Supplementary Table S1. Mouse key intestinal epithelial, tight junction protein and inflammatory markers primer sequence

Sl. No.	Gene	Gene sequence (5`-3`)	GenBank Accession number/Ref
1	*Notch1*	F: GATGGCCTCAATGGGTACAAG	NM_008714
		R: TCGTTGTTGTTGATGTCACAGT	
2	*Wnt3*	F: CTCGCTGGCTACCCAATTTG	NM_009521
		R: CTTCACACCTTCTGCTACGCT	
3	*Ocln*	F: TTGAAAGTCCACCTCCTTACAGA	NM_008756
		R: CCGGATAAAAAGAGTACGCTGG	
4	*Tjp1*	F: GCCGCTAAGAGCACAGCAA	M_00116357
		R: GCCCTCCTTTTAACACATCAGA	
5	*Pcna*	F: TTTGAGGCACGCCTGATCC	NM_011045
		R: GGAGACGTGAGACGAGTCCAT	
6	*Ccnd1*	F: GCGTACCCTGACACCAATCTC	NM_007631
		R: CTCCTCTTCGCACTTCTGCTC	
7	*Kir67*	F: ATCATTGACCGCTCCTTTAGGT	M_00108111
		R: GCTCGCCTTGATGGTTCCT	
8	*Lyz1*	F: GAGACCGAAGCACCGACTATG	MID: 2615969
		R: CGGTTTTGACATTGTGTTCGC	
9	*Gp2*	F: ACAGTGTCAACCATCTTGCTC	NM_025989
		R: CCCGATTATAGTCAATGGCTGG	
10	*Tff3*	F: TTGCTGGGTCCTCTGGGATAG	MID: 1918584
		R: TACACTGCTCCGATGTGACAG	
11	*Elf3*	F: GCTGCCACCTGTGAGATCAG	M_00116313
		R: GTGCCAAAGGTAGTCGGAGG	
12	*Spdef*	F: AAGGCAGCATCAGGAGCAATG	NM_013891
		R: CTGTCAATGACGGGACACTG	
13	*Gfi1*	F: AGAAGGCGCACAGCTATCAC	NM_010278
		R: GGCTCCATTTTCGACTCGC	
14	*Math1*	F: GAGTGGGCTGAGGTAAAAGAGT	NM_007500
		R: GGTCGGTGCTATCCAGGAG	
15	*Muc2*	F: TTCGGCACGAGCAACTTTG	MID: 3291612
		R: GGCAGGACACCTTGTCATTG	
16	*Muc6*	F: CGGCTGCGTCTGTCCTAAG	NM_181729
		R: GCATAGTCACATGGGCATTCCT	
17	*Muc13*	F: GATCTCTGCAACCCTAACCCC	NM_010739
		R: TCCTTTCACACATGACGACAG	
18	*Il10*	F: GCTCTTACTGACTGGCATGAG	MID: 3230229
		R: CGCAGCTCTAGGAGCATGTG	
19	*Tgfβ1*	F: CTCCCGTGGCTTCTAGTGC	NM_011577
		R: GCCTTAGTTTGGACAGGATCTG	
20	*Il1β*	F: GCAACTGTTCCTGAACTCAACT	NM_008361

20	*Il10*	R: ATCTTTTGGGGTCCGTCAACT	NM_008361
21	*Il6*	F: CCAAGAGGTGAGTGCTTCCC	MID: 3230229
		R: CTGTTGTTCAGACTCTCTCCCT	
22	*Tnfα*	F: CCCTCACACTCAGATCATCTTCT	NM_013693
		R: GCTACGACGTGGGCTACAG	
23	*Sis*	F: GCTATCGCTCTTGTTGTGGTT	M_00108113
		R: TTCCAGGACTAGGGGTTGAAG	
24	*CaII*	F: TCCCACCACTGGGGATACAG	NM_009801
		R: CTCTTGGACGCAGCTTTATCATA	
25	*Hes1*	F: CCAGCCAGTGTCAACACGA	NM_008235
		R: AATGCCGGGAGCTATCTTTCT	
26	*Casp3*	F: ATGGAGAACAACAAAACCTCAGT	NM_009810
		R: TTGCTCCCATGTATGGTCTTTAC	
27	*Casp8*	F: TGCTTGGACTACATCCCACAC	NM_009812
		R: TGCAGTCTAGGAAGTTGACCA	
28	*Bad*	F: GAGGAGGAGCTTAGCCCTTT	MID: 3229443
		R: AGGAACCCTCAAACTCATCG	
29	*Myc*	F: GCTGTTTGAAGGCTGGATTTC	MID: 3255000
		R: GATGAAATAGGGCTGTACGGAG	
30	*Bax*	F: TAGCAAACTGGTGCTCAAGG	MID: 2528875
		R: TCTTGGATCCAGACAAGCAG	
31	*Bcl2l2*	F: GCGGAGTTCACAGCTCTATAC	NM_007537
		R: AAAAGGCCCCTACAGTTACCA	
32	*Bcl2*	F: GATGACTGAGTACCTGAACCG	MID: 2583008
		R: CAGAGACAGCCAGGAGAAATC	
33	*Villin1*	F: TCAAAGGCTCTCTCAACATCAC	NM_009509
		R: AGCAGTCACCATCGAAGAAGC	
34	*Epcam*	F: GCGGCTCAGAGAGACTGTG	NM_008532
		R: CCAAGCATTTAGACGCCAGTTT	
35	*Vimentin*	F: CGTCCACACGCACCTACAG	NM_011701
		R: GGGGGATGAGGAATAGAGGCT	
36	*Lgr5*	F: CCTACTCGAAGACTTACCCAGT	NM_010195
		R: GCATTGGGGTGAATGATAGCA	
37	*Olfm4*	F: AAACAATGTCCTTAGCATTCGCC	M_00103029
		R: GCTTCCAAGGGCCAATGAAAC	
38	*Sox9*	F: AGTACCCGCATCTGCACAAC	NM_011448
		R: ACGAAGGGTCTCTTCTCGCT	
39	*Sox4*	F: GACCTGCTCGACCTGAACC	NM_009238
		R: ACTCCAGCCAATCTCCCGA	
40	*Neurog3*	F: CCAAGAGCGAGTTGGCACT	NM_009719
		R: CGGGCCATAGAAGCTGTGG	
41	*Chga*	F: ATCCTCTCTATCCTGCGACAC	NM_007693
		R: GGGCTCTGGTTCTCAAACACT	
42	*Cck*	F: AAGAGCGGCGTATGTCTGTG	NM_031161
		R: CATCCAGCCCATGTAGTCCC	

43	*Ffar2*	F: CTTGATCCTCACGGCCTACAT R: CCAGGGTCAGATTAAGCAGGAG	NM_146187
44	*Ffar3*	F: CTAAACCTGACCATTTCGGACC R: GATAGGCCACGCTCAGAAAAC	M_00103331
45	*Mct2*	F: GCTGGGTCGTAGTCTGTGC R: ATCCAAGCGATCTGACTGGAG	NM_011391
46	*Mct1*	F: TGTTAGTCGGAGCCTTCATTTC R: CACTGGTCGTTGCACTGAATA	NM_009196
47	*Glp1r*	F: ACGGTGTCCCTCTCAGAGAC R: ATCAAAGGTCCGGTTGCAGAA	NM_021332
48	*Neurogd2*	F: AACTCCACGTCCCCATACAG R: GAGGCGCATAACGATGCTTCT	NM_009718
49	*Gcg*	F: TTACTTTGTGGCTGGATTGCTT R: AGTGGCGTTTGTCTTCATTCA	NM_008100
50	*Pcsk1*	F: AGTTGGAGGCATAAGAATGCTG R: GCCTTCTGGGCTAGTCTGC	NM_013628
51	*Pcsk2*	F: AGAGAGACCCCAGGATAAAGATG R: CTTGCCCAGTGTTGAACAGGT	NM_008792
52	*Slc5a1*	F: AATGCGGCTGACATCTCAGTC R: ACCAAGGCGTTCCATTCAAAG	NM_019810
53	*Arid3a*	F: GCTTGGGACATCCGTCCTC R: CAAATGCCTATCTCCCTCAGC	NM_007880
54	*18s*	F: GCAATTATTCCCCATGAACG R: GGCCTCACTAAACCATCCAA	MID: 3230229

Supplementary Table S2. RFA (Random forest analysis) of intestinal specific marker gene expression in mice intestinal organoid treated with obese FCM (Fecal conditioned media) and mice administration with obese FMT (fecal microbiome transplant)

FCM treatment to mice organoid						
Sl. No.	**Gene**	**B6 FCM**	**db/db FCM**	**DIO FCM**	**p-Value**	
					B6 vs db/db FCM	**B6 vs DIO FCM**
1	*Tjp1*	1.024	0.042	0.062	0	0
2	*Tgfb1*	0.996	0.557	0.469	0.002	0
3	*Ocln*	1.002	0.129	0.082	0	0
4	*Il1β*	1.017	1.955	2.485	0	0
5	*Bax*	1.031	5.353	5.116	0	0
6	*Mct1*	1.036	3.062	5.301	0.047	0.001
7	*Ffar2*	0.996	0.686	0.794	0.019	0.029
8	*Kir67*	0.983	2.648	2.2	0	0
9	*Epcam*	1.026	1.693	1.687	0.029	0.003
10	*Casp3*	1.028	4.924	2.962	0.001	0
11	*Sox9*	0.99	1.903	1.622	0.003	0.014
12	*Sis*	1.002	1.053	2.302	0.058	0.007
13	*Cck*	0.993	0.95	0.696	0.273	0.01
14	*Casp8*	1.057	3.549	2.76	0	0
15	*Slc5a1*	1.032	0.669	0.614	0.019	0.012
16	*Pcna*	0.982	1.739	2.348	0.015	0.039
17	*Glp1r*	0.993	0.714	0.631	0.019	0.044
18	*Il10*	1.014	0.506	0.646	0	0.02
19	*Ccnd1*	1.074	5.432	3.231	0.018	0.018
20	*Pcsk1*	1.011	0.669	0.784	0.037	0.147
21	*Ffar3*	1.055	0.975	0.894	0.384	0.282
22	*Elf3*	1.004	0.481	0.452	0	0
23	*Notch1*	1.004	2.809	2.654	0.012	0.035
24	*Sox4*	1.064	1.609	1.042	0.014	0.437
25	*Wnt3*	0.989	4.744	4.529	0	0
26	*Hes1*	1.016	1.615	1.771	0.013	0.004
27	*Bad*	1.078	2.182	1.59	0.021	0.011
28	*Gp2*	1.103	0.862	1.039	0.19	0.404
29	*Villin1*	1.048	1.855	2.018	0.004	0
30	*Math1*	1.03	0.585	0.469	0.001	0
FMT administration to mice						

Sl. No.	Gene	B6 FMT	db/db FMT	DIO FMT	p-Value	
					B6 vs db/db FMT	B6 vs DIO FMT
1	*Tjp1*	0.993	0.29	0.352	0	0.001
2	*Tgfb1*	0.989	0.484	0.374	0.046	0.031
3	*Ocln*	1.014	0.253	0.336	0.002	0
4	*Il1β*	0.998	1.533	1.752	0	0
5	*Bax*	1.007	1.905	2.863	0.032	0.004
6	*Mct1*	0.988	1.755	1.995	0.018	0.006
7	*Ffar2*	0.989	0.623	0.52	0.034	0.014
8	*Kir67*	0.994	2.858	4.474	0.031	0.001
9	*Epcam*	1.029	3.243	7.717	0.031	0
10	*Casp3*	1.018	3.973	5.12	0.004	0.001
11	*Sox9*	1.005	1.892	2.583	0.048	0
12	*Sis*	1.024	1.754	2.775	0.045	0.006
13	*Cck*	0.982	0.57	0.438	0.043	0.014
14	*Casp8*	0.981	1.398	1.796	0.05	0.007
15	*Slc5a1*	0.983	0.486	0.592	0.029	0.03
16	*Pcna*	1.026	1.927	2.046	0.041	0.028
17	*Glp1r*	1.054	0.688	0.826	0.042	0.109
18	*Il10*	1.012	0.625	0.19	0.045	0.032
19	*Ccnd1*	0.984	1.866	2.251	0.032	0.021
20	*Pcsk1*	0.99	0.684	0.264	0.014	0.002
21	*Ffar3*	0.984	0.525	0.564	0.036	0.02
22	*Elf3*	1.015	0.709	0.348	0.003	0
23	*Notch1*	1.014	2.282	5.186	0.002	0.001
24	*Sox4*	0.986	1.705	2.236	0.017	0
25	*Wnt3*	0.995	2.747	3.645	0	0.001
26	*Hes1*	1.006	2.386	4.405	0.151	0.001
27	*Bad*	1.008	1.796	2.86	0.029	0.006
28	*Gp2*	0.985	1.401	1.344	0.046	0.214
29	*Villin1*	1.001	3.543	5.673	0.004	0
30	*Math1*	0.987	0.544	0.615	0.004	0.002

Supplementary table S3. Correlation of ethanolamine utilizing operon gene with ethanolamine metabolite, Tjp1 and leaky gut and inflammatory markers in obese mice

Correlations

	ine	*Tjp1*	FITC	*Il1b*	*Il6*	*Tnfa*	LBP	CD14
eutA	-.514	.413	-.430	-.577*	-.589*	-.572	-.556	-.647*
eutB	-.851**	.899**	-.900**	-.871**	-.766**	-.899**	-.966**	-.980**
eutC	-.854**	.952**	-.923**	-.868**	-.779**	-.910**	-.986**	-.981**
eutD	-.559	.521	-.619*	-.904**	-.651*	-.807**	-.701*	-.722**
eutP	-.295	.352	-.366	-.005	.123	-.068	-.230	-.201
eutQ	-.854**	.815**	-.858**	-.895**	-.702*	-.879**	-.922**	-.933**
eutS	-.616*	.581*	-.696*	-.923**	-.610*	-.805**	-.734**	-.731**
eutT	-.832**	.932**	-.895**	-.742**	-.707*	-.814**	-.935**	-.937**

Supplementary table S4. Non-targeted metabolomic analysis of obese human subject verses lean human

Participant ID	hCnt_1_3_1	hCnt_10_3_1	hCnt_11_3_1	hCnt_2_3_1	hCnt_3_3_1	hCnt_4_3_1	hCnt_5_3_1	hCnt_7_3_1	hCnt_8_3_1	hCnt_9_3_1	hOb_10_3_1	hOb_2_3_1	hOb_4_3_1
Normal weight (1), Obese (2)	1	1	1	1	1	1	1	1	1	1	2	2	2
Metabolites													
1,3-Dihydroxyacetone	0.0007	0.0005	0.0006	0.0006	0.0006	0.0007	0.0005	0.0007	0.0007	0.0007	0.0004	0.0007	0.0006
3-Methyl-2-oxovalerate	0.0006	0.0005	0.0008	0.0004	0.0006	0.0007	0.0006	0.0006	0.0005	0.0006	0.0006	0.0004	0.0009
4-Hydroxyphenylacetate	0.0003	0.0004	0.0002	0.0003	0.0004	0.0004	0.0002	0.0005	0.0003	0.0004	0.0002	0.0005	0.0004
Acetate	0.0809	0.1235	0.1193	0.1481	0.0729	0.0717	0.0860	0.0850	0.0697	0.0905	0.1049	0.0823	0.0658
Alanine	0.0051	0.0074	0.0084	0.0054	0.0077	0.0065	0.0114	0.0056	0.0080	0.0073	0.0095	0.0054	0.0076
Allantoin	0.0001	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001
Arabinose	0.0006	0.0005	0.0007	0.0006	0.0005	0.0008	0.0005	0.0007	0.0006	0.0006	0.0004	0.0008	0.0006
Aspartate	0.0018	0.0017	0.0013	0.0014	0.0018	0.0019	0.0017	0.0021	0.0020	0.0021	0.0013	0.0016	0.0021
Butyrate	0.0111	0.0119	0.0105	0.0169	0.0095	0.0185	0.0121	0.0010	0.0976	0.0119	0.0103	0.0067	0.0099
Choline	0.0014	0.0013	0.0041	0.0013	0.0015	0.0029	0.0016	0.0017	0.0016	0.0025	0.0014	0.0019	0.0018
Citrulline	0.0008	0.0012	0.0011	0.0009	0.0010	0.0010	0.0012	0.0011	0.0099	0.0011	0.0024	0.0021	0.0012
Ethanol	0.0055	0.0035	0.0021	0.0002	0.0033	0.0038	0.0037	0.0048	0.0032	0.0061	0.0059	0.0085	0.0039
Ethanolamine	0.0013	0.0019	0.0013	0.0017	0.0019	0.0017	0.0019	0.0016	0.0019	0.0020	0.0019	0.0194	0.0018
Formate	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
Fumarate	0.0002	0.0005	0.0008	0.0005	0.0003	0.0007	0.0004	0.0005	0.0003	0.0003	0.0002	0.0001	0.0003
Galactose	0.0001	0.0000	0.0001	0.0000	0.0001	0.0001	0.0000	0.0001	0.0001	0.0000	0.0000	0.0001	0.0001
Glucose	0.0014	0.0018	0.0021	0.0013	0.0013	0.0024	0.0011	0.0015	0.0014	0.0019	0.0023	0.0060	0.0012
Glutamate	0.0050	0.0062	0.0058	0.0055	0.0051	0.0072	0.0055	0.0060	0.0062	0.0053	0.0035	0.0043	0.0057
Glutamine	0.0010	0.0010	0.0009	0.0007	0.0011	0.0012	0.0014	0.0012	0.0012	0.0011	0.0007	0.0009	0.0011
Glycerol	0.0076	0.0071	0.0036	0.0040	0.0044	0.0063	0.0024	0.0051	0.0048	0.0038	0.0047	0.0078	0.0050
Glycine	0.0018	0.0036	0.0022	0.0016	0.0019	0.0027	0.0021	0.0019	0.0026	0.0022	0.0021	0.0037	0.0022

Isoleucine	0.0034	0.0057	0.0041	0.0033	0.0051	0.0050	0.0061	0.0035	0.0058	0.0047	0.0082	0.0041	0.0055
Lactate	0.0097	0.0056	0.0051	0.0044	0.0080	0.0066	0.0054	0.0068	0.0059	0.0052	0.0042	0.0045	0.0124
Lactulose	0.0003	0.0002	0.0004	0.0004	0.0003	0.0004	0.0003	0.0004	0.0003	0.0004	0.0002	0.0004	0.0003
Leucine	0.0021	0.0034	0.0030	0.0024	0.0041	0.0031	0.0043	0.0020	0.0040	0.0033	0.0055	0.0026	0.0032
Lysine/5-Aminopentanoate	0.0026	0.0039	0.0084	0.0038	0.0037	0.0037	0.0092	0.0033	0.0047	0.0043	0.0061	0.0029	0.0034
Malonate	0.0038	0.0051	0.0053	0.0044	0.0062	0.0050	0.0049	0.0059	0.0055	0.0062	0.0041	0.0052	0.0036
Methanol	0.0013	0.0018	0.0018	0.0016	0.0013	0.0020	0.0009	0.0016	0.0013	0.0015	0.0015	0.0021	0.0010
Methylamine	0.0011	0.0014	0.0013	0.0012	0.0014	0.0013	0.0011	0.0015	0.0013	0.0017	0.0011	0.0009	0.0020
N,N-Dimethylformamid	0.0013	0.0014	0.0013	0.0014	0.0019	0.0014	0.0010	0.0014	0.0011	0.0014	0.0016	0.0009	0.0015
Nicotinate	0.0000	0.0000	0.0001	0.0001	0.0000	0.0000	0.0001	0.0001	0.0000	0.0000	0.0001	0.0000	0.0001
Phenylalanine	0.0008	0.0012	0.0008	0.0009	0.0012	0.0010	0.0014	0.0009	0.0013	0.0011	0.0016	0.0009	0.0011
Propionate	0.0169	0.0195	0.0196	0.0207	0.0239	0.0113	0.0237	0.0185	0.0163	0.0160	0.0246	0.0139	0.0145
Pyruvate	0.0017	0.0021	0.0020	0.0019	0.0018	0.0023	0.0022	0.0021	0.0021	0.0018	0.0012	0.0014	0.0019
Sarcosine	0.0020	0.0014	0.0018	0.0014	0.0021	0.0020	0.0014	0.0023	0.0019	0.0018	0.0012	0.0011	0.0020
Succinate	0.0007	0.0006	0.0006	0.0006	0.0006	0.0008	0.0006	0.0008	0.0007	0.0007	0.0004	0.0005	0.0008
Taurine	0.0075	0.0010	0.0012	0.0087	0.0096	0.0012	0.0010	0.0010	0.0011	0.0010	0.0010	0.0021	0.0009
Threonine	0.0007	0.0007	0.0006	0.0007	0.0008	0.0009	0.0007	0.0008	0.0009	0.0008	0.0006	0.0010	0.0007
total bile acid and cholesterol	0.0004	0.0003	0.0002	0.0002	0.0005	0.0004	0.0003	0.0004	0.0003	0.0003	0.0003	0.0003	0.0005
total bile acid and cholesterol	0.0004	0.0004	0.0004	0.0003	0.0007	0.0004	0.0004	0.0004	0.0002	0.0004	0.0004	0.0003	0.0004
Tyrosine	0.0008	0.0012	0.0009	0.0010	0.0012	0.0010	0.0011	0.0010	0.0015	0.0011	0.0009	0.0010	0.0011
Uracil	0.0001	0.0003	0.0002	0.0001	0.0000	0.0002	0.0001	0.0001	0.0002	0.0002	0.0001	0.0001	0.0002
Valerate	0.0112	0.0036	0.0058	0.0037	0.0078	0.0082	0.0032	0.0073	0.0063	0.0050	0.0038	0.0029	0.0143
Valine	0.0024	0.0034	0.0030	0.0022	0.0036	0.0033	0.0040	0.0024	0.0037	0.0031	0.0063	0.0025	0.0035

Participant ID	hOb_5_3_1	hOb_6_3_1	hOb_7_3_1	hOb_8_3_1	hOb_9_3_1	hob_11_3_1	hob_3_3_1
Normal weight (1), Obese (2)	2	2	2	2	2	2	2
Metabolites							
1,3-Dihydroxyacetone	0.0006	0.0009	0.0006	0.0004	0.0009	0.0006	0.0008
3-Methyl-2-oxovalerate	0.0008	0.0006	0.0010	0.0006	0.0007	0.0006	0.0005
4-Hydroxyphenylacetate	0.0004	0.0003	0.0005	0.0003	0.0004	0.0002	0.0002
Acetate	0.0617	0.0766	0.1503	0.1022	0.0635	0.0989	0.1448
Alanine	0.0072	0.0061	0.0078	0.0077	0.0087	0.0089	0.0061
Allantoin	0.0001	0.0002	0.0000	0.0001	0.0000	0.0001	0.0000
Arabinose	0.0006	0.0009	0.0006	0.0005	0.0009	0.0005	0.0006
Aspartate	0.0017	0.0013	0.0014	0.0018	0.0026	0.0019	0.0013
Butyrate	0.0095	0.0052	0.0078	0.0012	0.0074	0.0028	0.0012
Choline	0.0038	0.0020	0.0020	0.0034	0.0018	0.0014	0.0026
Citrulline	0.0008	0.0012	0.0018	0.0012	0.0019	0.0014	0.0011
Ethanol	0.0055	0.0080	0.0024	0.0045	0.0031	0.0055	0.0056
Ethanolamine	0.0018	0.0157	0.0020	0.0217	0.0025	0.0021	0.0015
Formate	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Fumarate	0.0009	0.0002	0.0008	0.0005	0.0004	0.0001	0.0001
Galactose	0.0001	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
Glucose	0.0015	0.0023	0.0014	0.0017	0.0015	0.0017	0.0021
Glutamate	0.0057	0.0044	0.0055	0.0062	0.0073	0.0068	0.0048
Glutamine	0.0010	0.0007	0.0012	0.0010	0.0012	0.0011	0.0007
Glycerol	0.0052	0.0059	0.0034	0.0036	0.0035	0.0033	0.0031
Glycine	0.0028	0.0027	0.0023	0.0019	0.0026	0.0033	0.0021

Isoleucine	0.0053	0.0046	0.0049	0.0045	0.0073	0.0070	0.0047
Lactate	0.0056	0.0042	0.0045	0.0074	0.0062	0.0057	0.0042
Lactulose	0.0004	0.0004	0.0003	0.0003	0.0005	0.0003	0.0003
Leucine	0.0033	0.0032	0.0043	0.0028	0.0049	0.0050	0.0034
Lysine/5-Aminopentanoate	0.0034	0.0046	0.0066	0.0032	0.0042	0.0048	0.0035
Malonate	0.0047	0.0041	0.0048	0.0057	0.0062	0.0049	0.0055
Methanol	0.0013	0.0015	0.0047	0.0010	0.0016	0.0021	0.0027
Methylamine	0.0012	0.0011	0.0014	0.0014	0.0017	0.0015	0.0013
N,N-Dimethylformamide	0.0009	0.0009	0.0014	0.0013	0.0016	0.0016	0.0016
Nicotinate	0.0001	0.0001	0.0000	0.0001	0.0001	0.0000	0.0000
Phenylalanine	0.0011	0.0011	0.0010	0.0007	0.0016	0.0014	0.0009
Propionate	0.0200	0.0193	0.0289	0.0182	0.0138	0.0217	0.0257
Pyruvate	0.0021	0.0013	0.0016	0.0022	0.0024	0.0023	0.0017
Sarcosine	0.0019	0.0011	0.0012	0.0021	0.0025	0.0014	0.0016
Succinate	0.0007	0.0005	0.0005	0.0006	0.0008	0.0007	0.0005
Taurine	0.0009	0.0019	0.0010	0.0008	0.0011	0.0010	0.0011
Threonine	0.0009	0.0015	0.0006	0.0006	0.0011	0.0008	0.0006
total bile acid and cholesterol	0.0003	0.0003	0.0004	0.0003	0.0003	0.0003	0.0003
total bile acid and cholesterol	0.0004	0.0005	0.0007	0.0004	0.0004	0.0005	0.0005
Tyrosine	0.0014	0.0011	0.0016	0.0011	0.0015	0.0013	0.0008
Uracil	0.0003	0.0002	0.0001	0.0002	0.0001	0.0001	0.0001
Valerate	0.0036	0.0025	0.0037	0.0079	0.0035	0.0032	0.0045
Valine	0.0035	0.0028	0.0035	0.0032	0.0048	0.0041	0.0032

Supplementary table S5. RFA (Random forest analysis) of differential miRNA expression in organoids treated with obese (db/db and DIO [diet induced obese]) FCM (fecal conditioned media) vs control (B6-NC [normal chow]) FCM

Sl. No	miRNA	Organoid				
		B6 FCM	db/db FCM	DIO FCM	p-Value	
					B6 vs db/db FCM	B6 vs DIO FCM
1	*mmu-miR-101a-3p*	1	1.857	1.748	0	0
2	*mmu-miR-21*	1	1.413	1.452	0	0
3	*mmu-miR-574-5p*	1	0.754	0.702	0.001	0
4	*mmu-miR-10a*	1	1.23	1.193	0.002	0.009
5	*mmu-miR-665*	1	0.704	0.616	0	0
6	*mmu-miR-465c-5p*	1	0.864	0.875	0.045	0.056
7	*mmu-miR-466c-5p*	1	0.599	0.816	0.002	0
8	*mmu-miR-485*	1	0.846	0.728	0.018	0.001
9	*mmu-miR-770-5p*	1	0.597	0.626	0	0
10	*mmu-miR-871*	1	0.974	0.81	0.336	0.013
11	*mmu-miR-1188*	1	0.578	0.565	0	0
12	*mmu-miR-542-5p*	1	0.76	0.741	0.001	0
13	*mmu-miR-1951*	1	1.047	1.037	0.006	0.008
14	*mmu-miR-340-5p*	1	0.884	0.885	0.038	0.037
15	*mmu-miR-719*	1	2.011	1.348	0	0.001
16	*mmu-miR-208a*	1	0.752	0.765	0	0.001
17	*mmu-miR-675-3p*	1	1.385	1.252	0	0.002
18	*mmu-miR-214*	1	0.811	0.495	0	0
19	*mmu-miR-298*	1	1.378	1.309	0	0
20	*mmu-miR-687*	1	1.556	1.561	0	0.001
21	*mmu-miR-191*	1	0.886	0.888	0.042	0.066
22	*mmu-miR-107*	1	1.239	1.241	0.019	0.009
23	*mmu-miR-1*	1	0.84	0.861	0.191	0.238
24	*mmu-miR-204-3p*	1	0.745	0.85	0.023	0.131
25	*mmu-miR-674*	1	0.722	0.715	0.003	0.011
26	*mmu-miR-324-5p*	1	1.279	1.162	0.001	0.008
27	*mmu-miR-212*	1	0.585	0.607	0.047	0.076
28	*mmu-miR-465a-5p*	1	0.962	0.913	0.073	0.108
29	*mmu-miR-142-5p*	1	1.185	1.133	0.014	0.073
30	*mmu-miR-342-3p*	1	0.911	0.905	0.072	0.044

Supplementary Table 6a. Correlation network between miRNA amd mRNA differential expression in intestinal mice organoid trea

miRNA/Gene	*Cck*	*Elf3*	*Ffar2*	*Ffar3*	*Gp2*	*Math1*	*Tgfb1*	*Tjp1*	*Notch1*
mmu-miR-1	.059	-.083	-.039	-.049	.106	.141	.050	.195	-.298
mmu-miR-101a-3p	-.659**	-.604**	-.552*	-.474*	-.390	-.664**	-.650**	-.776**	.714**
mmu-miR-107	-.121	-.279	-.287	.003	-.346	-.368	-.303	-.323	.461
mmu-miR-1188	.207	.459	.223	-.021	.279	.385	.230	.320	-.393
mmu-miR-142-5p	-.361	-.257	-.073	-.081	-.033	-.312	-.118	-.312	.324
mmu-miR-191	.110	.174	-.078	-.147	.160	.190	.116	.209	-.272
mmu-miR-1951	-.136	-.234	-.145	.062	-.403	-.365	-.262	-.399	.537*
mmu-miR-204-3p	-.068	.315	.179	-.080	.151	.114	.086	-.003	-.010
mmu-miR-208a	.130	.329	.047	-.139	.406	.346	.222	.404	-.501*
mmu-miR-21	-.254	-.453	-.287	-.022	-.319	-.451	-.285	-.382	.483*
mmu-miR-212	.299	.313	.253	.035	.147	.411	.313	.218	-.334
mmu-miR-214	.210	.340	.222	.002	.397	.425	.274	.432	-.546*
mmu-miR-298	-.133	-.381	-.077	.116	-.383	-.339	-.211	-.371	.446
mmu-miR-324-5p	-.059	-.254	.038	.181	-.454	-.285	-.184	-.404	.500*
mmu-miR-340-5p	-.020	.076	-.364	-.242	.112	-.030	-.103	.131	-.110
mmu-miR-342-3p	-.022	.034	-.036	-.149	.363	.182	.147	.286	-.407
mmu-miR-465a-5p	-.010	-.076	-.296	-.209	.303	.072	.027	.324	-.374
mmu-miR-465c-5p	.249	.062	-.061	-.005	-.006	.189	.063	.215	-.254
mmu-miR-466c-5p	.115	.223	-.091	-.089	.101	.139	-.006	.163	-.210
mmu-miR-485	.050	.388	.247	-.017	.127	.206	.141	.051	-.079
mmu-miR-542-3p	.371	.381	.467	.219	.168	.487*	.293	.348	-.441
mmu-miR-574-5p	.283	.496*	.386	.102	.197	.433	.268	.284	-.353
mmu-miR-665	.147	.347	.101	-.075	.404	.348	.217	.406	-.480*
mmu-miR-674	-.057	.288	-.014	-.202	.422	.186	.138	.272	-.317
mmu-miR-675-3p	-.158	-.313	-.006	.133	-.385	-.340	-.197	-.417	.502*
mmu-miR-687	-.260	-.395	-.270	-.037	-.346	-.449	-.284	-.430	.537*
mmu-miR-719	-.244	-.395	-.159	.031	-.336	-.414	-.241	-.418	.503*
mmu-miR-770-5p	.204	.398	.195	-.010	.352	.388	.239	.392	-.463
mmu-miR-10a	-.378	-.391	-.331	-.148	-.149	-.456	-.254	-.346	.428
mmu-miR-871	-.259	-.027	-.085	-.217	.373	-.020	.062	.093	-.165

significant level; * = p<0.05, ** = p< 0.01

ated with db/db FCM (fecal conditioned media) vs control (B6-NC [normal chow]) FCM

miRNA/Gene	*Pcsk1*	*Slc5a1*	*Sox4*	*Sox9*	*Wnt3*	*Villin*	*Epcam*	*Il-1β*	*Glp1r*	*Ocln1*
mmu-miR-1	.145	.044	-.099	.002	.265	-.465	.022	.221	-.202	-.106
mmu-miR-101a-3p	-.694**	-.530*	.434	.083	.522*	.529*	.607**	.437	-.211	-.318
mmu-miR-107	-.482*	-.102	.105	-.142	.120	.205	.022	-.145	-.127	-.150
mmu-miR-1188	.668**	.119	-.008	.497*	-.445	.191	.099	-.154	.478*	.452
mmu-miR-142-5p	-.524*	-.255	.114	-.297	.173	.093	-.018	.180	-.330	-.421
mmu-miR-191	.286	.041	-.016	.183	-.188	-.156	-.016	-.210	.071	-.015
mmu-miR-1951	-.503*	-.092	.111	-.204	.103	.358	.039	-.103	-.020	-.083
mmu-miR-204-3p	.300	-.098	.176	.435	-.436	.547*	.195	-.073	.428	.302
mmu-miR-208a	.562*	.045	-.028	.408	-.322	-.162	.000	-.100	.145	.150
mmu-miR-21	-.725**	-.172	.071	-.443	.369	-.067	-.071	.059	-.448	-.465
mmu-miR-212	.446	.267	-.167	.034	-.163	-.041	-.004	-.107	.348	.243
mmu-miR-214	.647**	.145	-.107	.357	-.224	-.173	.012	.069	.220	.315
mmu-miR-298	-.591**	-.044	-.005	-.486*	.413	-.014	-.038	.146	-.267	-.257
mmu-miR-324-5p	-.485*	.013	.004	-.389	.265	.265	.021	.065	.002	-.033
mmu-miR-340-5p	.136	-.109	.133	.364	-.267	-.035	.023	-.381	-.021	-.085
mmu-miR-342-3p	.193	-.035	-.078	.044	.047	-.476*	-.080	.139	-.273	-.226
mmu-miR-465a-5p	.120	-.059	-.033	.098	.079	-.644**	-.135	-.001	-.422	-.312
mmu-miR-465c-5p	.335	.166	-.065	.129	.023	-.300	-.005	-.104	.096	.134
mmu-miR-466c-5p	.411	.031	.071	.421	-.279	.096	.115	-.298	.280	.230
mmu-miR-485	.400	.008	.097	.410	-.458	.539*	.172	-.137	.532*	.401
mmu-miR-542-3p	.696**	.311	-.201	.264	-.158	.040	.069	.147	.494*	.618**
mmu-miR-574-5p	.711**	.207	-.058	.444	-.420	.307	.121	-.083	.627**	.620**
mmu-miR-665	.590**	.070	-.030	.443	-.336	-.086	.011	-.063	.203	.264
mmu-miR-674	.372	-.112	.094	.448	-.407	.056	.028	-.103	.090	.061
mmu-miR-675-3p	-.574*	-.063	.027	-.430	.309	.193	-.002	.127	-.142	-.171
mmu-miR-687	-.708**	-.187	.107	-.376	.266	.118	-.022	-.011	-.323	-.409
mmu-miR-719	-.682**	-.148	.064	-.451	.342	.067	-.035	.098	-.324	-.370
mmu-miR-770-5p	.652**	.125	-.048	.455	-.360	.013	.039	-.059	.334	.396
mmu-miR-10a	-.712**	-.295	.142	-.331	.226	-.016	-.070	.029	-.500*	-.576*
mmu-miR-871	-.069	-.224	.059	.022	-.041	-.206	-.064	.142	-.344	-.372

miRNA/Gene	*Il-10*	*Hes1*	*Mct1*	*Sis*
mmu-miR-1	-.068	-.102	.280	.148
mmu-miR-	-.529*	.651**	.444	-.602**
mmu-miR-107	-.119	.192	.187	-.173
mmu-miR-	.237	-.435	-.381	.093
mmu-miR-142-	-.295	.403	-.057	-.197
mmu-miR-191	.026	-.322	-.125	.102
mmu-miR-	-.047	.338	.147	-.185
mmu-miR-204-	.068	-.131	-.476*	-.136
mmu-miR-	.041	-.509*	-.327	.126
mmu-miR-21	-.269	.424	.315	-.151
mmu-miR-212	.313	-.146	-.116	.232
mmu-miR-214	.157	-.419	-.230	.176
mmu-miR-298	-.084	.520*	.404	-.088
mmu-miR-324-	.067	.516*	.292	-.109
mmu-miR-340-	-.148	-.459	-.144	-.044
mmu-miR-342-	-.159	-.226	-.085	.117
mmu-miR-	-.250	-.388	.083	.127
mmu-miR-465c-	.141	-.269	.276	.164
mmu-miR-466c-	.083	-.402	-.085	.005
mmu-miR-485	.191	-.168	-.465	-.063
mmu-miR-542-	.424	-.224	-.103	.206
mmu-miR-574-	.380	-.321	-.344	.110
mmu-miR-665	.083	-.501*	-.333	.120
mmu-miR-674	-.100	-.432	-.510*	-.018
mmu-miR-675-	-.048	.548*	.267	-.136
mmu-miR-687	-.237	.418	.208	-.194
mmu-miR-719	-.193	.505*	.272	-.158
mmu-miR-770-	.183	-.465	-.327	.129
mmu-miR-10a	-.398	.329	.065	-.206
mmu-miR-871	-.322	-.073	-.311	-.066

Supplementary Table 6b. Correlation network between miRNA amd mRNA differential expression in inte

miRNA/Genes	*Cck*	*Elf3*	*Ffar2*	*Ffar3*	*Gp2*	*Math1*	*Tgf-β1*
mmu-miR-1	-.071	-.129	-.365	-.090	-.004	-.083	-.169
mmu-miR-101a-3p	-.382	-.628**	-.245	-.213	.319	-.619**	-.606**
mmu-miR-107	.186	-.273	-.040	-.109	-.038	-.392	-.444
mmu-miR-1188	-.070	.433	.030	.256	.134	.529*	.575*
mmu-miR-142-5p	-.191	-.306	-.020	-.188	-.272	-.249	-.354
mmu-miR-191	-.170	.153	.011	.013	-.037	.251	.272
mmu-miR-1951	.170	-.305	.045	-.025	-.311	-.325	-.531*
mmu-miR-204-3p	-.212	.095	.096	.109	.170	.162	.312
mmu-miR-208a	-.237	.285	-.090	.086	.039	.399	.444
mmu-miR-21	.082	-.431	-.048	-.266	-.128	-.532*	-.578*
mmu-miR-212	.026	.227	.117	.039	.317	.238	.335
mmu-miR-214	-.170	.372	.032	.206	.210	.451	.596**
mmu-miR-298	.165	-.335	.138	-.115	-.136	-.415	-.476*
mmu-miR-324-5p	.332	-.189	.183	.082	-.228	-.238	-.421
mmu-miR-340-5p	-.105	.106	-.258	-.086	.218	.089	.159
mmu-miR-342-3p	-.273	.054	-.217	-.128	-.064	.140	.147
mmu-miR-465a-5p	-.053	-.036	-.331	-.058	-.020	-.007	-.101
mmu-miR-465c-5p	-.085	.114	.020	.136	-.233	.257	.095
mmu-miR-466c-5p	-.124	.393	.046	.245	.057	.513*	.540*
mmu-miR-485	.016	.399	.024	.225	.203	.454	.498*
mmu-miR-542-5p	-.063	.371	-.064	.177	.152	.448	.480*
mmu-miR-574-5p	.041	.446	.099	.313	.177	.511*	.549*
mmu-miR-665	-.120	.323	-.080	.125	.240	.368	.460
mmu-miR-674	-.291	.098	-.130	.032	-.128	.226	.167
mmu-miR-675-3p	.258	-.240	.142	-.046	-.022	-.359	-.389
mmu-miR-687	.105	-.432	-.096	-.250	-.189	-.511*	-.616**
mmu-miR-719	.181	-.375	-.086	-.210	-.109	-.487*	-.573*
mmu-miR-770-5p	-.127	.389	.026	.229	.160	.467	.561*
mmu-miR-10a	-.109	-.441	-.166	-.330	-.237	-.465	-.551*
mmu-miR-871	-.294	.093	-.212	-.055	-.084	.201	.184

significant level; * = p<0.05, ** = p< 0.01

estinal mice organoid treated with DIO (diet induced obese) FCM (fecal conditioned media) vs control (B6

miRNA/Genes	*Tjp1*	*Notch1*	*Pcsk1*	*Slc5a1*	*Sox4*	*Sox9*	*Wnt3*
mmu-miR-1	.024	-.160	-.161	.108	.114	.230	-.152
mmu-miR-101a-3p	-.739**	.492*	-.414	-.287	.214	-.320	.556*
mmu-miR-107	-.352	.544*	-.129	-.021	-.091	-.209	.510*
mmu-miR-1188	.459	-.510*	.252	.254	.136	.434	-.639**
mmu-miR-142-5p	-.199	-.129	-.185	-.376	-.160	-.336	.425
mmu-miR-191	.212	-.404	.069	-.084	.019	.036	-.267
mmu-miR-1951	-.347	.216	-.076	-.058	-.269	-.297	.554*
mmu-miR-204-3p	.092	-.127	.075	-.103	.129	-.035	-.153
mmu-miR-208a	.440	-.611**	.104	.008	.122	.332	-.596**
mmu-miR-21	-.459	.529*	-.255	-.241	-.131	-.425	.735**
mmu-miR-212	.029	.099	.117	.211	.162	.055	-.297
mmu-miR-214	.428	-.410	.197	.116	.192	.345	-.638**
mmu-miR-298	-.470*	.519*	-.118	-.148	-.188	-.473*	.705**
mmu-miR-324-5p	-.383	.388	.050	.111	-.275	-.315	.515*
mmu-miR-340-5p	.202	-.091	-.071	.092	.230	.347	-.380
mmu-miR-342-3p	.280	-.501*	-.087	-.163	.079	.178	-.304
mmu-miR-465a-5p	.120	-.209	-.105	.116	.087	.309	-.234
mmu-miR-465c-5p	.164	-.535*	.125	.026	-.132	.055	-.224
mmu-miR-466c-5p	.448	-.587*	.241	.162	.088	.358	-.669**
mmu-miR-485	.354	-.310	.229	.328	.159	.415	-.673**
mmu-miR-542-5p	.416	-.447	.178	.260	.165	.458	-.708**
mmu-miR-574-5p	.388	-.352	.730**	.358	.125	.428	-.701**
mmu-miR-665	.392	-.346	.116	.193	.230	.464	-.661**
mmu-miR-674	.294	-.614**	.017	-.140	.002	.178	-.322
mmu-miR-675-3p	-.440	.647**	-.052	.001	-.136	-.366	.595**
mmu-miR-687	-.445	.453	-.248	-.185	-.160	-.386	.697**
mmu-miR-719	-.455	.580*	-.203	-.093	-.132	-.346	.658**
mmu-miR-770-5p	.458	-.467	.212	.168	.159	.418	-.678**
mmu-miR-10a	-.304	.144	-.636**	-.366	-.123	-.335	.588*
mmu-miR-871	.341	-.605**	-.046	-.134	.069	.249	-.384

-NC [normal chow]) FCM

miRNA/Genes	*Villin*	*Epcam*	*Il-1β*	*Glp1r*	*Ocln1*	*Il-10*	*Hes1*	*Mct1*	*Sis*
mmu-miR-1	-.091	.024	.002	-.282	-.088	-.055	-.143	.011	-.060
mmu-miR-101a-3p	.257	.349	.592**	-.306	-.316	-.413	.643**	.686**	-.634**
mmu-miR-107	.312	.107	.396	-.024	.084	-.046	.500*	.343	-.270
mmu-miR-1188	-.322	-.409	-.349	.186	.174	.199	-.683**	-.404	.411
mmu-miR-142-5p	.140	.649**	-.089	-.347	-.346	-.189	.307	.145	-.309
mmu-miR-191	-.238	.051	-.321	-.039	-.193	-.015	-.293	-.219	.141
mmu-miR-1951	.570*	.564*	.166	-.048	.109	.121	.543*	.309	-.340
mmu-miR-204-3p	-.090	.073	-.080	.170	-.130	-.057	-.068	-.036	.049
mmu-miR-208a	-.466	-.198	-.424	-.112	-.139	-.021	-.653**	-.405	.295
mmu-miR-21	.307	.387	.362	-.191	-.172	-.199	.678**	.412	-.407
mmu-miR-212	-.147	-.437	.043	.286	.121	.064	-.169	-.053	.216
mmu-miR-214	-.394	-.346	-.280	.157	.034	.053	-.595**	-.343	.352
mmu-miR-298	.512*	.432	.333	.071	.006	-.014	.735**	.406	-.362
mmu-miR-324-5p	.706**	.402	.255	.259	.320	.294	.608**	.344	-.261
mmu-miR-340-5p	-.484*	-.510*	-.007	-.209	-.081	-.161	-.427	-.148	.176
mmu-miR-342-3p	-.471*	-.001	-.343	-.385	-.353	-.198	-.442	-.272	.108
mmu-miR-465a-5p	-.189	-.123	-.051	-.301	-.029	-.040	-.286	-.075	.025
mmu-miR-465c-5p	.087	.303	-.381	-.018	-.007	.196	-.241	-.196	.061
mmu-miR-466c-5p	-.286	-.238	-.413	.139	.092	.176	-.640**	-.406	.360
mmu-miR-485	-.268	-.527*	-.200	.236	.251	.211	-.579*	-.303	.386
mmu-miR-542-5p	-.373	-.472*	-.285	.082	.137	.139	-.669**	-.364	.379
mmu-miR-574-5p	-.187	-.486*	-.233	.708**	.341	.292	-.588*	-.331	.409
mmu-miR-665	-.462	-.549*	-.195	.008	.092	.012	-.646**	-.324	.351
mmu-miR-674	-.278	.144	-.413	-.273	-.242	-.074	-.451	-.300	.090
mmu-miR-675-3p	.498*	.171	.423	.217	.156	.058	.668**	.391	-.275
mmu-miR-687	.347	.457	.326	-.219	-.136	-.134	.643**	.417	-.412
mmu-miR-719	.355	.270	.406	-.101	-.044	-.088	.637**	.425	-.364
mmu-miR-770-5p	-.371	-.388	-.311	.124	.117	.102	-.655**	-.389	.377
mmu-miR-10a	.099	.539*	.117	-.660**	-.376	-.300	.438	.263	-.389
mmu-miR-871	-.445	.013	-.401	-.371	-.300	-.151	-.527*	-.329	.133

Supplementary table S7. Predictive abundance of Eut operon expressing bacterial species and the abundance of bacterial species itself that were different in obese/T2D (both db/db and DIO) compared to Lean normal chow fed controls

Targeted Bacterial Species	Cumulative eut operon gene Correlation with Bacterial Species				Relative Abundance (R.A)				p-Value			FC				Lean abundance ranking
	Lean	dbdb	DIO	Obese	Lean	dbdb	DIO	Obese	dbdb	DIO	Obese	Lean	dbdb	DIO	Obese	
Pedobacter kwangyangensis	-0.78	0.77	0.89	0.83	21.00	12.54	0.05	6.30	0.00	0.00	0.00	1.00	0.60	0.00	0.30	1
Akkermansia muciniphila	-0.83	0.81	0.87	0.84	18.90	0.19	2.16	1.17	0.00	0.00	0.00	1.00	0.01	0.11	0.06	2
Alkaliphilus crotonatoxidans	-0.53	0.71	0.85	0.78	5.56	1.33	0.04	0.69	0.00	0.00	0.00	1.00	0.24	0.01	0.12	3
Johnsonella ignava	-0.44	0.71	0.84	0.77	2.26	0.54	0.24	0.39	0.00	0.00	0.00	1.00	0.24	0.11	0.17	4
Bacteroides thetaiotaomicron	-0.48	0.21	0.80	0.51	2.09	1.73	0.00	0.87	0.07	0.00	0.00	1.00	0.83	0.00	0.42	5
Clostridium termitidis	-0.53	0.32	0.85	0.59	0.49	0.43	0.01	0.22	0.03	0.00	0.00	1.00	0.86	0.01	0.44	6
Clostridium frigoris	-0.52	0.65	0.84	0.74	0.40	0.18	0.01	0.10	0.00	0.00	0.00	1.00	0.45	0.04	0.24	7
Lachnospira pectinoschiza	-0.43	0.47	0.57	0.52	0.26	0.11	0.10	0.11	0.01	0.01	0.01	1.00	0.44	0.38	0.41	8
Coprobacillus cateniformis	-0.49	0.64	0.85	0.75	0.16	0.07	0.00	0.04	0.00	0.00	0.00	1.00	0.47	0.02	0.24	9
Luteolibacter algae	-0.53	0.77	0.89	0.83	0.14	0.00	0.02	0.01	0.00	0.00	0.00	1.00	0.02	0.14	0.08	10
Peptococcus niger	-0.51	0.62	0.78	0.70	0.07	0.02	0.01	0.02	0.00	0.00	0.00	1.00	0.33	0.23	0.28	11
Bifidobacterium choerinum	-0.43	0.44	0.10	0.27	0.04	0.02	0.04	0.03	0.01	0.03	0.03	1.00	0.41	0.89	0.65	12

Supplementary table S8a. Control Diet nutrient profile

Ingredient	Control Diet (gm/100 gm)
Casein, USP	13
Whey Protein 895	13
Dextrin	15
Sucrose	15
Wheat Flour, Southern Biscuit self-rising	26
Alphacel	5
Lard	20
Corn Oil	0
Mineral Mix, TD93144 w/o Ca, P	3.1
Calcium Carbonate	0.3
Calcium Phosphate, Monobasic	0.1
Vitamin Mix, Envigo 85529 for Primates	2.5
TOTAL	100

Supplementary table S8b. Meat Supplementary Diet (MSD) nutrient profile

Ingredient	MSD (gm/100 gm)
Meat Protein	50
Dextrin	15
Sucrose	15
Wheat Flour, Southern Biscuit self-rising	14
Alphacel	0
Lard	0
Corn Oil	0
Mineral Mix, TD93144 w/o Ca, P	3.1
Calcium Carbonate	0.3
Calcium Phosphate, Monobasic	0.1
Vitamin Mix, Envigo 85529 for Primates	2.5
TOTAL	100

Supplementary Table S9. Ethanolamine operon specific gene primer sequence			
Sl. No	Gene	Gene sequence (5`-3`)	GenBank Accession number/Ref.
1	*16s*	27F: AGAGTTTGATCMTGGCTCAG	
		1492R: TACGGYTACCTTGTTACGACTT	
2	*eutA*	F: GCCAACACTCGCCAGCTATTGAG	PMID:16769691
		R: CCGGAAGGAAATGCGAGTGATTT	
3	*eutB*	F: GCCAAACTAAAGACCACATTGTT	PMID:16769691
		R: CCGAAGAACAGTGACGGATCGCC	
4	*eutC*	F: GCCGATCAAAAACAGATTGAAGA	PMID:16769691
		R: CCTCGGGTCATGTTGATGCCGGA	
5	*eutD*	F: AATCTGCTACGCACCAAAGTG	https://doi.org/10.1038/s41522-019-0092-7
		R: GGCTTTACAGGCTGCAACATC	
6	*eutP*	F: NNGCTCTTCNTTCATGAAACGTATTGCTTTTGTCG	PMID: 26448059
		R: NNGCTCTTCNTTATTAGCTGTGATAAGTTTTTTCACCTG	
7	*eutQ*	F: NNGCTCTTCNTTCGTGAAAAAACTTATCACAGCTAACGA	PMID: 26448059
		R: NNGCTCTTCNTTATCATACGGATTGCCAGTTTG	
8	*eutS*	F: TTGGTCATTTCACAAAGCGT	DOI: 10.1128/JB.00937-13
		R: GCGCAGTAGAAGAAGCGTT	
9	*eutT*	F: GCGGCTCTCAGTGAACAGGA	DOI: 10.1128/JB.186.17.570
		R: CGCTGCAATCGGCGAACC	

Supplementary Table S10. Human inflammatory and tight junction protein markers primer sequence			
1	*Ocln*	F: ACAAGCGGTTTTATCCAGAGTC R: GTCATCCACAGGCGAAGTTAAT	NM_001205254
2	*Tjp1*	F: CAACATACAGTGACGCTTCACA R: CACTATTGACGTTTCCCCACTC	NM_003257
3	*Il10*	F: CTGTGAAAACAAGAGCAAGGC R: GAAGCTTCTGTTGGCTCCC	PMID: 32302292
4	*Tgf-β1*	F: GCAGCACGTGGAGCTGTA R: CAGCCGGTTGCTGAGGTA	PMID: 32302292
5	*Il-1β*	F: ATGATGGCTTATTACAGTGGCAA R: GTCGGAGATTCGTAGCTGGA	NM_000576
6	*Il6*	F: ACTCACCTCTTCAGAACGAATTG R: CCATCTTTGGAAGGTTCAGGTTG	NM_000600
7	*Tnf-α*	F: GAGGCCAAGCCCTGGTATG R: CGGGCCGATTGATCTCAGC	NM_000594
8	*Arid3a*	F: ACCACGGCGACTGGACTTA R: CACAGGTGTCCCTCGCTTC	NM_005224

Supplementary Table S11. siRNA, miRNA and miR101a-3p promoter sequences

Sl. No.	siRNA/miRNA/miR101a-3p promoter	Nucleotide sequence (5`-3`)	GenBank Accession number/Ref./Catalog No.
1	*RNU6B*	CGCAAGGATGACACGCAAATTCGTGAAGCGTTCCATATTTTT	Assay ID: 001093
2	*miR101a-3p*	Mature miRNA sequence-UACAGUACUGUGAUAACUGAA	Assay ID: 002253
3	*Mimic-miR101a-3p*	Chr.1: 65058434 - 65058508 [-] on Build GRCh38; Product type- mirVana® miRNA mimic	Assay ID: MC11414
4	*Inhibitor miR101a-3p*	Chr.1: 65058434 - 65058508 [-] on Build GRCh38; Product type- mirVana® miRNA inhibitor	Assay ID: MH11414
5	Scrambled *miR101a-3p* lentivirus	SMARTvector Non-targeting mCMV-TurboGFP Control Particles, 50 µL, 10^8 TU/mL	S01-005000-01
6	Mimic *miR101a-3p* lentivirus	shMIMIC Mouse Lentiviral microRNA mmu-miR-101a-3p ,100 µL, 10^8 TU/mL	VSM6213-213647697
7	Negative Control for *Arid3a* siRNA	STEALTH RNAI NEG CTRL MED GC#2; Invitrogen Stealth RNAi siRNA Negative Control Med GC Duplex #2,	12935112
8	*Arid3a* siRNA	Ambion Human Single, Format: Tube(s), Stealth RNAi Pre-designed siRNA- Chr. 19: 925733 - 975934 on Build GRCh38	Assay ID HSS102931
9	NC *cel-miR-67*: Custom miRNA	NC cel-miR-67: Length: 24	CTM-545375
	Mimic, Standard 0.05 µmol	Active: 5' 5'-P.U.C.A.C.A.A.C.C.U.C.C.U.A.G.A.A.A.G.A.G.U.A.G.A 3'	
	miRIDIAN mimic	Passenger: 5' U.A.C.U.C.U.U.U.C.U.A.G.G.A.G.G.U.U.G.U.G.A.U.U.3'-LCBi 3'	
10	3-Biotin LC *mmu-miR101a-3p*:	3-Biotin LC mmu-miR101a-3p: Length: 21	CTM-545376
	Custom miRNA Mimic, Standard	Active: 5' 5'-P.U.A.C.A.G.U.A.C.U.G.U.G.A.U.A.A.C.U.G.A.A 3'	
	0.05 µmol miRIDIAN mimic	Passenger: 5' C.A.G.U.U.A.U.C.A.C.A.G.U.A.C.U.G.U.A.U.U.3'-LCBi 3'	
11	Promoter-*miR-101-1*-500_to-1	19AEPDPC_miR-101-1-500_to-1_pMCSRedFireLuc	Project ID-2019AAMC7C
12	Promoter-*miR-101-1*-1000_to-1	19AEPDQC_miR-101-1-1000_to-1_pMCSRedFireLuc	Project ID-2019AAMC7C
13	Promoter-*miR-101-1*-1500_to-1	19AEPDRC_miR-101-1-1500_to-1_pMCSRedFireLuc	Project ID-2019AAMC7C
14	Promoter-*miR-101-1*-2000_to-1	19AEPDRC_miR-101-1-2000_to-1_pMCSRedFireLuc	Project ID-2019AAMC7C

Sl. No.	siRNA/miRNA/miR101a-3p promoter	Nucleotide sequence (5`-3`)	GenBank Accession number/Ref./Catalog No.
15	scrambled _*miR101-1* (-1000 to -500)	5'- ATC CCT ATA CTT CCG GGT TTT AAG ATT TAC AAT CGT ATA CAT CGC AAG ATC TAA ACT GCC CTT AAG CTG CGT ATA TAG CCA GAC ACG TTC AAT GTG TTA GAA GGA AGT AAC TTA GAC TCC TTA GAA ATT AAT ACC CAA CAG TTC AAT ACA TAA ATA AAA TAG GTT GCC GCG AGA ACC GAA CTT ATA TAT AAT CAA GTC CGT ACT CGA GCT TGG TGC CCA AGG CGA TCG AAA AGT GTC GTA GTG TTA GAC GAT TAC ACT GCA GCA CAG GGG AAT AAA AAG CAG TAA TGC GGA GAA GAA CTG AGT GGA CTC GAC CTC CTC GGA CCA CAA AAT AAT ACG CTA ACA ACG CAC CTG TTT AAA AGG AGG GAA GAT ATG AAT TCC AGA TAT ACG AGA CGC ATA AAG GTT TGT TGG AGA CAC AAC GAG GAT TAT GCT TGG ACT AAA ATC CAC ATC TCG CAC GCG GGT TAC TTA GTC ACT CCT AAA TCT TAC TAC ACT CTC ACT CAC GA – 3'	16739056
16	*miR-101-1* (-1000 to -500)	5'- ACT CAC GAA AAA CAA AAG TGA AAG TGC CTG AAG GGA ACC CAG TAG TAA ACA AGA GTA CAA AAT TCT ATA TCT CAC CGG AAA ACA GTG GCA GAG TTC CCA AAT ATT TTT TTT TCA GCA ACT GTG AAC TTC GGA AAG AAT GAA ATG TCT ATC ACT CCC TTT GAA TGT GAA TAA GAT CAG TGT AAC ACG AAT CCA CCT TGC TCT ATG CAA CTG TCT TCT GAA ACA ATC CTC TGA CCC TGA ACA CCA CTT ATT TAA ATA AGC GGT TCT TAA ATC AAT CAA TCC GTA GTG AAT GGT CCA TCC CCA CAA AAC CAA TCC CCA TTG AAG ACC ACA CCA AGT TGT GCC CCA CTT TGG GAA AAG GGG GAA AGC GGG GGT AGA GAA AGA GGG GAA GGA TTG GAA CCA ACA TTA GAT TGT GCC TGG TGT TGC CAC GCG GTT GTC ATA AAC AAC GGC GTC GAA GCA AAC TGT TTT AAA ACT TAG AAA ATA CGG CGG CCT TTA AAC TCT ATT AT -3'	16739056
17	Control for ZO1_KI	Precision lentiORF RFP positive control viral particles	OHS5833
18	ZO1_KI	Precision LentiORF TJP1 w/Stop Codon, 2 x 25 µl viral particles	OHS5899-202624463