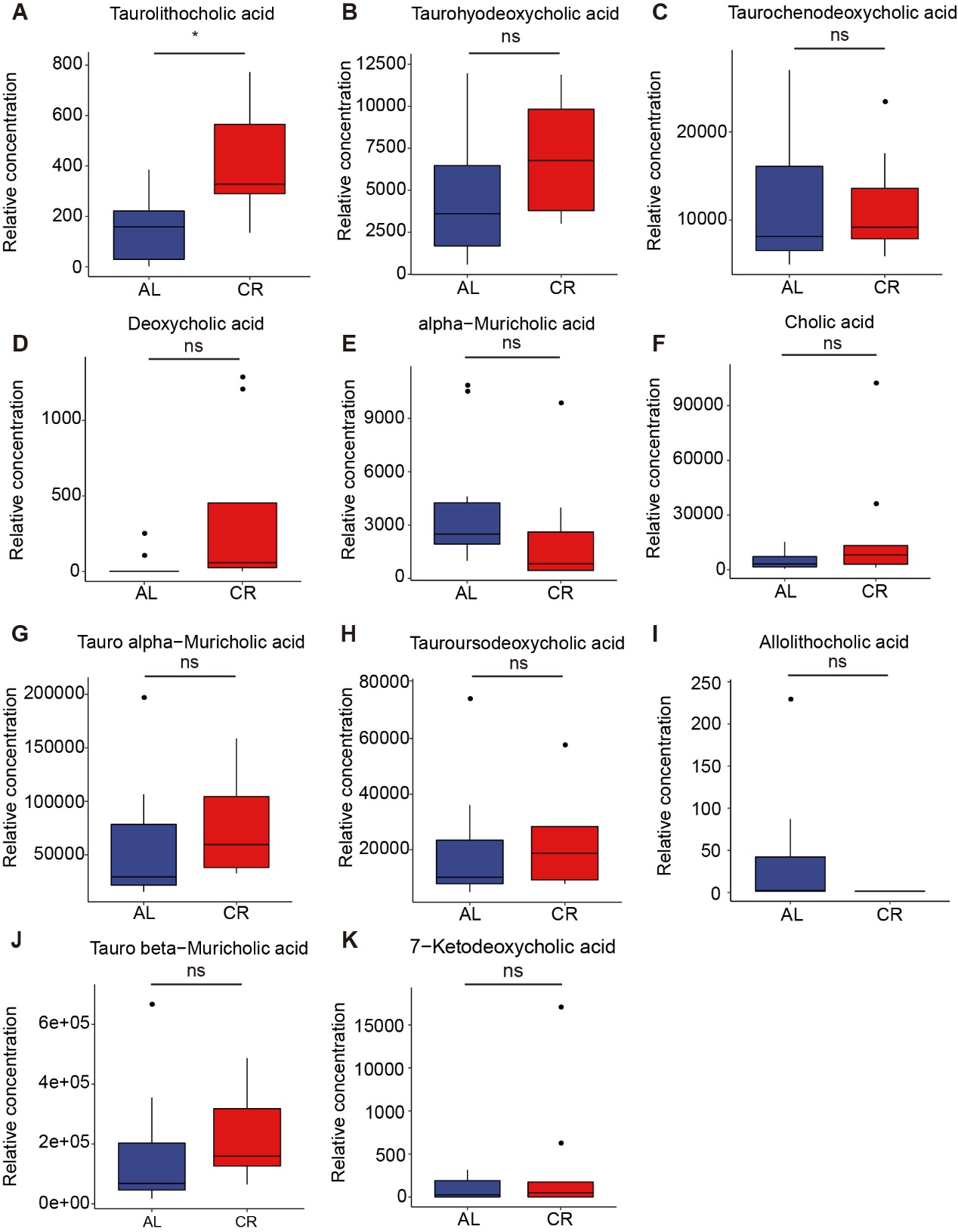
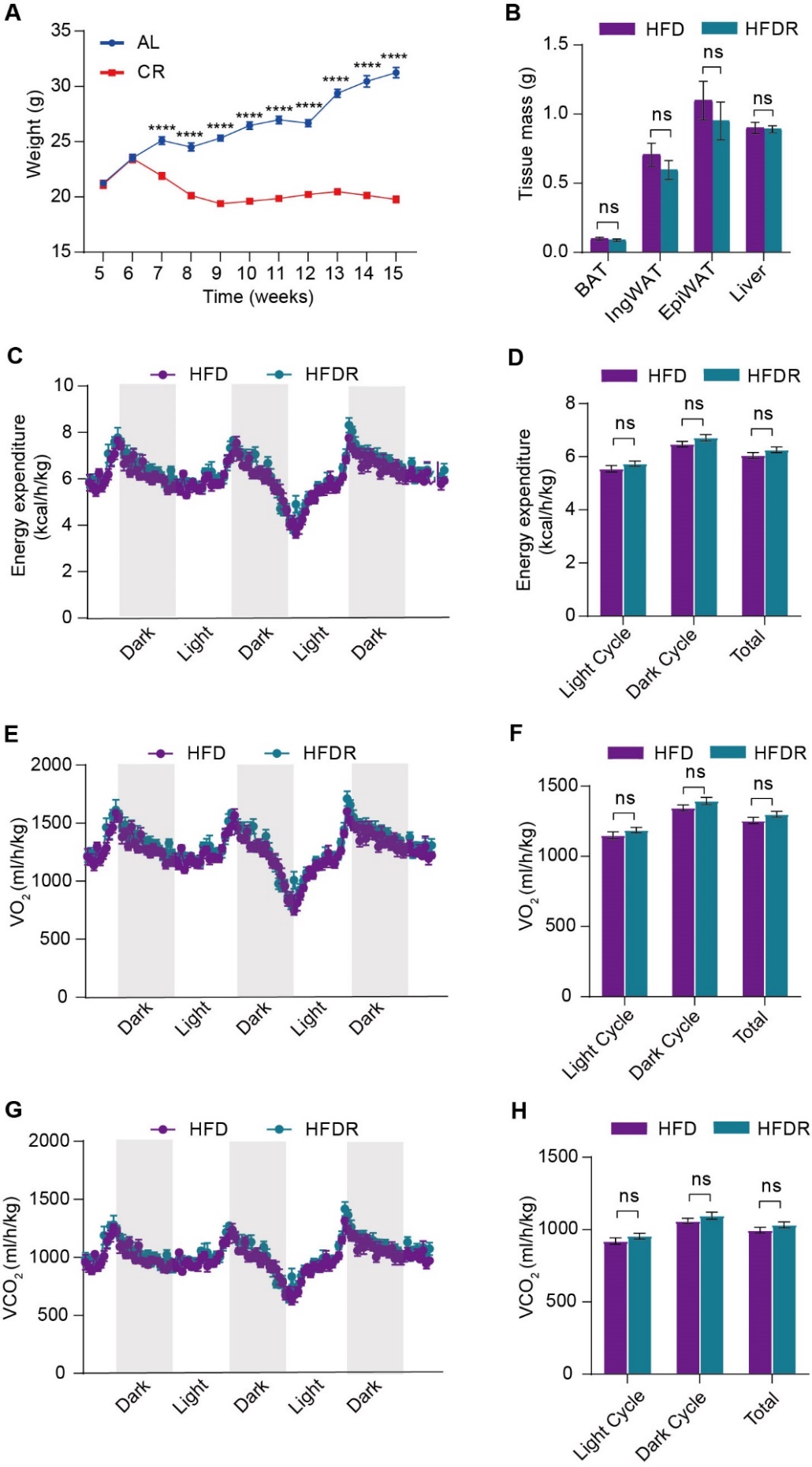
**Fig. S1.**



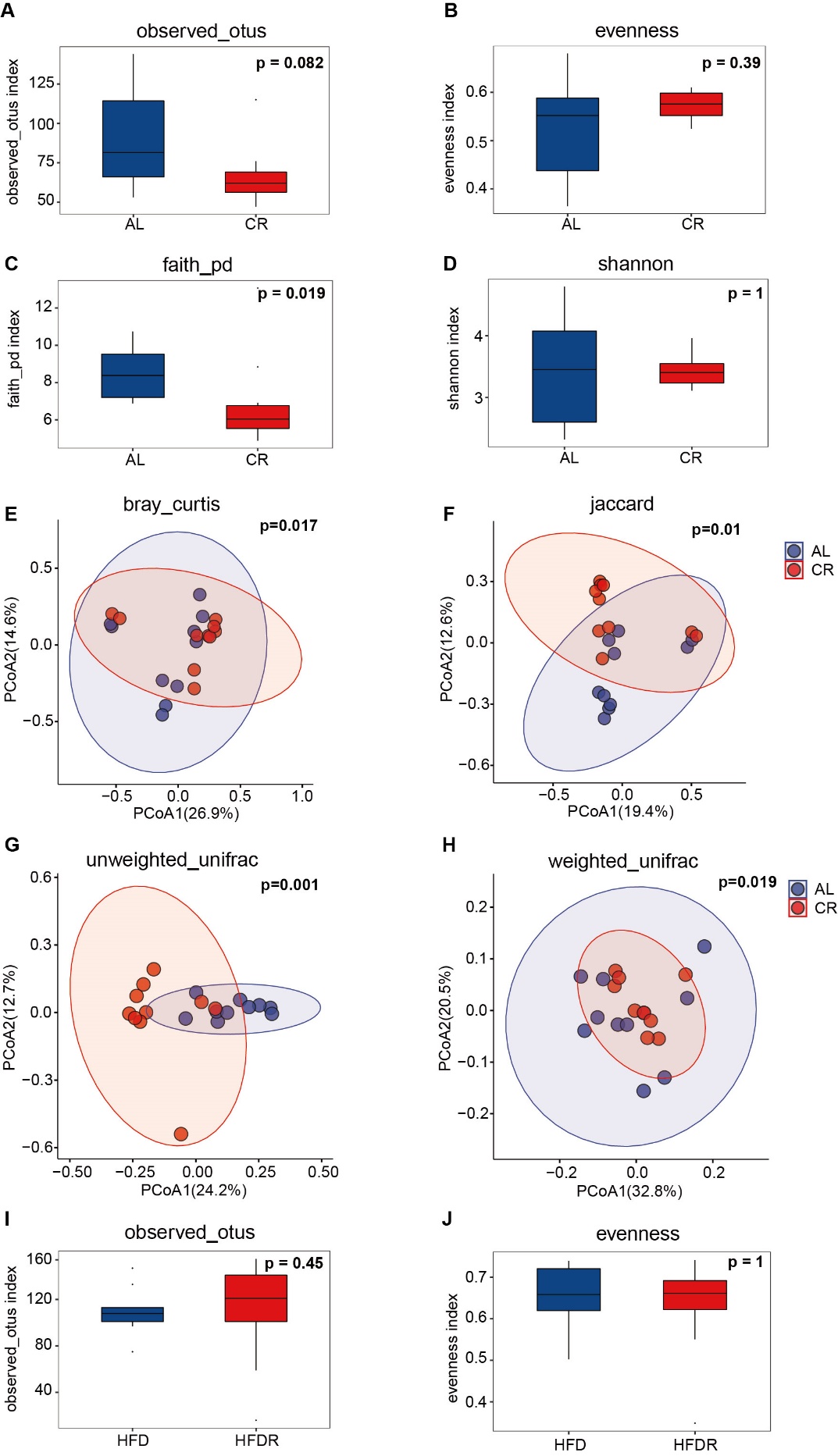
**Relative concentrations of identified bile acids in AL and CR groups.** (**A**) Relative concentration of taurolithocholic acid in AL and CR group (n=9-10 per group).(**B**) Relative concentration of allolithocholic acid in AL and CR group (n=9-10 per group).(**C**) Relative concentration of 7-Ketodeoxycholic acid in AL and CR group (n=9-10 per group).(**D**) Relative concentration of alpha-Muricholic acid in AL and CR group (n=9-10 per group).(**E**) Relative concentration of cholic acid in AL and CR group (n=9-10 per group).(**F**) Relative concentration of deoxycholic acid in AL and CR group (n=9-10 per group).(**G**) Relative concentration of tauro alpha-Muricholic acid in AL and CR group (n=9-10 per group).(**H**) Relative concentration of tauroursodeoxycholic acid in AL and CR group (n=9-10 per group).(**I**) Relative concentration of taurohyodeoxycholic acid in AL and CR group (n=9-10 per group).(**J**) Relative concentration of tauro beta-Muricholic acid in AL and CR group (n=9-10 per group).(**K**) Relative concentration of taurochenodeoxycholic acid in AL and CR group (n=9-10 per group). Multiple testing correction was calculated. \* *FDR* < 0.1, \*\* *FDR* < 0.05, \*\*\* *FDR* < 0.01 and \*\*\*\* *FDR* < 0.001 were determined statistically significant.

**Fig. S2.**



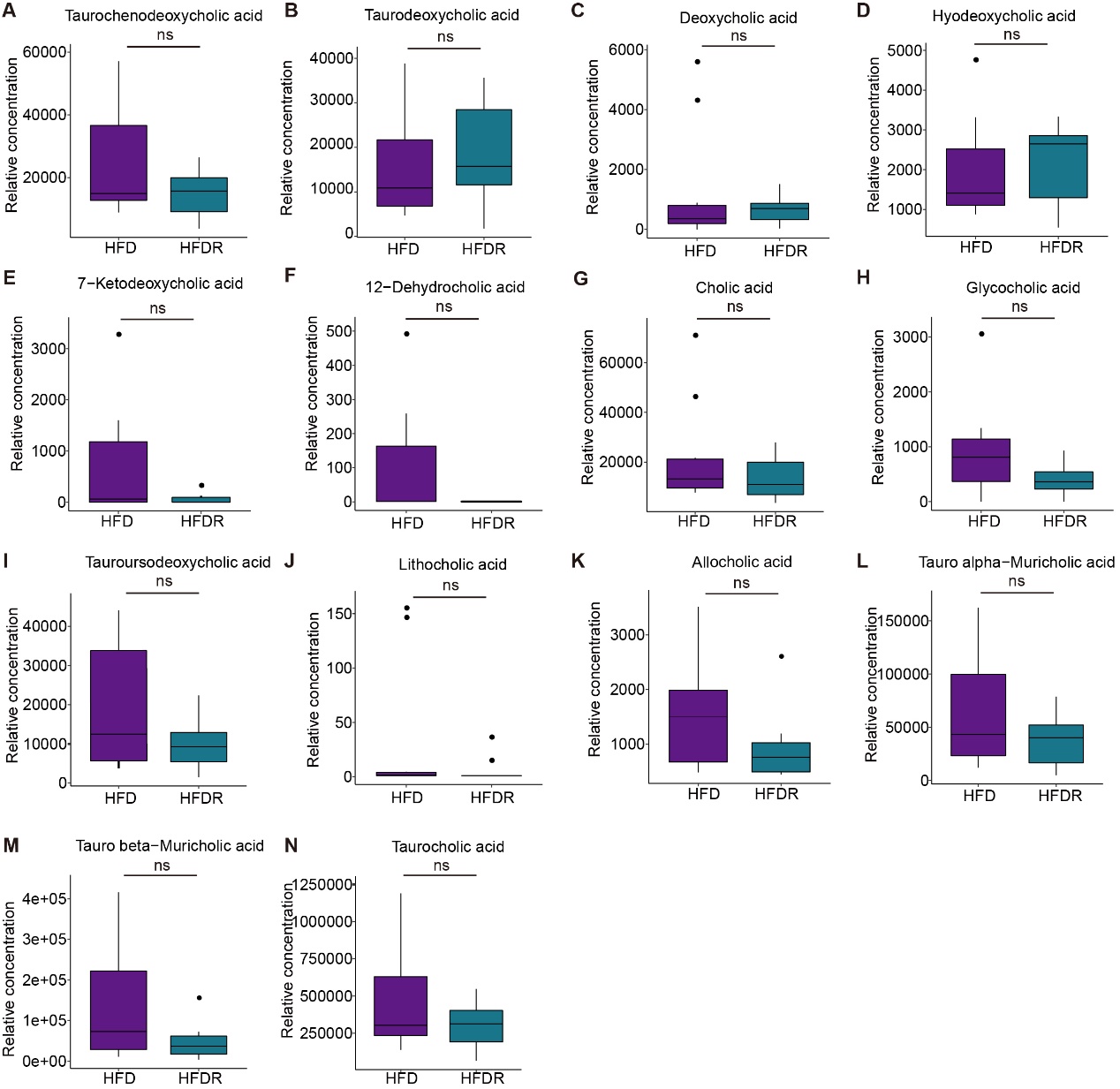
**The phenotypes of HFD male mice after CR gut microbiota transplantation.** (**A**) Body weight of male mice after AL or CR treatment (n=10 per group).(**B**) Brown adipose tissue (BAT), inguinal adipose tissue (IngWAT), epididymal adipose tissue (EpiWAT), and liver mass of male mice in HFD or HFDR groups (n= 8-10 per group).(**C-H**) TSE phenoMaster cages analysis of oxygen energy expenditure (EE), consumption rate (VO2), and carbon dioxide production (VCO2), of male mice in the HFD or HFDR groups (n=6 per group). Significance was calculated using non-paired two-tailed Student’s t test. ∗*p* < 0.05, ∗∗*p* < 0.01, ∗∗∗*p* < 0.001, ∗∗∗∗*p* < 0.0001.

**Fig. S3.**



**Cecal gut microbiota composition alterations in donor groups and recipient groups.** (**A-D**) Indexes of observed\_otus, evenness, faith\_pd, Shannon of cecal samples from AL or CR group at 15-week (n=10 per group).(**E-H**) Principal coordinate analysis (PCoA) of the bray-curtis and weighted\_unifrac distances of cecal samples from AL or CR group at 15-week (n=10 per group).(**I-J**) Indexes of observed\_otus and evenness of cecal samples from HFD or HFDR group at 15-week (n=9-10 per group). Significance was calculated using Kruskal-Wallis test (alpha diversity) and permutational multivariate analysis of variance test (beta diversity). ∗*p* < 0.05, ∗∗*p* < 0.01, ∗∗∗*p* < 0.001, ∗∗∗∗*p* < 0.0001.

**Fig. S4.**



**Relative concentrations of identified bile acids in HFD and HFDR groups.** (**A**) Relative concentration of taurochenodeoxycholic acid in HFD and HFDR groups (n=9-10 per group).(**B**) Relative concentration of taurodeoxycholic acid in HFD and HFDR groups (n=9-10 per group).(**C**) Relative concentration of deoxycholic acid in HFD and HFDR groups (n=9-10 per group).(**D**) Relative concentration of hyodeoxycholic acid in HFD and HFDR groups (n=9-10 per group).(**E**) Relative concentration of 7-ketodeoxycholic acid in HFD and HFDR groups (n=9-10 per group).(**F**) Relative concentration of 12-dehydrocholic acid in HFD and HFDR groups (n=9-10 per group).(**G**) Relative concentration of cholic acid in HFD and HFDR groups (n=9-10 per group).(**H**) Relative concentration of glycocholic acid in HFD and HFDR groups (n=9-10 per group).(**I**) Relative concentration of tauroursodeoxycholic acid in HFD and HFDR groups (n=9-10 per group). (**J**) Relative concentration of lithocholic acid in HFD and HFDR groups (n=9-10 per group).(**K**) Relative concentration of allocholic acid in HFD and HFDR groups (n=9-10 per group).(**L**) Relative concentration of tauro alpha-Muricholic acid in HFD and HFDR groups (n=9-10 per group).(**M**) Relative concentration of tauro beta-Muricholic acid in HFD and HFDR groups (n=9-10 per group).(**N**) Relative concentration of taurocholic acid in HFD and HFDR groups (n=9-10 per group). Multiple testing correction was calculated. \* *FDR* < 0.1, \*\* *FDR* < 0.05, \*\*\* *FDR* < 0.01 and \*\*\*\* *FDR* < 0.001 were determined statistically significant.

**Table S1: The caloric consumption in the study.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Group#** | **Control Group** | | **CR Group** | |
|  | **gm (%)** | **Kcal (%)** | **gm (%)** | **Kcal (%)** |
| Protein | 19.2 | 20 | 31.3 \* 0.6 = 18.8 | 33 \* 0.6 = 19.8 |
| Carbohydrate | 67.3 | 70 | 46.9 \* 0.6 = 28.1 | 50 \* 0.6 = 30 |
| Fat | 4.3 | 10 | 6.9 \* 0.6 = 4.1 | 17 \* 0.6 = 11.2 |
| Total |  | 100 |  | 100 \* 0.6 = 60 |
| **kcal/gm** | **3.85** |  | **3.75** | **kcal/gm** |

**Table S2: The components of the diets used in the study.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Product#** | **Control Diet** | | **Caloric Restriction Diet** | |
|  | **gm (%)** | **Kcal (%)** | **gm (%)** | **Kcal (%)** |
| Protein | 19.2 | 20 | 31.3 | 33 |
| Carbohydrate | 67.3 | 70 | 46.9 | 50 |
| Fat | 4.3 | 10 | 6.9 | 17 |
| Total |  | 100 |  | 100 |
|  |  |  |  |  |
| **Ingredient** | **gm** | **kcal** | **gm** | **kcal** |
| Casein, 80 Mesh | 200 | 800 | 200 | 800 |
| L-Cystine | 3 | 12 | 3 | 12 |
|  |  |  |  |  |
| Corm Starch | 315 | 1260 | 110 | 440 |
| Maltodextrin 10 | 35 | 140 | 35 | 140 |
| Sucrose | 350 | 1400 | 149.3 | 597 |
|  |  |  |  |  |
| Cellulose, BW200 | 50 | 0 | 50 | 0 |
|  |  |  |  |  |
| Soybean Oil | 25 | 225 | 25 | 225 |
| Lard | 20 | 180 | 20 | 180 |
|  |  |  |  |  |
| Mineral Mix S10026 | 10 | 0 | 10 | 0 |
| DiCalcium Phosphate | 13 | 0 | 13 | 0 |
| Calcium Carbonate | 5.5 | 0 | 5.5 | 0 |
| Potassium Citrate, 1 H2O | 16.5 | 0 | 16.5 | 0 |
|  |  |  |  |  |
| Vitamin Mix V10001 | 10 | 40 | 10 | 40 |
| Choline Bitartrate | 2 | 0 | 2 | 0 |
| **Total** | **1055.05** | **4057** | **649.35** | **2434** |
| **kcal/gm** | **3.85** |  | **3.75** |  |

**Table S3: Primary antibodies used in this study**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Host | Manufacturer | Catalog number | Dilution |
| H3K27ac | rabbit | Abcam, Cambridge, U.K. | ab4729 | 1:100 |
| H3K4me1 | rabbit | Abcam, Cambridge, U.K. | Ab8895 | 1:100 |
| HNF4α | mouse | Abcam, Cambridge, U.K. | ab41898 | 1:100 |

**Table S4: Sequences of primers for RT‐qPCR.**

|  |  |  |
| --- | --- | --- |
| Gene | Forward Sequence | Reverse Sequence |
| *Ucp1* | AGGCTTCCAGTACCATTAGGT | CTGAGTGAGGCAAAGCTGATTT |
| *Pgc1α(Ppargc1a)* | TATGGAGTGACATAGAGTGTGCT | CCACTTCAATCCACCCAGAAAG |
| *Dio2* | AATTATGCCTCGGAGAAGACCG | GGCAGTTGCCTAGTGAAAGGT |
| *Cidea* | TGACATTCATGGGATTGCAGAC | GGCCAGTTGTGATGACTAAGAC |
| *CD11b* | ATGGACGCTGATGGCAATACC | TCCCCATTCACGTCTCCCA |
| *Ccl2* | TTAAAAACCTGGATCGGAACCAA | GCATTAGCTTCAGATTTACGGGT |
| *Cxcl9* | GGAGTTCGAGGAACCCTAGTG | GGGATTTGTAGTGGATCGTGC |
| *IL-10* | GCTCTTACTGACTGGCATGAG | CGCAGCTCTAGGAGCATGTG |
| *CD68* | TGTCTGATCTTGCTAGGACCG | GAGAGTAACGGCCTTTTTGTGA |
| *CD80* | ACCCCCAACATAACTGAGTCT | TTCCAACCAAGAGAAGCGAGG |
| *F4/80* | TGACTCACCTTGTGGTCCTAA | CTTCCCAGAATCCAGTCTTTCC |
| *CD163* | ATGGGTGGACACAGAATGGTT | CAGGAGCGTTAGTGACAGCAG |
| *CD206* | CTCTGTTCAGCTATTGGACGC | CGGAATTTCTGGGATTCAGCTTC |
| *Cyp7a1* | GGGATTGCTGTGGTAGTGAGC | GGTATGGAATCAACCCGTTGTC |
| *Cyp7b1* | GGAGCCACGACCCTAGATG | TGCCAAGATAAGGAAGCCAAC |
| *Cyp8b1* | CCTCTGGACAAGGGTTTTGTG | GCACCGTGAAGACATCCCC |
| *CYP27a1* | CCAGGCACAGGAGAGTACG | GGGCAAGTGCAGCACATAG |
| *PPARα* | AGAGCCCCATCTGTCCTCTC | ACTGGTAGTCTGCAAAACCAAA |
| *Hnf4α* | CACGCGGAGGTCAAGCTAC | CCCAGAGATGGGAGAGGTGAT |
| *Gapdh* | AGGTCGGTGTGAACGGATTTG | TGTAGACCATGTAGTTGAGGTCA |

**Table S5: Sequences of primers for ChIP‐qPCR.**

|  |  |  |
| --- | --- | --- |
| Gene | Forward Sequence | Reverse Sequence |
| *Cyp8b1* | CTCCTAGCACTGTACACCAC | GCCTCTGAGCAAAGTCCAAG |
| *Input* | ATGTACCTGCGTCTTCTCCA | CACTGAGTGCTGGGATTACA |