

Table S1: The list of significantly altered lipids with >5 folds change.

| Lipid | FC | log2(FC) | raw.pval | LOG10(p) |
|----------------|----------|----------|----------|----------|
| FA 22:6 | 26.241 | 4.7137 | 1.65E-08 | 7.7812 |
| PG (22:6/22:6) | 8.9811 | 3.1669 | 3.22E-07 | 6.4926 |
| TAG (56:8) | 158.79 | 7.3109 | 3.67E-07 | 6.435 |
| TAG (58:8) | 156.16 | 7.2869 | 4.94E-07 | 6.3063 |
| TAG (58:9) | 635.42 | 9.3116 | 5.00E-07 | 6.3009 |
| TAG (58:10) | 1387.1 | 10.438 | 5.56E-07 | 6.2549 |
| PG (18:1/18:1) | 0.059104 | -4.0806 | 6.51E-07 | 6.1862 |
| PG (18:1/22:6) | 0.059127 | -4.08 | 6.67E-07 | 6.1762 |
| TAG (60:12) | 1811.4 | 10.823 | 9.07E-07 | 6.0425 |
| TAG (56:7) | 88.974 | 6.4753 | 1.28E-06 | 5.8912 |
| TAG (62:13) | 1959.5 | 10.936 | 1.44E-06 | 5.8414 |
| TAG (62:14) | 2415 | 11.238 | 1.67E-06 | 5.7775 |
| TAG (60:13) | 2807 | 11.455 | 2.15E-06 | 5.6667 |
| TAG (54:6) | 40.752 | 5.3488 | 3.10E-06 | 5.5085 |
| TAG (66:18) | 2629.9 | 11.361 | 5.82E-06 | 5.235 |
| TAG (54:4) | 14.244 | 3.8323 | 1.21E-05 | 4.9175 |
| TAG (62:12) | 1320.6 | 10.367 | 1.60E-05 | 4.7961 |
| TAG (56:16) | 6789.1 | 12.729 | 2.44E-05 | 4.6125 |
| TAG (56:6) | 40.322 | 5.3335 | 2.50E-05 | 4.6028 |
| TAG (58:7) | 95.44 | 6.5765 | 4.72E-05 | 4.3264 |
| TAG (62:15) | 52887 | 15.691 | 5.64E-05 | 4.2491 |
| TAG (60:8) | 246.71 | 7.9467 | 5.74E-05 | 4.2413 |
| CL (68:2) | 46.307 | 5.5332 | 9.18E-05 | 4.0374 |
| 12DHAHOA | 22387 | 14.45 | 9.98E-05 | 4.0009 |
| CL (64:0) | 29.952 | 4.9046 | 0.000101 | 3.9976 |
| TAG (64:17) | 85901 | 16.39 | 0.000113 | 3.9474 |
| TAG (52:2) | 6.0159 | 2.5888 | 0.000153 | 3.8147 |
| TAG (58:6) | 40.42 | 5.337 | 0.000162 | 3.7909 |
| CL (76:12) | 358.71 | 8.4867 | 0.000184 | 3.7361 |
| TAG (54:3) | 7.5426 | 2.9151 | 0.00021 | 3.6777 |
| TAG (60:7) | 60.754 | 5.9249 | 0.00024 | 3.6194 |
| TAG (58:13) | 103200 | 16.655 | 0.000324 | 3.4896 |
| TAG (62:8) | 326.68 | 8.3517 | 0.000327 | 3.4857 |
| TAG (53:2) | 8.2242 | 3.0399 | 0.000434 | 3.3628 |
| TAG (52:1) | 9.9042 | 3.308 | 0.000454 | 3.3428 |
| TAG (56:12) | 31812 | 14.957 | 0.000457 | 3.3406 |
| TAG (55:3) | 7.7314 | 2.9507 | 0.000585 | 3.233 |
| TAG (54:2) | 9.3769 | 3.2291 | 0.000585 | 3.233 |
| TAG (62:7) | 113.2 | 6.8227 | 0.000648 | 3.1887 |
| TAG (64:8) | 594.63 | 9.2158 | 0.000695 | 3.1583 |
| TAG (56:3) | 7.866 | 2.9756 | 0.000954 | 3.0206 |
| TAG (54:1) | 9.2226 | 3.2052 | 0.00102 | 2.9915 |
| TAG (58:2) | 10.901 | 3.4463 | 0.001313 | 2.8817 |
| TAG (56:2) | 8.1229 | 3.022 | 0.00144 | 2.8416 |
| TAG (60:3) | 10.615 | 3.408 | 0.001455 | 2.8371 |
| TAG (58:3) | 8.8447 | 3.1448 | 0.001643 | 2.7844 |

Table S2: The list of lipid metabolites with their loading scores corresponds to OPLSDA plot.

| Lipid | p[1] | p(corr)[1] | Lipid | p[1] | p(corr)[1] |
|-----------------|-----------|------------|----------------|-----------|------------|
| PG (18:1/18:1) | 22.67 | 0.99 | TAG (52:1) | -6558.30 | -0.91 |
| PG (18:1/22:6) | 22.66 | 0.99 | TAG (56:12) | -3714.80 | -0.91 |
| PE (18:1/22:5) | 49.73 | 0.97 | TAG (53:2) | -1136.60 | -0.91 |
| PI (18:0/20:2) | 31.64 | 0.97 | 12-DHAHOA | -121.46 | -0.92 |
| PI (18:1/20:4) | 53.15 | 0.96 | TAG (62:8) | -3178.00 | -0.92 |
| PE (16:0/20:4) | 57.35 | 0.95 | TAG (58:13) | -2205.40 | -0.92 |
| PE (16:0/18:1) | 39.42 | 0.95 | TAG (60:7) | -5222.10 | -0.92 |
| PI (16:1/18:1) | 8.42 | 0.95 | TAG (54:3) | -10409.00 | -0.93 |
| PE (18:1/20:4) | 173.39 | 0.94 | PE (18:1/22:6) | -176.55 | -0.93 |
| PI (18:0/18:1) | 19.56 | 0.94 | TAG (58:6) | -3730.80 | -0.93 |
| PI (16:0/20:4) | 15.87 | 0.94 | TAG (52:2) | -9051.80 | -0.93 |
| PI (18:0/22:4) | 8.58 | 0.94 | TAG (50:1) | -3010.40 | -0.93 |
| PE (18:0/20:4) | 255.58 | 0.93 | FA 18:3 | -5.67 | -0.93 |
| PS (18:0/22:5) | 34.25 | 0.91 | TAG (64:17) | -2642.40 | -0.94 |
| PE (16:1/18:1) | 40.00 | 0.91 | TAG (62:15) | -5834.10 | -0.95 |
| PE (18:0/20:3) | 13.36 | 0.90 | TAG (60:8) | -5196.20 | -0.95 |
| PE (18:0/18:1) | 32.96 | 0.90 | TAG (58:7) | -11198.00 | -0.95 |
| LPE-N (FA 18:1) | 163.06 | 0.88 | TAG (56:16) | -6438.50 | -0.96 |
| FA 18:1 | 79.47 | 0.82 | TAG (56:6) | -6033.40 | -0.96 |
| PS (18:0/18:1) | 47.91 | 0.82 | TAG (62:12) | -3059.20 | -0.96 |
| FA 16:0 | 1633.10 | 0.75 | PE (18:0/22:6) | -486.96 | -0.96 |
| TAG (58:3) | -2225.20 | -0.87 | TAG (52:3) | -1646.90 | -0.96 |
| TAG (56:2) | -2985.80 | -0.88 | TAG (66:18) | -7590.00 | -0.97 |
| TAG (60:3) | -1683.90 | -0.88 | TAG (54:6) | -2263.30 | -0.97 |
| TAG (58:2) | -1724.00 | -0.88 | TAG (54:4) | -2937.00 | -0.97 |
| CL (76:12) | -10.27 | -0.89 | TAG (62:14) | -8182.50 | -0.97 |
| TAG (54:1) | -1971.30 | -0.89 | TAG (60:13) | -3054.30 | -0.97 |
| TAG (56:3) | -5710.50 | -0.89 | TAG (62:13) | -5777.90 | -0.97 |
| PE (16:0/22:6) | -162.36 | -0.90 | TAG (60:12) | -5228.20 | -0.98 |
| FA 18:2 | -37.70 | -0.90 | | | |
| CL (64:0) | -14.84 | -0.90 | | | |
| TAG (64:8) | -3068.20 | -0.90 | | | |
| CL (68:2) | -21.16 | -0.90 | | | |
| TAG (62:7) | -3419.80 | -0.90 | | | |
| TAG (54:2) | -10743.00 | -0.90 | | | |
| TAG (55:3) | -809.39 | -0.90 | | | |

Figure S1: Reporter gene assay results of DHA. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, ns: not significant (one-way ANOVA) ($n = 6$).

