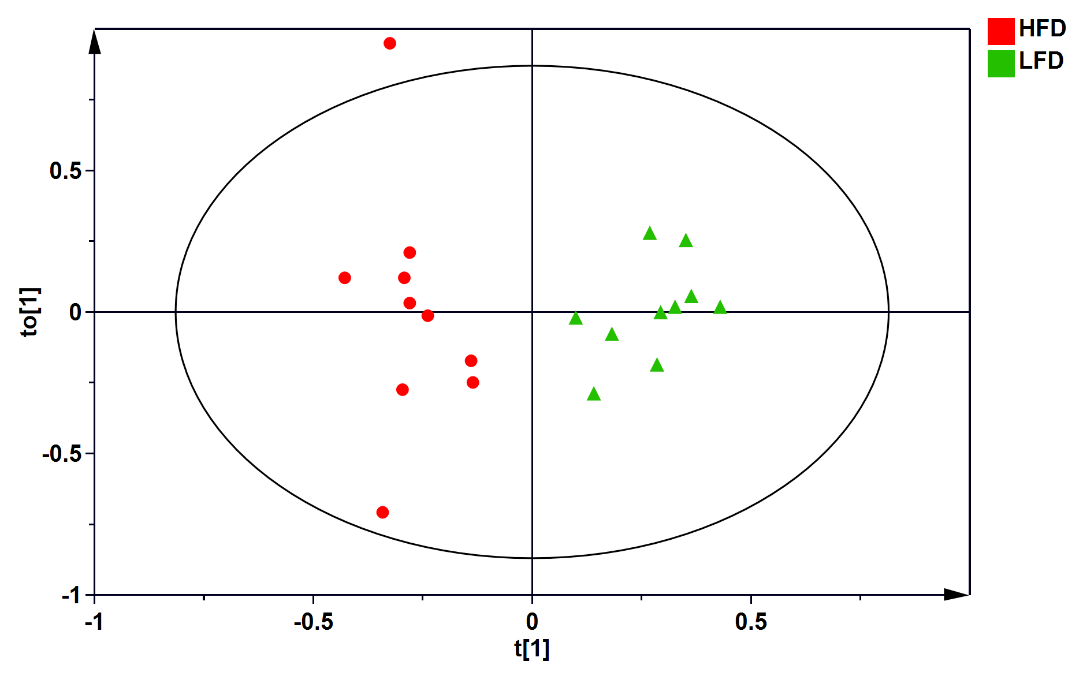
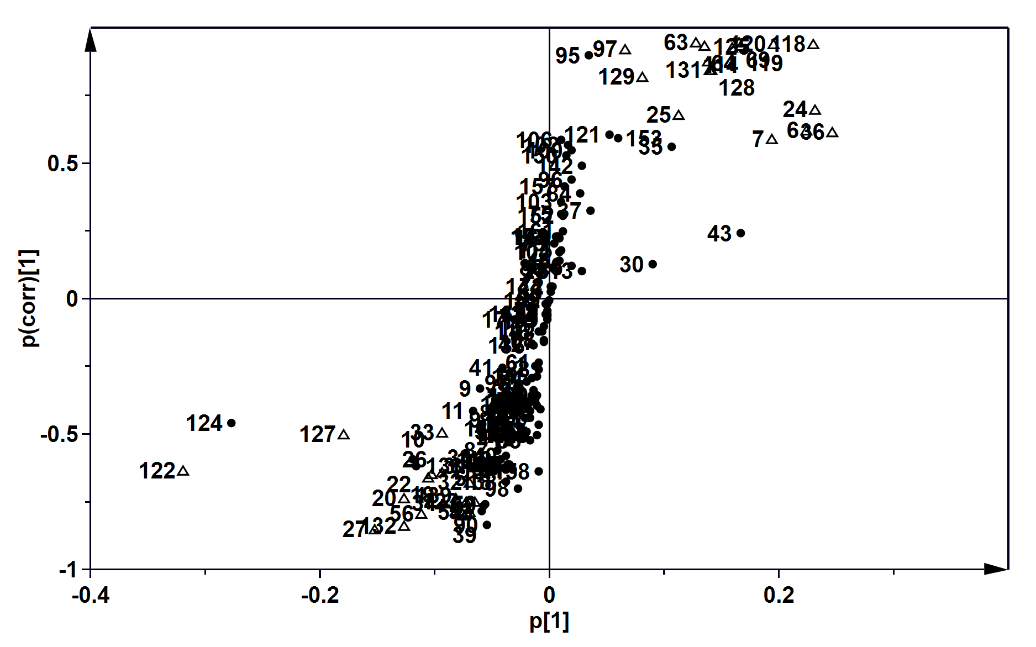
**SUPPLEMENTARY FIGURES AND RESULTS**

**S1**

**A**



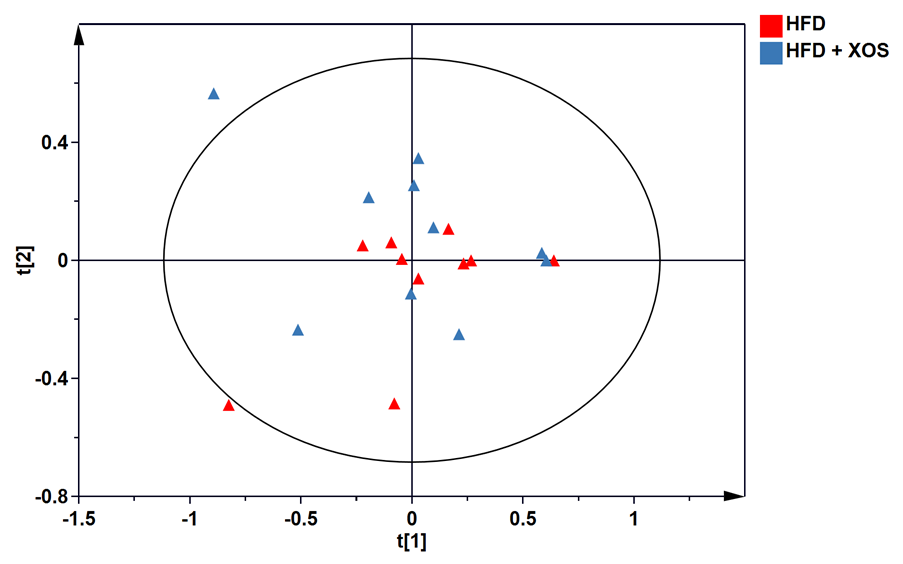
**B**



**Supplementary figure S1.**  OPLS-DA of caecal content metabolic profiles between the HFD and LFD.A) Score scatter plot; B) *S*-loading plot. Bin labels of the metabolites identified to be discriminatory are symbolized with empty triangles ( ). Please refer to Supplementary table 1 to interpret the numbers of discriminatory bins. *R2X*(cum) = 0.552 and *R2Y*(cum) = 0.9, *Q2* = 0.841.

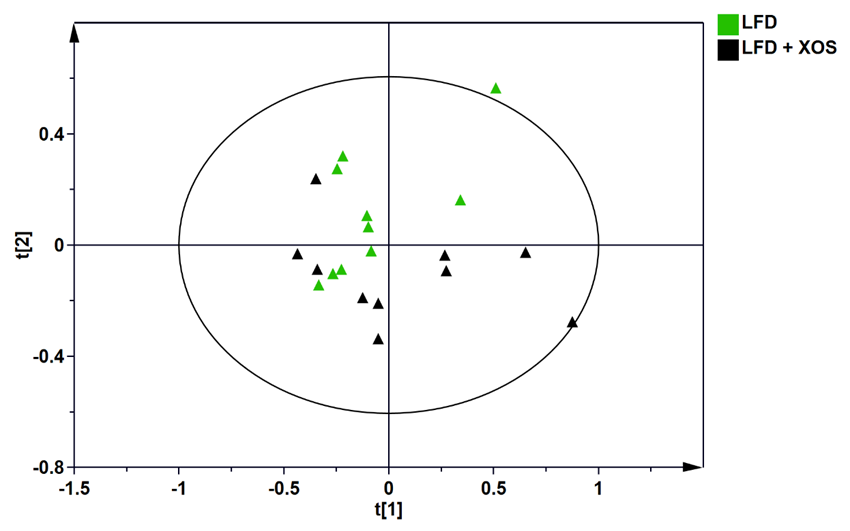
(

**S2**

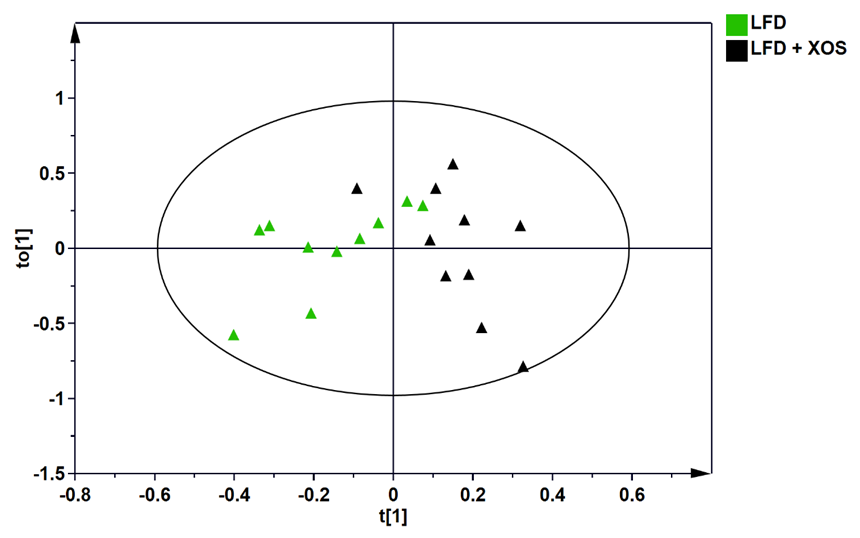


**Supplementary figure S2.** Score scatter plot of thePrincipal Component Analysis of the caecal content metabolic profiles between HFD and HFD + XOS rats.

**S3 A**

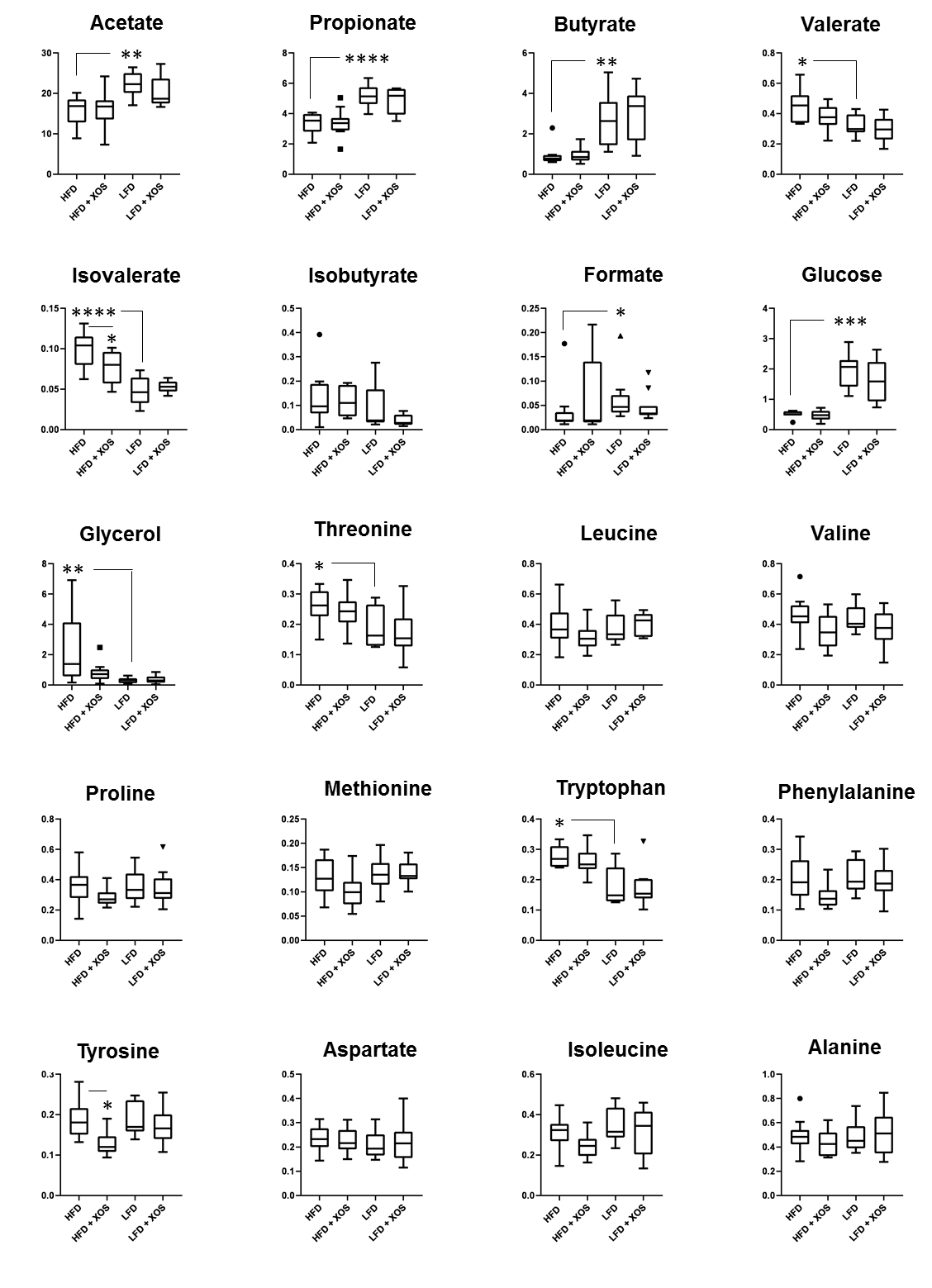


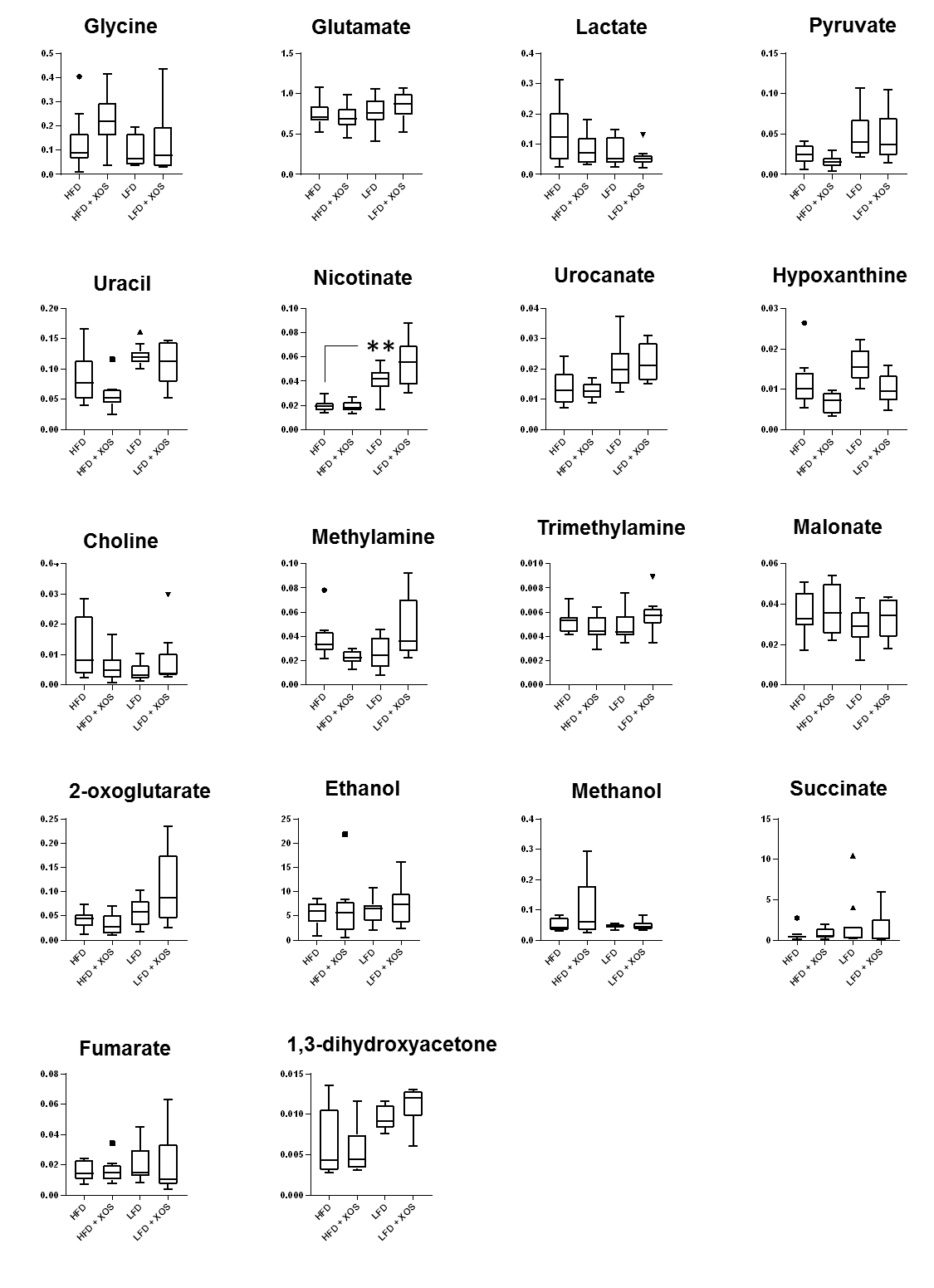
**B**



**Supplementary figure S3.** Multivariate analysis of the caecal content metabolic profiles between the LFD and LFD + XOS rats. A) PCA Score scatter plot; B) OPLS-DA Score scatter plot. A1+1+0 component model OPLS-DA showed a kind of separation of the two groups based on component t[1]. However, the model diagnostics represented only a moderate goodness of fit (R2X(cum) = 0.593 and R2Y(cum) = 0.595), and a low predictive ability (Q2 = 0.244).

**S4**





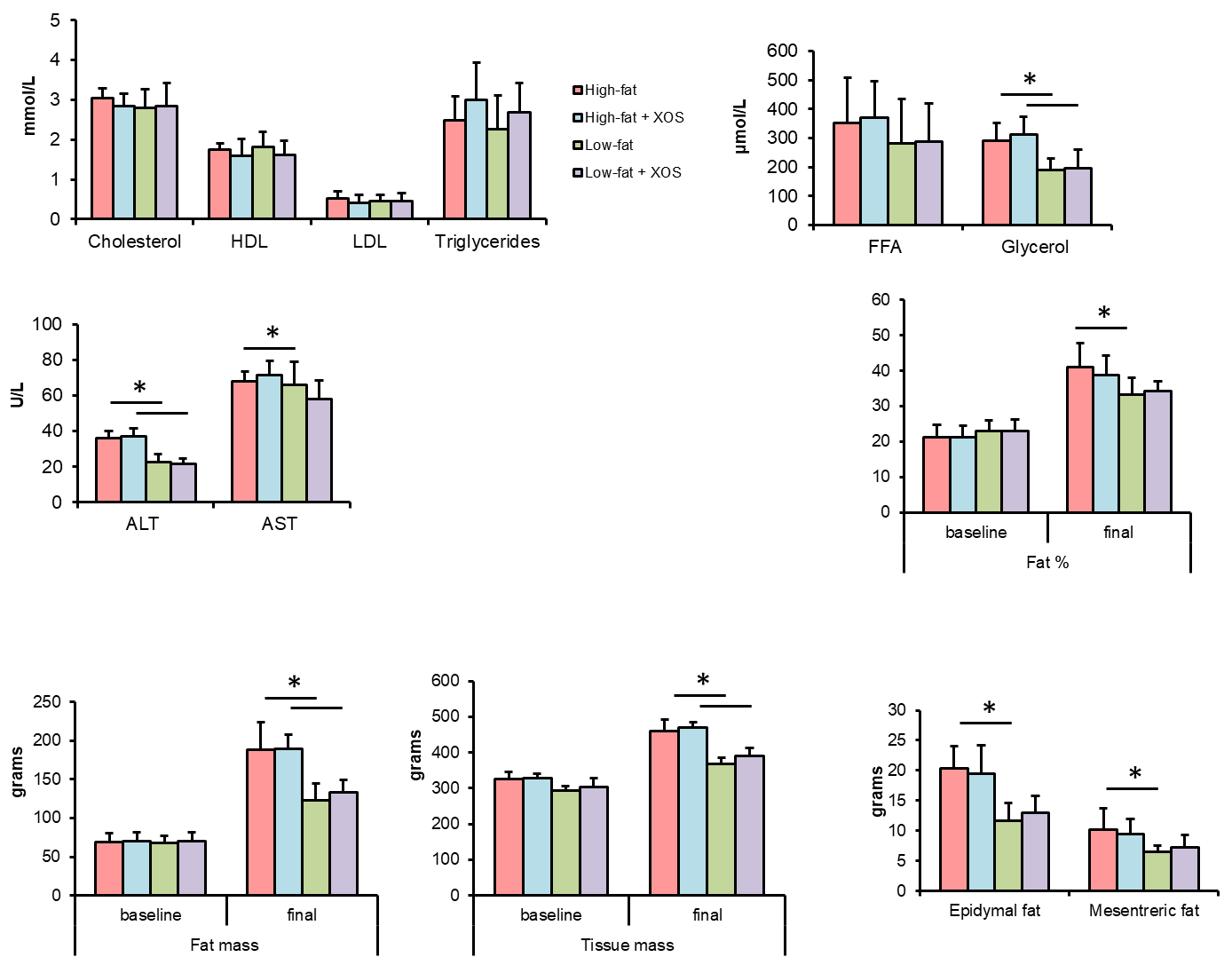
**Supplementary figure S4.** The concentrations of the extracted caecal metabolites in different experimental groups as determined using Profiler module of Chenomx NMR Suite Professional 8.3. All concentrations are mmol/L.

**S5**

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**Supplementary figure S5. Development of body weight during the diet intervention.** Body weight differed between the HFD and LFD groups during the diet intervention, but XOS supplementation did not affect the weight. The time point 0 indicates the time when the intervention started. Week [F (12, 72.76) = 68.99, p < 0.001], Diet [F (1, 446.9) = 807.1, p < 0.001], and Week \* Diet [F (12, 72.76) = 8.54, p < 0.001].

**S6**

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**Supplementary figure S6. Compared to the HFD, XOS-supplemented HFD did not modulate serum clinical variables, or body composition measured by dual energy x-ray absorption or from tissues at necropsy.** \* denotes statistically significant difference between the groups that are connected with a line.

**S7**

**S7**

**Supplementary figure S7. The energy intake during the diet intervention.** The left graph shows the energy intake relative to weight (KJ/g) and the right graph the energy intake per day (KJ/day). \* = significant difference between the groups (crtl vs. XOS). Statistically significant differences were calculated with linear mixed model ANOVA accounting for repeated measures for each individual.

**Supplementary table 1.** List of highly influential variables (bins) identified by combining *S*-plot, column loading plot and VIP values ≥ 0.7, as obtained from the OPLS-DA.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Bin no.** |  | **Chemical shift region (ppm)** | **Metabolite ID** | **VIP score** |
| 5 |  | 0. 8405–0.8595 | Bile | ≥ 1.0 |
| 6 |  | 0.8605–0.8845 | Butyrate + valerate | ≥ 1.0 |
| 7 |  | 0.8855–0.9095 | Butyrate + isovalerate | ≥ 1.0 |
| 19 |  | 1.250–1.30 | Valerate | 0.7 – 0.99 |
| 20 |  | 1.30–1.34 | Threonine + lactate | ≥ 1.0 |
| 24 |  | 1.523–1.56 | Butyrate | ≥ 1.0 |
| 25 |  | 1.56–1.59 | Butyrate | ≥ 1.0 |
| 26 |  | 1.60–1.68 | Leucine | 0.7 – 0.99 |
| 27 |  | 1.68–1.76 | Leucine | ≥ 1.0 |
| 34 |  | 2.08–2.12 | Glutamate/methionine | 0.7 – 0.99 |
| 35 |  | 2.12–2.14 | Butyrate/methionine | ≥ 1.0 |
| 36 |  | 2.14–2.185 | Propionate | ≥ 1.0 |
| 37 |  | 2.185–2.202 | Propionate | 0.7 – 0.99 |
| 38 |  | 2.202–2.245 | Valine | ≥ 1.0 |
| 39 |  | 2.245–2.2940 | Valine | 0.7 – 0.99 |
| 63 |  | 4.60–4.64 | Glucose | ≥ 1.0 |
| 64 |  | 4.64–4.678 | Glucose | ≥ 1.0 |
| 69 |  | 5.21–5.25 | Glucose | ≥ 1.0 |
| 114 |  | 3.215–3.265 | Glucose | ≥ 1.0 |
| 118 |  | 3.3650–3.4320 | Glucose/proline | ≥ 1.0 |
| 119 |  | 3.4320–3.4650 | Glucose | ≥ 1.0 |
| 120 |  | 3.4650–3.5050 | Glucose | ≥ 1.0 |
| 122 |  | 3.5320–3.5760 | Glycerol | ≥ 1.0 |
| 123 |  | 3.5880–3.610 | Valine/threonine | 0.7 – 0.99 |
| 124 |  | 3.620–3.6820 | Glycerol/ethanol | ≥ 1.0 |
| 125 |  | 3.6840–3.7180 | Glucose | ≥ 1.0 |
| 127 |  | 3.7550–3.802 | Glycerol | ≥ 1.0 |
| 128 |  | 3.802–3.840 | Glucose | ≥ 1.0 |
| 129 |  | 3.840–3.86 | Glucose | 0.7 – 0.99 |
| 131 |  | 3.874–3.910 | Glucose | ≥ 1.0 |
| 132 |  | 3.91–3.95 | Unknown | ≥ 1.0 |
| 139 |  | 4.206–4.2560 | Threonine | 0.7 – 0.99 |
| 97 |  | 7.56–7.60 | Unknown | ≥ 1.0 |

**Supplementary table 2.**  Concentrations of the caecal metabolites expressed as mM (Mean ± SEM), discriminating between the HFD and LFD groups, calculated using Profiler module of Chenomx NMR Suite Professional 8.3. Highlighted cells denote upregulation of the metabolites.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Metabolite** | **HFD**  **(Mean ± SEM)** | **LFD**  **(Mean ± SEM)** |  | ***p*-value (t-test)** |
| Acetate | 16 ± 1.2 | 22 ± 0.9 |  | 0.0004 \*\*\* |
| Butyrate | 0.91 ± 0.16 | 2.6 ± 0.39 |  | 0.0001 \*\*\* |
| Propionate | 3.4 ± 0.22 | 5.2 ± 0.22 |  | ˂0.0001 \*\*\*\* |
| Valerate | 0.45 ± 0.03 | 0.32 ± 0.02 |  | 0.0070 \*\* |
| Isovalerate | 0.099 ± 0.007 | 0.049 ± 0.005 |  | ˂0.0001 \*\*\*\* |
| Glucose | 0.51 ± 0.04 | 2.0 ± 0.19 |  | ˂0.0001 \*\*\*\* |
| Glycerol | 2.5 ± 0.80 | 0.31 ± 0.06 |  | 0.0015 \*\* |
| Threonine | 0.26 ± 0.02 | 0.19 ± 0.02 |  | 0.0355 \* |
| Leucine | 0.39 ± 0.05 | 0.38 ± 0.03 |  | 0.726 |
| Methionine | 0.13 ± 0.01 | 0.14 ± 0.01 |  | 0.763 |
| Valine | 0.46 ± 0.04 | 0.43 ± 0.03 |  | 0.536 |
| Proline | 0.36 ± 0.04 | 0.36 ± 0.03 |  | 0.981 |
| Lactate | 0.13 ± 0.03 | 0.071 ± 0.01 |  | 0.105 |
| Glutamate | 0.75 ± 0.05 | 0.77 ± 0.06 |  | 0.828 |
| Ethanol | 5.6 ± 0.74 | 5.9 ± 0.85 |  | 0.912 |