

Supplementary material

Table S1. Animal feed formulation

ingredient	Proportion (%)	
	Normal control	High fat diet
corn flour	48.38	30.3
Wheat flour	9	9
Wheat bran	9	9
soybean meal	24.52	24.52
Soybean oil	2.8	2.8
lard	2.54	20.62
sucrose	0.1	0.1
Lysine	0.28	0.28
Methionine	0.2	0.2
CaHPO ₃	1.2	1.2
CaCO ₃	1.6	1.6
NaCl	0.2	0.2
Choline chloride	0.1	0.1
Mixed vitamin ^a	0.02	0.02
Mixed minerals ^b	0.06	0.06

^a Mixed vitamin (per 1 Kg): Vitamin A 1×10^6 IU, Vitamin D3 5×10^4 IU, Vitamin E 5×10^2 IU, Vitamin K₃ 100 mg, Vitamin B₁ 100 mg, Vitamin B₂ 100 mg, Vitamin B₆ 200 mg, Vitamin B₁₂ 5 mg, niacin 100 mg, thbrthdrexvdr 200 mg, Add sucrose to 1 Kg; ^bMixed minerals (per 1 Kg): FeSO₄•H₂O 255 g, GuSO₄•H₂O 27.9 g, MnSO₄•H₂O 253.8 g, ZnSO₄•H₂O 137 g, Na₂SeO₃ 0.5 g, KI 0.7 g, Add sucrose to 1 Kg.

Table S2 PCR primers used in AFLP and mRNA expression analysis

Name	Sequence	Annealing temperature (°C)
β -action	F: TGACGTTGACATCCGTAAAGACC R: CTCAGGAGGAGCAATGATCTTGA	60
ZO-1	F: TACCTCTTGAGCCTTGAACCTT R: CGTGCTGATGTGCCATAATA	60
Occludin	F: GTGTGGTTGATCCCCAGGAG R: TCGCTTGCCATTCACTTTGC	60
Claudin-2	F: CCCAGGCCATGATGGTGA R: TCATGCCCACCACAGAGATAAT	60
pIgR	F: AGTAACCGAGGCCTGTCCTT R: GTCACTCGGCAACTCAGGA	60
MUC2	F: CCCAGAAGGGACTGTGTATG R: TGCAGACACACTGCTCACA	59
FAS	F: CGCTCGGCTCGATGGCTCAG R: CCAGCACCACGGCATGCTCA	60
SREBP-1c	F: GTGAGGCGGCTCTGGAACAGAC R: ATAGGGGGCGTCAAACAGGCC	60
Lactobacillus reuteri	F: ACCGAGAACACCGCGTTATTT CATAACTTAACCTAAACAATCAAAGATTGTCT	59
Bacterial Universal	F: ACTCCTACGGGAGGCAGCAGT R: GTATTACCGCGGCTGCTGGCAC	59

Table S3 Cosinor analysis of microbiota alpha diversity (12 hr cycle)

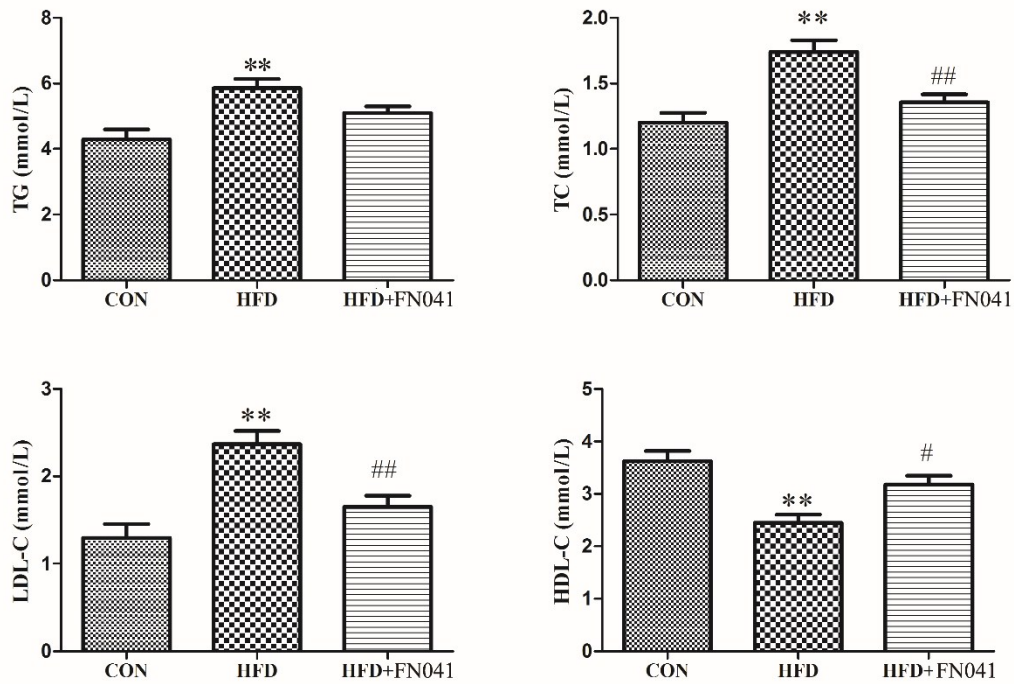
	Goodness of fit	Amplitude	Acrophase (hr)	Phase change (hr)
Chao1				
CON	0.03*	162.149	3	-
HFD	0.005**	182.089	3	0
HFD+FN041	0.005**	218.446	3	0
Observed OUT				
CON	0.061*	192.25	3	-
HFD	0.003**	175.0	3	0
HFD+ FN041	0.008**	195.5	3	0

Data were fitted with median;

*fit is significant good ($P < 0.05$); ** fit is significant food ($P < 0.01$);

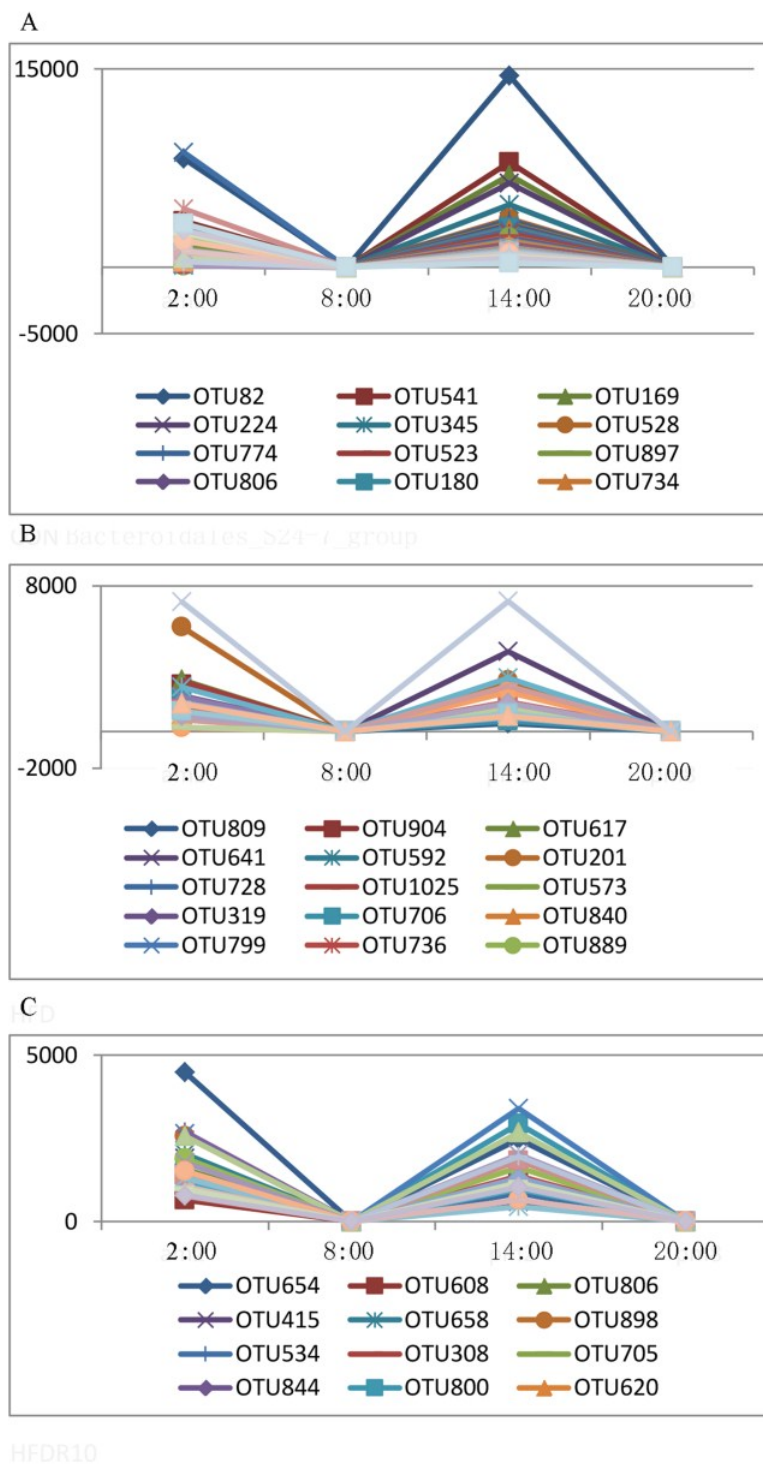
CON, Normal control group; HFD, High fat diet group; HFD+FN041, HFD fed mice treated with *Lactobacillus reuteri* FN041

Figure S1



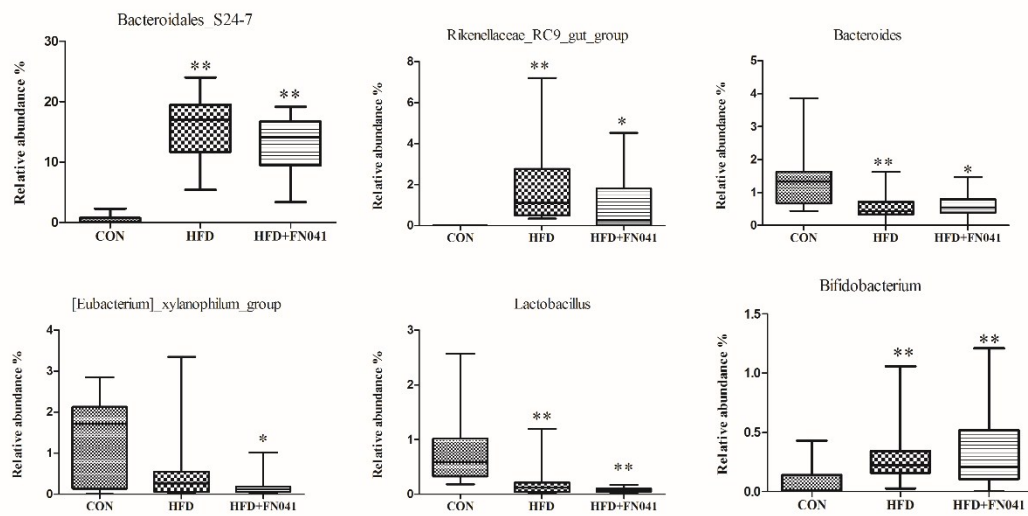
Effects of *Lactobacillus reuteri* FN041 on the average blood lipid in HFD mice without considering circadian effects. ** $P < 0.01$ as compared with group CON; # $P < 0.05$, ## $P < 0.01$ as compared with group HFD. HDL-C, high-density lipoprotein cholesterol; HFD, control high-fat diet group; HFD+ FN041, high-fat diet group treated with *L. reuteri* FN041; LDL-C, low-density lipoprotein cholesterol; Srebp1c, sterol-regulatory-element-binding protein 1c; TG, triglyceride; TC, total cholesterol.

Figure S2



OTU with significant 12-hour oscillations in the control group (A), high fat diet group (B) and high fat diet group treated by *Lactobacillus reuteri* Fn041 (C)

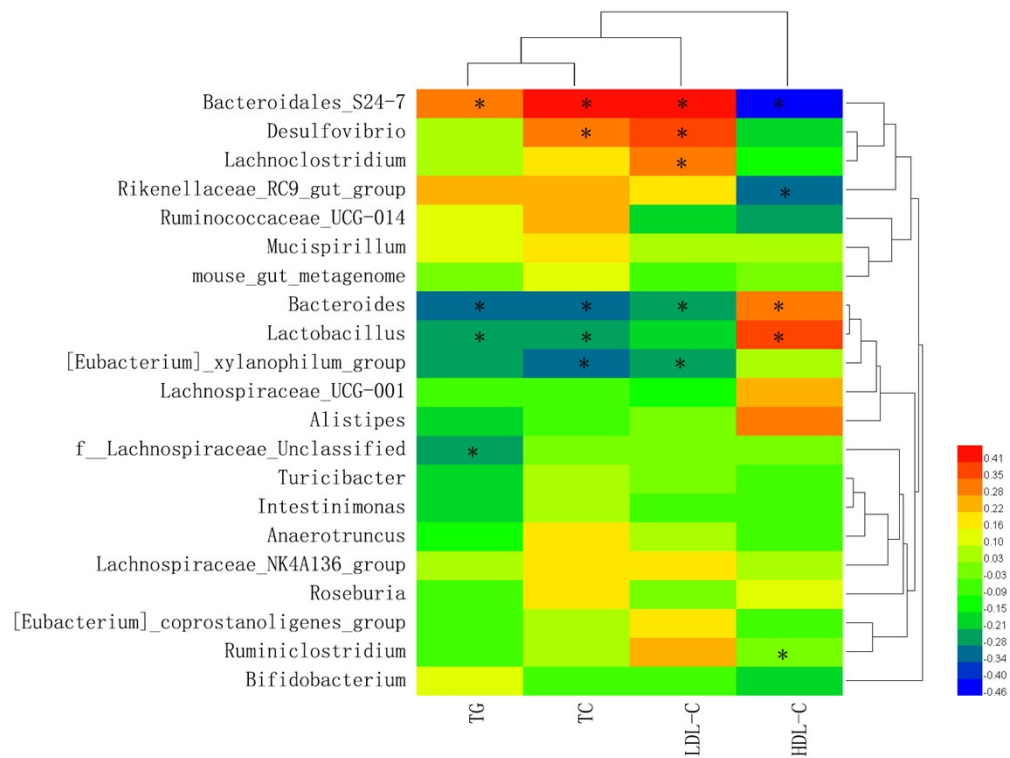
Figure S3



High fat diet and *Lactobacillus reuteri* FN041 induced changed of gut genus without considering circadian effects. *P < 0.05, **P < 0.01 as compared with group CON.

HFD, control high-fat diet group; HFD+ FN041, high-fat diet group treated with *L. reuteri* FN041

Figure S4



Correlation between lipids levels and gut microbiota of genus level. *, p<0.05