

1 **Supplementary Table**

2 **Coordinated changes in microbiota features, short-chain fatty acids,**  
3 **and peripheral clocks accompany fructo-oligosaccharide-associated**  
4 **metabolic improvement**

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16 **Supplementary Table 1.** Primer sequences used for RT-qPCR analysis

	Forward (5'-3' sequence)	Reverse (5'-3' sequence)
<b>qPCR</b>		
<i>Ppara</i>	ACAGGAGAGCAGGGATTTGC	TACCTACGCTCAGCCCTCTT
<i>Fasn</i>	GGTGTGGTGGGTTTGGTGAATTGT	TCACGAGGTCATGCTTTAGCACCT
<i>Srebp1c</i>	AAGCAAATCACTGAAGGACCTGG	AAAGACAAGGGGCTACTCTGGGAG
<i>Pfk</i>	GCTACCGTGGACCTGGAGAACTGC	ACAGTCACTCGTGTATCGAAGCCCA
<i>G6pc</i>	GGTTCATCCTTGTGTCTGTG	GCTGTAGTAGTCGGTGTCC
<i>Cd36</i>	CACAGCTGCCTTCTGAAATGTGTGG	TTTCTACGTGGCCCGGTTCTAATTC
<i>Mttp</i>	ATGATCCTCTTGGCAGTGCTT	TGAGAGGCCAGTTGTGTGAC
<i>Bmall</i>	CCAAGAAAGTATGGACACAGACAAA	GCATTCTTGATCCTTCCTTGGT
<i>Clock</i>	AAGTCTTGGGAACATCAGGCTA	GTCTGAAGCCATATCCACTGCT

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19 **Supplementary Table 2.** MetaCycle (JTK\_CYCLE) rhythmicity parameters for  
 20 peripheral tissue gene expression, gut microbiota features, and short-chain fatty acids  
 21 across six zeitgeber time points

	JTK <i>p</i> value	JTK BH.Q	JTK period	JTK adjphase	JTK amplitude
<b>eWAT</b>					
LFD_Bmal1	8.35E-08	5.40E-07	24	14	3.055686754
HFD_Bmal1	5.60E-06	2.48E-05	24	14	0.937858397
HFD+FOS_Bmal1	0.001922217	0.005208589	24	16	1.292047307
LFD_Clock	0.000301974	0.001056907	24	14	1.144512144
HFD_Clock	1	1	20	14	0.439847208
HFD+FOS_Clock_	0.069229071	0.129227599	24	14	0.262799107
LFD_Srebp1c	1.17E-13	4.90E-12	24	16	1.982006716
HFD_Srebp1c	9.34E-05	0.000356683	24	18	0.496168156
HFD+FOS_Srebp1c	5.70E-13	9.57E-12	24	18	1.356784881
LFD_Ppara $\alpha$	2.69E-06	1.26E-05	24	16	3.742782148
HFD_Ppara $\alpha$	0.000301974	0.001056907333	20	0	0.048380741
HFD+FOS_Ppara $\alpha$	0.318942565	0.461916818	24	16	1.270890655
LFD_Fasn	1	1	20	12	0.401643176
HFD_Fasn	2.23E-05	8.93E-05	20	18	0.049739479
HFD+FOS_Fasn	0.001697666	0.004753465	20	18	0.202381745
<b>hepatic tissue</b>					
LFD_Bmal1	0.002048068	0.005376178	20	4	0.372171219
HFD_Bmal1	6.94E-07	3.64E-06	24	4	0.565482633

HFD+FOS_Bmal1	0.000525536	0.001765801	24	0	0.701612372
LFD_Clock	3.05E-07	1.71E-06	20	2	0.466018638
HFD_Clock	1.64E-08	1.26E-07	20	4	0.415212706
HFD+FOS_Clock	4.75E-09	3.99E-08	20	2	0.722673188
LFD_Srebp1c	0.485556756	0.668635533	20	6	0.510054203
HFD_Srebp1c	1	1	20	6	0.315277724
HFD+FOS_Srebp1c	1	1	20	6	0.266232112
LFD_Pfk	0.188276607	0.310102647	24	16	0.118695232
HFD_Pfk	0.188276607	0.310102647	24	18	0.123107057
HFD+FOS_Pfk	0.005583941	0.012677055	24	12	0.807490771
LFD_G6pc	7.52E-16	6.32E-14	20	2	0.314700872
HFD_G6pc	1.85E-06	9.12E-06	20	2	0.044492553
HFD+FOS_G6pc	5.70E-13	9.57E-12	20	2	0.263257958
LFD_Ppara $\alpha$	0.00971662	0.020928105	24	12	0.817188434
HFD_Ppara $\alpha$	0.000785586	0.002356758	24	12	1.063378847
HFD+FOS_Ppara $\alpha$	0.001020623	0.002956286	24	12	1.162961333
<b>intestinal tissue</b>					
LFD_Bmal1	1.74E-10	1.83E-09	20	4	0.694638619
HFD_Bmal1	3.87E-13	9.57E-12	20	6	0.593041155
HFD+FOS_Bmal1	6.12E-12	7.35E-11	20	6	0.730819684
LFD_Clock	1.60E-05	6.70E-05	24	18	0.652635549
HFD_Clock	6.12E-12	7.35E-11	20	0	0.442227471
HFD+FOS_Clock	0.002770855	0.006845641	24	18	0.443886300
LFD_Cd36	0.632608834	0.830299094	20	8	1.068570929

HFD_Cd36	1	1	20	10	0.411301599
HFD+FOS_Cd36	0.069229071	0.129227599	24	16	0.743744529
LFD_Mttp	1	1	20	0	3.04796285
HFD_Mttp	0.296536049	0.444804074	20	18	0.619656835
HFD+FOS_Mttp	1	1	20	14	0.86059046
<b><math>\alpha</math>-diversity</b>					
LFD_Shannon	0.174040719	0.298355518	24	6	1.043619403
HFD_Shannon	0.485556756	0.668635533	20	18	0.579704148
HFD+FOS_Shannon	0.12600042	0.22519224	20	8	0.647018203
LFD_Simpson	0.318942565	0.461916818	24	4	0.073988066
HFD_Simpson	0.255710585	0.397772022	20	16	0.014298973
HFD+FOS_Simpson	0.718773875	0.901149336	20	8	0.05394919
<b>Genus-level relative abundance</b>					
HFD_g_Bifidobacterium	0.003122858	0.007286668	24	22	0.956361922
HFD+FOS_g_Bifidobacterium	0.203505754	0.328740064	20	18	7.59432683
HFD_g_Akkermansia	1	1	24	18	0.38890873
HFD+FOS_g_Akkermansia	1	1	20	18	5.798275606
HFD_g_Absiella	0.865628753	1	24	0	0.060104076
HFD+FOS_g_Absiella	1	1	20	12	2.899137803
HFD_g_Allobaculum	0.0419624359151	0.083924871830	20	6	0.190918830
HFD+FOS_g_Allobaculum	0.000687933	0.002222553376	20	10	1.520279579
HFD_g_Desulfovibrio	0.6535902375766	0.844639691637	24	6	0.519723484
HFD+FOS_g_Desulfovibrio	0.0029468562002	0.007072454880	24	6	0.141421356

HFD_g_Erysipelatoclostridium	1	1	20	14	0.197989899
HFD+FOS_g_Erysipelatoclostridium	1	1	24	0	0.113137085
HFD_g_Streptococcus	0.010820647	0.022723359	20	14	0.410121933
HFD+FOS_g_Streptococcus	0.275480124	0.420733281	20	0	0.035355339
HFD_g_Romboutsia	0.006621442	0.014636871	20	14	0.494974747
HFD+FOS_g_Romboutsia	1	1	20	2	0.014142136
HFD_g_Oscillibacter	1	1	20	4	0.261629509
HFD+FOS_g_Oscillibacter	0.060598878	0.118379204	20	8	0.091923882
<b>SCFAs</b>					
LFD_Acetate in feces	0.160745182	0.281304068	20	2	27.77027533
HFD_Acetate in feces	0.012037617	0.024662435	20	0	33.61476036
HFD+FOS_Acetate in feces	0.592805095	0.790406793	24	6	56.78409339
LFD_Propionate in feces	0.000785586	0.002356758	20	6	48.54360178
HFD_Propionate in feces	0.865628753	1	24	6	4.359285022
HFD+FOS_Propionate in feces	0.075614479	0.138078613	24	4	28.65201981
LFD_Isobutyrate in feces	9.67E-10	9.02E-09	20	6	44.87960071
HFD_Isobutyrate in feces	0.5550808139362	0.752044973720	24	6	2.799103406
HFD+FOS_Isobutyrate in feces	0.0024557202210	0.006250924198	24	6	12.09192547
LFD_Butyrate in feces	1.04E-07	6.26E-07	20	6	41.45384513
HFD_Butyrate in feces	0.255710585	0.397772022	24	4	2.955328043
HFD+FOS_Butyrate in feces	0.718773875	0.901149336	24	6	10.11112139
LFD_Valerate in feces	2.65E-08	1.86E-07	20	6	45.38419918

HFD_Valerate in feces	1	1	20	10	0.889420123
HFD+FOS_Valerate in feces	0.342765656	0.488005341	24	4	3.665401137
LFD_Acetate in plasma	1.89E-05	9.44E-05	24	20	20.36467529
HFD_Acetate in plasma	0.0939806034396	0.156634339066	24	20	3.747665940
HFD+FOS_Acetate in plasma	9.53E-06	7.15E-05	24	20	13.71787155
LFD_Propionate in plasma	0.0399966386318	0.074993697434	24	20	3.535533905
HFD_Propionate in plasma	0.1367731458395	0.205159718759	24	18	0.459619407
HFD+FOS_Propionate in plasma	0.0212671146543	0.045572388545	24	20	4.772970773
LFD_Isobutyrate in plasma	1	1	24	22	0.282842712
HFD_Isobutyrate in plasma	0.537219042	0.671523802	24	22	0.212132034
HFD+FOS_Isobutyrate in plasma	0.892615301	0.985287694	20	4	0.141421356
LFD_Butyrate in plasma	7.87E-09	1.18E-07	24	4	2.121320343
HFD_Butyrate in plasma	0.3427656558847	0.467407712570	24	22	0.212132034
HFD+FOS_Butyrate in plasma	0.0114291321736	0.028572830434	24	18	1.414213562
LFD_Valerate in plasma	0.0031228575566	0.011710715837	20	4	1.060660171
HFD_Valerate in plasma	0.9196018479751	0.985287694259	24	20	0.212132034
HFD+FOS_Valerate in plasma	0.0108206471338	0.028572830434	20	4	0.424264068