Supporting information

Table S1 Strains used in specificity analysis of LJP-A use in *Bacteroides* species.

Table S2 Components of the gut microbiota medium (GMM).

Fig. S1 Chemical composition of LJP-A was analyzed by HPLC (A) after PMP derivatization, ^{1}H-NMR and ^{13}C-NMR (B), and CD spectrum (C).

Fig. S2 Correlation analysis between the gut microbiota, LJP-A utilization and SCFAs production by Spearman's correlation test.

Fig. S3 Heatmap showing the relative abundances of 38 OTUs altered by LJP-A.

Table S1 Strains used in specificity analysis of LJP-A use in *Bacteroides* species.

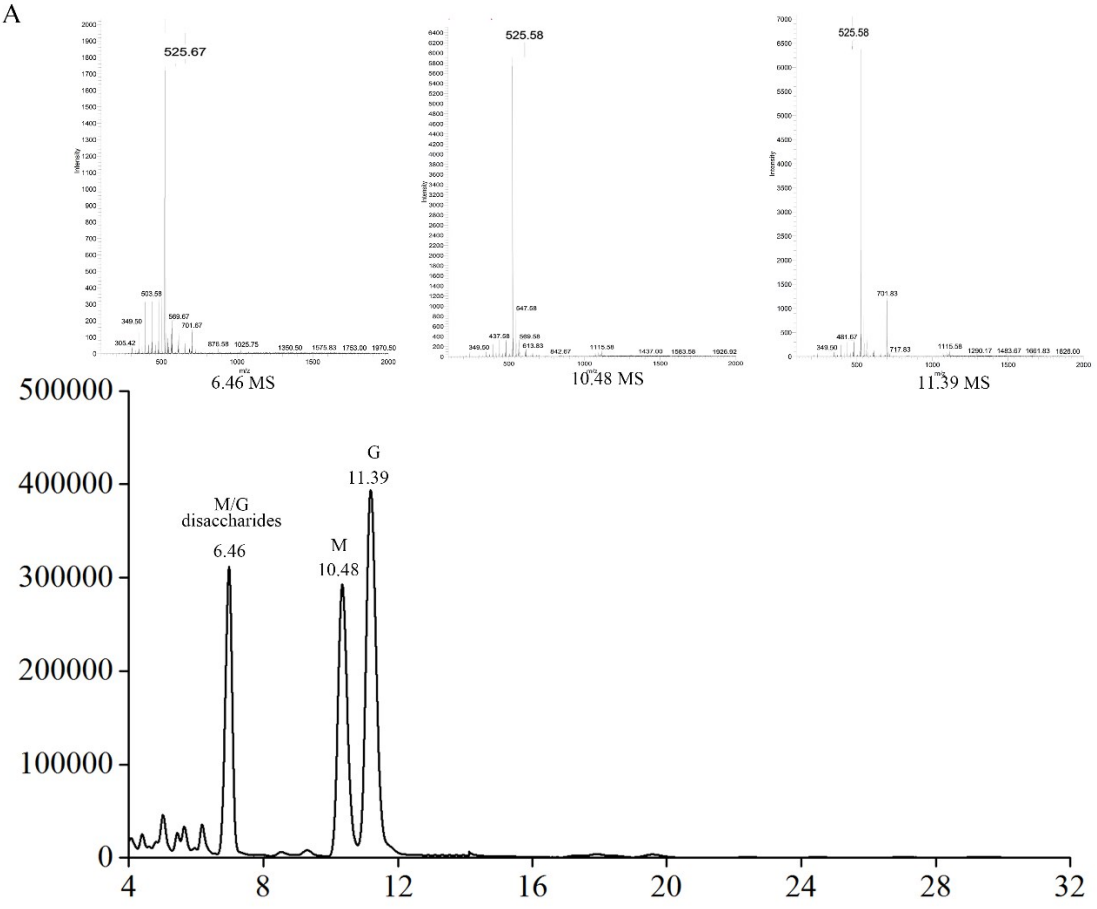
Species	Strain	Source	GeneBank number
Bacteroides ovatus	DM-BO11	Other individual	MK742889
Bacteroides caccae	DM-BC2	Individual#1	MK743932
Bacteroides vulgatus	DM-BV13	Individual#2	MK743934
Bacteroides finegoldii	DM-BF4	Individual#3	MK743931
Bacteroides stercoris	DM-BS25	Other individual	MK743935
Bacteroides uniformis	DM-BU6	Individual#3	MK696409
Bacteroides thetaiotaomicron	DM-BT7	Individual#3	MK742887
Parabacteroides distasonis	DM-PD18	Individual#2	MK696408
Parabacteroides goldsteinii	DM-PG9	Individual#1	MK696407
Parabacteroides johnsonii	DM-PJ29	Individual#2	MK743930

Table S2 Components of the gut microbiota medium (GMM) with 0.5% of LJP-A.

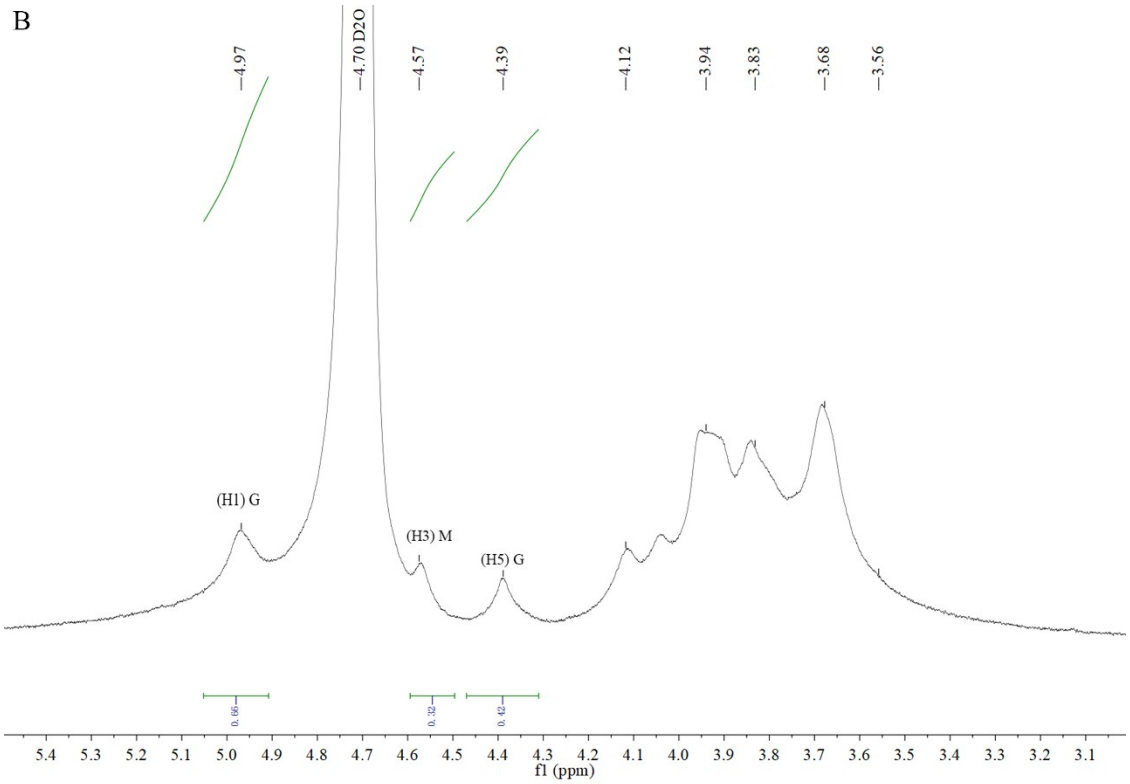
Components	**Amount/L**	**Concentration**
Tryptone Peptone	2 g	0.2%
Yeast Extract	1 g	0.1%
LJP-A	0.5 g	0.5%
L-cysteine	0.5 g	3.2 mM
Meat Extract	5 g	0.5%
KH_2PO4	100 mL	100 mM
$MgSO_4$-$7H_20$	0.002 g	0.008 mM
$NaHCO_3$	0.4 g	4.8 mM
NaCl	0.08 g	1.37 mM
CaCl2	1 mL	0.80%
Vitamin K (menadione)	1 mL	5.8 mM
$FeSO_4$	1 mL	1.44 mM
Histidine Hematin Solution	1 mL	0.1%
Tween 80	2 mL	0.05%
ATCC Vitamin Mix	10 mL	1%
ATCC Trace Mineral Mix	10 mL	1%
Resazurin	4 mL	4 mM

Fig. S1

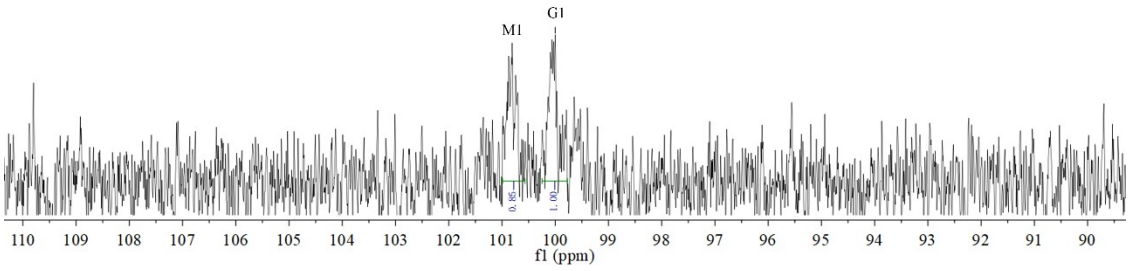
A


525.67
6.46 MS
525.58
10.48 MS
525.58
11.39 MS
500000
400000
300000
200000
100000
0
4
8
12
16
20
24
28
32
M/G
disaccharides
6.46
M
10.48
G
11.39

B

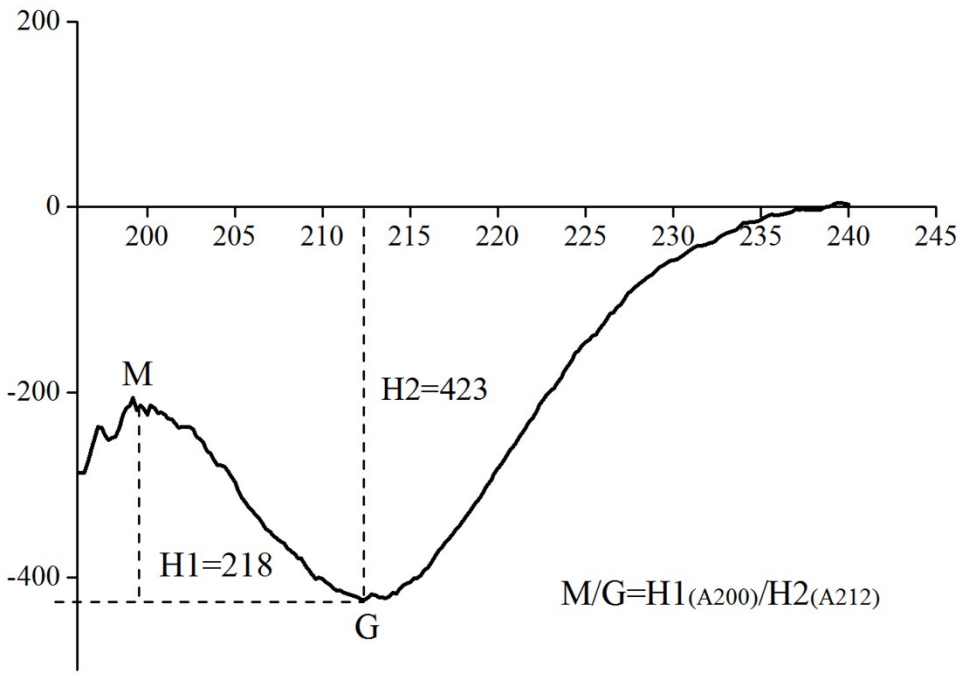


^{1}H-NMR



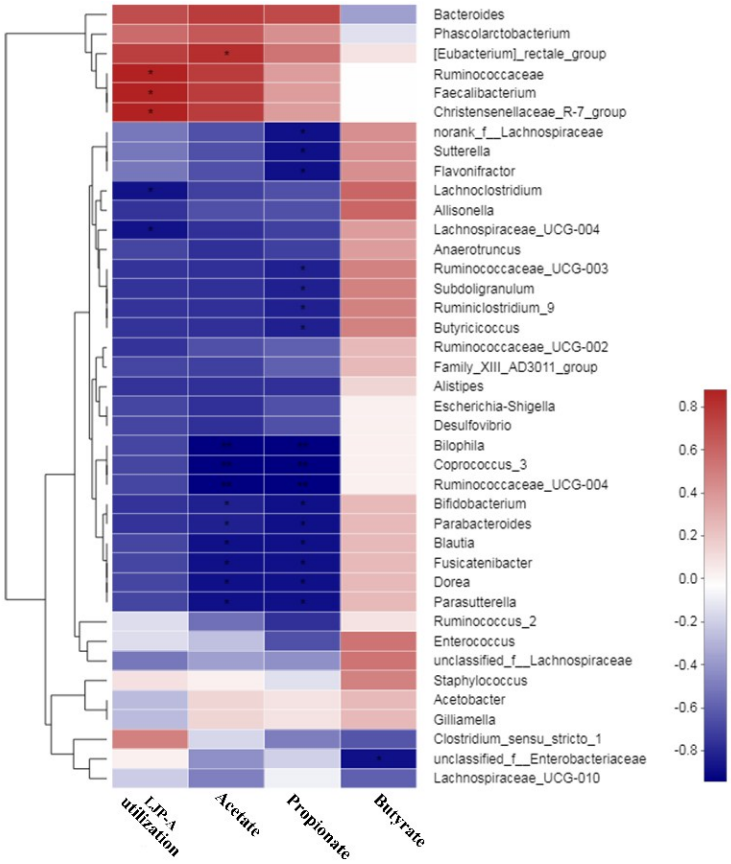
^{13}C-NMR

C



CD spectrum

Fig. S2


Bacteroides
Phascolarctobacterium
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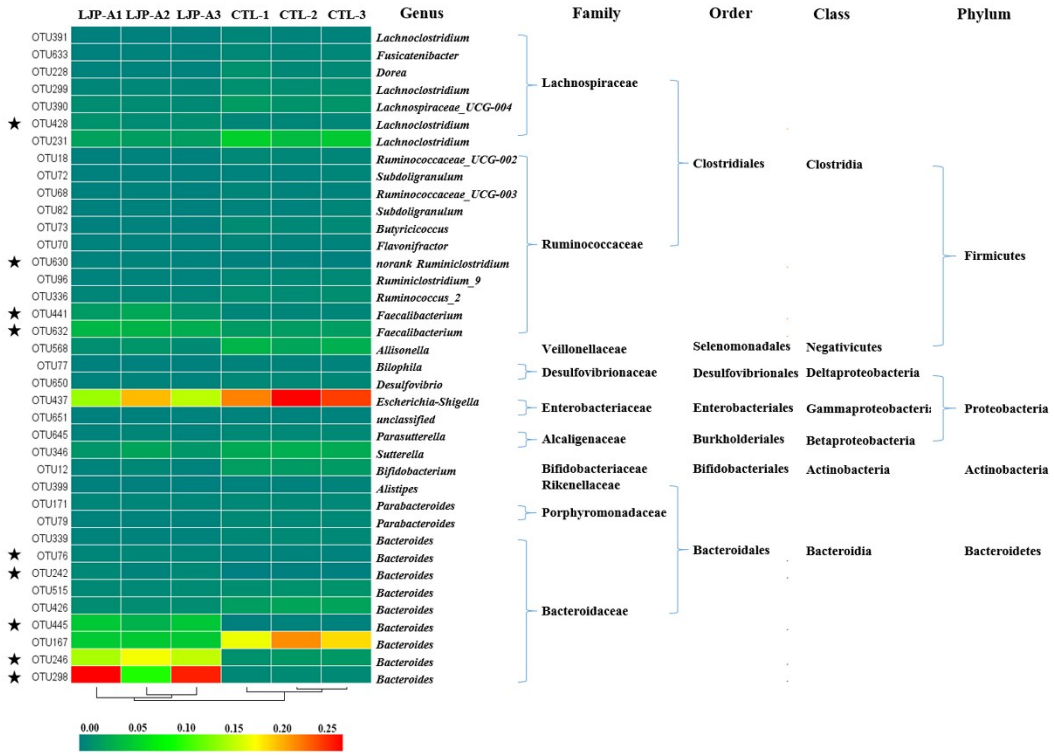
Ruminococcaceae
Faecalibacterium
Christensenellaceae_R-7_group
norank_f__Lachnospiraceae
Sutterella
Flavonifractor
Lachnoclostridium
Allisonella
Lachnospiraceae_UCG-004
Anaerotruncus
Ruminococcaceae_UCG-003
Subdoligranulum
Ruminiclostridium_9
Butyricicoccus
Ruminococcaceae_UCG-002
Family_XIII_AD3011_group
Alistipes
Escherichia-Shigella
Desulfovibrio
Bilophila
Coprococcus_3
Ruminococcaceae_UCG-004
Bifidobacterium
Parabacteroides
Blautia
Fusicatenibacter
Dorea
Parasutterella
Ruminococcus_2
Enterococcus
unclassified_f__Lachnospiraceae
Staphylococcus
Acetobacter
Gilliamella
Clostridium_sensu_stricto_1
unclassified_f__Enterobacteriaceae
Lachnospiraceae_UCG-010
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
L-Lp-A utilization
Acetate
Propionate
Butyrate

Fig. S3


LJP-A1 LJP-A2 LJP-A3 CTL-1 CTL-2 CTL-3
Genus
Family
Order
Class
Phylum
OTU391 Lachnoclostridium
OTU633 Fusicatenibacter
OTU228 Dorea
OTU299 Lachnoclostridium
OTU390 Lachnospiraceae_UCG-004
★ OTU428 Lachnoclostridium
OTU231 Lachnoclostridium
OTU18 Ruminococcaceae_UCG-002
OTU72 Subdoligranulum
OTU68 Ruminococcaceae_UCG-003
OTU82 Subdoligranulum
OTU73 Butyricicoccus
OTU70 Flavonifractor
★ OTU630 norank_Ruminiclostridium
OTU96 Ruminiclostridium_9
OTU336 Ruminococcus_2
★ OTU441 Faecalibacterium
★ OTU632 Faecalibacterium
OTU568 Allisonella
OTU77 Bilophila
OTU650 Desulfovibrio
OTU437 Escherichia-Shigella
OTU651 unclassified
OTU645 Parasutterella
OTU346 Sutterella
OTU12 Bifidobacterium
OTU399 Alistipes
OTU171 Parabacteroides
OTU79 Parabacteroides
OTU339 Bacteroides
★ OTU76 Bacteroides
★ OTU242 Bacteroides
OTU515 Bacteroides
OTU426 Bacteroides
★ OTU445 Bacteroides
OTU167 Bacteroides
★ OTU246 Bacteroides
★ OTU298 Bacteroides
Lachnospiraceae
Ruminococcaceae
Veillonellaceae
Desulfovibrionaceae
Enterobacteriaceae
Alcaligenaceae
Bifidobacteriaceae
Rikenellaceae
Porphyromonadaceae
Bacteroidaceae
Clostridiales
Selenomonadales
Desulfovibrionales
Enterobacteriales
Burkholderiales
Bifidobacteriales
Bacteroidales
Clostridia
Negativicutes
Deltaproteobacteria
Gammaproteobacteria
Betaproteobacteria
Actinobacteria
Bacteroidia
Firmicutes
Proteobacteria
Actinobacteria
Bacteroidetes
0.00 0.05 0.10 0.15 0.20 0.25