

Supplementary Table S1. Group-specific primers for real time PCR

| | | primer sequence | Standard bacteria | Strain No. |
|-------------------------------------|---------|------------------------|----------------------------------|------------|
| <i>Bacteroides fragilis</i> group | Forward | GTCAGTTGTGAAAGTTTGC | <i>Bacteroides fragilis</i> | JCM11019 |
| | Reverse | CAATCGGAGTTCTTCGTG | | |
| <i>Prevotella</i> | Forward | CACCAAGGCGACGATCA | <i>Prevotella melaninogenica</i> | JCM6325 |
| | Reverse | GGATAACGCCYGGACCT | | |
| <i>Bifidobacterium</i> | Forward | AGGGTTCGATTCTGGCTCAG | <i>Bifidobacterium longum</i> | JCM1217 |
| | Reverse | CATCCGGCATTACCACCC | | |
| <i>Lactobacillus</i> | Forward | TGGAAACAGGTGCTAATACCG | <i>Lactobacillus rhamnosus</i> | ATCC8530 |
| | Reverse | GTCCATTGTGGAAGATTCCC | | |
| <i>Clostridium coccooides</i> group | Forward | AAATGACGGTACCTGACTAA | <i>Clostridium coccooides</i> | JCM1395T |
| | Reverse | CTTTGAGTTTCATTCTTGCGAA | | |
| <i>Clostridium leptum</i> subgroup | Forward | GCACAAGCAGTGGAGT | <i>Ruminococcus albus</i> | JCM14654 |
| | Reverse | CTTCCTCCGTTTTGTCAA | | |
| <i>Atopobium</i> cluster | Forward | GGGTTGAGAGACCGACC | <i>Collinsella aerofaciens</i> | JCM10188 |
| | Reverse | CGGRGCTTCTTCTGCAGG | | |

Supplementary Table S2. Primers used in the real-time reverse transcription polymerase chain reaction (PCR).

| | Forward | Reverse |
|---------------------------------|----------------------------------|------------------------------------|
| <i>Hepatic Lipid metabolism</i> | | |
| PPAR α | 5'-AGGAAGCCGTTCTGTGACAT-3' | 5'-AATCCCCTCCTGCAACTTCT-3' |
| LXR | 5'-CCTTCCTCAAGGACTTCAGTTACAA-3' | 5'-CATGGCTCTGGAGAACTCAAAGAT-3' |
| SREBP1c | 5'-GGACTAAGTGCCCTCAACCT-3' | 5'-GCCACATAGATCTCTGCCAGTGT-3' |
| FAS | 5'-CCTGGATAGCATTCCGAACCT-3' | 5'-AGCACATCTCGAAGGCTACACA-3' |
| ACC | 5'-GGATGACAGGCTTGCAGCTATG-3' | 5'-GGAACGTAAGTCGCCGGATG-3' |
| G6PD | 5'-CTGGAACCGCATCATCGTGGAG-3' | 5'-CCTGATGATCCCAAATTCATCAAAATAG-3' |
| SCD1 | 5'-CCTTATCATTGCCAACACCAT-3' | 5'-AGCCAACCCACGTGAGAGAA-3' |
| CD36 (FAT) | 5'-TCCCTCTCTGGAGTTCTTGG-3' | 5'-TTGCAGCTGAGCAGAAAGAG-3' |
| PK | 5'-TGCAATTGGAGCCGTGGA-3' | 5'-TGGCTGTCATTCAAG-3' |
| DGAT1 | 5'-GCTGAGTCTGTACCTACTTTTGG-3' | 5'-AGGCTTGTAGAAGTGTCTGATGCA-3' |
| CPT1 | 5'-GATGGAGAGGATGTTCAACACTACAC-3' | 5'-AGCCCTCATAGAGCCAGACCTT-3' |
| ACOX | 5'-CAGCGTTACGAGGTGGCTGTTA-3' | 5'-TGCCCAAGTGAAGGTCCAAAG-3' |
| HMG-CoA reductase | 5'-CCAAGGTGGTGAGAGAGGTGTT-3' | 5'-CGTCAACCATAGCTTCCGTAGTT-3' |
| <i>Ileal L cell function</i> | | |
| NeuroD | 5'-CTTGGCCAAGAACTACATCTGG-3' | 5'-CGTGTGTTGAAAGAGAAGTTGCC-3' |
| NGN3 | 5'-AAGAGCGAGTTGGCACTCAGC-3' | 5'-AAGCTGTGGTCCGCTATGCG-3' |
| PPAR β/δ | 5'-ACTTGGCGTGGCGCCTGC-3' | 5'-AGCGGTGTGGGTATGCGCA-3' |
| PGCG | 5'-ATTGCCAAACGTCATGATGA-3' | 5'-GGCGACTTCTTCTGGGAAGT-3' |
| PC1/3 | 5'-AGACAGCATTACACCATCTCTA-3' | 5'-AGAACAATTCTCTGCATACCAAGGT-3' |
| GPBAR1 | 5'-AACGCTACATGGCAGTGTTG-3' | 5'-GGAGGCCATAAACTTCCAGGTAGA-3' |
| GPR43 | 5'-GGGATCTGGGTACATGCTTAT-3' | 5'-ATGTCAGACAGACGGGTACCAA-3' |
| <i>Reference</i> | | |
| 36B4 | 5'-GGCCCTGCACTCTCGCTTTC-3' | 5'-TGCCAGGACGCGCTTGT-3' |

R =A or G

PPAR α , peroxisome proliferator-activated receptor α ; LXR, liver X receptor; SREBP-1c, sterol regulatory element-binding transcription factor-1c; FAS, fatty acid synthase; ACC, acetyl-CoA carboxylase; G6PD, glucose 6-phosphate dehydrogenase; SCD1, stearoyl coenzyme A desaturase 1; CD36 (FAT), fatty acid translocase; PK, pyruvate kinase; DGAT1, diacyl glycerol acyl-transferase 1; CPT1, carnitine palmitoyl transferase 1; ACOX, acyl-coenzyme A oxidase; 3-hydroxy-3-methyl-glutaryl-CoA reductase, (HMG-CoA reductase); NeuroD, neurogenic differentiation factor; NGN3, neurogenin 3; PPAR β/δ , peroxisome proliferator-activated receptor β/δ ; PGCG, proglucagon; PC1/3, prohormone convertases1/3; GPBAR1, G-protein-coupled bile acid receptor 1; GPR43, G-protein-coupled receptor 43; 36B4, acidic ribosomal protein.

Supplementary Table S3. Bacterial counts of major genus microbiota in the cecal digesta of mice fed the test diets

| Log CFU/g cecum | Control | LMW-BG | HMW-BG |
|-------------------------------------|----------------|----------------|----------------|
| <i>Lactobacillus</i> | 9.3 \pm 0.2 | 10.0 \pm 0.2 | 9.7 \pm 0.2 |
| <i>Prevotella</i> | 6.5 \pm 0.2 | 6.2 \pm 0.1 | 6.1 \pm 0.1 |
| <i>Clostridium coccooides</i> group | 9.1 \pm 0.1 | 9.2 \pm 0.1 | 9.2 \pm 0.1 |
| <i>Clostridium leptum</i> subgroup | 10.8 \pm 0.1 | 11.0 \pm 0.1 | 11.0 \pm 0.1 |
| <i>Atopobium</i> cluster | 9.1 \pm 0.2 | 9.7 \pm 0.2 | 9.3 \pm 0.2 |

Values are means \pm SE, n=8.

Supplementary Table S4. Liver lipid accumulation

| | Control | LMW-BG | HMW-BG |
|---------------------------|-----------|-----------|-----------|
| Cholesterol (mmol/liver) | 0.37±0.02 | 0.35±0.01 | 0.33±0.01 |
| (mmol/g liver) | 0.34±0.01 | 0.34±0.01 | 0.36±0.02 |
| Triglyceride (mmol/liver) | 2.18±0.21 | 2.44±0.18 | 2.08±0.27 |
| (mmol/g liver) | 1.98±0.16 | 2.38±0.19 | 2.22±0.24 |

Values are means±SE, n=8.

Supplementary Table S5. Spearman's rank correlation coefficient related to the prebiotic effect

| | Ileum | | Liver | | | | | Serum | | | |
|-------------|-------|--------|----------|------|-------|--------|---------------|-------------------|-----------------|---------|--------|
| | NGN3 | GPBAR1 | SREBP-1c | FAS | CD36 | LXR | PPAR α | Total cholesterol | LDL-cholesterol | Glucose | Leptin |
| Total SCFAs | 0.47* | 0.22 | -0.50* | 0.08 | -0.31 | -0.45* | -0.31 | -0.46* | -0.44* | -0.48* | -0.46* |
| Acetate | 0.45* | 0.20 | -0.51* | 0.15 | -0.25 | -0.44* | -0.31 | -0.49* | -0.51* | -0.49* | -0.44* |
| Propionate | 0.56* | 0.37 | -0.40 | 0.09 | -0.22 | -0.22 | -0.10 | -0.50* | -0.46* | -0.40 | -0.41 |

* p<0.05

SCFA, short chain fatty acids; NGN 3, neurogenin 3; SREBP-1c, sterol regulatory element-binding transcription factor 1c; GPBAR1, G-protein-coupled bile acid receptor 1; FAS, fatty acid synthase; CD36 (FAT), fatty acid translocase; LXR, liver X receptor; PPAR α , peroxisome proliferator-activated receptor α

Supplementary Table S6. Spearman's rank correlation coefficients for the relationship between parameters related to liver lipid metabolism (A) and ileal L cell function (B).

| (A) | PPAR α | LXR | FAS | ACC | G6PD | SCD1 | CD36 | PK | DGAT1 | CPT1 | ACOX | HMG-CoA reductase |
|---------------------|---------------|--------|---------------------|-------|-------|--------|-------|-------|-------|--------|-------|-------------------|
| SREBP-1c | 0.42* | 0.50* | 0.46* | 0.15 | -0.02 | 0.17 | 0.42* | 0.05 | 0.30 | -0.16 | 0.39 | 0.30 |
| | PPAR α | 0.54* | 0.39 | 0.56* | -0.16 | 0.34 | 0.34 | 0.57* | 0.45* | 0.06 | 0.88* | 0.33 |
| | | LXR | 0.27 | 0.32 | 0.09 | 0.35 | 0.32 | 0.44* | 0.76* | -0.45* | 0.46* | -0.00 |
| | | | FAS | 0.20 | -0.03 | 0.41* | -0.01 | 0.31 | 0.05 | -0.10 | 0.35 | 0.56* |
| | | | | ACC | -0.04 | 0.33 | 0.22 | 0.51* | 0.35 | 0.15 | 0.45* | 0.32 |
| | | | | | G6PD | -0.15 | 0.17 | 0.29 | -0.04 | -0.26 | -0.04 | 0.18 |
| (B) | NGN3 | | | | | SCD1 | 0.14 | 0.17 | 0.14 | -0.50* | 0.28 | 0.22 |
| NeuroD | 0.50* | NeuroD | | | | | CD36 | 0.24 | 0.26 | 0.23 | 0.31 | 0.04 |
| PPAR β/δ | 0.31 | 0.55* | PPAR β/δ | | | | | PK | 0.43* | -0.03 | 0.55* | 0.36 |
| PGCG | 0.13 | 0.52* | 0.25 | PGCG | | | | | DGAT1 | -0.34 | 0.39 | -0.21 |
| PC1/3 | 0.26 | 0.44* | 0.56* | 0.38 | PC1/3 | | | | | CPT1 | 0.08 | 0.17 |
| GPBAR1 | 0.64* | 0.45* | 0.29 | 0.24 | 0.26 | GPBAR1 | | | | | ACOX | 0.50* |
| GPR43 | 0.39 | 0.34 | 0.45* | 0.24 | 0.29 | 0.55* | | | | | | |

SREBP-1c, sterol regulatory element-binding transcription factor-1c; PPAR α , peroxisome proliferator-activated receptor α ; LXR, liver X receptor; FAS, fatty acid synthase; ACC, acetyl-CoA carboxylase; G6PD, glucose 6-phosphate dehydrogenase; SCD1, stearoyl coenzyme A desaturase 1; CD36 (FAT), fatty acid translocase; PK, pyruvate kinase; DGAT1, diacyl glycerol acyl-transferase 1; CPT1, carnitine palmitoyl transferase 1; ACOX, acyl-coenzyme A oxidase; 3-hydroxy-3-methyl-glutaryl-CoA reductase, (HMG-CoA reductase); NeuroD, neurogenic differentiation factor; NGN3, neurogenin 3; PPAR β/δ , peroxisome proliferator-activated receptor β/δ ; PGCG, proglucagon; PC1/3, prohormone convertases1/3; GPBAR1, G-protein-coupled bile acid receptor 1; GPR43, G-protein-coupled receptor 43.