

Supplemental Table 1

Table S1. Composition of diets fed to mice

Ingredient	MD10% Fat	MD 60% Fat
Casein	18.96	25.85
L-cystein	0.28	0.39
Corn starch	29.86	0
Maltodextrin	3.32	16.15
Sucrose	33.17	8.89
Cellulose	4.74	6.46
Soybean oil	2.37	3.23
Lard	1.9	31.66
Mineral Mix	4.24	5.79
Choline bitartrate	1.14	1.55
Total	99.98	99.97
Energy Composition	100	100
Protein	20	20
Carbohydrate	70	20
Fat	10	60

Supplemental Table 2

Table S2 The information and changing trend of potential biomarkers in Tu group and

HFD group

ID	Metabolite	Formula	Retention time (min)	Tu vs HFD
pos_6339	Cys Gly Ala Asp	C12H20N4O7S	0.616683	↓
pos_98	13Z-Docosenamide	C22H43NO	9.7878	↑
pos_4930	C16 Sphinganine	C16H35NO2	5.876367	↑
pos_288	myo-Inositol	C6H12O6	0.616683	↓
pos_36	Salicylaldehyde	C7H6O2	0.888167	↓
pos_656	PI(20:4(5Z,8Z,11Z,14Z)/0:0)	C29H49O12P	7.4536	↓
pos_2741	LysoPC(20:0)	C28H58NO7P	9.316	↓
pos_3257	2-(1-Aziridinyl)ethanol	C4H9NO	14.07322	↑
pos_728	LysoPE(22:0/0:0)	C27H56NO7P	9.060017	↓
pos_6300	Vaccinoside	C25H28O13	0.7075	↓
pos_3318	2,2,4,4,6,6-Hexamethyl-1,3,5-trithiane	C9H18S3	14.76695	↓
pos_6294	Glycerophosphocholine	C8H20NO6P	0.718	↓
pos_4521	25-Acetylvulgaroside	C27H42O7	7.760083	↓
pos_4934	Dihydroceramide	C19H39NO3	5.856367	↑
pos_947	Sporidesmolide I	C33H58N4O8	12.91712	↑
pos_1015	24S-OH-7-DHC	C27H44O2	9.2385	↑
pos_3168	DG(18:2n6/0:0/22:6n3)	C44H70O5	13.15877	↑
pos_2753	3-Hydroxy-10'-apo-b,y-carotenal	C27H36O2	9.376667	↓
pos_4451	Leu Ser Pro Lys Lys	C26H49N7O7	8.1324	↓
pos_706	Palmitoyl Ethanolamide	C18H37NO2	8.6107	↑
pos_4638	Stearyl citrate	C24H44O7	7.181283	↑
pos_3652	1-O-beta-D-Glucopyranosyl-2,3-di-O-(8-hexadecenoyl)glycerol	C41H74O10	12.32532	↑
pos_4965	Lys Ala Trp Trp	C31H39N7O5	5.63755	↓
pos_467	Lumichrome	C12H10N4O2	3.286017	↑
pos_251	2,4-Dihydroxy-2,5-dimethyl-3(2H)-furanone	C6H8O4	0.2616	↓

pos_4088	Ile Arg Leu	C18H36N6O4	9.8443	↑
pos_4477	Docosaehaenoyl Ethanolamide	C24H37NO2	8.0084	↓
pos_1013	D-erythro-Sphingosine C-20	C20H41NO2	9.2385	↑
pos_675	Arg Cys Lys Gln	C20H39N9O6S	7.93825	↑
pos_3917	PE(15:0/16:1(9Z))	C36H70NO8P	10.9334	↑
pos_3529	Pisumoside B	C32H52O16	13.3442	↓
pos_967	Hericenone E	C37H54O6	11.69652	↑

Supplemental Table 3

Table S3 Correlation between metabolics and otu_table in phylum levels

Metabolite	<i>Firmicutes</i>	<i>Bacteroidetes</i>	<i>Actinobacteria</i>	<i>Proteobacteria</i>
Glutathione	-0.7714	0.4286	-0.0857	0.6571
Cys Gly Ala Asp	-0.8286	0.2571	-0.1429	0.2571
Leu Ser Pro Lys Lys	-0.8286	0.2571	-0.1429	0.2571
Tazobactam	-0.4286	-0.1429	-0.4286	0.8857
25-Acetylvulgaroside	-0.1429	-0.4286	-0.8286	0.2571
3-Hydroxy-10'-apo-b,y-carotenal	-0.0857	-0.3143	-0.7714	0.3714
LysoPE(22:0/0:0)	-0.7143	0.0857	-0.3714	0.4857
LysoPE (0:0/20:4(8Z,11Z,14Z,17Z))	-0.3143	0.7714	0.7143	0.3714
C16 Sphinganine	-0.7143	-0.3714	0.0286	-0.8286
Dihydroceramide	-0.7714	-0.2571	0.0857	0.7143
Arg Cys Lys Gln	0.8286	-0.2571	-0.2	-0.0857
2-(1-Aziridinyl)ethanol	0.7714	-0.1429	0.0857	-0.1429
Stearyl citrate	0.8286	-0.2571	0.1429	-0.2571
24S-OH-7-DHC	0.0857	0.5429	0.7714	-0.1429

Supplemental Table 4

Table S4 Correlation between metabolics and otu_table in genus levels

Metabolite	<i>Desulfovibrio</i>	<i>Erysipelatoclostridium</i>	<i>unidentified_ Ruminococcaceae</i>	<i>Oscillibacter</i>	<i>Faecalibaculum</i>	<i>Bacteroides</i>
C16 Sphinganine	0.3143	-0.5429	-0.6	-0.7143	0.3143	-0.3714
Ethyl glucuronide	-0.7143	0.4857	-0.2571	0.3143	-0.7143	0.1429
PS(20:3(8Z,11Z,14Z)/18:1(9Z))	0.0857	-0.2571	0.3714	-0.0857	0.8286	0.2571
SM(d18:1/20:0)	0.1429	-0.4286	0.3143	-0.1429	0.7714	0.0286
stearoyl sphingomyelin	0.1429	-0.4286	0.3143	-0.1429	0.7714	0.0286
Ile Arg Leu LysoPE	0.1429	-0.4286	0.3143	-0.1429	0.7714	0.0286
(0:0/20:4(8Z,11Z,14Z,17Z))	-0.4286	0.4286	0.4857	0.6	0.2571	0.7714
Vaccinoside	-0.6	0.8286	-0.0857	0.7143	-0.8286	0.5429
Tazobactam	0.2	0.0286	0.7143	0.3714	-0.0286	-0.1429