |
| CAR 18:0 | 3.765 | 1.913 | 0.0021 | 2.674 |
| Tetradecanoic acid | 3.863 | 1.950 | 0.0006 | 3.204 |
| Dodecanoic acid | 3.895 | 1.962 | 0.0002 | 3.819 |
| CAR 6:1;O2 | 4.143 | 2.051 | 0.0060 | 2.222 |
| Glycocholate | 6.670 | 2.738 | 0.0219 | 1.659 |
| Myristoleic acid | 6.772 | 2.760 | 0.0004 | 3.403 |
| Taurochenodeoxycholate | 7.994 | 2.999 | 0.0710 | 1.148 |

Differences between offspring groups were assessed using volcano plot analyses using a fold change cutoff of 1.5 and a raw p-value cutoff of 0.1.

n = 4 wCH-O, n = 6 wWD-O.

CAR, carnitine.

Table S3. Volcano plot analysis of serum metabolites differing between GF offspring.

| Metabolite | FC | Log2(FC) | Raw <i>p</i> value | -Log10(<i>p</i>) |
|-----------------------------------|-------|----------|--------------------|--------------------|
| Cholic acid | 0.100 | -3.340 | 0.0009 | 3.040 |
| Indole | 0.180 | -2.480 | 6.7E-12 | 11.180 |
| N2-gamma-Glutamylglutamine | 0.420 | -1.240 | 0.0009 | 3.030 |
| CAR 6:0 | 0.440 | -1.200 | 0.0003 | 3.580 |
| n-gamma-L-Glutamyl-D-alanine | 0.470 | -1.080 | 0.0036 | 2.450 |
| Adenosine | 0.500 | -0.990 | 0.0333 | 1.480 |
| CAR 4:0 | 0.510 | -0.960 | 0.0001 | 3.890 |
| CAR 8:1 | 0.570 | -0.820 | 0.0002 | 3.640 |
| Inosine | 0.570 | -0.820 | 0.0045 | 2.350 |
| 3-Methyleneoxindole | 0.570 | -0.820 | 0.0056 | 2.260 |
| S-Glutathionyl-L-cysteine | 0.570 | -0.800 | 4.2E-05 | 4.370 |
| 5-Hydroxyindoleacetate | 0.580 | -0.790 | 0.0083 | 2.080 |
| Glutathione | 0.580 | -0.790 | 0.0289 | 1.540 |
| 4-Pyridoxate | 0.590 | -0.750 | 0.0049 | 2.310 |
| Indole-3-acetate | 0.600 | -0.740 | 0.0055 | 2.260 |
| 7-8-Dihydroxycoumarin | 0.600 | -0.730 | 0.0014 | 2.870 |
| Deoxycholic acid | 0.610 | -0.720 | 0.0072 | 2.140 |
| CAR 12:1 | 0.620 | -0.690 | 0.0030 | 2.520 |
| Pyridoxal | 0.630 | -0.670 | 0.0028 | 2.550 |
| Trimethylamine N-oxide (TMAO) | 0.640 | -0.660 | 0.0014 | 2.860 |
| 5-Guanidino-2-oxopentanoate | 0.640 | -0.640 | 0.0017 | 2.760 |
| 3-Indolepropionic acid | 0.660 | -0.590 | 0.0533 | 1.270 |
| Creatine | 1.530 | 0.610 | 0.0604 | 1.220 |
| Methylenediurea | 1.550 | 0.630 | 0.0900 | 1.050 |
| Eicosapentaenoic acid | 2.110 | 1.080 | 0.0367 | 1.440 |
| 5,8,11,14,17-Icosapentaenoic acid | 2.110 | 1.080 | 0.0367 | 1.440 |
| Spermidine | 2.190 | 1.130 | 0.0433 | 1.360 |
| Ethanolamine phosphate | 2.190 | 1.130 | 0.0409 | 1.390 |
| alpha-D-Ribose 1-phosphate | 2.250 | 1.170 | 0.0112 | 1.950 |
| 2-Phospho-D-glyceric acid | 2.410 | 1.270 | 0.0367 | 1.440 |
| Nicotinamide | 2.680 | 1.420 | 0.0040 | 2.400 |

Differences between offspring groups were assessed using volcano plot analyses using a fold change cutoff of 1.5 and a raw *p*-value cutoff of 0.1.

n = 8 GF-CH-O, *n* = 16 GF-WD-O.

CAR, carnitine; GF, germ-free.

Table S4. Volcano plot analysis of serum metabolites differing between GF dams.

| Metabolite | FC | Log2(FC) | Raw <i>p</i> value | -Log10(<i>p</i>) |
|------------------------------------|--------|----------|--------------------|--------------------|
| Indole | 0.130 | -2.900 | 0.0143 | 1.840 |
| TMAO | 0.340 | -1.560 | 0.0704 | 1.150 |
| Arginine | 0.430 | -1.230 | 0.0487 | 1.310 |
| Pyridoxal | 0.430 | -1.210 | 0.0998 | 1.000 |
| Indoxyl | 0.440 | -1.180 | 0.0833 | 1.080 |
| Indole-3-acetate | 0.540 | -0.890 | 0.0929 | 1.030 |
| CAR 8:1 | 0.590 | -0.770 | 0.0008 | 3.070 |
| CAR 10:1 | 0.640 | -0.650 | 0.0207 | 1.680 |
| trans-Homoaconitate | 1.510 | 0.590 | 0.0200 | 1.700 |
| Pyridoxamine 5'-phosphate | 1.550 | 0.630 | 0.0587 | 1.230 |
| gamma-Glutamyl-gamma-aminobutyrate | 1.590 | 0.670 | 0.0036 | 2.440 |
| D-Arabitol | 1.600 | 0.680 | 0.0215 | 1.670 |
| S-Glutathionyl-L-cysteine | 1.650 | 0.730 | 0.0034 | 2.470 |
| Cysteine | 1.700 | 0.770 | 0.0100 | 2.000 |
| Tetradecanoic acid | 1.760 | 0.820 | 0.0143 | 1.840 |
| Dodecanoic acid | 1.770 | 0.820 | 0.0134 | 1.870 |
| Dehydroascorbate | 1.790 | 0.840 | 0.0025 | 2.600 |
| Nicotinamide | 1.800 | 0.850 | 0.0217 | 1.660 |
| Taurine | 1.810 | 0.860 | 0.0077 | 2.110 |
| Glutathione disulfide | 1.860 | 0.890 | 0.0618 | 1.210 |
| D-Glyceraldehyde 3-phosphate | 1.880 | 0.910 | 0.0866 | 1.060 |
| Decanoic acid | 1.890 | 0.920 | 0.0543 | 1.260 |
| Myristoleic acid | 2.030 | 1.020 | 0.0306 | 1.510 |
| Glycerol 3-phosphate | 2.060 | 1.040 | 0.0256 | 1.590 |
| alpha-D-Ribose 1-phosphate | 2.200 | 1.140 | 0.0004 | 3.450 |
| Spermidine | 2.250 | 1.170 | 0.0657 | 1.180 |
| Leucocyanidin | 2.260 | 1.180 | 0.0164 | 1.790 |
| 4-Acetamidobutanoate | 2.360 | 1.240 | 0.0292 | 1.530 |
| GMP | 2.550 | 1.350 | 0.0002 | 3.760 |
| D-Hexose 6-phosphate | 2.780 | 1.470 | 0.0121 | 1.920 |
| AMP | 3.140 | 1.650 | 0.0280 | 1.550 |
| Spermine | 3.360 | 1.750 | 0.0033 | 2.490 |
| Xanthine | 4.050 | 2.020 | 0.0220 | 1.660 |
| Taurochenodeoxycholate | 4.620 | 2.210 | 0.0700 | 1.150 |
| UMP | 6.170 | 2.630 | 0.0098 | 2.010 |
| IMP | 10.050 | 3.330 | 0.0052 | 2.280 |
| Hypoxanthine | 11.050 | 3.470 | 0.0139 | 1.860 |

Differences between dam groups were assessed using volcano plot analyses using a fold change cutoff of 1.5 and a raw *p*-value cutoff of 0.1.

n = 3 GF-CH-D and GF-WD-D.

CAR, carnitine; GF, germ-free.

Table S5. Pathway enrichment analysis in serum comparing GF weanlings from FMT-recipient lactating dams and conventionally raised weanlings from CH- and WD-fed dams.

| Pathways | Total cmpd | Hits | GF weanlings | | | Conventional weanlings | | |
|---|---------------|------|--------------|--------------------|---------------|------------------------|--------------------|---------------|
| | | | Raw <i>p</i> | -Log10(<i>p</i>) | FDR | Raw <i>p</i> | -Log10(<i>p</i>) | FDR |
| Vitamin B6 Metabolism | 15 | 4 | 0.0039 | 2.408 | 0.0382 | 0.0001 | 3.957 | 0.0044 |
| Tryptophan Metabolism | 55 | 9 | 0.0111 | 1.957 | 0.0455 | 0.0002 | 3.788 | 0.0044 |
| Catecholamine Biosynthesis | 14 | 3 | 0.0060 | 2.224 | 0.0382 | 0.0036 | 2.443 | 0.0495 |
| Tyrosine Metabolism | 55 | 5 | 0.0067 | 2.172 | 0.0382 | 0.0040 | 2.393 | 0.0495 |
| Lysine Degradation | 20 | 2 | 0.0139 | 1.857 | 0.0455 | 0.0048 | 2.322 | 0.0505 |
| Beta-Alanine Metabolism | 26 | 6 | 0.0023 | 2.636 | 0.0382 | 0.0130 | 1.887 | 0.0903 |
| Pyruvate Metabolism | 30 | 4 | 0.0115 | 1.939 | 0.0455 | 0.0158 | 1.802 | 0.0903 |
| Pterine Biosynthesis | 18 | 2 | 0.0192 | 1.718 | 0.0525 | 0.0141 | 1.852 | 0.0903 |
| Transfer of Acetyl Groups into Mitochondria | 18 | 3 | 0.0040 | 2.401 | 0.0382 | 0.0189 | 1.724 | 0.0987 |
| Pyruvaldehyde Degradation | 7 | 2 | 0.0012 | 2.929 | 0.0382 | 0.0432 | 1.365 | 0.1595 |
| Ammonia Recycling | 25 | 8 | 0.0056 | 2.251 | 0.0382 | 0.0526 | 1.279 | 0.1719 |
| Carnitine Synthesis | 16 | 5 | 0.0037 | 2.435 | 0.0382 | 0.0515 | 1.288 | 0.1719 |
| Oxidation of Branched Chain Fatty Acids | 21 | 5 | 0.0061 | 2.215 | 0.0382 | 0.0691 | 1.161 | 0.2054 |
| Glutamate Metabolism | 45 | 10 | 0.0130 | 1.887 | 0.0455 | 0.0720 | 1.142 | 0.2054 |
| Nicotinate and Nicotinamide Metabolism | 32 | 3 | 0.0086 | 2.065 | 0.0407 | 0.0949 | 1.023 | 0.2373 |
| Citric Acid Cycle | 25 | 5 | 0.0019 | 2.731 | 0.0382 | 0.1009 | 0.996 | 0.2450 |
| Aspartate Metabolism | 34 | 7 | 0.0156 | 1.806 | 0.0487 | 0.1193 | 0.923 | 0.2604 |
| Bile Acid Biosynthesis | 60 | 7 | 0.0080 | 2.095 | 0.0402 | 0.1613 | 0.792 | 0.2856 |
| Urea Cycle | 23 | 6 | 0.0160 | 1.795 | 0.0487 | 0.1565 | 0.805 | 0.2856 |
| Glycolysis | 20 | 5 | 0.0105 | 1.978 | 0.0455 | 0.1852 | 0.732 | 0.3213 |
| Mitochondrial Electron Transport Chain | 15 | 4 | 0.0041 | 2.389 | 0.0382 | 0.2033 | 0.692 | 0.3455 |
| Arginine and Proline Metabolism | 48 | 9 | 0.0183 | 1.739 | 0.0517 | 0.2540 | 0.595 | 0.4074 |
| Glucose-Alanine Cycle | 9 | 2 | 0.0028 | 2.554 | 0.0382 | 0.2850 | 0.545 | 0.4461 |
| Pentose Phosphate Pathway | 27 | 5 | 0.0134 | 1.874 | 0.0455 | 0.2987 | 0.525 | 0.4461 |
| Pyrimidine Metabolism | 54 | 7 | 0.0182 | 1.741 | 0.0517 | 0.5006 | 0.301 | 0.6351 |
| Valine, Leucine and Isoleucine Degradation | 51 | 4 | 0.0077 | 2.113 | 0.0402 | 0.5329 | 0.273 | 0.6565 |
| Alanine Metabolism | 14 | 4 | 0.0136 | 1.866 | 0.0455 | 0.6153 | 0.211 | 0.7366 |
| Ketone Body Metabolism | 12 | 1 | 0.0052 | 2.283 | 0.0382 | 0.9272 | 0.033 | 0.9314 |
| Phytanic Acid Peroxisomal Oxidation | 19 | 3 | 0.0137 | 1.863 | 0.0455 | 0.9103 | 0.041 | 0.9314 |

Bolded values show significance, $p < 0.05$.

Showing all significant pathways in GF weanlings after FDR correction and sorted by significance in conventional weanlings after FDR correction.

$n = 8$ GF-CH-O, $n = 16$ GF-WD-O GF offspring; $n = 4$ wCH-O, $n = 6$ wWD-O conventional offspring.

Cmpd, compound; GF, germ-free.

Table S6. LASSO variable selection for serum metabolite and gut microbial count data in conventionally raised offspring.

| Metabolite (measure) | Order.Family.Genus (xvar) | r2 | correlation | p.value.xvar | padj |
|--|--|---------|-------------|--------------|---------------|
| Asparagine | Clostridiales.Ruminococcaceae.unclassified | 0.1734 | 0.5578 | 0.1932 | 0.2816 |
| Asparagine | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.6196 | 0.8264 | 0.0219 | 0.0756 |
| Cysteine | Clostridiales.Ruminococcaceae.unclassified | 0.1416 | 0.5335 | 0.2175 | 0.3089 |
| Cysteine | Turicibacterales.Turicibacteraceae.Turicibacter | 0.4769 | -0.7511 | 0.0517 | 0.1084 |
| Glutamine | Clostridiales.Ruminococcaceae.unclassified | 0.4498 | 0.7358 | 0.0594 | 0.1135 |
| Glycine | Clostridiales.Lachnospiraceae.Clostridium | 0.7958 | 0.9109 | 0.0043 | 0.0577 |
| Leucine | Clostridiales.Ruminococcaceae.unclassified | 0.4552 | 0.7389 | 0.0578 | 0.1129 |
| Isoleucine | Clostridiales.Ruminococcaceae.unclassified | 0.5143 | -0.7715 | 0.0422 | 0.0989 |
| Lysine | Clostridiales.Lachnospiraceae.Clostridium | 0.4337 | -0.7267 | 0.0643 | 0.1201 |
| Lysine | Clostridiales.Ruminococcaceae.unclassified.1 | 0.4580 | -0.7405 | 0.0570 | 0.1122 |
| Lysine | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.2827 | 0.6342 | 0.1261 | 0.1983 |
| Lysine | Desulfovibrionales.Desulfovibrionaceae.Desulfovibrio | 0.7955 | 0.9108 | 0.0043 | 0.0577 |
| Lysine | Turicibacterales.Turicibacteraceae.Turicibacter | -0.0744 | -0.3235 | 0.4791 | 0.5644 |
| Methionine | Clostridiales.Ruminococcaceae.unclassified | 0.2664 | 0.6234 | 0.1347 | 0.2056 |
| Tryptophan | Clostridiales.Lachnospiraceae.Clostridium | 0.8234 | -0.9235 | 0.0030 | 0.0550 |
| Tryptophan | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.4584 | 0.7407 | 0.0568 | 0.1122 |
| Cytidine | Clostridiales.Lachnospiraceae.Clostridium | 0.3703 | -0.6894 | 0.0866 | 0.1442 |
| Cytidine | Clostridiales.Ruminococcaceae.unclassified | -0.0001 | 0.4081 | 0.3634 | 0.4561 |
| Inosine | Clostridiales.Ruminococcaceae.unclassified | -0.1067 | -0.2788 | 0.5449 | 0.6193 |
| Inosine | Clostridiales.Ruminococcaceae.Anaerotruncus | 0.4098 | -0.7129 | 0.0722 | 0.1258 |
| Inosine | Desulfovibrionales.Desulfovibrionaceae.Bilophila | -0.0339 | 0.3721 | 0.4112 | 0.5027 |
| Inosine | Turicibacterales.Turicibacteraceae.Turicibacter | 0.7892 | 0.9079 | 0.0047 | 0.0577 |
| Allantoate | Clostridiales.Lachnospiraceae.Clostridium | 0.4863 | 0.7562 | 0.0492 | 0.1075 |
| Allantoate | Clostridiales.Ruminococcaceae.unclassified | 0.1301 | -0.5245 | 0.2268 | 0.3181 |
| Allantoate | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.5963 | -0.8146 | 0.0256 | 0.0817 |
| 5-Hydroxyisourate | Clostridiales.Ruminococcaceae.unclassified | 0.1202 | -0.5166 | 0.2352 | 0.3228 |
| Pyridoxal | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.4740 | 0.7495 | 0.0524 | 0.1091 |
| 4-Pyridoxate | Clostridiales.Ruminococcaceae.unclassified | 0.2782 | -0.6313 | 0.1284 | 0.1987 |
| 4-Pyridoxate | Erysipelotrichales.Erysipelotrichaceae.Allobaculum | 0.4127 | -0.7145 | 0.0712 | 0.1258 |
| Pyridoxamine-5'-phosphate | Clostridiales.Ruminococcaceae.unclassified | 0.5036 | 0.7657 | 0.0448 | 0.1024 |
| Nicotinamide | Clostridiales.Ruminococcaceae.unclassified | 0.6589 | 0.8460 | 0.0164 | 0.0749 |
| D-Hexose 6-phosphate | Clostridiales.Ruminococcaceae.unclassified | 0.5366 | 0.7835 | 0.0372 | 0.0913 |
| 1-3-Bisphosphoglycerate | Bifidobacteriales.Bifidobacteriaceae.Bifidobacterium | 0.9590 | -0.9828 | 7.4E-05 | 0.0192 |
| 1-3-Bisphosphoglycerate | Clostridiales.Ruminococcaceae.unclassified | 0.1761 | 0.5598 | 0.1912 | 0.2803 |
| 1-3-Bisphosphoglycerate | Clostridiales.Ruminococcaceae.unclassified.1 | -0.0660 | -0.3341 | 0.4639 | 0.5541 |
| 1-3-Bisphosphoglycerate | Turicibacterales.Turicibacteraceae.Turicibacter | 0.6190 | -0.8261 | 0.0220 | 0.0756 |
| Pyruvate | Bacteroidales.Rikenellaceae.unclassified | 0.3521 | 0.6783 | 0.0939 | 0.1524 |
| Pyruvate | Clostridiales.Ruminococcaceae.unclassified | 0.6312 | -0.8322 | 0.0202 | 0.0749 |
| Pyruvate | Desulfovibrionales.Desulfovibrionaceae.Bilophila | -0.1960 | -0.0574 | 0.9027 | 0.9205 |
| Lactate | Bifidobacteriales.Bifidobacteriaceae.Bifidobacterium | 0.1231 | 0.5189 | 0.2327 | 0.3211 |
| Lactate | Clostridiales.Lachnospiraceae.unclassified | -0.1949 | 0.0649 | 0.8900 | 0.9112 |
| Lactate | Clostridiales.Lachnospiraceae.Clostridium | 0.4090 | 0.7124 | 0.0724 | 0.1258 |
| Lactate | Clostridiales.Ruminococcaceae.Oscillospira | -0.0774 | 0.3197 | 0.4846 | 0.5683 |
| Lactate | Desulfovibrionales.Desulfovibrionaceae.Bilophila | -0.1986 | 0.0346 | 0.9412 | 0.9523 |
| Lactate | Turicibacterales.Turicibacteraceae.Turicibacter | -0.1306 | 0.2404 | 0.6035 | 0.6626 |
| Citrate | Bifidobacteriales.Bifidobacteriaceae.Bifidobacterium | -0.1944 | 0.0682 | 0.8846 | 0.9092 |
| Citrate | Clostridiales.Lachnospiraceae.unclassified | 0.5685 | -0.8003 | 0.0307 | 0.0841 |
| Citrate | Clostridiales.Lachnospiraceae.Clostridium | -0.1993 | -0.0248 | 0.9579 | 0.9589 |
| Citrate | Clostridiales.Ruminococcaceae.Oscillospira | 0.1769 | 0.5604 | 0.1907 | 0.2803 |
| Citrate | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.1550 | 0.5439 | 0.2069 | 0.2982 |
| Citrate | Lactobacillales.Lactobacillaceae.Lactobacillus | 0.1256 | -0.5209 | 0.2306 | 0.3204 |
| Fumarate | Clostridiales.Ruminococcaceae.unclassified | 0.5929 | 0.8129 | 0.0262 | 0.0825 |
| Malate | Clostridiales.Ruminococcaceae.unclassified | 0.4108 | 0.7134 | 0.0718 | 0.1258 |
| 2-Hydroxyglutarate | Clostridiales.Lachnospiraceae.Clostridium | -0.0735 | 0.3247 | 0.4773 | 0.5644 |
| 2-Hydroxyglutarate | Clostridiales.Ruminococcaceae.unclassified | -0.1641 | -0.1729 | 0.7108 | 0.7610 |
| 2-Hydroxyglutarate | Clostridiales.Ruminococcaceae.Anaerotruncus | 0.2778 | -0.6310 | 0.1286 | 0.1987 |
| 2-Hydroxyglutarate | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.0461 | 0.4529 | 0.3075 | 0.4007 |
| Glutathione | Clostridiales.Ruminococcaceae.unclassified | 0.7623 | 0.8955 | 0.0064 | 0.0682 |
| Glutathione disulfide | Clostridiales.Ruminococcaceae.unclassified | 0.6039 | 0.8185 | 0.0244 | 0.0797 |
| 5-Oxoproline | Clostridiales.Ruminococcaceae.unclassified | 0.4773 | 0.7513 | 0.0516 | 0.1084 |
| Dehydroascorbate | Clostridiales.Ruminococcaceae.unclassified | 0.3913 | 0.7020 | 0.0787 | 0.1336 |
| Dehydroascorbate | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.7367 | 0.8835 | 0.0083 | 0.0718 |
| gamma-Glutamyl-Se-methylselenocysteine | Clostridiales.Ruminococcaceae.unclassified | 0.5769 | -0.8046 | 0.0291 | 0.0835 |
| gamma-Glutamyl-gamma-aminobutyrate | Bacteroidales.Rikenellaceae.unclassified | -0.1221 | 0.2547 | 0.5814 | 0.6494 |
| gamma-Glutamyl-gamma-aminobutyrate | Clostridiales.Ruminococcaceae.unclassified | 0.4330 | 0.7263 | 0.0645 | 0.1201 |
| gamma-Glutamyl-gamma-aminobutyrate | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.4632 | 0.7434 | 0.0555 | 0.1119 |
| L-Homocysteine | Clostridiales.Ruminococcaceae.unclassified | 0.4630 | 0.7433 | 0.0555 | 0.1119 |

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|--------------------------|--|---------|---------|--------|--------|
| Dimethylglycine | Erysipelotrichales.Erysipelotrichaceae.Allobaculum | 0.1410 | -0.5331 | 0.2179 | 0.3089 |
| Ornithine | Bacteroidales.Rikenellaceae.unclassified | 0.0684 | -0.4729 | 0.2838 | 0.3774 |
| Ornithine | Bifidobacteriales.Bifidobacteriaceae.Bifidobacterium | -0.0555 | -0.3470 | 0.4458 | 0.5374 |
| Ornithine | Clostridiales.Lachnospiraceae.Clostridium | 0.5840 | 0.8083 | 0.0278 | 0.0835 |
| Ornithine | Clostridiales.Ruminococcaceae.unclassified | 0.0927 | -0.4938 | 0.2600 | 0.3494 |
| Ornithine | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.4965 | -0.7619 | 0.0465 | 0.1035 |
| Ornithine | Desulfovibrionales.Desulfovibrionaceae.Desulfovibrio | 0.8078 | -0.9164 | 0.0037 | 0.0577 |
| L-Citrulline | Clostridiales.Lachnospiraceae.Clostridium | 0.0318 | -0.4395 | 0.3239 | 0.4199 |
| L-Citrulline | Clostridiales.Ruminococcaceae.unclassified.1 | 0.0466 | -0.4534 | 0.3069 | 0.4007 |
| L-Citrulline | Desulfovibrionales.Desulfovibrionaceae.Bilophila | -0.0414 | 0.3635 | 0.4228 | 0.5121 |
| L-Citrulline | Desulfovibrionales.Desulfovibrionaceae.Desulfovibrio | 0.6005 | 0.8168 | 0.0249 | 0.0805 |
| L-Citrulline | Erysipelotrichales.Erysipelotrichaceae.Allobaculum | -0.1845 | -0.1138 | 0.8081 | 0.8567 |
| L-Citrulline | Turicibacterales.Turicibacteraceae.Turicibacter | 0.0898 | -0.4915 | 0.2627 | 0.3511 |
| Carnosine | Clostridiales.Ruminococcaceae.unclassified | 0.4509 | 0.7365 | 0.0590 | 0.1135 |
| Creatine | Bifidobacteriales.Bifidobacteriaceae.Bifidobacterium | 0.6570 | -0.8451 | 0.0167 | 0.0749 |
| Creatinine | Clostridiales.Ruminococcaceae.unclassified | 0.4510 | 0.7366 | 0.0590 | 0.1135 |
| Taurine | Bifidobacteriales.Bifidobacteriaceae.Bifidobacterium | -0.1300 | -0.2415 | 0.6018 | 0.6626 |
| Taurine | Clostridiales.Lachnospiraceae.Clostridium | 0.6618 | 0.8474 | 0.0161 | 0.0749 |
| Taurine | Clostridiales.Ruminococcaceae.unclassified.1 | 0.4318 | 0.7256 | 0.0649 | 0.1201 |
| Taurine | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.3867 | -0.6992 | 0.0804 | 0.1356 |
| Taurine | Erysipelotrichales.Erysipelotrichaceae.Allobaculum | 0.2058 | -0.5816 | 0.1708 | 0.2533 |
| Hypotaurine | Erysipelotrichales.Erysipelotrichaceae.Allobaculum | 0.4310 | -0.7251 | 0.0652 | 0.1201 |
| Hypotaurine | Turicibacterales.Turicibacteraceae.Turicibacter | 0.6306 | -0.8320 | 0.0203 | 0.0749 |
| L-Methionine-S-oxide | Erysipelotrichales.Erysipelotrichaceae.Allobaculum | 0.7431 | -0.8865 | 0.0078 | 0.0718 |
| 3-Methyleneoxindole | Bifidobacteriales.Bifidobacteriaceae.Bifidobacterium | -0.0359 | 0.3698 | 0.4142 | 0.5040 |
| 3-Methyleneoxindole | Clostridiales.Lachnospiraceae.Clostridium | 0.4084 | 0.7120 | 0.0727 | 0.1258 |
| 3-Methyleneoxindole | Clostridiales.Ruminococcaceae.unclassified | 0.6703 | -0.8516 | 0.0150 | 0.0749 |
| 3-Methyleneoxindole | Clostridiales.Ruminococcaceae.unclassified.1 | 0.4675 | 0.7458 | 0.0543 | 0.1111 |
| 3-Methyleneoxindole | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.6528 | -0.8430 | 0.0172 | 0.0749 |
| Indole | Clostridiales.Ruminococcaceae.unclassified | 0.7208 | -0.8760 | 0.0097 | 0.0749 |
| Indole | Erysipelotrichales.Erysipelotrichaceae.Allobaculum | 0.6571 | -0.8451 | 0.0166 | 0.0749 |
| Indole-3-acetate | Clostridiales.Ruminococcaceae.unclassified | 0.5524 | -0.7918 | 0.0338 | 0.0875 |
| 6-Hydroxykynurenine acid | Clostridiales.Ruminococcaceae.unclassified | 0.4824 | 0.7541 | 0.0502 | 0.1084 |
| Kynurenine | Clostridiales.Ruminococcaceae.unclassified | 0.6818 | 0.8572 | 0.0137 | 0.0749 |
| N-formyl kynurenine | Bifidobacteriales.Bifidobacteriaceae.Bifidobacterium | 0.6797 | -0.8562 | 0.0139 | 0.0749 |
| Anthranilate | Clostridiales.Ruminococcaceae.unclassified | 0.8367 | -0.9295 | 0.0024 | 0.0525 |
| Anthranilate | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.5324 | -0.7812 | 0.0381 | 0.0918 |
| L-Adrenaline | Bifidobacteriales.Bifidobacteriaceae.Bifidobacterium | 0.8537 | -0.9371 | 0.0018 | 0.0525 |
| Glycerol-3-phosphate | Clostridiales.Ruminococcaceae.unclassified | 0.6406 | 0.8370 | 0.0188 | 0.0749 |
| Choline | Clostridiales.Ruminococcaceae.unclassified | 0.7000 | 0.8660 | 0.0117 | 0.0749 |
| L-Carnitine | Clostridiales.Ruminococcaceae.unclassified | 0.5427 | -0.7867 | 0.0358 | 0.0898 |
| CAR 3:0 | Clostridiales.Ruminococcaceae.unclassified | 0.7993 | -0.9125 | 0.0041 | 0.0577 |
| CAR 3:0 | Clostridiales.Ruminococcaceae.unclassified.1 | 0.5766 | 0.8045 | 0.0291 | 0.0835 |
| CAR 4:0 | Clostridiales.Ruminococcaceae.unclassified | 0.8545 | -0.9374 | 0.0018 | 0.0525 |
| CAR 4:0;O | Clostridiales.Ruminococcaceae.unclassified | 0.1251 | -0.5205 | 0.2310 | 0.3204 |
| CAR 5:0 | Clostridiales.Ruminococcaceae.unclassified | 0.7558 | -0.8925 | 0.0069 | 0.0682 |
| CAR 5:0;O | Clostridiales.Lachnospiraceae.Clostridium | 0.6737 | 0.8533 | 0.0146 | 0.0749 |
| CAR 5:0;O | Clostridiales.Ruminococcaceae.unclassified | 0.7236 | -0.8773 | 0.0095 | 0.0749 |
| CAR 5:0;O | Clostridiales.Ruminococcaceae.unclassified.1 | 0.4184 | 0.7179 | 0.0693 | 0.1253 |
| CAR 5:0;O | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.4800 | -0.7528 | 0.0508 | 0.1084 |
| CAR 5:0;O | Desulfovibrionales.Desulfovibrionaceae.Desulfovibrio | 0.6839 | -0.8582 | 0.0134 | 0.0749 |
| CAR 5:0;O | Lactobacillales.Lactobacillaceae.Lactobacillus | 0.1004 | 0.5003 | 0.2528 | 0.3415 |
| CAR 6:0 | Bacteroidales.Rikenellaceae.unclassified | -0.1633 | 0.1748 | 0.7077 | 0.7608 |
| CAR 6:0 | Clostridiales.Lachnospiraceae.Clostridium | 0.5259 | 0.7778 | 0.0395 | 0.0944 |
| CAR 6:0 | Clostridiales.Ruminococcaceae.unclassified | 0.8598 | -0.9398 | 0.0017 | 0.0525 |
| CAR 6:0 | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.3582 | -0.6821 | 0.0914 | 0.1493 |
| CAR 6:0 | Lactobacillales.Lactobacillaceae.Lactobacillus | 0.2349 | 0.6020 | 0.1527 | 0.2290 |
| CAR 6:0 | Turicibacterales.Turicibacteraceae.Turicibacter | -0.1304 | 0.2408 | 0.6030 | 0.6626 |
| CAR 6:1;O2 | Bacteroidales.Rikenellaceae.unclassified | -0.0226 | -0.3845 | 0.3944 | 0.4893 |
| CAR 6:1;O2 | Bifidobacteriales.Bifidobacteriaceae.Bifidobacterium | 0.0557 | -0.4616 | 0.2971 | 0.3931 |
| CAR 6:1;O2 | Clostridiales.Lachnospiraceae.Clostridium | -0.0922 | -0.2997 | 0.5138 | 0.5918 |
| CAR 6:1;O2 | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.5685 | 0.8003 | 0.0306 | 0.0841 |
| CAR 6:1;O2 | Lactobacillales.Lactobacillaceae.Lactobacillus | 0.6397 | -0.8365 | 0.0190 | 0.0749 |
| CAR 8:0 | Bacteroidales.Rikenellaceae.unclassified | -0.1963 | -0.0553 | 0.9063 | 0.9205 |
| CAR 8:0 | Clostridiales.Lachnospiraceae.Clostridium | 0.7563 | 0.8927 | 0.0068 | 0.0682 |
| CAR 8:0 | Clostridiales.Ruminococcaceae.unclassified | 0.5603 | -0.7960 | 0.0323 | 0.0858 |
| CAR 8:0 | Clostridiales.Ruminococcaceae.Anaerotruncus | -0.1409 | 0.2218 | 0.6326 | 0.6886 |
| CAR 8:0 | Desulfovibrionales.Desulfovibrionaceae.Desulfovibrio | 0.6860 | -0.8593 | 0.0132 | 0.0749 |
| CAR 8:0 | Turicibacterales.Turicibacteraceae.Turicibacter | -0.1869 | 0.1045 | 0.8236 | 0.8638 |
| CAR 8:1 | Clostridiales.Ruminococcaceae.unclassified | 0.5794 | -0.8059 | 0.0286 | 0.0835 |

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| CAR 10:0 | Bacteroidales.Rikenellaceae.unclassified | 0.5032 | 0.7655 | 0.0449 | 0.1024 |
| CAR 10:0 | Clostridiales.Ruminococcaceae.unclassified | -0.0983 | -0.2911 | 0.5265 | 0.6037 |
| CAR 10:0 | Clostridiales.Ruminococcaceae.Anaerotruncus | 0.3614 | -0.6840 | 0.0902 | 0.1481 |
| CAR 10:0 | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.0534 | 0.4595 | 0.2996 | 0.3943 |
| CAR 10:0 | Turicibacterales.Turicibacteraceae.Turicibacter | 0.4710 | 0.7478 | 0.0533 | 0.1100 |
| CAR 10:1 | Clostridiales.Ruminococcaceae.unclassified | 0.5826 | 0.8076 | 0.0280 | 0.0835 |
| CAR 10:1 | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.6463 | 0.8398 | 0.0181 | 0.0749 |
| CAR 10:1 | Clostridiales.Lachnospiraceae.Clostridium | 0.7696 | -0.8989 | 0.0059 | 0.0663 |
| CAR 10:1 | Clostridiales.Ruminococcaceae.unclassified | 0.6273 | 0.8303 | 0.0207 | 0.0749 |
| CAR 10:1 | Erysipelotrichales.Erysipelotrichaceae.Allobaculum | 0.6491 | 0.8412 | 0.0177 | 0.0749 |
| CAR 14:0 | Clostridiales.Lachnospiraceae.Clostridium | 0.8458 | -0.9335 | 0.0021 | 0.0525 |
| CAR 14:0 | Clostridiales.Ruminococcaceae.unclassified | 0.5488 | 0.7899 | 0.0346 | 0.0875 |
| CAR 14:0 | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.4384 | 0.7294 | 0.0629 | 0.1193 |
| CAR 16:0 | Clostridiales.Lachnospiraceae.Clostridium | 0.8088 | -0.9169 | 0.0037 | 0.0577 |
| CAR 16:0 | Clostridiales.Ruminococcaceae.unclassified | 0.6632 | 0.8482 | 0.0159 | 0.0749 |
| CAR 16:0 | Clostridiales.Ruminococcaceae.unclassified.1 | 0.4021 | -0.7084 | 0.0748 | 0.1287 |
| CAR 16:0 | Lactobacillales.Lactobacillaceae.Lactobacillus | -0.0240 | -0.3830 | 0.3965 | 0.4894 |
| CAR 16:0 | Turicibacterales.Turicibacteraceae.Turicibacter | -0.1929 | -0.0769 | 0.8699 | 0.8977 |
| CAR 18:0 | Clostridiales.Ruminococcaceae.unclassified | 0.7905 | 0.9085 | 0.0046 | 0.0577 |
| CAR 18:0 | Clostridiales.Ruminococcaceae.unclassified | 0.4164 | 0.7167 | 0.0699 | 0.1253 |
| Linoleoyl-CoA | Clostridiales.Ruminococcaceae.unclassified | 0.7720 | -0.9000 | 0.0058 | 0.0663 |
| Linoleoyl-CoA | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.4997 | -0.7636 | 0.0457 | 0.1026 |
| Linoleoyl-CoA | Lactobacillales.Lactobacillaceae.Lactobacillus | 0.5652 | 0.7985 | 0.0313 | 0.0850 |
| Butanoic acid | Bifidobacteriales.Bifidobacteriaceae.Bifidobacterium | 0.1089 | -0.5073 | 0.2451 | 0.3329 |
| Dodecanoic acid | Clostridiales.Ruminococcaceae.unclassified | 0.6847 | 0.8587 | 0.0133 | 0.0749 |
| Tetradecanoic acid | Clostridiales.Ruminococcaceae.unclassified | 0.5503 | 0.7907 | 0.0343 | 0.0875 |
| Hexadecanoic acid | Bifidobacteriales.Bifidobacteriaceae.Bifidobacterium | 0.0072 | -0.4155 | 0.3539 | 0.4520 |
| Hexadecanoic acid | Clostridiales.Lachnospiraceae.unclassified | -0.1906 | -0.0886 | 0.8502 | 0.8845 |
| Hexadecanoic acid | Clostridiales.Lachnospiraceae.Clostridium | 0.6044 | -0.8187 | 0.0243 | 0.0797 |
| Hexadecanoic acid | Clostridiales.Ruminococcaceae.Oscillospira | -0.0125 | -0.3953 | 0.3800 | 0.4737 |
| Hexadecanoic acid | Desulfovibrionales.Desulfovibrionaceae.Bilophila | -0.1882 | 0.0994 | 0.8321 | 0.8692 |
| Stearic acid | Clostridiales.Lachnospiraceae.Clostridium | 0.7097 | -0.8707 | 0.0108 | 0.0749 |
| Stearic acid | Clostridiales.Ruminococcaceae.Oscillospira | 0.3182 | -0.6571 | 0.1087 | 0.1732 |
| Myristoleic acid | Clostridiales.Ruminococcaceae.unclassified | 0.6694 | 0.8512 | 0.0151 | 0.0749 |
| Hexadecenoic acid | Clostridiales.Lachnospiraceae.unclassified | -0.1927 | -0.0778 | 0.8684 | 0.8977 |
| Hexadecenoic acid | Clostridiales.Lachnospiraceae.Clostridium | 0.5797 | -0.8061 | 0.0286 | 0.0835 |
| Hexadecenoic acid | Clostridiales.Ruminococcaceae.unclassified | 0.3217 | 0.6593 | 0.1072 | 0.1717 |
| Hexadecenoic acid | Clostridiales.Ruminococcaceae.Anaerotruncus | -0.1993 | 0.0242 | 0.9589 | 0.9589 |
| Hexadecenoic acid | Clostridiales.Ruminococcaceae.Oscillospira | -0.0005 | -0.4077 | 0.3639 | 0.4561 |
| Oleic acid | Clostridiales.Ruminococcaceae.unclassified | 0.2173 | 0.5897 | 0.1635 | 0.2438 |
| Linoleate | Bacteroidales.Rikenellaceae.unclassified | -0.0870 | 0.3068 | 0.5033 | 0.5854 |
| Linoleate | Bifidobacteriales.Bifidobacteriaceae.Bifidobacterium | -0.0873 | 0.3065 | 0.5037 | 0.5854 |
| Linoleate | Clostridiales.Ruminococcaceae.unclassified | 0.5689 | -0.8005 | 0.0306 | 0.0841 |
| Linoleate | Clostridiales.Ruminococcaceae.unclassified.1 | 0.6290 | 0.8311 | 0.0205 | 0.0749 |
| Linoleate | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.6882 | -0.8603 | 0.0130 | 0.0749 |
| Linoleate | Lactobacillales.Lactobacillaceae.Lactobacillus | 0.3681 | 0.6880 | 0.0875 | 0.1447 |
| Linolenic acid | Bacteroidales.Rikenellaceae.unclassified | -0.0743 | 0.3237 | 0.4788 | 0.5644 |
| Linolenic acid | Bifidobacteriales.Bifidobacteriaceae.Bifidobacterium | -0.0907 | 0.3018 | 0.5106 | 0.5908 |
| Linolenic acid | Clostridiales.Lachnospiraceae.Clostridium | -0.1078 | 0.2772 | 0.5473 | 0.6193 |
| Linolenic acid | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.6826 | -0.8576 | 0.0136 | 0.0749 |
| Linolenic acid | Lactobacillales.Lactobacillaceae.Lactobacillus | 0.4866 | 0.7564 | 0.0491 | 0.1075 |
| Arachidonic acid | Bifidobacteriales.Bifidobacteriaceae.Bifidobacterium | -0.1851 | 0.1115 | 0.8120 | 0.8567 |
| Arachidonic acid | Clostridiales.Ruminococcaceae.unclassified | 0.5723 | -0.8022 | 0.0299 | 0.0841 |
| Arachidonic acid | Clostridiales.Ruminococcaceae.unclassified.1 | 0.6462 | 0.8397 | 0.0181 | 0.0749 |
| Arachidonic acid | Clostridiales.Ruminococcaceae.Anaerotruncus | -0.0316 | 0.3746 | 0.4078 | 0.5010 |
| Arachidonic acid | Desulfovibrionales.Desulfovibrionaceae.Desulfovibrio | 0.7024 | -0.8672 | 0.0115 | 0.0749 |
| Arachidonic acid | Lactobacillales.Lactobacillaceae.Lactobacillus | 0.1450 | 0.5362 | 0.2147 | 0.3077 |
| Docosahexaenoic acid | Clostridiales.Lachnospiraceae.unclassified | 0.4007 | 0.7075 | 0.0753 | 0.1287 |
| Docosahexaenoic acid | Clostridiales.Lachnospiraceae.Clostridium | -0.1376 | 0.2280 | 0.6229 | 0.6809 |
| Docosahexaenoic acid | Clostridiales.Ruminococcaceae.unclassified | 0.6277 | -0.8305 | 0.0207 | 0.0749 |
| Docosahexaenoic acid | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.2527 | -0.6142 | 0.1423 | 0.2146 |
| Docosahexaenoic acid | Erysipelotrichales.Erysipelotrichaceae.Allobaculum | -0.0007 | -0.4075 | 0.3642 | 0.4561 |
| Docosahexaenoic acid | Lactobacillales.Lactobacillaceae.Lactobacillus | 0.8534 | 0.9369 | 0.0019 | 0.0525 |
| Dodecanedioic acid | Bacteroidales.Rikenellaceae.unclassified | -0.0648 | 0.3356 | 0.4618 | 0.5541 |
| Dodecanedioic acid | Bifidobacteriales.Bifidobacteriaceae.Bifidobacterium | 0.1696 | 0.5550 | 0.1959 | 0.2840 |
| Dodecanedioic acid | Clostridiales.Lachnospiraceae.Clostridium | 0.5833 | 0.8079 | 0.0279 | 0.0835 |
| Dodecanedioic acid | Clostridiales.Ruminococcaceae.unclassified | 0.6357 | -0.8345 | 0.0195 | 0.0749 |
| Dodecanedioic acid | Desulfovibrionales.Desulfovibrionaceae.Bilophila | -0.1117 | -0.2712 | 0.5563 | 0.6267 |
| Dodecanedioic acid | Erysipelotrichales.Erysipelotrichaceae.Allobaculum | 0.2705 | -0.6262 | 0.1325 | 0.2034 |
| Docosapentaenoic acid | Bifidobacteriales.Bifidobacteriaceae.Bifidobacterium | 0.1184 | 0.5151 | 0.2368 | 0.3232 |

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| Docosapentaenoic acid | Clostridiales.Ruminococcaceae.unclassified | 0.5894 | -0.8111 | 0.0268 | 0.0834 |
| Docosapentaenoic acid | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.4281 | -0.7235 | 0.0661 | 0.1210 |
| Docosapentaenoic acid | Lactobacillales.Lactobacillaceae.Lactobacillus | 0.5344 | 0.7823 | 0.0376 | 0.0916 |
| Glycocholate | Clostridiales.Ruminococcaceae.unclassified | 0.5211 | 0.7752 | 0.0406 | 0.0961 |
| Glycocholate | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.6652 | 0.8491 | 0.0156 | 0.0749 |
| 13(S)-HODE | Clostridiales.Lachnospiraceae.unclassified | 0.4177 | 0.7175 | 0.0695 | 0.1253 |
| 13(S)-HODE | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.6705 | -0.8517 | 0.0150 | 0.0749 |
| 13(S)-HODE | Lactobacillales.Lactobacillaceae.Lactobacillus | 0.4610 | 0.7422 | 0.0561 | 0.1122 |
| Triacanthine | Clostridiales.Ruminococcaceae.unclassified | 0.9103 | -0.9619 | 0.0005 | 0.0407 |
| Triacanthine | Clostridiales.Ruminococcaceae.Oscillospira | -0.1014 | -0.2866 | 0.5332 | 0.6087 |
| 6-Lactoyltetrahydropterin | Clostridiales.Ruminococcaceae.unclassified | 0.3237 | 0.6606 | 0.1062 | 0.1713 |
| 6-Lactoyltetrahydropterin | Clostridiales.Ruminococcaceae.unclassified.1 | 0.5006 | -0.7641 | 0.0455 | 0.1026 |
| 6-Lactoyltetrahydropterin | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.8241 | 0.9238 | 0.0030 | 0.0550 |
| 6-Lactoyltetrahydropterin | Lactobacillales.Lactobacillaceae.Lactobacillus | 0.2566 | -0.6168 | 0.1401 | 0.2126 |
| 4-Aminobenzoate | Clostridiales.Ruminococcaceae.unclassified | 0.8799 | -0.9486 | 0.0011 | 0.0525 |
| Leucocyanidin | Clostridiales.Ruminococcaceae.unclassified | 0.7094 | 0.8706 | 0.0108 | 0.0749 |
| Methylenediurea | Bifidobacteriales.Bifidobacteriaceae.Bifidobacterium | 0.7382 | -0.8842 | 0.0082 | 0.0718 |
| beta-Butoxyethyl nicotinate | Clostridiales.Ruminococcaceae.unclassified | 0.9180 | -0.9652 | 0.0004 | 0.0407 |
| cis-p-Coumarate | Clostridiales.Ruminococcaceae.unclassified | 0.6862 | -0.8593 | 0.0132 | 0.0749 |
| N6-Methyl-L-lysine | Clostridiales.Ruminococcaceae.unclassified | 0.6190 | -0.8261 | 0.0220 | 0.0756 |
| N6-Methyl-L-lysine | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.4789 | -0.7522 | 0.0511 | 0.1084 |
| N6-Methyl-L-lysine | Lactobacillales.Lactobacillaceae.Lactobacillus | 0.6895 | 0.8610 | 0.0128 | 0.0749 |
| D-Glucono-1,5-lactone | Clostridiales.Ruminococcaceae.unclassified | 0.3006 | 0.6459 | 0.1171 | 0.1854 |
| Pyridoxamine | Bacteroidales.Rikenellaceae.unclassified | -0.1854 | -0.1105 | 0.8136 | 0.8567 |
| Pyridoxamine | Clostridiales.Lachnospiraceae.Clostridium | 0.6088 | -0.8210 | 0.0236 | 0.0790 |
| Pyridoxamine | Clostridiales.Ruminococcaceae.unclassified | 0.7225 | 0.8768 | 0.0096 | 0.0749 |
| Pyridoxamine | Clostridiales.Ruminococcaceae.Anaerotruncus | -0.1541 | -0.1955 | 0.6744 | 0.7280 |
| Pyridoxamine | Desulfovibrionales.Desulfovibrionaceae.Desulfovibrio | 0.6262 | 0.8297 | 0.0209 | 0.0749 |
| Pyridoxamine | Turicibacteriales.Turicibacteraceae.Turicibacter | -0.1462 | -0.2117 | 0.6486 | 0.7031 |
| N-Acyl-D-glutamate | Clostridiales.Lachnospiraceae.Clostridium | 0.8398 | -0.9309 | 0.0023 | 0.0525 |
| N-Acyl-D-glutamate | Clostridiales.Ruminococcaceae.unclassified | 0.5537 | 0.7925 | 0.0336 | 0.0875 |
| N-Acyl-D-glutamate | Erysipelotrichales.Erysipelotrichaceae.Allobaculum | 0.6118 | 0.8225 | 0.0231 | 0.0784 |
| N-Acetylmethionine | Bacteroidales.Rikenellaceae.unclassified | 0.3793 | 0.6948 | 0.0832 | 0.1393 |
| N-Acetylmethionine | Clostridiales.Ruminococcaceae.unclassified | 0.6414 | -0.8374 | 0.0187 | 0.0749 |
| N-Acetylmethionine | Clostridiales.Ruminococcaceae.unclassified.1 | 0.6568 | 0.8450 | 0.0167 | 0.0749 |
| N-Acetylmethionine | Clostridiales.Ruminococcaceae.Oscillospira | 0.1368 | -0.5298 | 0.2214 | 0.3121 |
| N-Acetylmethionine | Lactobacillales.Lactobacillaceae.Lactobacillus | 0.5385 | 0.7845 | 0.0367 | 0.0911 |
| 10-Hydroxydecanoic acid | Bacteroidales.Rikenellaceae.unclassified | 0.0051 | 0.4135 | 0.3565 | 0.4531 |
| 10-Hydroxydecanoic acid | Clostridiales.Lachnospiraceae.unclassified | -0.1657 | 0.1691 | 0.7170 | 0.7644 |
| 10-Hydroxydecanoic acid | Clostridiales.Lachnospiraceae.Clostridium | 0.5633 | -0.7976 | 0.0317 | 0.0851 |
| 10-Hydroxydecanoic acid | Clostridiales.Ruminococcaceae.unclassified | 0.0249 | 0.4329 | 0.3320 | 0.4261 |
| 10-Hydroxydecanoic acid | Clostridiales.Ruminococcaceae.Anaerotruncus | -0.1993 | 0.0247 | 0.9581 | 0.9589 |
| trans-Homoaconitate | Clostridiales.Lachnospiraceae.Clostridium | -0.1260 | -0.2483 | 0.5913 | 0.6575 |
| trans-Homoaconitate | Clostridiales.Ruminococcaceae.unclassified | 0.0285 | 0.4363 | 0.3277 | 0.4227 |
| trans-Homoaconitate | Clostridiales.Ruminococcaceae.Anaerotruncus | 0.2800 | 0.6325 | 0.1275 | 0.1987 |
| trans-Homoaconitate | Clostridiales.Ruminococcaceae.Oscillospira | -0.1151 | 0.2661 | 0.5642 | 0.6328 |
| 2-Oxo-7-methylthioheptanoic acid | Clostridiales.Ruminococcaceae.unclassified | 0.5486 | 0.7898 | 0.0346 | 0.0875 |
| Homomethionine | Clostridiales.Ruminococcaceae.unclassified | 0.6462 | 0.8398 | 0.0181 | 0.0749 |
| Betaine | Clostridiales.Ruminococcaceae.unclassified | 0.7468 | -0.8883 | 0.0075 | 0.0718 |
| 3-Indolepropionic acid | Clostridiales.Ruminococcaceae.unclassified | 0.9041 | -0.9592 | 0.0006 | 0.0407 |
| 3-Indolepropionic acid | Desulfovibrionales.Desulfovibrionaceae.Bilophila | 0.5066 | -0.7673 | 0.0440 | 0.1024 |

p values determined by ANOVA and FDR correction for adjusted (adj.) *p* values applied using the Benjamini-Hochberg procedure.

Bolded padj values are significant (*p* <0.05)

n = 4 CH-O, n = 3 WD-O.

CAR, carnitine.

Table S7. LASSO variable selection for serum metabolite and gut microbial count data in GF offspring.

| Metabolite (measure) | Order.Family.Genus (xvar) | r2 | correlation | p.value.xvar | padj |
|----------------------|--|---------|-------------|--------------|---------------|
| Alanine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.2835 | -0.5650 | 0.00761 | 0.0391 |
| Alanine | Lactobacillales.Lactobacillaceae.Lactobacillus | 0.1995 | 0.4894 | 0.02435 | 0.0719 |
| Arginine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.1760 | -0.4661 | 0.03321 | 0.0865 |
| Asparagine | Clostridiales.Mogibacteriaceae.unclassified | 0.2416 | -0.5287 | 0.01375 | 0.0554 |
| Asparagine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.1215 | -0.4067 | 0.06728 | 0.1394 |
| Aspartate | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.1055 | 0.3876 | 0.08258 | 0.1576 |
| Cysteine | Clostridiales.Ruminococcaceae.unclassified | 0.1896 | -0.4797 | 0.02776 | 0.0783 |
| Cysteine | Clostridiales.Mogibacteriaceae.unclassified | 0.1618 | -0.4513 | 0.04002 | 0.0989 |
| Cysteine | Clostridiales.Ruminococcaceae.Anaerotruncus | 0.1077 | -0.3903 | 0.08025 | 0.1562 |
| Cysteine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.0947 | -0.3741 | 0.09477 | 0.1676 |
| Cysteine | Turicibacterales.Turicibacteraceae.Turicibacter | -0.0053 | -0.2121 | 0.35610 | 0.4378 |
| Cysteine | Clostridiales.Ruminococcaceae.Ruminococcus | -0.0152 | 0.1887 | 0.41274 | 0.4914 |
| Glutamate | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.2268 | 0.5152 | 0.01684 | 0.0638 |
| Glycine | Bacteroidales.S24.7.unclassified | 0.4790 | -0.7107 | 0.00031 | 0.0090 |
| Glycine | Coriobacteriales.Coriobacteriaceae.Adlercreutzia | 0.4449 | 0.6875 | 0.00057 | 0.0098 |
| Glycine | Clostridiales.Mogibacteriaceae.unclassified | 0.3867 | 0.6461 | 0.00156 | 0.0160 |
| Glycine | Turicibacterales.Turicibacteraceae.Turicibacter | 0.3827 | -0.6431 | 0.00166 | 0.0160 |
| Leucine | Coriobacteriales.Coriobacteriaceae.Adlercreutzia | 0.2141 | 0.5034 | 0.02001 | 0.0701 |
| Isoleucine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.1072 | -0.3896 | 0.08082 | 0.1562 |
| Lysine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.3854 | -0.6451 | 0.00159 | 0.0160 |
| Lysine | Clostridiales.Ruminococcaceae.Ruminococcus | 0.1281 | 0.4144 | 0.06183 | 0.1329 |
| Methionine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.5123 | -0.7326 | 0.00016 | 0.0066 |
| Phenylalanine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.1054 | -0.3874 | 0.08269 | 0.1576 |
| Proline | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.5042 | -0.7273 | 0.00019 | 0.0067 |
| Serine | Turicibacterales.Turicibacteraceae.Turicibacter | 0.2087 | -0.4982 | 0.02153 | 0.0708 |
| Serine | Coriobacteriales.Coriobacteriaceae.Adlercreutzia | 0.1839 | 0.4740 | 0.02994 | 0.0808 |
| Serine | Bacteroidales.S24.7.unclassified | 0.1311 | -0.4178 | 0.05946 | 0.1307 |
| Serine | Clostridiales.Ruminococcaceae.Anaerotruncus | 0.1252 | -0.4110 | 0.06421 | 0.1346 |
| Serine | Clostridiales.Ruminococcaceae.Ruminococcus | 0.1163 | 0.4006 | 0.07195 | 0.1466 |
| Threonine | Turicibacterales.Turicibacteraceae.Turicibacter | 0.2287 | -0.5170 | 0.01640 | 0.0628 |
| Threonine | Clostridiales.Mogibacteriaceae.unclassified | 0.2201 | 0.5091 | 0.01843 | 0.0665 |
| Threonine | Clostridiales.Lachnospiraceae.unclassified.1 | 0.1439 | 0.4320 | 0.05048 | 0.1168 |
| Threonine | Bacteroidales.S24.7.unclassified | 0.0701 | -0.3414 | 0.12982 | 0.2081 |
| Threonine | Clostridiales.Ruminococcaceae.Ruminococcus | 0.0493 | 0.3111 | 0.16980 | 0.2568 |
| Threonine | Clostridiales.Ruminococcaceae.unclassified | 0.0213 | 0.2650 | 0.24560 | 0.3399 |
| Threonine | Clostridiales.Lachnospiraceae.unclassified | -0.0422 | -0.0997 | 0.66718 | 0.7446 |
| Threonine | Bacteroidales.Porphyromonadaceae.Parabacteroides | -0.0492 | 0.0567 | 0.80701 | 0.8573 |
| Tryptophan | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.1873 | -0.4775 | 0.02861 | 0.0783 |
| Tyrosine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.4620 | -0.6992 | 0.00042 | 0.0092 |
| Valine | Coriobacteriales.Coriobacteriaceae.Adlercreutzia | 0.1617 | 0.4512 | 0.04005 | 0.0989 |
| Valine | Bacteroidales.S24.7.unclassified | 0.0966 | -0.3765 | 0.09251 | 0.1669 |
| Valine | Clostridiales.Lachnospiraceae.unclassified | 0.0950 | -0.3745 | 0.09445 | 0.1676 |
| Valine | Clostridiales.Ruminococcaceae.Anaerotruncus | 0.0842 | -0.3605 | 0.10841 | 0.1848 |
| Valine | Clostridiales.Mogibacteriaceae.unclassified | 0.0771 | 0.3511 | 0.11867 | 0.1978 |
| Valine | Clostridiales.unclassified.unclassified | 0.0218 | 0.2659 | 0.24393 | 0.3388 |
| Valine | Clostridiales.Ruminococcaceae.unclassified | 0.0047 | 0.2333 | 0.30871 | 0.3965 |
| Valine | Lactobacillales.Lactobacillaceae.Lactobacillus | 0.0006 | 0.2248 | 0.32714 | 0.4145 |
| Valine | Clostridiales.Ruminococcaceae.Oscillospira | -0.0108 | 0.1993 | 0.38636 | 0.4659 |
| Valine | Clostridiales.Lachnospiraceae.Coproccoccus | -0.0191 | 0.1786 | 0.43869 | 0.5157 |
| Valine | Clostridiales.Lachnospiraceae.unclassified.1 | -0.0278 | 0.1536 | 0.50630 | 0.5824 |
| Valine | Turicibacterales.Turicibacteraceae.Turicibacter | -0.0417 | -0.1018 | 0.66049 | 0.7394 |
| Valine | Clostridiales.Ruminococcaceae.Ruminococcus | -0.0436 | 0.0926 | 0.68981 | 0.7653 |
| Valine | Bacteroidales.Porphyromonadaceae.Parabacteroides | -0.0521 | 0.0229 | 0.92145 | 0.9425 |
| Valine | Bacteroidales.Rikenellaceae.unclassified | -0.0521 | 0.0215 | 0.92619 | 0.9438 |
| Cystine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.2177 | -0.5068 | 0.01904 | 0.0674 |
| Cystine | Coriobacteriales.Coriobacteriaceae.Adlercreutzia | 0.0139 | 0.2515 | 0.27146 | 0.3636 |
| Cystine | Clostridiales.Ruminococcaceae.unclassified | 0.0062 | -0.2364 | 0.30221 | 0.3921 |
| AMP | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.2629 | 0.5475 | 0.01020 | 0.0444 |
| Adenine | Clostridiales.Lachnospiraceae.unclassified | 0.1884 | -0.4785 | 0.02822 | 0.0783 |
| Adenine | Lactobacillales.Lactobacillaceae.Lactobacillus | 0.1002 | -0.3811 | 0.08832 | 0.1623 |
| Adenine | Clostridiales.Ruminococcaceae.Ruminococcus | 0.0438 | -0.3027 | 0.18233 | 0.2735 |
| Adenine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.0034 | -0.2307 | 0.31441 | 0.3997 |
| Adenine | Clostridiales.Ruminococcaceae.unclassified | -0.0084 | 0.2051 | 0.37256 | 0.4521 |
| Adenine | Turicibacterales.Turicibacteraceae.Turicibacter | -0.0224 | -0.1695 | 0.46265 | 0.5371 |
| GMP | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.1476 | 0.4361 | 0.04812 | 0.1128 |
| Cytidine | Bacteroidales.S24.7.unclassified | 0.1082 | -0.3909 | 0.07976 | 0.1562 |
| Thymine | Lactobacillales.Lactobacillaceae.Lactobacillus | 0.2299 | 0.5181 | 0.01613 | 0.0624 |

| | | | | | |
|------------------------------|--|---------|---------|---------|---------------|
| Thymine | Clostridiales.Mogibacteriaceae.unclassified | 0.1633 | -0.4529 | 0.03922 | 0.0987 |
| Thymine | Turicibacterales.Turicibacteraceae.Turicibacter | 0.1454 | 0.4337 | 0.04950 | 0.1153 |
| Thymine | Clostridiales.Ruminococcaceae.Ruminococcus | -0.0191 | 0.1786 | 0.43865 | 0.5157 |
| UMP | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.1959 | 0.4859 | 0.02554 | 0.0742 |
| Uracil | Bacteroidales.S24.7.unclassified | 0.2017 | -0.4916 | 0.02363 | 0.0708 |
| IDP | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.0932 | -0.3722 | 0.09665 | 0.1702 |
| IMP | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.4665 | 0.7023 | 0.00039 | 0.0092 |
| Inosine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.3466 | -0.6159 | 0.00296 | 0.0209 |
| Inosine | Clostridiales.Mogibacteriaceae.unclassified | 0.2533 | -0.5391 | 0.01168 | 0.0492 |
| Inosine | Lactobacillales.Lactobacillaceae.Lactobacillus | 0.2256 | 0.5141 | 0.01711 | 0.0642 |
| Inosine | Clostridiales.Ruminococcaceae.unclassified | 0.0485 | -0.3100 | 0.17150 | 0.2583 |
| Hypoxanthine | Coriobacteriales.Coriobacteriaceae.Adlercreutzia | 0.0914 | 0.3699 | 0.09881 | 0.1723 |
| Hypoxanthine | Clostridiales.Ruminococcaceae.Ruminococcus | 0.0620 | -0.3300 | 0.14409 | 0.2261 |
| Hypoxanthine | Lactobacillales.Lactobacillaceae.Lactobacillus | 0.0294 | 0.2792 | 0.22034 | 0.3118 |
| Hypoxanthine | Clostridiales.Mogibacteriaceae.unclassified | 0.0152 | 0.2539 | 0.26670 | 0.3598 |
| Hypoxanthine | Clostridiales.Lachnospiraceae.Coprococcus | -0.0013 | 0.2208 | 0.33606 | 0.4229 |
| Hypoxanthine | Bacteroidales.Rikenellaceae.unclassified | -0.0140 | 0.1917 | 0.40524 | 0.4855 |
| Hypoxanthine | Bacteroidales.Porphyromonadaceae.Parabacteroides | -0.0188 | -0.1792 | 0.43710 | 0.5157 |
| Hypoxanthine | Clostridiales.Lachnospiraceae.unclassified.1 | -0.0342 | 0.1322 | 0.56789 | 0.6414 |
| Hypoxanthine | Clostridiales.Ruminococcaceae.unclassified | -0.0412 | 0.1041 | 0.65346 | 0.7337 |
| Hypoxanthine | Turicibacterales.Turicibacteraceae.Turicibacter | -0.0525 | -0.0112 | 0.96171 | 0.9669 |
| Xanthine | Coriobacteriales.Coriobacteriaceae.Adlercreutzia | 0.0826 | 0.3584 | 0.11061 | 0.1868 |
| Xanthine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.0242 | -0.2701 | 0.23628 | 0.3319 |
| Xanthine | Clostridiales.Ruminococcaceae.Ruminococcus | 0.0153 | -0.2540 | 0.26664 | 0.3598 |
| Xanthine | Clostridiales.Lachnospiraceae.Coprococcus | 0.0112 | 0.2462 | 0.28207 | 0.3711 |
| Xanthine | Clostridiales.Mogibacteriaceae.unclassified | 0.0055 | 0.2351 | 0.30504 | 0.3945 |
| Xanthine | Clostridiales.Ruminococcaceae.unclassified | -0.0305 | 0.1450 | 0.53065 | 0.6067 |
| Xanthine | Bacteroidales.S24.7.unclassified | -0.0526 | -0.0066 | 0.97736 | 0.9800 |
| Allantoate | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.0402 | -0.2969 | 0.19117 | 0.2825 |
| (S)(+)-Allantoin | Clostridiales.Ruminococcaceae.Ruminococcus | 0.2774 | 0.5600 | 0.00829 | 0.0409 |
| (S)(+)-Allantoin | Lactobacillales.Lactobacillaceae.Lactobacillus | 0.1270 | 0.4131 | 0.06268 | 0.1335 |
| Urate | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.0895 | -0.3675 | 0.10128 | 0.1736 |
| Pyridoxal | Bacteroidales.S24.7.unclassified | 0.4192 | 0.6695 | 0.00090 | 0.0130 |
| Pyridoxal | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.3924 | -0.6502 | 0.00142 | 0.0156 |
| Pyridoxal | Clostridiales.Mogibacteriaceae.unclassified | 0.3957 | -0.6526 | 0.00134 | 0.0156 |
| Pyridoxal | Clostridiales.Ruminococcaceae.unclassified | 0.1009 | -0.3819 | 0.08761 | 0.1618 |
| 4-Pyridoxate | Clostridiales.Mogibacteriaceae.unclassified | 0.4523 | -0.6926 | 0.00050 | 0.0094 |
| 4-Pyridoxate | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.2067 | -0.4964 | 0.02209 | 0.0708 |
| Nicotinamide | Bacteroidales.S24.7.unclassified | 0.3264 | -0.6000 | 0.00403 | 0.0265 |
| Nicotinamide | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.2012 | 0.4911 | 0.02378 | 0.0708 |
| Nicotinamide | Clostridiales.Ruminococcaceae.unclassified | 0.1286 | 0.4149 | 0.06147 | 0.1329 |
| Phosphate | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.0722 | -0.3444 | 0.12627 | 0.2032 |
| Diphosphate | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.1148 | -0.3988 | 0.07332 | 0.1477 |
| D-Glucose | Clostridiales.Mogibacteriaceae.unclassified | 0.3434 | -0.6134 | 0.00311 | 0.0212 |
| D-Glucose | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.2055 | -0.4952 | 0.02247 | 0.0708 |
| D-Glucose | Clostridiales.Ruminococcaceae.unclassified | 0.0331 | -0.2854 | 0.20981 | 0.3026 |
| D-Glucose | Clostridiales.Ruminococcaceae.Anaerotruncus | -0.0042 | -0.2145 | 0.35042 | 0.4337 |
| D-Hexose 6-phosphate | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.2618 | 0.5466 | 0.01036 | 0.0444 |
| D-Glyceraldehyde 3-phosphate | Clostridiales.Mogibacteriaceae.unclassified | 0.2670 | -0.5511 | 0.00962 | 0.0435 |
| D-Glyceraldehyde 3-phosphate | Bacteroidales.S24.7.unclassified | 0.1941 | 0.4842 | 0.02614 | 0.0754 |
| 2-Phospho-D-glyceric acid | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.3139 | 0.5901 | 0.00486 | 0.0305 |
| 2-Phospho-D-glyceric acid | Bacteroidales.S24.7.unclassified | 0.2506 | -0.5367 | 0.01213 | 0.0505 |
| 2-Phospho-D-glyceric acid | Clostridiales.Ruminococcaceae.unclassified | -0.0018 | 0.2198 | 0.33845 | 0.4245 |
| Pyruvate | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.5472 | -0.7549 | 0.00008 | 0.0058 |
| Pyruvate | Clostridiales.Mogibacteriaceae.unclassified | 0.2626 | -0.5472 | 0.01025 | 0.0444 |
| Pyruvate | Clostridiales.Ruminococcaceae.unclassified | 0.0132 | -0.2501 | 0.27415 | 0.3659 |
| Lactate | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.4719 | -0.7059 | 0.00035 | 0.0092 |
| Lactate | Lactobacillales.Lactobacillaceae.Lactobacillus | 0.2061 | 0.4957 | 0.02229 | 0.0708 |
| Lactate | Clostridiales.Ruminococcaceae.unclassified | 0.1144 | -0.3984 | 0.07364 | 0.1477 |
| Mannitol | Clostridiales.Mogibacteriaceae.unclassified | 0.2468 | -0.5333 | 0.01278 | 0.0527 |
| Mannitol | Bacteroidales.S24.7.unclassified | 0.1907 | 0.4808 | 0.02736 | 0.0783 |
| D-Ribose | Clostridiales.Mogibacteriaceae.unclassified | 0.3446 | -0.6143 | 0.00305 | 0.0212 |
| D-Ribose | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.2245 | -0.5131 | 0.01738 | 0.0644 |
| Succinate | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.4624 | -0.6995 | 0.00042 | 0.0092 |
| Succinate | Clostridiales.Mogibacteriaceae.unclassified | 0.3618 | -0.6274 | 0.00233 | 0.0183 |
| Succinate | Clostridiales.Ruminococcaceae.unclassified | 0.1281 | -0.4144 | 0.06179 | 0.1329 |
| Succinate | Coriobacteriales.Coriobacteriaceae.Adlercreutzia | -0.0327 | -0.1375 | 0.55227 | 0.6276 |
| alpha-D-Ribose 1-phosphate | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.3138 | 0.5900 | 0.00487 | 0.0305 |
| Glutathione | Clostridiales.Ruminococcaceae.Ruminococcus | 0.0901 | 0.3682 | 0.10053 | 0.1736 |
| Glutathione | Clostridiales.Ruminococcaceae.unclassified | 0.0897 | -0.3677 | 0.10108 | 0.1736 |

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| Glutathione | Clostridiales.Mogibacteriaceae.unclassified | 0.0754 | -0.3487 | 0.12130 | 0.1999 |
| Glutathione | Clostridiales.unclassified | 0.0118 | 0.2475 | 0.27940 | 0.3711 |
| Glutathione | Bacteroidales.S24.7.unclassified | -0.0463 | -0.0774 | 0.73893 | 0.8117 |
| Glutathione | Clostridiales.Ruminococcaceae.Anaerotruncus | -0.0481 | -0.0653 | 0.77854 | 0.8414 |
| Glutathione | Clostridiales.Lachnospiraceae.unclassified | -0.0487 | 0.0612 | 0.79216 | 0.8487 |
| Glutathione | Bacteroidales.Rikenellaceae.unclassified | -0.0503 | 0.0468 | 0.84052 | 0.8829 |
| Glutathione | Clostridiales.Ruminococcaceae.Oscillospira | -0.0510 | 0.0396 | 0.86467 | 0.9032 |
| Glutathione | Coriobacteriales.Coriobacteriaceae.Adlercreutzia | -0.0514 | -0.0347 | 0.88143 | 0.9182 |
| Glutathione | Turicibacterales.Turicibacteraceae.Turicibacter | -0.0523 | -0.0183 | 0.93713 | 0.9509 |
| Glutathione | Bacteroidales.Porphyromonadaceae.Parabacteroides | -0.0523 | -0.0168 | 0.94226 | 0.9524 |
| Glutathione disulfide | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.0401 | 0.2968 | 0.19134 | 0.2825 |
| 5-Oxoproline | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.0557 | 0.3208 | 0.15622 | 0.2411 |
| S-Glutathionyl-L-cysteine | Clostridiales.Mogibacteriaceae.unclassified | 0.3049 | -0.5828 | 0.00556 | 0.0326 |
| S-Glutathionyl-L-cysteine | Clostridiales.Ruminococcaceae.unclassified | 0.1332 | -0.4202 | 0.05791 | 0.1300 |
| S-Glutathionyl-L-cysteine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.0345 | -0.2877 | 0.20599 | 0.2985 |
| Dehydroascorbate | Lactobacillales.Lactobacillaceae.Lactobacillus | 0.2035 | 0.4933 | 0.02307 | 0.0708 |
| Dehydroascorbate | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.0827 | -0.3586 | 0.11047 | 0.1868 |
| Dehydroascorbate | Coriobacteriales.Coriobacteriaceae.Adlercreutzia | -0.0147 | 0.1897 | 0.41014 | 0.4898 |
| gamma-Glutamyl-Se-methylselenocysteine | Bacteroidales.S24.7.unclassified | 0.0727 | -0.3451 | 0.12547 | 0.2031 |
| gamma-L-Glutamyl-D-alanine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.4092 | -0.6624 | 0.00107 | 0.0143 |
| gamma-L-Glutamyl-D-alanine | Clostridiales.Ruminococcaceae.unclassified | 0.0035 | -0.2309 | 0.31384 | 0.3997 |
| gamma-Glutamyl-gamma-aminobutyrate | Clostridiales.Mogibacteriaceae.unclassified | 0.0320 | 0.2836 | 0.21287 | 0.3047 |
| gamma-Glutamyl-gamma-aminobutyrate | Clostridiales.Ruminococcaceae.Anaerotruncus | 0.0210 | -0.2645 | 0.24657 | 0.3399 |
| gamma-Glutamyl-gamma-aminobutyrate | Bacteroidales.Rikenellaceae.unclassified | 0.0143 | 0.2522 | 0.27005 | 0.3630 |
| gamma-Glutamyl-gamma-aminobutyrate | Clostridiales.Lachnospiraceae.Coproccoccus | 0.0105 | 0.2449 | 0.28470 | 0.3733 |
| gamma-Glutamyl-gamma-aminobutyrate | Clostridiales.Ruminococcaceae.Ruminococcus | -0.0184 | 0.1803 | 0.43421 | 0.5153 |
| gamma-Glutamyl-gamma-aminobutyrate | Turicibacterales.Turicibacteraceae.Turicibacter | -0.0202 | -0.1756 | 0.44644 | 0.5232 |
| gamma-Glutamyl-gamma-aminobutyrate | Clostridiales.Ruminococcaceae.unclassified | -0.0208 | -0.1740 | 0.45071 | 0.5265 |
| gamma-Glutamyl-gamma-aminobutyrate | Clostridiales.Ruminococcaceae.Oscillospira | -0.0269 | -0.1565 | 0.49813 | 0.5765 |
| gamma-Glutamyl-gamma-aminobutyrate | Bacteroidales.S24.7.unclassified | -0.0477 | 0.0682 | 0.76880 | 0.8332 |
| gamma-Glutamyl-gamma-aminobutyrate | Lactobacillales.Lactobacillaceae.Lactobacillus | -0.0483 | 0.0641 | 0.78248 | 0.8432 |
| gamma-Glutamyl-gamma-aminobutyrate | Clostridiales.Lachnospiraceae.unclassified | -0.0486 | -0.0616 | 0.79076 | 0.8487 |
| gamma-Glutamyl-gamma-aminobutyrate | Coriobacteriales.Coriobacteriaceae.Adlercreutzia | -0.0502 | 0.0480 | 0.83627 | 0.8809 |
| gamma-Glutamyl-gamma-aminobutyrate | Clostridiales.unclassified | -0.0519 | -0.0272 | 0.90673 | 0.9341 |
| gamma-Glutamyl-gamma-aminobutyrate | Clostridiales.Lachnospiraceae.unclassified.1 | -0.0520 | -0.0240 | 0.91789 | 0.9425 |
| gamma-Glutamyl-gamma-aminobutyrate | Bacteroidales.Porphyromonadaceae.Parabacteroides | -0.0526 | -0.0007 | 0.99744 | 0.9974 |
| (5-L-Glutamyl)-L-glutamine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.2036 | -0.4934 | 0.02303 | 0.0708 |
| L-Homocysteine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.0568 | 0.3225 | 0.15395 | 0.2386 |
| Dimethylglycine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.0751 | -0.3483 | 0.12174 | 0.1999 |
| L-Citrulline | Clostridiales.Ruminococcaceae.unclassified | 0.1660 | -0.4557 | 0.03789 | 0.0967 |
| L-Citrulline | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.1279 | -0.4141 | 0.06200 | 0.1329 |
| Spermidine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.3528 | 0.6206 | 0.00268 | 0.0194 |
| Spermine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.3591 | 0.6254 | 0.00243 | 0.0186 |
| 5-Guanidino-2-oxopentanoate | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.1341 | -0.4212 | 0.05724 | 0.1293 |
| Creatine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.4566 | 0.6955 | 0.00046 | 0.0092 |
| Creatine | Clostridiales.Mogibacteriaceae.unclassified | 0.2732 | 0.5564 | 0.00881 | 0.0417 |
| Creatine | Coriobacteriales.Coriobacteriaceae.Adlercreutzia | 0.2064 | 0.4960 | 0.02219 | 0.0708 |
| Creatine | Clostridiales.Ruminococcaceae.unclassified | 0.0117 | 0.2472 | 0.28004 | 0.3711 |
| Creatinine | Coriobacteriales.Coriobacteriaceae.Adlercreutzia | 0.3961 | 0.6529 | 0.00133 | 0.0156 |
| Creatinine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.1536 | 0.4427 | 0.04448 | 0.1063 |
| 4-Acetamidobutanoate | Turicibacterales.Turicibacteraceae.Turicibacter | 0.1353 | 0.4226 | 0.05635 | 0.1288 |
| 4-Acetamidobutanoate | Bacteroidales.S24.7.unclassified | 0.1043 | 0.3861 | 0.08383 | 0.1580 |
| 4-Acetamidobutanoate | Clostridiales.Mogibacteriaceae.unclassified | 0.0949 | -0.3744 | 0.09452 | 0.1676 |
| 4-Acetamidobutanoate | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.0684 | -0.3391 | 0.13259 | 0.2110 |
| Guanidinoacetate | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.0525 | 0.3160 | 0.16286 | 0.2493 |
| Pantothenate | Clostridiales.Ruminococcaceae.unclassified | 0.2209 | -0.5098 | 0.01824 | 0.0664 |
| Pantothenate | Turicibacterales.Turicibacteraceae.Turicibacter | 0.0765 | -0.3503 | 0.11954 | 0.1984 |
| Pantothenate | Clostridiales.Ruminococcaceae.Ruminococcus | 0.0502 | 0.3126 | 0.16773 | 0.2557 |
| Taurine | Bacteroidales.S24.7.unclassified | 0.5343 | -0.7467 | 0.00010 | 0.0058 |
| Taurine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.4361 | 0.6814 | 0.00067 | 0.0109 |
| Hypotaurine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.0998 | 0.3805 | 0.08881 | 0.1625 |
| L-Methionine S-oxide | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.5385 | -0.7494 | 0.00009 | 0.0058 |
| Indole | Lactobacillales.Lactobacillaceae.Lactobacillus | 0.2922 | 0.5723 | 0.00670 | 0.0362 |
| Indole | Clostridiales.Mogibacteriaceae.unclassified | 0.1790 | -0.4691 | 0.03193 | 0.0843 |
| Indole | Clostridiales.Ruminococcaceae.unclassified | 0.1616 | -0.4512 | 0.04009 | 0.0989 |
| Indole | Bacteroidales.S24.7.unclassified | 0.1251 | 0.4109 | 0.06424 | 0.1346 |
| Indole | Turicibacterales.Turicibacteraceae.Turicibacter | 0.1147 | 0.3987 | 0.07337 | 0.1477 |
| Indole | Clostridiales.Lachnospiraceae.unclassified.1 | 0.0414 | -0.2989 | 0.18810 | 0.2799 |
| Indole | Bacteroidales.Rikenellaceae.unclassified | 0.0164 | -0.2560 | 0.26263 | 0.3568 |
| Indole | Clostridiales.Ruminococcaceae.Anaerotruncus | -0.0027 | 0.2177 | 0.34316 | 0.4275 |

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| Indole | Bacteroidales.Porphyromonadaceae.Parabacteroides | -0.0375 | -0.1200 | 0.60434 | 0.6806 |
| Indole | Clostridiales.Lachnospiraceae.unclassified | -0.0465 | -0.0766 | 0.74135 | 0.8117 |
| Indole | Clostridiales.Lachnospiraceae.Coproccoccus | -0.0489 | 0.0598 | 0.79690 | 0.8514 |
| Indole | Clostridiales.unclassified.unclassified | -0.0499 | 0.0512 | 0.82567 | 0.8746 |
| Indole | Clostridiales.Ruminococcaceae.Ruminococcus | -0.0516 | 0.0315 | 0.89210 | 0.9267 |
| Indole-3-acetaldehyde | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.2073 | 0.4969 | 0.02193 | 0.0708 |
| Indole-3-acetate | Clostridiales.Mogibacteriaceae.unclassified | 0.4481 | -0.6897 | 0.00054 | 0.0097 |
| Indole-3-acetate | Bacteroidales.S24.7.unclassified | 0.3564 | 0.6234 | 0.00254 | 0.0190 |
| Indole-3-acetate | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.2880 | -0.5689 | 0.00712 | 0.0371 |
| Indoxyl | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.2682 | -0.5521 | 0.00947 | 0.0433 |
| L-Formylkynurenine | Clostridiales.Mogibacteriaceae.unclassified | 0.3546 | -0.6220 | 0.00261 | 0.0192 |
| Serotonin | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.2363 | 0.5239 | 0.01479 | 0.0578 |
| Glycerol 3-phosphate | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.0299 | 0.2799 | 0.21908 | 0.3112 |
| Ethanolamine phosphate | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.3720 | 0.6352 | 0.00198 | 0.0177 |
| Choline | Clostridiales.Mogibacteriaceae.unclassified | 0.3975 | 0.6539 | 0.00130 | 0.0156 |
| Choline | Bacteroidales.S24.7.unclassified | 0.3766 | -0.6386 | 0.00184 | 0.0172 |
| Choline | Clostridiales.Ruminococcaceae.unclassified | 0.2181 | 0.5072 | 0.01895 | 0.0674 |
| Choline | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.2045 | 0.4942 | 0.02277 | 0.0708 |
| L-Carnitine | Clostridiales.Mogibacteriaceae.unclassified | 0.2030 | -0.4928 | 0.02321 | 0.0708 |
| L-Carnitine | Bacteroidales.S24.7.unclassified | 0.2012 | 0.4911 | 0.02378 | 0.0708 |
| L-Carnitine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.1636 | -0.4532 | 0.03908 | 0.0987 |
| L-Carnitine | Clostridiales.unclassified.unclassified | 0.1188 | -0.4035 | 0.06968 | 0.1432 |
| L-Carnitine | Clostridiales.Ruminococcaceae.Anaerotruncus | 0.0427 | 0.3009 | 0.18503 | 0.2764 |
| L-Carnitine | Clostridiales.Lachnospiraceae.unclassified | -0.0065 | 0.2094 | 0.36233 | 0.4436 |
| L-Carnitine | Coriobacteriales.Coriobacteriaceae.Adlercreutzia | -0.0312 | -0.1428 | 0.53700 | 0.6121 |
| CAR 3:0 | Bacteroidales.S24.7.unclassified | 0.5021 | 0.7259 | 0.00020 | 0.0067 |
| CAR 3:0 | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.2948 | -0.5745 | 0.00646 | 0.0356 |
| CAR 3:0 | Clostridiales.Ruminococcaceae.unclassified | 0.2079 | -0.4975 | 0.02175 | 0.0708 |
| CAR 4:0 | Clostridiales.Mogibacteriaceae.unclassified | 0.5311 | -0.7447 | 0.00011 | 0.0058 |
| CAR 4:0 | Bacteroidales.S24.7.unclassified | 0.3656 | 0.6303 | 0.00219 | 0.0183 |
| CAR 4:0 | Clostridiales.Ruminococcaceae.unclassified | 0.1900 | -0.4801 | 0.02762 | 0.0783 |
| CAR 4:0;O | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.4561 | 0.6952 | 0.00047 | 0.0092 |
| CAR 4:0;O | Bacteroidales.S24.7.unclassified | 0.3955 | -0.6525 | 0.00135 | 0.0156 |
| CAR 5:0 | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.6130 | -0.7952 | 0.00002 | 0.0031 |
| CAR 5:0 | Bacteroidales.S24.7.unclassified | 0.5121 | 0.7325 | 0.00016 | 0.0066 |
| CAR 5:0;O | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.0310 | 0.2819 | 0.21579 | 0.3077 |
| CAR 6:0 | Clostridiales.Mogibacteriaceae.unclassified | 0.3940 | -0.6514 | 0.00138 | 0.0156 |
| CAR 6:0 | Clostridiales.Ruminococcaceae.unclassified | 0.2697 | -0.5534 | 0.00926 | 0.0429 |
| CAR 6:0 | Bacteroidales.S24.7.unclassified | 0.1606 | 0.4501 | 0.04061 | 0.0989 |
| CAR 6:1;O2 | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.4233 | 0.6724 | 0.00084 | 0.0126 |
| CAR 8:0 | Clostridiales.Ruminococcaceae.unclassified | 0.1809 | -0.4710 | 0.03116 | 0.0835 |
| CAR 8:0 | Turicibacteriales.Turicibacteraceae.Turicibacter | 0.0726 | -0.3450 | 0.12564 | 0.2031 |
| CAR 8:0 | Bacteroidales.Porphyromonadaceae.Parabacteroides | -0.0038 | 0.2153 | 0.34853 | 0.4328 |
| CAR 8:1 | Clostridiales.Ruminococcaceae.unclassified | 0.6420 | -0.8123 | 0.00001 | 0.0029 |
| CAR 8:1 | Clostridiales.Mogibacteriaceae.unclassified | 0.1607 | -0.4501 | 0.04060 | 0.0989 |
| CAR 8:1 | Bacteroidales.S24.7.unclassified | 0.1021 | 0.3834 | 0.08625 | 0.1602 |
| CAR 8:1 | Clostridiales.Ruminococcaceae.Anaerotruncus | 0.0653 | 0.3346 | 0.13813 | 0.2186 |
| CAR 8:1 | Lactobacillales.Lactobacillaceae.Lactobacillus | -0.0075 | 0.2070 | 0.36806 | 0.4481 |
| CAR 8:1 | Clostridiales.Lachnospiraceae.Coproccoccus | -0.0330 | 0.1366 | 0.55483 | 0.6286 |
| CAR 8:1 | Turicibacteriales.Turicibacteraceae.Turicibacter | -0.0455 | 0.0822 | 0.72314 | 0.7976 |
| CAR 8:1 | Clostridiales.Ruminococcaceae.Ruminococcus | -0.0468 | 0.0745 | 0.74812 | 0.8137 |
| CAR 10:0 | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.1244 | 0.4101 | 0.06480 | 0.1350 |
| CAR 10:1 | Clostridiales.Ruminococcaceae.unclassified | 0.4123 | -0.6646 | 0.00101 | 0.0141 |
| CAR 10:1 | Bacteroidales.S24.7.unclassified | 0.0493 | 0.3112 | 0.16977 | 0.2568 |
| CAR 10:1 | Clostridiales.Lachnospiraceae.unclassified | 0.0323 | -0.2840 | 0.21219 | 0.3047 |
| CAR 10:1 | Clostridiales.Lachnospiraceae.Coproccoccus | 0.0193 | 0.2613 | 0.25248 | 0.3468 |
| CAR 10:1 | Clostridiales.Mogibacteriaceae.unclassified | 0.0172 | -0.2576 | 0.25956 | 0.3548 |
| CAR 10:1 | Clostridiales.Ruminococcaceae.Anaerotruncus | 0.0038 | 0.2315 | 0.31273 | 0.3997 |
| CAR 10:1 | Turicibacteriales.Turicibacteraceae.Turicibacter | -0.0438 | -0.0914 | 0.69360 | 0.7673 |
| CAR 10:1 | Coriobacteriales.Coriobacteriaceae.Adlercreutzia | -0.0518 | 0.0281 | 0.90373 | 0.9336 |
| CAR 10:1 | Lactobacillales.Lactobacillaceae.Lactobacillus | -0.0518 | 0.0282 | 0.90347 | 0.9336 |
| CAR 10:1 | Bacteroidales.Rikenellaceae.unclassified | -0.0523 | 0.0180 | 0.93818 | 0.9509 |
| CAR 12:0 | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.1515 | 0.4403 | 0.04575 | 0.1086 |
| CAR 12:1 | Clostridiales.Ruminococcaceae.unclassified | 0.2376 | -0.5250 | 0.01453 | 0.0573 |
| CAR 14:0 | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.1705 | 0.4604 | 0.03569 | 0.0917 |
| CAR 14:1 | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.0915 | 0.3700 | 0.09875 | 0.1723 |
| CAR 16:0 | Coriobacteriales.Coriobacteriaceae.Adlercreutzia | 0.1878 | 0.4780 | 0.02841 | 0.0783 |
| CAR 16:0 | Bacteroidales.S24.7.unclassified | 0.1802 | -0.4703 | 0.03142 | 0.0836 |
| CAR 16:0 | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.1326 | 0.4195 | 0.05832 | 0.1302 |
| CAR 16:1 | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.1053 | 0.3874 | 0.08277 | 0.1576 |

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| CAR 18:0 | Coriobacteriales.Coriobacteriaceae.Adlercreutzia | 0.1867 | 0.4768 | 0.02885 | 0.0784 |
| CAR 18:1 | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.1732 | 0.4632 | 0.03445 | 0.0891 |
| CAR 18:1 | Coriobacteriales.Coriobacteriaceae.Adlercreutzia | 0.1494 | 0.4381 | 0.04697 | 0.1108 |
| Nonanoic acid | Clostridiales.Mogibacteriaceae.unclassified | 0.1781 | -0.4682 | 0.03232 | 0.0848 |
| Nonanoic acid | Clostridiales.unclassified.unclassified | 0.0951 | -0.3747 | 0.09425 | 0.1676 |
| Nonanoic acid | Bacteroidales.S24.7.unclassified | 0.0730 | 0.3454 | 0.12513 | 0.2031 |
| Nonanoic acid | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.0622 | -0.3303 | 0.14369 | 0.2261 |
| Nonanoic acid | Clostridiales.Lachnospiraceae.unclassified.1 | 0.0591 | -0.3258 | 0.14950 | 0.2326 |
| Nonanoic acid | Lactobacillales.Lactobacillaceae.Lactobacillus | 0.0358 | -0.2898 | 0.20254 | 0.2978 |
| Nonanoic acid | Clostridiales.Ruminococcaceae.Anaerotruncus | 0.0346 | 0.2878 | 0.20582 | 0.2985 |
| Nonanoic acid | Clostridiales.Ruminococcaceae.unclassified | 0.0171 | -0.2573 | 0.26016 | 0.3548 |
| Nonanoic acid | Turicibacteriales.Turicibacteraceae.Turicibacter | -0.0047 | 0.2135 | 0.35283 | 0.4352 |
| Nonanoic acid | Clostridiales.Lachnospiraceae.unclassified | -0.0283 | -0.1521 | 0.51046 | 0.5854 |
| Nonanoic acid | Bacteroidales.Rikenellaceae.unclassified | -0.0492 | -0.0572 | 0.80534 | 0.8573 |
| Nonanoic acid | Clostridiales.Ruminococcaceae.Ruminococcus | -0.0499 | -0.0505 | 0.82797 | 0.8746 |
| Decanoic acid | Clostridiales.Mogibacteriaceae.unclassified | 0.2055 | -0.4952 | 0.02246 | 0.0708 |
| Dodecanoic acid | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.2916 | 0.5719 | 0.00676 | 0.0362 |
| Tetradecanoic acid | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.2109 | 0.5004 | 0.02089 | 0.0708 |
| Stearic acid | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.0990 | 0.3796 | 0.08967 | 0.1632 |
| Stearic acid | Coriobacteriales.Coriobacteriaceae.Adlercreutzia | 0.0813 | 0.3567 | 0.11243 | 0.1891 |
| Stearic acid | Clostridiales.Ruminococcaceae.unclassified | 0.0683 | -0.3390 | 0.13281 | 0.2110 |
| Myristoleic acid | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.1032 | 0.3848 | 0.08500 | 0.1594 |
| Hexadecenoic acid | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.0051 | 0.2341 | 0.30710 | 0.3957 |
| Oleic acid | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.2725 | 0.5558 | 0.00890 | 0.0417 |
| Linoleate | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.1118 | 0.3953 | 0.07616 | 0.1519 |
| Arachidonic acid | Bacteroidales.S24.7.unclassified | 0.3695 | -0.6332 | 0.00206 | 0.0180 |
| Arachidonic acid | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.3088 | 0.5860 | 0.00525 | 0.0317 |
| Eicosapentaenoic acid | Bacteroidales.S24.7.unclassified | 0.4246 | -0.6733 | 0.00082 | 0.0126 |
| Eicosapentaenoic acid | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.3065 | 0.5841 | 0.00543 | 0.0323 |
| Docosahexaenoic acid | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.2125 | 0.5018 | 0.02045 | 0.0708 |
| Docosapentaenoic acid | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.2614 | 0.5462 | 0.01042 | 0.0444 |
| Cholic acid | Lactobacillales.Lactobacillaceae.Lactobacillus | 0.1349 | 0.4220 | 0.05669 | 0.1288 |
| Cholic acid | Clostridiales.Ruminococcaceae.unclassified | 0.1310 | -0.4176 | 0.05959 | 0.1307 |
| Cholic acid | Turicibacteriales.Turicibacteraceae.Turicibacter | 0.1112 | 0.3945 | 0.07676 | 0.1523 |
| Cholic acid | Clostridiales.Mogibacteriaceae.unclassified | 0.1048 | -0.3867 | 0.08331 | 0.1578 |
| Cholic acid | Clostridiales.Lachnospiraceae.unclassified.1 | 0.0603 | -0.3276 | 0.14719 | 0.2300 |
| Cholic acid | Bacteroidales.Porphyromonadaceae.Parabacteroides | -0.0214 | 0.1723 | 0.45506 | 0.5300 |
| Cholic acid | Clostridiales.Ruminococcaceae.Ruminococcus | -0.0465 | -0.0763 | 0.74241 | 0.8117 |
| Cholic acid | Clostridiales.Ruminococcaceae.Anaerotruncus | -0.0521 | 0.0227 | 0.92236 | 0.9425 |
| Taurocholate | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.1322 | 0.4190 | 0.05867 | 0.1302 |
| Taurochenodeoxycholate | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.1095 | 0.3925 | 0.07842 | 0.1548 |
| Deoxycholic acid | Clostridiales.Mogibacteriaceae.unclassified | 0.3745 | -0.6370 | 0.00190 | 0.0174 |
| Deoxycholic acid | Turicibacteriales.Turicibacteraceae.Turicibacter | 0.2998 | 0.5786 | 0.00600 | 0.0339 |
| Deoxycholic acid | Coriobacteriales.Coriobacteriaceae.Adlercreutzia | 0.1552 | -0.4444 | 0.04357 | 0.1054 |
| Deoxycholic acid | Clostridiales.Ruminococcaceae.unclassified | 0.1020 | -0.3833 | 0.08629 | 0.1602 |
| 13(S)-HODE | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.0112 | 0.2462 | 0.28205 | 0.3711 |
| 9(S)-HODE | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.1265 | 0.4126 | 0.06307 | 0.1336 |
| Triacanthine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.1186 | 0.4033 | 0.06988 | 0.1432 |
| 2-Methyleneglutarate | Clostridiales.Mogibacteriaceae.unclassified | 0.3106 | -0.5874 | 0.00511 | 0.0314 |
| 2-Methyleneglutarate | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.2104 | -0.4999 | 0.02102 | 0.0708 |
| 2-Methyleneglutarate | Clostridiales.Ruminococcaceae.unclassified | 0.0222 | -0.2667 | 0.24257 | 0.3382 |
| 6-Lactoyltetrahydropterin | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.2379 | -0.5254 | 0.01446 | 0.0573 |
| 6-Lactoyltetrahydropterin | Clostridiales.Ruminococcaceae.unclassified | 0.0894 | -0.3673 | 0.10140 | 0.1736 |
| Leucocyanidin | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.0283 | 0.2773 | 0.22369 | 0.3154 |
| Methylenediurea | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.3906 | 0.6489 | 0.00146 | 0.0157 |
| Methylenediurea | Bacteroidales.S24.7.unclassified | 0.3617 | -0.6274 | 0.00233 | 0.0183 |
| Methylenediurea | Coriobacteriales.Coriobacteriaceae.Adlercreutzia | 0.2896 | 0.5702 | 0.00696 | 0.0368 |
| Methylenediurea | Clostridiales.Mogibacteriaceae.unclassified | 0.2750 | 0.5579 | 0.00859 | 0.0413 |
| cis-p-Coumarate | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.5900 | -0.7813 | 0.00003 | 0.0036 |
| N6-Methyl-L-lysine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.1072 | -0.3897 | 0.08080 | 0.1562 |
| D-Glucono-1,5-lactone | Clostridiales.unclassified.unclassified | 0.3615 | -0.6272 | 0.00234 | 0.0183 |
| D-Glucono-1,5-lactone | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.3345 | -0.6065 | 0.00356 | 0.0238 |
| D-Glucono-1,5-lactone | Clostridiales.Mogibacteriaceae.unclassified | 0.2419 | -0.5290 | 0.01368 | 0.0554 |
| D-Glucono-1,5-lactone | Clostridiales.Lachnospiraceae.Coprococcus | 0.0349 | -0.2884 | 0.20491 | 0.2985 |
| D-Glucono-1,5-lactone | Lactobacillales.Lactobacillaceae.Lactobacillus | 0.0071 | 0.2382 | 0.29842 | 0.3886 |
| D-Glucono-1,5-lactone | Coriobacteriales.Coriobacteriaceae.Adlercreutzia | -0.0106 | -0.1999 | 0.38495 | 0.4657 |
| D-Glucono-1,5-lactone | Clostridiales.Ruminococcaceae.unclassified | -0.0435 | -0.0933 | 0.68742 | 0.7649 |
| D-Glucono-1,5-lactone | Bacteroidales.Rikenellaceae.unclassified | -0.0508 | 0.0412 | 0.85922 | 0.9000 |
| Catechin | Bacteroidales.S24.7.unclassified | 0.1968 | 0.4868 | 0.02522 | 0.0739 |
| Pyridoxamine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.4777 | -0.7098 | 0.00031 | 0.0090 |

| | | | | | |
|----------------------------------|--|---------|---------|---------|---------------|
| N-Amidino-L-aspartate | Clostridiales.Ruminococcaceae.Ruminococcus | 0.3653 | 0.6301 | 0.00220 | 0.0183 |
| N-Amidino-L-aspartate | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.1536 | -0.4426 | 0.04451 | 0.1063 |
| N-Amidino-L-aspartate | Clostridiales.Mogibacteriaceae.unclassified | 0.0089 | -0.2417 | 0.29123 | 0.3805 |
| N-Amidino-L-aspartate | Clostridiales.Ruminococcaceae.Anaerotruncus | -0.0111 | -0.1987 | 0.38792 | 0.4662 |
| N-Acyl-D-glutamate | Bacteroidales.S24.7.unclassified | 0.0540 | -0.3182 | 0.15975 | 0.2455 |
| 6-Carboxyhexanoate | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.2239 | 0.5126 | 0.01751 | 0.0644 |
| 7,8-Dihydroxycoumarin | Clostridiales.Mogibacteriaceae.unclassified | 0.3039 | -0.5820 | 0.00564 | 0.0326 |
| 7,8-Dihydroxycoumarin | Bacteroidales.S24.7.unclassified | 0.2079 | 0.4975 | 0.02176 | 0.0708 |
| 10-Hydroxydecanoic acid | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.2756 | 0.5584 | 0.00852 | 0.0413 |
| 2-Oxo-7-methylthioheptanoic acid | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.3839 | -0.6440 | 0.00163 | 0.0160 |
| 2-Oxo-7-methylthioheptanoic acid | Clostridiales.Lachnospiraceae.unclassified.1 | 0.1883 | -0.4784 | 0.02824 | 0.0783 |
| 2-Oxo-7-methylthioheptanoic acid | Clostridiales.Mogibacteriaceae.unclassified | 0.0965 | -0.3764 | 0.09258 | 0.1669 |
| 2-Oxo-7-methylthioheptanoic acid | Clostridiales.Ruminococcaceae.Ruminococcus | 0.0803 | 0.3553 | 0.11397 | 0.1908 |
| 2-Oxo-7-methylthioheptanoic acid | Bacteroidales.S24.7.unclassified | 0.0749 | 0.3481 | 0.12206 | 0.1999 |
| 2-Oxo-7-methylthioheptanoic acid | Bacteroidales.Rikenellaceae.unclassified | 0.0345 | 0.2876 | 0.20613 | 0.2985 |
| 2-Oxo-7-methylthioheptanoic acid | Clostridiales.Ruminococcaceae.unclassified | -0.0026 | -0.2179 | 0.34265 | 0.4275 |
| 2-Oxo-7-methylthioheptanoic acid | Clostridiales.Lachnospiraceae.Coproccoccus | -0.0273 | 0.1552 | 0.50181 | 0.5790 |
| 2-Oxo-7-methylthioheptanoic acid | Coriobacteriales.Coriobacteriaceae.Adlercreutzia | -0.0468 | -0.0744 | 0.74864 | 0.8137 |
| 2-Oxo-7-methylthioheptanoic acid | Turicibacterales.Turicibacteraceae.Turicibacter | -0.0524 | 0.0154 | 0.94709 | 0.9547 |
| L-Homocitrulline | Bacteroidales.S24.7.unclassified | 0.2821 | 0.5639 | 0.00776 | 0.0393 |
| L-Homocitrulline | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.2794 | -0.5616 | 0.00806 | 0.0403 |
| Homomethionine | Coriobacteriales.Coriobacteriaceae.Adlercreutzia | 0.3198 | 0.5948 | 0.00445 | 0.0288 |
| Homomethionine | Bacteroidales.S24.7.unclassified | 0.2992 | -0.5781 | 0.00605 | 0.0339 |
| Homomethionine | Bacteroidales.Porphyromonadaceae.Parabacteroides | 0.2623 | 0.5470 | 0.01029 | 0.0444 |
| Indole-3-carbinol | Bacteroidales.Rikenellaceae.unclassified | 0.1358 | 0.4231 | 0.05599 | 0.1288 |
| Indole-3-carbinol | Clostridiales.Mogibacteriaceae.unclassified | 0.0229 | 0.2679 | 0.24039 | 0.3364 |
| Indole-3-carbinol | Bacteroidales.S24.7.unclassified | 0.0001 | -0.2239 | 0.32930 | 0.4158 |
| Indole-3-carbinol | Clostridiales.Ruminococcaceae.unclassified | -0.0066 | -0.2090 | 0.36314 | 0.4436 |

p values determined by ANOVA and FDR correction for adjusted (adj.) *p* values applied using the Benjamini-Hochberg procedure.

Bolded *p*adj values are significant (*p* <0.05).

n = 7 GF-CH-O, n = 14 GF-WD-O.

CAR, carnitine.

Table S8. Analysis of hepatic steatosis and gene expression in AHR^{fl/fl} x LysMCre mice.

| | Unchallenged mice | | | | WD-challenged mice | | | |
|----------------------------|-------------------|------------|-----------|------------|--------------------|------------|------------|------------|
| AHR: | WT | KD | WT | KD | WT | KD | WT | KD |
| Maternal diet: | CH | CH | WD | WD | CH | CH | WD | WD |
| Triglycerides (mg/g liver) | 4.2 ± 0.4 | 3.3 ± 0.2* | 5.9 ± 0.8 | 5.2 ± 0.4& | 14.8 ± 1.6 | 15.1 ± 2.0 | 21.0 ± 3.3 | 18.9 ± 2.3 |
| Hepatic gene expression | | | | | | | | |
| <i>Scd1</i> | 1.0 ± 0.2 | 1.1 ± 0.2 | 1.1 ± 0.2 | 0.9 ± 0.2 | 2.7 ± 0.5 | 3.2 ± 0.7 | 4.3 ± 0.7 | 3.3 ± 0.5 |
| <i>Srebp1c</i> | 1.0 ± 0.1 | 1.4 ± 0.2 | 1.2 ± 0.2 | 0.8 ± 0.1& | 2.6 ± 0.5 | 3.1 ± 0.6 | 3.5 ± 0.4 | 3.7 ± 0.7 |
| <i>Acc1</i> | 1.0 ± 0.1 | 1.2 ± 0.1 | 1.1 ± 0.2 | 0.9 ± 0.1& | 1.3 ± 0.3 | 1.5 ± 0.3 | 1.7 ± 0.1 | 1.4 ± 0.1 |
| <i>Ii1b</i> | 1.0 ± 0.2 | 0.9 ± 0.2 | 1.9 ± 0.4 | 1.9 ± 0.3& | 1.7 ± 0.2 | 1.0 ± 0.1* | 2.2 ± 0.5 | 1.6 ± 0.3 |
| <i>Acta2</i> | 1.0 ± 0.1 | 1.3 ± 0.1 | 1.3 ± 0.2 | 1.3 ± 0.1 | 2.0 ± 0.3 | 1.8 ± 0.3 | 3.4 ± 0.6* | 2.0 ± 0.4 |
| <i>Col1a1</i> | 1.0 ± 0.1 | 1.4 ± 0.3 | 0.8 ± 0.1 | 0.9 ± 0.2 | 0.9 ± 0.2 | 1.6 ± 0.3 | 2.9 ± 0.9 | 1.5 ± 0.2 |

Data are represented as mean ± SEM. qPCR data are normalized to *Rn18s* and AHR^{fl/fl} x LysMCre⁻ CH-CH.

n = 7-8 per group. **p* < 0.05 versus AHR WT/maternal CH group, [&]*p* < 0.5 versus AHR KD/maternal CH group by Student's *t* test.

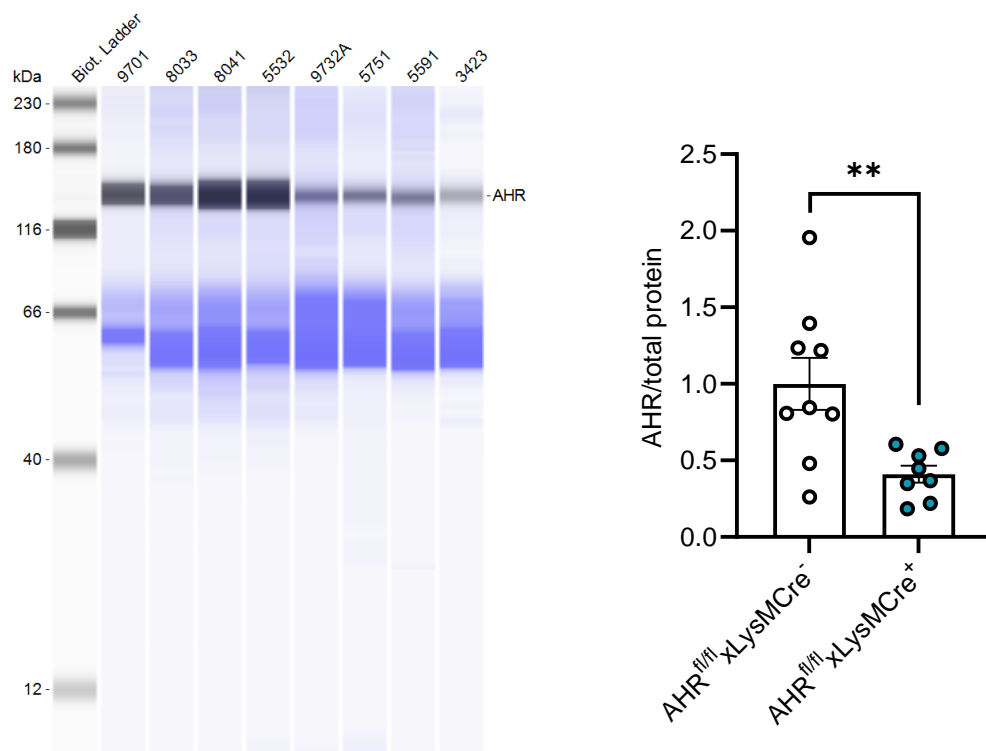


Figure S1. Verification of knockdown of AHR protein expression in AHR^{fl/fl} x LysMCre liver macrophages. Representative Simple Western blot using the Jess Simple Western system with AHR and the Protein Normalization module (blue shows total protein) and AHR quantitation normalized to total protein. n = 8-9. ***p* < 0.01 by Student's *t* test.

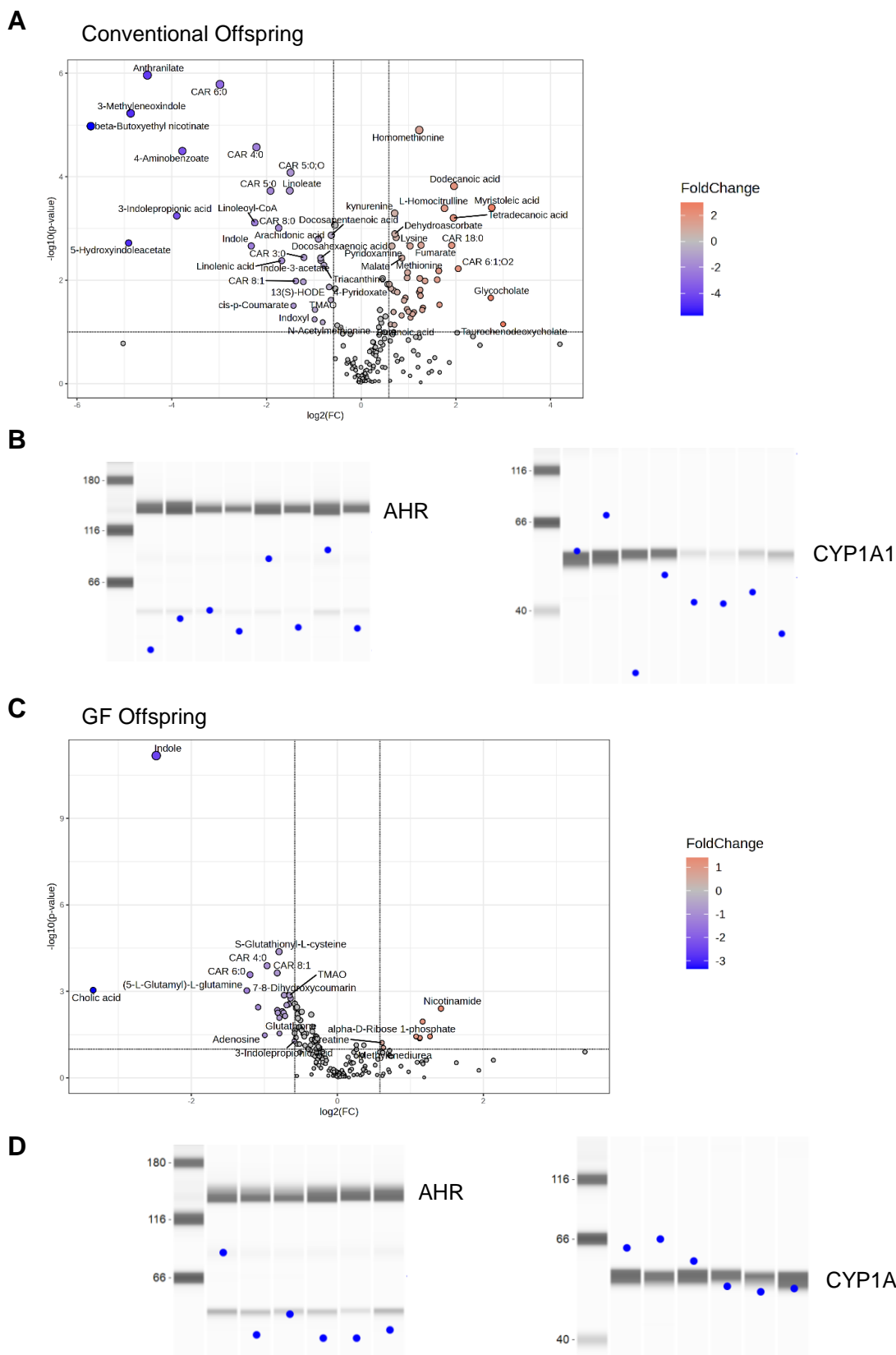
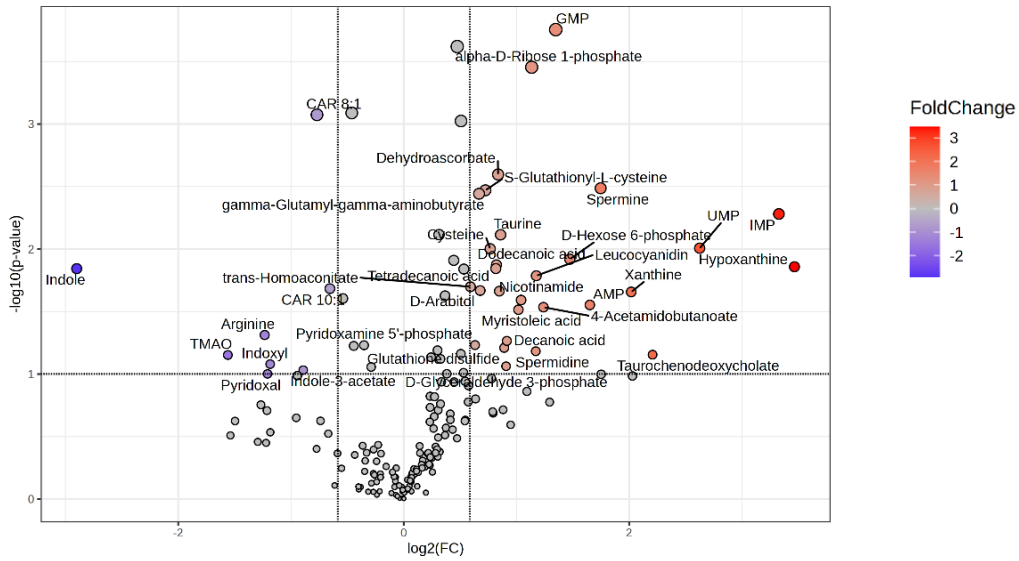


Figure S2. **(A)** Volcano plot analysis of metabolites from untargeted metabolomics in conventional weanlings. **(B)** Western blot analysis of AHR and CYP1A1 in conventional weanlings showing total protein normalization in Simple Western system. Blue dots represent total protein amount; lower blue dots have lower total protein. **(C)** Volcano plot analysis of metabolites from untargeted metabolomics in GF offspring. **(D)** Western blot analysis of AHR and CYP1A1 in GF weanlings showing total protein normalization in Simple Western system.

A



B

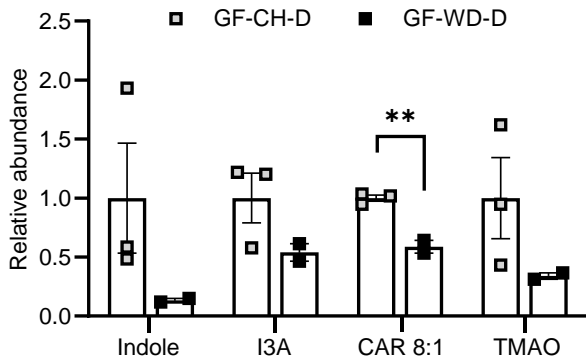
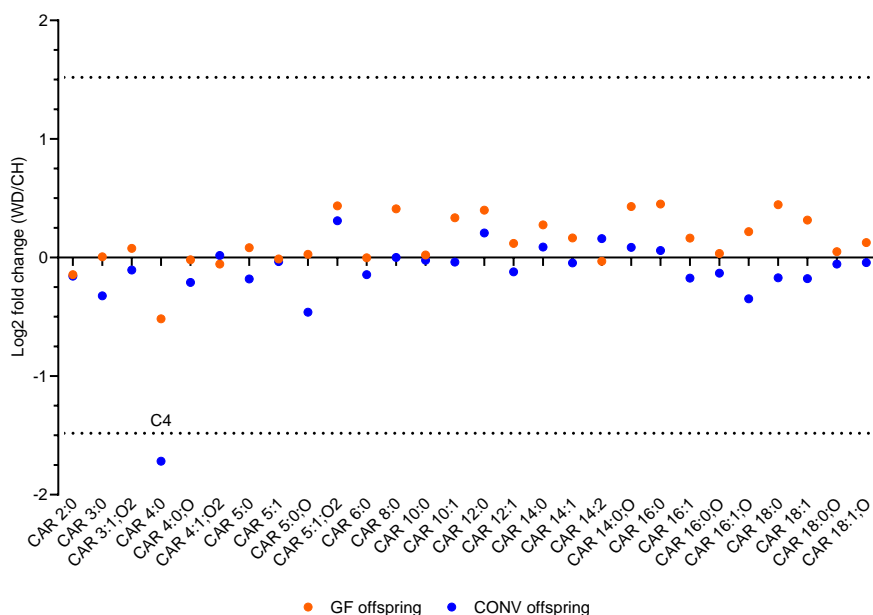


Figure S3. **(A)** Volcano plot analysis of metabolites from untargeted metabolomics in GF dams. **(B)** Relative abundance of indole, indole-3-acetate (I3A), 2-octenoylcarnitine (CAR 8:1), and trimethylamine N-oxide (TMAO) in GF dams. ** $p < 0.01$ by Student's t test.

A Liver



B Serum

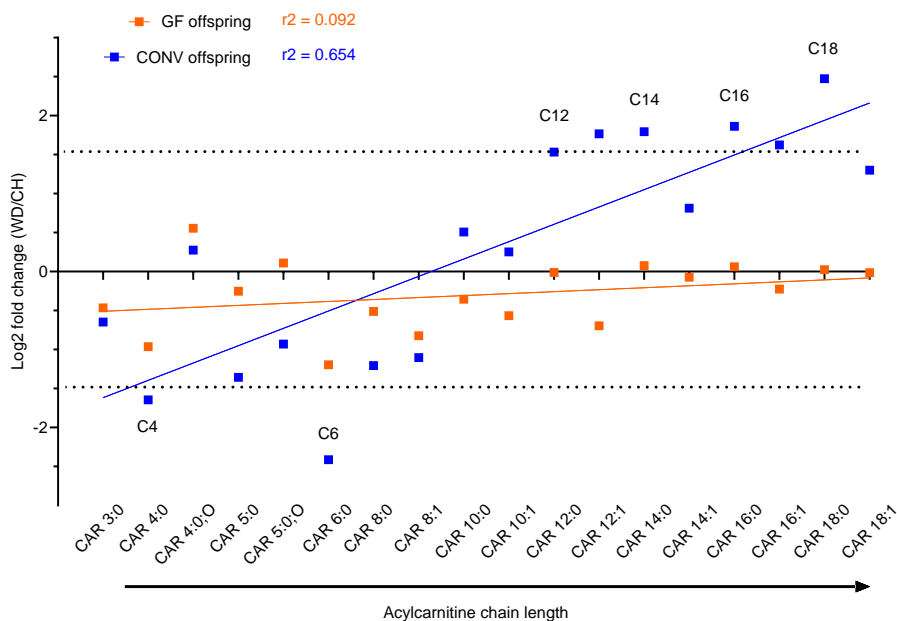


Figure S4. Analyses of acylcarnitines of germ-free (GF) offspring and conventional (CONV) weanlings. **(A)** Scatter plot of the fold change (WD/CH) of hepatic acylcarnitines (CAR) using targeted acylcarnitine LC-MS/MS analysis in CH and WD offspring for each group. $n = 8$ GF-CH-O, $n = 15$ GF-WD-O, $n = 4$ wCH-O, $n = 6$ wWD-O. **(B)** Scatter plot of the fold change of serum acylcarnitines using untargeted metabolomics in CH offspring vs. WD offspring for each group with nonlinear regression analysis. $n = 8$ GF-CH-O, $n = 15$ GF-WD-O, $n = 6$ wCH-O, $n = 6$ wWD-O.

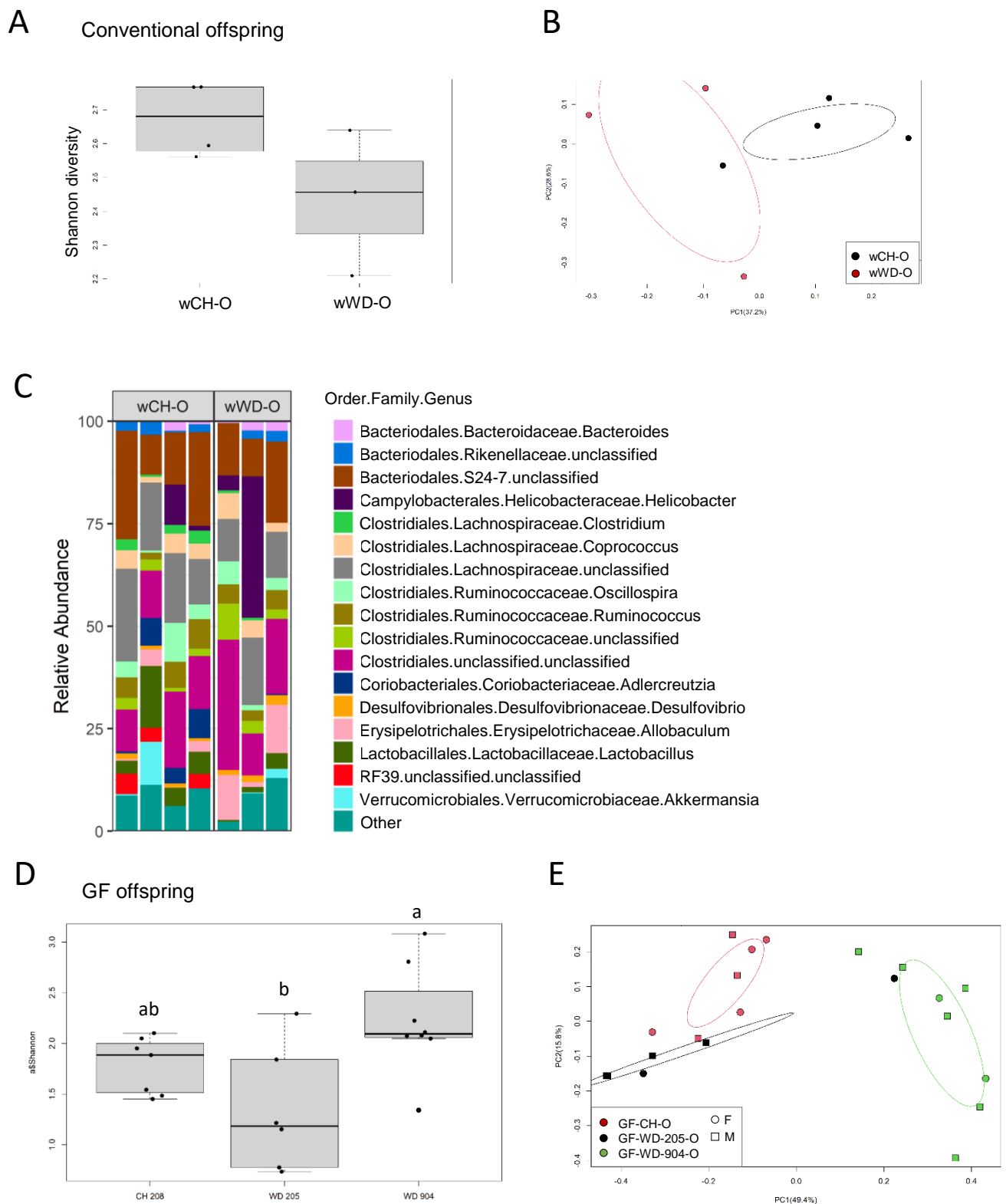


Figure S5. Diversity analyses of 16S sequencing results in conventional and GF weanlings. Conventionally raised PND21 offspring alpha (Shannon index; **A**) and beta (pairwise PERMANOVA; **B**) diversity. (**C**) Seventeen most abundant genera in conventionally raised PND21 offspring. $n = 6$ wCH-O, $n = 3$ wWD-O. GF offspring alpha (**D**) and beta (**E**) diversity. $n = 7$ GF-CH-O, $n = 6$ GF-WD-205-O, and $n = 8$ GF-WD-904-O.

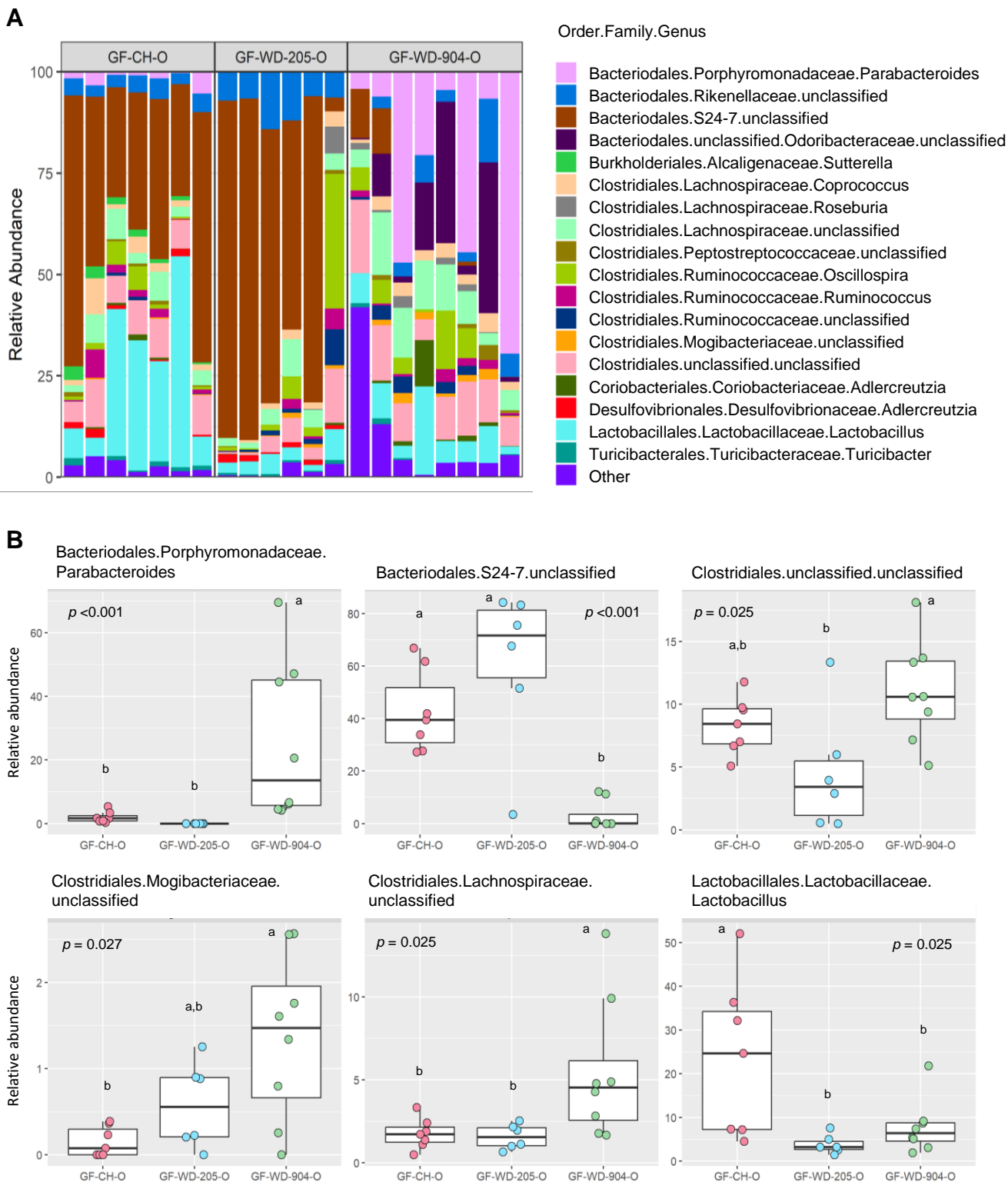


Figure S6. Early microbial dysbiosis due to maternal WD alters gut microbiota composition in GF offspring. **(A)** Twenty most abundant genera in germ-free (GF) offspring. GF-WD offspring were split into two groups (GF-WD-205-O and GF-WD-904-O). **(B)** Relative abundance of significantly different genera between groups. $n = 7$ GF-CH-O, $n = 6$ GF-WD-205-O, and $n = 8$ GF-WD-904-O. ANOVA followed by Tukey's HSD was used to test for differences between groups; different letters above the box plots indicate a statistical difference between groups after FDR correction ($p < 0.05$).