**Correlation heatmap**

1-palmitoyl-2-oleoyl-sn-glycero-3-phosphoethanolamine
5-(1,4-Dihydroxycyclohexyl)-1,2-dihydroxy-3-[2E,4E,6E,8R,10R]-6,8,10-trimethyl-2,4,6-dodecatrienoyl-4(1H)-pyridinone
Eicosanediolic acid
Lumichrome
2-Aminoethyldi(2R)-3-[1Z]-1-hexadecen-1-yloxy-2-hydroxypropyl hydrogen phosphate
(S)-Abscisic acid
Osthol
DMPC
2-Isocapryloyl-3R-hydroxymethyl-gamma-butyrolactone
3,4-Dihydroxy-2-(7-hydroxy-9-methoxy-3,4-dioxo-1,2,3,4-tetrahydrocyclopenta[c]chromen-6-yl)butanal
1_2-Dihydrosantonin
Tryptamine
6-Methylquinoline
(9Z_15Z)-(13S)-12_13-Epoxyoctadeca-9_11_15-trienoic acid
3_4-Dihydroxyphenylethleneglycol
Hexyl 2-furoate
BMK glycidic acid
Coumarone
N1-Acetylperimidine
1,5-Isouquinolinediol
1-[5-(Methoxymethyl)-2-furyl-9H-beta-carboline-3-carboxylic acid
DL-Arginine
2-Iodoanisole
3-Hydroxy-4-methylanthranilate
2-Aminoadipic acid
n-Amylbenzene
CY9070000
12-oxo-10Z-dodecenoic acid
Methylimidazoleacetic acid
Suberic acid
Proclavaminic acid
quinbolone
1,3,7-Octanetriol
Aceclidine
Linoleamide
Gabapentin
Methyl indole-3-acetate
Isoquinoline
Gynocardin
9,12-Octadecadienal
Ethyl palmitoleate
Stigmatellin Y
butyrin
Nicotinic acid
Gly-Val
Nitrobenzene
Deoxyelephantopin
lys-leu
N5-(L-1-Carboxyethyl)-L-ornithine
L-Alanyl-L-proline

**Fig. S5-1 Spearman correlations of rumen microbes and metabolites.**
The abscissa is the metabolites, and the ordinate is the microorganisms. Red and green indicate positive and negative correlations, respectively. * means P<0.05, ** means P<0.01.
Fig. S5-2 Spearman correlations of hindgut microbes and metabolites.
The abscissa is the metabolites, and the ordinate is the microorganisms. Red and green indicate positive and negative correlations, respectively. * means P<0.05, ** means P<0.01.