**Supplementary Table 1.** Pearson correlations for the NOB group at the end of the intervention.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Variables (NOB group) | **GLP-1 pmol/L** | **Leptin pg/mL** | **IL1beta pg/mL** | **Methanogenesis** | **L-tyrosine degradation** | ***Bacteroidota*** | ***Bacillota*** |
| Body weight | - | - | - | - | - | - | - |
| HOMA-IR index | - | - | - | - | - | - | 0.907\* |
| Cholic acid | - | -0.958\*\* | - | - | - | - | - |
| Chenodeoxycholic acid | - | -0.917\*\* | - | - | - | - | - |
| Ursodeoxycholic + Hyodeoxycholic acid | - | -0.92\*\* | - | - | - | - | - |
| Glycocholic acid | - | - | -0.915\* | - | - | - | - |
| Glycochenodeoxycholic acid | - | - | -0.827\* | - | - | - | - |
| Taurocholic acid | - | - | - | - | - | - | - |
| Taurodeoxycholic acid | - | - | - | 0.763\* | - | - | - |
| TG(50:1) | - | - | - | - | - | -0.89\* | - |
| PE(16:0/20:4) | -0.822\* | - | - | - | - | - | - |
| Acetic acid | - | - | - | -0.998\*\* | -0.957\* | - | - |
| Propionic acid | - | - | - | -0.97\*\* | -0.926\* | - | - |
| GLP-1 pmol/L | - | - | - | - | - | - | - |
| IL1beta pg/mL | - | - | - | - | - | - | - |
| MCP-1 pg/mL | - | - | - | - | 0.799\* | - | - |
| Glycolysis with Entner-Doudoroff | - | - | - | - | - | - | - |
| Glucoronic acid degradation | - | - | - | - | - | - | - |
| Galacturonate degradation | - | - | - | - | - | - | - |
| N-actyl-glucosamine, mannosamine and neuroaminate degradation | - | - | - | - | - | - | - |
| Pentose phosphate pathway | - | - | - | - | - | - | - |
| Methanogenesis | - | - | - | - | - | - | - |
| Methanogenesis from acetate | - | - | - | - | - | - | - |
| Fatty acid biosynthesis | - | - | - | - | - | - | - |
| Tricarboxylic acid cycle (prokaryotic) | - | - | - | - | - | - | - |
| D-glucarate degradation | - | - | - | - | - | - | - |

**Supplementary Table 1.** Continued

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variables (NOB group) | ***Bifidobacterium*** | ***Bacteroides*** | ***Blautia*** | ***Butyricimonas*** | ***Muribaculum*** | ***Rikenellaceae*  RC9 gut group** | ***Flavonifractor*** | ***Ruminiclostridium* 5** |
| Body weight | - | - | - | -0.844\* | - | - | - | -0.828\* |
| HOMA-IR index | - | - | - | - | - | - | - | - |
| Cholic acid | - | - | - | - | - | - | - | - |
| Chenodeoxycholic acid | - | - | - | - | 0.819\* | - | - | - |
| Ursodeoxycholic + Hyodeoxycholic acid | - | - | - | - | - | - | - | - |
| Glycocholic acid | 0.883\* | - | - | - | - | - | - | - |
| Glycochenodeoxycholic acid | - | - | -0.962\* | - | - | - | - | - |
| Taurocholic acid | - | - | - | - | - | - | - | 0.857\* |
| Taurodeoxycholic acid | - | - | - | - | - | - | - | 0.873\* |
| TG(50:1) | - | - | - | - | - | - | - | - |
| PE(16:0/20:4) | - | - | - | - | - | -0.83\* | - | - |
| Acetic acid | - | - | - | 0.999\*\* | - | - | - | - |
| Propionic acid | - | - | - | - | - | - | - | - |
| GLP-1 pmol/L | - | - | - | - | - | 0.837\* | - | - |
| IL1beta pg/mL | - | - | 0.862\* | - | - | - | - | - |
| MCP-1 pg/mL | - | - | - | - | - | - | - | - |
| Glycolysis with Entner-Doudoroff | - | -0.875\* | - | - | - | - | - | - |
| Glucoronic acid degradation | - | -0.915\* | - | - | - | - | - | - |
| Galacturonate degradation | - | -0.887\* | - | - | - | - | -0.839\* | - |
| N-actyl glucosamine, mannosamine and neuroaminate degradation | - | -0.887\* | - | - | - | - | - | - |
| Pentose phosphate pathway | - | -0.905\* | - | - | - | - | - | - |
| Methanogenesis | - | - | - | 0.924\* | - | - | - | - |
| Methanogenesis from acetate | - | -0.888\* | - | - | - | - | -0.819\* | - |
| Fatty acid biosynthesis | - | - | - | - | - | - | -0.817\* | - |
| Tricarboxylic acid cycle (prokaryotic) | - | - | - | - | - | - | -0.827\* | - |
| D-glucarate degradation | - | -0.817\* | - | - | - | - | -0.825\* | - |

**Abbreviations**, HOMA-IR, Homeostatic Model Assessment for Insulin Resistance; GLP-1, Glucagon-like peptide-1; IL, interleukin; MCP-1, Monocyte chemoattractant protein-1, TG(50:1), glycerolipids. Subclass: Triacylglycerols. Composition: TG(16:0+18:1+16:0); PE(16:0/20:4), glycerophospholipids. Subclass: 1-ether, 2-acylglycerophosphoethanolamine). \**p* <0.05, \*\**p* <0.001.

**Supplementary Table 2.** Pearson correlations for the OBE group at the end of the intervention.

|  |  |  |  |
| --- | --- | --- | --- |
| Variables (OBE group) | **GLP-1 pmol/L** | **D-glucarate degradation** | ***Butyricimonas*** |
| Taurodeoxycholic acid | -0.304\* | - | -0.755\* |
| GLP-1 pmol/L | - | - | 0.772\* |
| *Blautia* | - | -0.711\* | - |

**Abbreviations**, GLP-1, Glucagon-like peptide-1. \**p* <0.05.

**Supplementary Table 3.** Pearson correlations for the ISR group at the end of the intervention.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Variables (ISR group) | **Glucoronic acid degradation** | **PPP** | **MTG** | **MTG from acetate** | **L-tyrosine  degradation** | **Tricarboxylic acid cycle (prokaryotic)** | ***Bacteroidota*** |
| Deoxycholic acid | - | - | - | - | - | - | - |
| Cholic acid | 0.657\* | - | - | - | - | - | - |
| Chenodeoxycholic acid | 0.739\* | 0.639\* | - | - | - | - | - |
| Ursodeoxycholic + Hyodeoxycholic  acid | 0.755\* | - | - | - | - | - | 0.665\* |
| Glycocholic acid | - | - | 0.878\*\* | 0.759\* | 0.729\* | - | - |
| Glycochenodeoxycholic acid | - | - | 0.681\* | - | - | - | - |
| Taurocholic acid | - | - | - | - | - | - | 0.72\* |
| Taurodeoxycholic acid | 0.704\* | - | - | - | - | - | 0.728\* |
| PE(16:0/20:4) | - | - | - | - | - | - | - |
| Acetic acid | - | - | - | - | - | -0.693\* | - |
| Propionic acid | - | - | - | - | - | -0.677\* | - |
| Butiric acid | - | - | - | - | - | - | - |
| GLP-1 pmol/L | - | - | - | - | - | - | - |
| IL1ß pg/mL | - | - | - | - | - | - | - |
| TNFα pg/mL | - | - | - | - | - | - | - |
| Galacturonate degradation | - | - | - | - | - | - | - |
| N-actyl- glucosamine, mannosamine and  neuroaminate degradation | - | - | - | - | - | - | - |
| L-tyrosine degradation | - | - | - | - | - | - | - |

**Supplementary Table 3.** Continued.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variables (ISR group) | ***Bacillota*** | ***Bifidobacterium*** | ***Bacteroides*** | ***Butyricimonas*** | ***Muribaculum*** | ***Flavonifractor*** | ***Rumini***  ***clostridium* 5** | ***Rumini***  ***clostridium* 9** | ***Faecali baculum*** |
| Deoxycholic acid | - | - | - | 0.969\* | - | - | 0.98 | - | 0.973\* |
| Cholic acid | - | - | - | - | - | - | - | - | 0.656\* |
| Chenodeoxycholic acid | - | - | - | - | 0.698\* | - | - | - | - |
| Ursodeoxycholic + Hyodeoxycholic  acid | - | - | - | - | 0.686\* | - | - | - | 0.668\* |
| Glycocholic acid | - | - | - | - | - | - | - | - | - |
| Glycochenodeoxycholic acid | - | - | - | - | - | - | - | - | - |
| Taurocholic acid | - | - | - | - | - | - | - | - | - |
| Taurodeoxycholic acid | - | - | - | - | - | - | - | - | - |
| PE(16:0/20:4) | - | -0.654\* | - | -0.733\* | - | - | - | - | -0.74\* |
| Acetic acid | - | - | - | - | - | - | - | - | - |
| Propionic acid | - | - | - | - | - | - | - | - | - |
| Butiric acid | - | - | - | - | - | - | 0.821\* | - | - |
| GLP-1 pmol/L | - | - | -0.711\* | - | - | - | - | - | - |
| IL1ß pg/mL | - | - | - | - | - | - | 0.678\* | - | - |
| TNFα pg/mL | - | - | - | - | - | - | 0.731\* | - | - |
| Galacturonate degradation | 0.678\* | - | - | - | - | - | - | - | - |
| N-actyl-glucosamine, mannosamine and  neuroaminate degradation | 0.708\* | - | - | - | - | - | - | 0.641\* | - |
| L-tyrosine degradation | - | - | - | - | - | -0.636\* | - | - | - |

**Abbreviations**, GLP-1, Glucagon-like peptide-1; IL, interleukin; PE(16:0/20:4), glycerophospholipids. Subclass: 1-ether, 2-acylglycerophosphoethanolamine); TNFα, tumor necrosis factor alpha; PPP, pentose phosphate pathway, MTG, methanogenesis. \**p* <0.05, \*\**p* <0.001.