

**Supplementary Table**

**Supplementary Table S1** Primers used in the Quantitative Real-time PCR.

**Supplementary Table S2** Changes in Spleen index of the CTX-induced immunosuppressed mice

**Supplementary Table S3** Alpha diversity of gut microbiota.

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**Supplementary Table S5** The top 50 metabolites of *W. coagulans* BCG44 supernatant in both positive and negative ion modes ..

**Supplementary Table S1 Primers used in the Quantitative Real-time PCR**

Gene		Sequence (5'-3')
TLR4	TLR4-F	TCAGCAAAGTCCCTGATGACA
	TLR4-R	CCTGGGGAAAACTCTGGATAG
IL-10	IL-10-F	CTTACTGACTGGCATGAGGATCA
	IL-10-R	GCAGCTCTAGGAGCATGTGG
IL-6	IL-6-F	CTGCAAGAGACTTCCATCCAG
	IL-6-R	AGTGGTATAGACAGGTCTGTTGG
ZO-1	ZO-1-F	CATCTCCAGTCCCTTACCTTC
	ZO-1-R	CCTCGGCTGACATTAGTTAC
Occludin	Occludin-F	GAGCTTACAGGCAGAACTAGAC
	Occludin-R	CAGCCATGTACTCTTCACTCTC
$\beta$ -actin	$\beta$ -actin-F	GCCTCACTGTCCACCTTCCA
	$\beta$ -actin-R	GCAGCTCAGTAACAGTCCGCCT

**Supplementary Table S2 Changes in Spleen index of the CTX-induced immunosuppressed mice**

Group	N	M	BC	BCS
Spleen index	3.16±0.18	1.32±0.03	1.90±0.27	1.87±0.17
		-58.12%#	+43.74%*	+41.51%*

#: For the spleen index of the M group compared with the N group:  $[(M - N)/N] * 100\%$ ; \*: For the spleen index of the BC and BCS groups compared with the M group:

$[(BC \text{ or } BCS - M)/M] * 100\%$

**Supplementary Table S3 Alpha diversity of gut microbiota**

Group	Ace	Chaos	Shannon	Simpson	Coverage	Sobs	Pd	ASVs
N	648.27±100.77	642.26±97.20	4.84±0.20	0.0346±0.0121	0.9992±0.0006	638.60±94.95	78.78±11.93	643.00±94.58
M	742.67±97.42	735.65±93.86	5.21±0.21	0.0170±0.0044	0.9988±0.007	728.40±88.21	90.30±9.82	727.60±88.17
BC	738.75±96.37	728.68±94.81	5.05±0.16	0.0260±0.0050	0.9984±0.0004	718.20±93.17	88.38±10.82	717.60±93.17
BCS	709.21±96.79	701.28±93.49	4.93±0.28	0.0303±0.0126	0.9988±0.007	694.20±89.02	86.49±10.73	694.00±87.29

**Supplementary Table S4 The co-abundance networks on the ASV level**

ASV	Phylum	Family	Genus	Moudle	Hub
ASV556	p__Firmicutes	f__Lactobacillaceae	g__Lactobacillus	M1	0
ASV88	p__Firmicutes	f__Bacillaceae	g__Bacillus	M1	0
ASV58	p__Firmicutes	f__Oscillospiraceae	g__Colidextribacter	M1	0
ASV107	p__Firmicutes	f__unclassified_c__Bacilli	g__unclassified_c__Bacilli	M1	0
ASV563	p__Firmicutes	f__Lachnospiraceae	g__Lachnoclostridium	M1	0
ASV1584	p__Firmicutes	f__Lactobacillaceae	g__Lactobacillus	M1	0
ASV588	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M1	0
ASV101	p__Firmicutes	f__Oscillospiraceae	g__unclassified_f__Oscillospiraceae	M1	0
ASV557	p__Firmicutes	f__Oscillospiraceae	g__Colidextribacter	M1	0
ASV204	p__Firmicutes	f__Lachnospiraceae	g__norank_f__Lachnospiraceae	M1	0
ASV608	p__Firmicutes	f__Bacillaceae	g__Bacillus	M1	0
ASV598	p__Firmicutes	f__Bacillaceae	g__Bacillus	M1	0
ASV231	p__Actinobacteriota	f__Eggerthellaceae	g__Enterorhabdus	M1	0
ASV62	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M1	0
ASV4247	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_UCG-006	M1	0
ASV2564	p__Firmicutes	f__Peptostreptococcaceae	g__Romboutsia	M1	0
ASV724	p__Firmicutes	f__norank_o__RF39	g__norank_f__norank_o__RF39	M1	0
ASV94	p__Firmicutes	f__Oscillospiraceae	g__norank_f__Oscillospiraceae	M1	0
ASV2232	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M1	0

ASV735	p__Desulfobacterota	f__Desulfovibrionaceae	g__Desulfovibrio	M1	0
ASV1656	p__Firmicutes	f__Ruminococcaceae	g__norank_f__Ruminococcaceae	M1	0
ASV3689	p__Firmicutes	f__Lactobacillaceae	g__Lactobacillus	M1	0
ASV320	p__Actinobacteriota	f__Eggerthellaceae	g__Gordonibacter	M1	0
ASV5447	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M1	0
ASV1588	p__Firmicutes	f__Oscillospiraceae	g__Colidextribacter	M1	0
ASV1857	p__Firmicutes	f__Oscillospiraceae	g__unclassified_f__Oscillospiraceae	M1	0
ASV202	p__Firmicutes	f__Lachnospiraceae	g__Marvinbryantia	M1	0
ASV393	p__Firmicutes	f__Christensenellaceae	g__Christensenellaceae_R-7_group	M1	0
ASV1082	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M1	0
ASV1640	p__Firmicutes	f__UCG-010	g__norank_f__UCG-010	M1	0
ASV6838	p__Firmicutes	f__Staphylococcaceae	g__Jeotgalicoccus	M1	0
ASV2829	p__Firmicutes	f__Ruminococcaceae	g__norank_f__Ruminococcaceae	M1	0
ASV4269	p__Firmicutes	f__Enterococcaceae	g__Enterococcus	M1	0
ASV1837	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M1	0
ASV756	p__Firmicutes	f__Aerococcaceae	g__Aerococcus	M1	0
ASV1204	p__Firmicutes	f__Erysipelotrichaceae	g__norank_f__Erysipelotrichaceae	M1	0
ASV11474	p__Firmicutes	f__Lactobacillaceae	g__Lactobacillus	M1	0
ASV2261	p__Firmicutes	f__Staphylococcaceae	g__Staphylococcus	M1	0
ASV5648	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M1	0
ASV2222	p__Firmicutes	f__norank_o__Clostridia_U CG-014	g__norank_f__norank_o__Clostridia _UCG-014	M1	0

ASV1241	p__Firmicutes	f__Monoglobaceae	g__Monoglobus	M1	0
ASV416	p__Firmicutes	f__norank_o_RF39	g__norank_f__norank_o_RF39	M1	0
ASV3729	p__Firmicutes	f__Ruminococcaceae	g__norank_f__Ruminococcaceae	M1	0
ASV99	p__Bacteroidota	f__Tannerellaceae	g__Parabacteroides	M2	0
ASV28	p__Bacteroidota	f__Bacteroidaceae	g__Bacteroides	M2	0
ASV18	p__Bacteroidota	f__Tannerellaceae	g__Parabacteroides	M2	0
ASV117	p__Firmicutes	f__Lachnospiraceae	g__Lachnoclostridium	M2	0
ASV115	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M2	0
ASV44	p__Bacteroidota	f__Bacteroidaceae	g__Bacteroides	M2	0
ASV66	p__Firmicutes	f__Acholeplasmataceae	g__Anaeroplasma	M2	0
ASV804	p__Bacteroidota	f__Bacteroidaceae	g__Bacteroides	M2	0
ASV79	p__Bacteroidota	f__Muribaculaceae	g__Muribaculum	M2	0
ASV36	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M2	0
ASV59	p__Firmicutes	f__Oscillospiraceae	g__UCG-003	M2	0
ASV174	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M2	0
ASV680	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_NK4A136_group	M2	0
ASV639	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M2	0
ASV132	p__Firmicutes	f__Eubacterium_coprostanoligenes_group	g__norank_f__Eubacterium_coprostanoligenes_group	M2	0
ASV130	p__Firmicutes	f__Oscillospiraceae	g__Oscillibacter	M2	0
ASV1052	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M2	0

ASV145	p__Firmicutes	f__Oscillospiraceae	g__unclassified_f__Oscillospiraceae	M2	0
ASV1060	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M2	0
ASV430	p__Firmicutes	f__Ruminococcaceae	g__unclassified_f__Ruminococcaceae	M2	0
			e		
ASV128	p__Firmicutes	f__Ruminococcaceae	g__Ruminococcus	M2	0
ASV206	p__Bacteroidota	f__Muribaculaceae	g__Muribaculum	M2	0
ASV200	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M2	0
ASV1079	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M2	0
ASV1054	p__Firmicutes	f__Lachnospiraceae	g__Marvinbryantia	M2	0
ASV616	p__Bacteroidota	f__Rikenellaceae	g__Alistipes	M2	0
ASV1595	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M2	0
ASV597	p__Bacteroidota	f__Rikenellaceae	g__Alistipes	M2	0
ASV1059	p__Firmicutes	f__norank_o__Clostridia_U CG-014	g__norank_f__norank_o__Clostridia _UCG-014	M2	0
ASV1090	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M2	0
ASV254	p__Bacteroidota	f__Rikenellaceae	g__Rikenella	M2	0
ASV241	p__Bacteroidota	f__Bacteroidaceae	g__Bacteroides	M2	0
ASV718	p__Firmicutes	f__Oscillospiraceae	g__unclassified_f__Oscillospiraceae	M2	0
ASV1058	p__Firmicutes	f__Oscillospiraceae	g__Oscillibacter	M2	0.000001
ASV176	p__Firmicutes	f__norank_o__Clostridia_U CG-014	g__norank_f__norank_o__Clostridia _UCG-014	M2	0
ASV1234	p__Firmicutes	f__Anaerovoracaceae	g__Family_XIII_AD3011_group	M2	0



ASV764	p__Firmicutes	f__Lachnospiraceae	g__norank_f__Lachnospiraceae	M2	0
ASV1066	p__Firmicutes	f__norank_o__Clostridia_vadinBB60_group	g__norank_f__norank_o__Clostridia_vadinBB60_group	M2	0
ASV1105	p__Firmicutes	f__norank_o__Clostridia_vadinBB60_group	g__norank_f__norank_o__Clostridia_vadinBB60_group	M2	0
ASV5	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M3	0
ASV4	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M3	0
ASV20	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M3	0
ASV50	p__Firmicutes	f__Lachnospiraceae	g__Blautia	M3	0
ASV39	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M3	0.000001
ASV38	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_NK4A136_group	M3	0
ASV165	p__Deferribacterota	f__Deferribacteraceae	g__Mucispirillum	M3	0
ASV104	p__Deferribacterota	f__Deferribacteraceae	g__Mucispirillum	M3	0
ASV811	p__Bacteroidota	f__Bacteroidaceae	g__Bacteroides	M3	0
ASV1855	p__Bacteroidota	f__Rikenellaceae	g__Alistipes	M3	0
ASV573	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_NK4A136_group	M3	0
ASV141	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M3	0
ASV123	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M3	0
ASV199	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M3	0
ASV5442	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M3	0

ASV1111	p__Deferribacterota	f__Deferribacteraceae	g__Mucispirillum	M3	0
ASV10017	p__Firmicutes	f__Eubacterium_coprostanoligenes_group	g__norank_f__Eubacterium_coprostanoligenes_group	M3	0
ASV791	p__Bacteroidota	f__Rikenellaceae	g__Alistipes	M3	0
ASV276	p__Bacteroidota	f__Bacteroidaceae	g__Bacteroides	M3	0.000004
ASV279	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M3	0
ASV10018	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M3	0
ASV1883	p__Firmicutes	f__Lachnospiraceae	g__Roseburia	M3	0
ASV663	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M3	0
ASV2798	p__Firmicutes	f__Oscillospiraceae	g__norank_f__Oscillospiraceae	M3	0
ASV1604	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M3	0
ASV292	p__Firmicutes	f__Christensenellaceae	g__Christensenellaceae_R-7_group	M3	0
ASV5470	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M3	0
ASV2299	p__Proteobacteria	f__norank_o__Rhodospirillales	g__norank_f__norank_o__Rhodospirillales	M3	0
ASV4033	p__Firmicutes	f__Oscillospiraceae	g__unclassified_f__Oscillospiraceae	M3	0
ASV10019	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M3	0
ASV2541	p__Cyanobacteria	f__norank_o__Gastranaerophilales	g__norank_f__norank_o__Gastranaerophilales	M3	0
ASV10020	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M3	0
ASV4262	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M3	0
ASV2795	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M3	0

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ASV2800	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_NK4A136_gro up	M3	0
ASV3424	p__Bacteroidota	f__Bacteroidaceae	g__Bacteroides	M3	0
ASV1	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_UCG-006	M4	0
ASV51	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M4	0
ASV26	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M4	0
ASV558	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_NK4A136_gro up	M4	0
ASV21	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M4	0
ASV16	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M4	0
ASV203	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M4	0
ASV334	p__Firmicutes	f__Oscillospiraceae	g__unclassified_f__Oscillospiraceae	M4	0
ASV2154	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M4	0
ASV108	p__Firmicutes	f__Lachnospiraceae	g__Roseburia	M4	0
ASV1646	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M4	0
ASV2163	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M4	0
ASV1505	p__Proteobacteria	f__norank_o__Rhodospirillales	g__norank_f__norank_o__Rhodospirillales	M4	0
ASV1596	p__Firmicutes	f__Lachnospiraceae	g__Lachnoclostridium	M4	0
ASV651	p__Firmicutes	f__Lachnospiraceae	g__Roseburia	M4	0
ASV1644	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M4	0
ASV610	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M4	0

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ASV2160	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M4	0
ASV1622	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M4	0
ASV2161	p__Firmicutes	f__Oscillospiraceae	g__Colidextribacter	M4	0
ASV3706	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_NK4A136_group	M4	0
ASV214	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M4	0
ASV2176	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M4	0
ASV3699	p__Firmicutes	f__Oscillospiraceae	g__Colidextribacter	M4	0
ASV2162	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M4	0
ASV2165	p__Firmicutes	f__norank_o__Clostridia_UCG-014	g__norank_f__norank_o__Clostridia_UCG-014	M4	0
ASV4281	p__Firmicutes	f__unclassified_o__Oscillospirales	g__unclassified_o__Oscillospirales	M4	0
ASV363	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M4	0
ASV3691	p__Firmicutes	f__Oscillospiraceae	g__unclassified_f__Oscillospiraceae	M4	0
ASV2168	p__Firmicutes	f__Ruminococcaceae	g__unclassified_f__Ruminococcaceae	M4	0
ASV1353	p__unclassified_k__norank_d__Bacteria	f__unclassified_k__norank_d__Bacteria	g__unclassified_k__norank_d__Bacteria	M4	0
ASV2172	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M4	0
ASV2159	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M4	0
ASV227	p__Desulfobacterota	f__Desulfovibrionaceae	g__Desulfovibrio	M5	0

ASV646	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M5	0
ASV1063	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_NK4A136_gro up	M5	0.000002
ASV122	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_NK4A136_gro up	M5	0
ASV140	p__Bacteroidota	f__Rikenellaceae	g__Alistipes	M5	0
ASV744	p__Firmicutes	f__Ruminococcaceae	g__Ruminococcus	M5	0
ASV729	p__Firmicutes	f__Lachnospiraceae	g__Roseburia	M5	0
ASV113	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_NK4A136_gro up	M5	0
ASV85	p__Firmicutes	f__Lachnospiraceae	g__GCA-900066575	M5	0
ASV1064	p__Patescibacteria	f__Saccharimonadaceae	g__Candidatus_Saccharimonas	M5	0
ASV3392	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_NK4A136_gro up	M5	0.000002
ASV3391	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M5	0
ASV2251	p__Firmicutes	f__Oscillospiraceae	g__unclassified_f__Oscillospiraceae	M5	0
ASV2470	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M5	0.000001
ASV732	p__Firmicutes	f__norank_o__Clostridia_U CG-014	g__norank_f__norank_o__Clostridia _UCG-014	M5	0
ASV3396	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_NK4A136_gro up	M5	0.000018
ASV1202	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_NK4A136_gro	M5	0

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			up		
ASV2302	p__Firmicutes	f__Lachnospiraceae	g__Roseburia	M5	0
ASV3395	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M5	0
ASV3400	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_NK4A136_gro	M5	0.000012
			up		
ASV1690	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_NK4A136_gro	M5	0.000002
			up		
ASV341	p__Actinobacteriota	f__Eggerthellaceae	g__unclassified_f__Eggerthellaceae	M5	0
ASV353	p__Patescibacteria	f__Saccharimonadaceae	g__Candidatus_Saccharimonas	M5	0
ASV2851	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M5	0
ASV3393	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M5	0
ASV3406	p__Firmicutes	f__norank_o__Clostridia_U CG-014	g__norank_f__norank_o__Clostridia _UCG-014	M5	0
ASV3394	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M5	0
ASV116	p__Firmicutes	f__Lachnospiraceae	g__Blautia	M6	0
ASV1921	p__Firmicutes	f__Lachnospiraceae	g__Blautia	M6	0
ASV568	p__Firmicutes	f__Lachnospiraceae	g__Roseburia	M6	0
ASV685	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M6	0
ASV1618	p__Firmicutes	f__Oscillospiraceae	g__Oscillibacter	M6	0
ASV2155	p__Firmicutes	f__Lachnospiraceae	g__Roseburia	M6	0
ASV649	p__Desulfobacterota	f__Desulfovibrionaceae	g__Bilophila	M6	0
ASV1071	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M6	0

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ASV248	p__Firmicutes	f__Oscillospiraceae	g__unclassified_f__Oscillospiraceae	M6	0
ASV574	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M6	0
ASV11223	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M6	0
ASV1846	p__Firmicutes	f__Oscillospiraceae	g__Colidextribacter	M6	0
ASV1148	p__Firmicutes	f__Lachnospiraceae	g__Roseburia	M6	0
ASV630	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M6	0
ASV1829	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_NK4A136_group	M6	0
ASV2530	p__Firmicutes	f__Lachnospiraceae	g__A2	M6	0
ASV1647	p__Firmicutes	f__Lachnospiraceae	g__A2	M6	0
ASV611	p__Firmicutes	f__Lachnospiraceae	g__Acetatifactor	M6	0
ASV677	p__Firmicutes	f__Lachnospiraceae	g__Roseburia	M6	0
ASV3445	p__Firmicutes	f__Lachnospiraceae	g__Roseburia	M6	0
ASV1088	p__Firmicutes	f__Lachnospiraceae	g__Acetatifactor	M6	0
ASV2821	p__Firmicutes	f__Oscillospiraceae	g__norank_f__Oscillospiraceae	M6	0
ASV12070	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M6	0
ASV12068	p__Firmicutes	f__unclassified_c__Clostridia	g__unclassified_c__Clostridia	M6	0
ASV25	p__Actinobacteriota	f__Bifidobacteriaceae	g__Bifidobacterium	M7	0
ASV13	p__Actinobacteriota	f__Bifidobacteriaceae	g__Bifidobacterium	M7	0
ASV77	p__Firmicutes	f__Erysipelotrichaceae	g__Faecalibaculum	M7	0
ASV305	p__Firmicutes	f__Oscillospiraceae	g__norank_f__Oscillospiraceae	M7	0

ASV23	p__Actinobacteriota	f__Bifidobacteriaceae	g__Bifidobacterium	M7	0
ASV93	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M7	0
ASV100	p__Firmicutes	f__Eubacterium_coprostanol igenes_group	g__norank_f__Eubacterium_coprost anoligenes_group	M7	0
ASV2	p__Verrucomicrobiota	f__Akkermansiaceae	g__Akkermansia	M7	0
ASV192	p__Actinobacteriota	f__Eggerthellaceae	g__Enterorhabdus	M7	0
ASV211	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M7	0
ASV591	p__Actinobacteriota	f__Eggerthellaceae	g__Enterorhabdus	M7	0
ASV205	p__Actinobacteriota	f__Eggerthellaceae	g__Enterorhabdus	M7	0
ASV216	p__Actinobacteriota	f__Eggerthellaceae	g__Enterorhabdus	M7	0
ASV6366	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M7	0
ASV5474	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M7	0
ASV596	p__Actinobacteriota	f__Eggerthellaceae	g__Enterorhabdus	M7	0
ASV659	p__Actinobacteriota	f__Eggerthellaceae	g__Parvibacter	M7	0
ASV263	p__Firmicutes	f__norank_o__Clostridia_U CG-014	g__norank_f__norank_o__Clostridia _UCG-014	M7	0
ASV179	p__Firmicutes	f__norank_o__Clostridia_U CG-014	g__norank_f__norank_o__Clostridia _UCG-014	M7	0
ASV1067	p__Firmicutes	f__Eubacterium_coprostanol igenes_group	g__norank_f__Eubacterium_coprost anoligenes_group	M7	0
ASV81	p__Firmicutes	f__norank_o__Clostridia_U CG-014	g__norank_f__norank_o__Clostridia _UCG-014	M7	0



ASV6367	p__Firmicutes	f__Erysipelotrichaceae	g__Dubosiella	M7	0
ASV2487	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M7	0
ASV6368	p__Firmicutes	f__Erysipelotrichaceae	g__Dubosiella	M7	0
ASV627	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M8	0.115023
ASV1109	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_NK4A136_group	M8	0.201582
ASV250	p__Firmicutes	f__Lactobacillaceae	g__Lactobacillus	M8	0.230271
ASV54	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M8	0.230273
ASV625	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M8	0.220413
ASV2823	p__Proteobacteria	f__Comamonadaceae	g__Comamonas	M8	0.235584
ASV549	p__Firmicutes	f__Ruminococcaceae	g__unclassified_f__Ruminococcaceae	M8	0.199056
ASV567	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M8	0.235584
ASV2839	p__Proteobacteria	f__Caulobacteraceae	g__Brevundimonas	M8	0.229617
ASV8675	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_NK4A136_group	M8	0.220538
ASV1123	p__Firmicutes	f__Lachnospiraceae	g__A2	M8	0.177419
ASV5446	p__Firmicutes	f__Lachnospiraceae	g__Roseburia	M8	0.175012
ASV2878	p__Proteobacteria	f__Devosiaceae	g__Devosia	M8	0.235584
ASV2224	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M8	0.0126
ASV5188	p__Firmicutes	f__Eubacterium_coprostanoligenes_group	g__norank_f__Eubacterium_coprostanoligenes_group	M8	0.226505

ASV2863	p__Proteobacteria	f__Caulobacteraceae	g__Brevundimonas	M8	0.235584
ASV7383	p__Firmicutes	f__Lachnospiraceae	g__norank_f__Lachnospiraceae	M8	0.235584
ASV10028	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_UCG-001	M8	0.229617
ASV13368	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M8	0.226505
ASV6757	p__Proteobacteria	f__Devosiaceae	g__Devosia	M8	0.235584
ASV6383	p__Firmicutes	f__Ruminococcaceae	g__norank_f__Ruminococcaceae	M8	0.210086
ASV10081	p__Firmicutes	f__Carnobacteriaceae	g__Atopostipes	M8	0.235584
ASV645	p__Firmicutes	f__Lachnospiraceae	g__Acetatifactor	M9	0
ASV137	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M9	0
ASV1602	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M9	0
ASV233	p__Firmicutes	f__Oscillospiraceae	g__unclassified_f__Oscillospiraceae	M9	0
ASV437	p__Bacteroidota	f__Tannerellaceae	g__Parabacteroides	M9	0
ASV2170	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M9	0
ASV2158	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_NK4A136_gro up	M9	0
ASV4692	p__Desulfobacterota	f__Desulfovibrionaceae	g__norank_f__Desulfovibrionaceae	M9	0
ASV9306	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_NK4A136_gro up	M9	0
ASV3409	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M9	0
ASV4254	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M9	0
ASV1168	p__Firmicutes	f__Lachnospiraceae	g__Acetatifactor	M9	0
ASV4242	p__Firmicutes	f__norank_o__Clostridia_U	g__norank_f__norank_o__Clostridia	M9	0

		CG-014	_UCG-014		
ASV2580	p__Firmicutes	f__Ruminococcaceae	g__UBA1819	M9	0
ASV9307	p__Firmicutes	f__unclassified_c__Clostridia a	g__unclassified_c__Clostridia	M9	0
ASV8180	p__Firmicutes	f__Oscillospiraceae	g__unclassified_f__Oscillospiraceae	M9	0
ASV2542	p__Patescibacteria	f__Saccharimonadaceae	g__Candidatus_Saccharimonas	M9	0
ASV9308	p__Firmicutes	f__Lachnospiraceae	g__norank_f__Lachnospiraceae	M9	0
ASV6398	p__Firmicutes	f__Lachnospiraceae	g__ASF356	M9	0
ASV67	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M10	0.000026
ASV601	p__Firmicutes	f__Ruminococcaceae	g__unclassified_f__Ruminococcaceae e	M10	0.000024
ASV629	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M10	0.000025
ASV581	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_NK4A136_gro up	M10	0.000063
ASV262	p__Firmicutes	f__Ruminococcaceae	g__norank_f__Ruminococcaceae	M10	0.000003
ASV3697	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_NK4A136_gro up	M10	0.000027
ASV2166	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M10	0.000062
ASV2186	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M10	0.000023
ASV10027	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M10	0.012639
ASV701	p__Firmicutes	f__Lachnospiraceae	g__Roseburia	M10	0.000013
ASV2194	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M10	0.000005

ASV1332	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M10	0.000064
ASV5466	p__Firmicutes	f__norank_o__Clostridia_U CG-014	g__norank_f__norank_o__Clostridia _UCG-014	M10	0.000019
ASV897	p__Firmicutes	f__norank_o__Clostridia_va dinBB60_group	g__norank_f__norank_o__Clostridia _vadinBB60_group	M10	0.000023
ASV2229	p__Firmicutes	f__norank_o__Clostridia_U CG-014	g__norank_f__norank_o__Clostridia _UCG-014	M10	0.000709
ASV11224	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M10	0.000064
ASV8426	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M10	0.000063
ASV9	p__Bacteroidota	f__Prevotellaceae	g__Alloprevotella	M11	0
ASV562	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M11	0
ASV68	p__Bacteroidota	f__Prevotellaceae	g__Prevotellaceae_UCG-001	M11	0
ASV41	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M11	0
ASV713	p__Proteobacteria	f__norank_o__Rhodospirillal es	g__norank_f__norank_o__Rhodospi rillales	M11	0
ASV282	p__Deferribacterota	f__Deferribacteraceae	g__Mucispirillum	M11	0
ASV1150	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M11	0
ASV2464	p__Bacteroidota	f__Prevotellaceae	g__Alloprevotella	M11	0
ASV198	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M11	0
ASV638	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_NK4A136_gro up	M11	0
ASV1697	p__Firmicutes	f__Ruminococcaceae	g__Anaerotruncus	M11	0

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ASV2465	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_UCG-001	M11	0
ASV2333	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M11	0
ASV2466	p__Bacteroidota	f__Prevotellaceae	g__Alloprevotella	M11	0
ASV2467	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M11	0
ASV560	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M12	0
ASV234	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M12	0
ASV1856	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M12	0
ASV3403	p__Firmicutes	f__Peptostreptococcaceae	g__Romboutsia	M12	0
ASV1616	p__Firmicutes	f__Lachnospiraceae	g__Acetatifactor	M12	0
ASV657	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M12	0
ASV3084	p__Firmicutes	f__Oscillospiraceae	g__Colidextribacter	M12	0
ASV2491	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M12	0
ASV2187	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M12	0
ASV4241	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M12	0
ASV2806	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M12	0
ASV4239	p__Firmicutes	f__Ruminococcaceae	g__Ruminococcus	M12	0
ASV4243	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M12	0
ASV4240	p__Firmicutes	f__Lactobacillaceae	g__Lactobacillus	M12	0
ASV1048	p__Firmicutes	f__Oscillospiraceae	g__unclassified_f__Oscillospiraceae	M13	0
ASV2472	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M13	0
ASV664	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_NK4A136_gro up	M13	0

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ASV6654	p__Firmicutes	f__Ruminococcaceae	g__Ruminococcus	M13	0
ASV605	p__Firmicutes	f__Lachnospiraceae	g__Roseburia	M13	0
ASV700	p__Actinobacteriota	f__Eggerthellaceae	g__Enterorhabdus	M13	0
ASV7111	p__Firmicutes	f__norank_o__Clostridia_vadinBB60_group	g__norank_f__norank_o__Clostridia_vadinBB60_group	M13	0
ASV1139	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M13	0
ASV6812	p__Firmicutes	f__Lachnospiraceae	g__norank_f__Lachnospiraceae	M13	0
ASV5025	p__Firmicutes	f__Anaerovoracaceae	g__Eubacterium_brachy_group	M13	0
ASV7951	p__Firmicutes	f__norank_o__Clostridia_vadinBB60_group	g__norank_f__norank_o__Clostridia_vadinBB60_group	M13	0
ASV7950	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_NK4A136_group	M13	0
ASV7949	p__Firmicutes	f__Lachnospiraceae	g__norank_f__Lachnospiraceae	M13	0
ASV182	p__Bacteroidota	f__Marinifilaceae	g__Odoribacter	M14	0
ASV2178	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M14	0
ASV8840	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M14	0
ASV2000	p__Firmicutes	f__Lachnospiraceae	g__Roseburia	M14	0
ASV652	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M14	0
ASV4714	p__Firmicutes	f__Lachnospiraceae	g__A2	M14	0
ASV2182	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M14	0
ASV8843	p__Firmicutes	f__Oscillospiraceae	g__Oscillibacter	M14	0
ASV8841	p__Desulfobacterota	f__Desulfovibrionaceae	g__norank_f__Desulfovibrionaceae	M14	0

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ASV8844	p__Firmicutes	f__norank_o__Clostridia_U CG-014	g__norank_f__norank_o__Clostridia _UCG-014	M14	0
ASV8842	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M14	0
ASV1288	p__Firmicutes	f__norank_o__Clostridia_U CG-014	g__norank_f__norank_o__Clostridia _UCG-014	M14	0
ASV7	p__Bacteroidota	f__Bacteroidaceae	g__Bacteroides	M15	0
ASV220	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M15	0
ASV12326	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M15	0
ASV5487	p__Firmicutes	f__Lachnospiraceae	g__Roseburia	M15	0
ASV2519	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M15	0
ASV12327	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M15	0
ASV1860	p__Bacteroidota	f__Bacteroidaceae	g__Bacteroides	M15	0
ASV11720	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_NK4A136_gro up	M15	0
ASV5024	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M15	0
ASV1172	p__Firmicutes	f__norank_o__Clostridia_U CG-014	g__norank_f__norank_o__Clostridia _UCG-014	M15	0
ASV1639	p__Firmicutes	f__norank_o__Clostridia_U CG-014	g__norank_f__norank_o__Clostridia _UCG-014	M16	0
ASV2167	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M16	0
ASV2264	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M16	0
ASV1638	p__Firmicutes	f__norank_o__Clostridia_U	g__norank_f__norank_o__Clostridia	M16	0

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		CG-014	UCG-014		
ASV5440	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M16	0
ASV197	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M16	0
ASV2468	p__Firmicutes	f__Lachnospiraceae	g__norank_f__Lachnospiraceae	M16	0
ASV795	p__Firmicutes	f__Anaerovoracaceae	g__Eubacterium_nodatum_group	M16	0
ASV634	p__Firmicutes	f__Lachnospiraceae	g__Roseburia	M17	0
ASV64	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M17	0
ASV755	p__Bacteroidota	f__Rikenellaceae	g__Alistipes	M17	0
ASV3404	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M17	0
ASV4695	p__Desulfobacterota	f__Desulfovibrionaceae	g__Desulfovibrio	M17	0
ASV10794	p__Firmicutes	f__Lactobacillaceae	g__Lactobacillus	M17	0
ASV8850	p__Firmicutes	f__Lachnospiraceae	g__Lachnospiraceae_NK4A136_group	M17	0
			up		
ASV53	p__Bacteroidota	f__Marinifilaceae	g__Odoribacter	M18	0
ASV76	p__Bacteroidota	f__Rikenellaceae	g__Alistipes	M18	0
ASV604	p__Bacteroidota	f__Rikenellaceae	g__Alistipes	M18	0
ASV295	p__Firmicutes	f__Butyricicoccaceae	g__Butyricoccus	M18	0
ASV692	p__Firmicutes	f__Oscillospiraceae	g__norank_f__Oscillospiraceae	M18	0
ASV653	p__Firmicutes	f__Lachnospiraceae	g__ASF356	M18	0
ASV5448	p__Firmicutes	f__Oscillospiraceae	g__Colidextribacter	M19	0
ASV3066	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M19	0
ASV2808	p__Firmicutes	f__Lachnospiraceae	g__norank_f__Lachnospiraceae	M19	0



ASV4258	p__Firmicutes	f__Ruminococcaceae	g__Ruminococcus	M19	0
ASV9697	p__Firmicutes	f__unclassified_c__Clostridia a	g__unclassified_c__Clostridia	M19	0
ASV585	p__Firmicutes	f__Lachnospiraceae	g__GCA-900066575	M20	0
ASV2157	p__Firmicutes	f__Lachnospiraceae	g__Anaerostipes	M20	0
ASV386	p__Firmicutes	f__norank_o__Clostridia_U CG-014	g__norank_f__norank_o__Clostridia _UCG-014	M20	0
ASV30	p__Firmicutes	f__Lachnospiraceae	g__Anaerostipes	M21	0
ASV450	p__Desulfobacterota	f__Desulfovibrionaceae	g__Desulfovibrio	M21	0
ASV1599	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M21	0
ASV577	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M22	0
ASV2802	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M22	0
ASV2206	p__Actinobacteriota	f__Eggerthellaceae	g__Enterorhabdus	M22	0
ASV177	p__Firmicutes	f__Oscillospiraceae	g__unclassified_f__Oscillospiraceae	M23	0
ASV236	p__Firmicutes	f__Oscillospiraceae	g__norank_f__Oscillospiraceae	M23	0
ASV257	p__Firmicutes	f__Oscillospiraceae	g__unclassified_f__Oscillospiraceae	M23	0
ASV61	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M24	0.000643
ASV207	p__Firmicutes	f__Lachnospiraceae	g__norank_f__Lachnospiraceae	M24	0.011101
ASV300	p__Desulfobacterota	f__Desulfovibrionaceae	g__norank_f__Desulfovibrionaceae	M24	0.000643
ASV1049	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M25	0
ASV691	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M25	0
ASV1055	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M25	0

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ASV1072	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M26	0
ASV643	p__Desulfobacterota	f__Desulfovibrionaceae	g__norank_f__Desulfovibrionaceae	M26	0
ASV1101	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M27	0
ASV1113	p__Firmicutes	f__Anaerovoracaceae	g__Eubacterium_brachy_group	M27	0
ASV52	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M28	0
ASV129	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M28	0
ASV1053	p__Patescibacteria	f__Saccharimonadaceae	g__Candidatus_Saccharimonas	M29	0
ASV1074	p__Firmicutes	f__Lachnospiraceae	g__unclassified_f__Lachnospiraceae	M29	0
ASV704	p__Firmicutes	f__Lachnospiraceae	g__Roseburia	M30	0
ASV2473	p__Bacteroidota	f__Rikenellaceae	g__Alistipes	M30	0
ASV2156	p__Deferribacterota	f__Deferribacteraceae	g__Mucispirillum	M31	0
ASV1867	p__Firmicutes	f__Oscillospiraceae	g__Oscillibacter	M31	0
ASV95	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M32	0
ASV119	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M32	0
ASV96	p__Bacteroidota	f__Rikenellaceae	g__Alistipes	M33	0
ASV3414	p__Bacteroidota	f__Rikenellaceae	g__Alistipes	M33	0
ASV637	p__Firmicutes	f__Oscillospiraceae	g__Colidextribacter	M34	0
ASV13015	p__Firmicutes	f__Lactobacillaceae	g__Lactobacillus	M34	0
ASV153	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M35	0
ASV590	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M35	0
ASV71	p__Desulfobacterota	f__Desulfovibrionaceae	g__Desulfovibrio	M36	0
ASV1056	p__Desulfobacterota	f__Desulfovibrionaceae	g__Desulfovibrio	M36	0

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ASV8	p__Bacteroidota	f__Rikenellaceae	g__Rikenellaceae_RC9_gut_group	M37	0
ASV120	p__Bacteroidota	f__Rikenellaceae	g__Rikenellaceae_RC9_gut_group	M37	0
ASV102	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M38	0
ASV1086	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M38	0
ASV1103	p__Firmicutes	f__Oscillospiraceae	g__unclassified_f__Oscillospiraceae	M39	0
ASV1586	p__Firmicutes	f__Oscillospiraceae	g__unclassified_f__Oscillospiraceae	M39	0
ASV593	p__Firmicutes	f__Oscillospiraceae	g__norank_f__Oscillospiraceae	M40	0
ASV599	p__Firmicutes	f__Oscillospiraceae	g__norank_f__Oscillospiraceae	M40	0
ASV83	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M41	0
ASV78	p__Bacteroidota	f__Muribaculaceae	g__norank_f__Muribaculaceae	M41	0
ASV10	p__Firmicutes	f__Lactobacillaceae	g__Lactobacillus	M42	0
ASV75	p__Firmicutes	f__Lactobacillaceae	g__Lactobacillus	M42	0

**Supplementary Table S5 The top 50 metabolites of *W. coagulans* BC-G44 supernatant in both positive and negative ion modes**

Name	m/z	rt(s)	SuperClass	Class	SubClass	mean	SD	proportion
<b>pos</b>								
Arginine	175.1162	520.304	Organic acids and derivatives	Carboxylic acids and derivatives	Amino acids, peptides, and analogues	144159638.4	53393083.94	10.10
Triethanolamine	337.1659	509.315	Organonitrogen compounds	Amines	Alkanolamines	95345434.16	50061279.53	6.68
Pyridoxine	170.0786	113.154	Organoheterocyclic compounds	Pyridines derivatives	and Pyridoxines	77968273.2	8201877.703	5.46
Dibucaine	344.224	83.746	Organoheterocyclic compounds	Quinolines derivatives	and Quinolones and derivatives	64614471.91	2838797.465	4.53
Adenine	136.0593	157.599	Organoheterocyclic compounds	Imidazopyrimidines	Purines and purine derivatives	51570168.99	4621301.122	3.61

Thiamine	265.1074	376.313	Organoheterocyclic compounds	Diazines	Pyrimidines and pyrimidine derivatives	47956358.9	6924687.837	3.36
2-ethylpyrazine	109.0736	249.023	Organoheterocyclic compounds	Diazines	Pyrazines	33216585.26	556273.1933	2.33
Carnitine	162.1094	344.525	Organic nitrogen compounds	Organonitrogen compounds	Quaternary ammonium salts	32754561.88	2951009.107	2.29
2-amino-1-phenylethanol	120.0785	248.383	Organic nitrogen compounds	Organonitrogen compounds	Amines	29812834.17	9830365.051	2.09
Pro-Trp	302.3011	63.263	Organic nitrogen compounds	Organonitrogen compounds	Amines	27241446.57	2593792.155	1.91
C17-sphinganine	288.286	64.905	Organic nitrogen compounds	Organonitrogen compounds	Amines	26032342.72	3463009.009	1.82
1,5-pentanediamine	86.09444	254.146	Organic nitrogen compounds	Organonitrogen compounds	Amines	24104136.35	2252563.068	1.69
L-Arginine	175.116	577.9235	Organic acids and derivatives	Carboxylic acids and derivatives	Amino acids, peptides, and analogues	22115947.23	6167277.758	1.55
N-(1-amino-3,3-dimethyl-1-oxobutan-2-yl)-1-pentyl-1h-indole-3-carboxamide	327.197	83.863	Organic acids and derivatives	Carboxylic acids and derivatives	Amino acids, peptides, and analogues	20673393.79	857525.1253	1.45
Methyl (1-(cyclohexylmethyl)-1h-indole-3-carbonyl)-l-valinate	371.2221	90.756	Organic acids and derivatives	Carboxylic acids and derivatives	Amino acids, peptides, and analogues	18175869.35	1728607.587	1.27
Dfnha	155.0792	72.937	Organic acids and derivatives	Carboxylic acids and derivatives	Amino acids, peptides, and analogues	16834139.93	6379480.735	1.18
His-Pro	235.1158	143.133	Organic acids and derivatives	Carboxylic acids and derivatives	Amino acids, peptides, and analogues	15763733.45	5105553.211	1.10
DL-phenylalanine	166.0836	248.383	Organic acids and derivatives	Carboxylic acids and derivatives	Amino acids, peptides, and analogues	15273724.24	328764.0251	1.07
Creatinine	114.0645	167.818	Organic acids and derivatives	Carboxylic acids and derivatives	Amino acids, peptides, and analogues	13897863.25	1062440.404	0.97
Creatine	132.0737	337.36	Organic acids and derivatives	Carboxylic acids and derivatives	Amino acids, peptides, and analogues	11995358.78	1063794.486	0.84
Betaine	118.0836	264.432	Organic acids and derivatives	Carboxylic acids and derivatives	Amino acids, peptides, and analogues	11949145.19	971901.2563	0.84
DL-arginine	158.0894	302.972	Organic acids and derivatives	Carboxylic acids and derivatives	Amino acids, peptides, and analogues	11798128.73	234631.5315	0.83
Tyrosine	182.0776	292.073	Organic acids and derivatives	Carboxylic acids and derivatives	Amino acids, peptides, and analogues	10089907.62	754130.3022	0.71
Ala-Arg	247.1365	340.017	Organic acids and derivatives	Carboxylic acids and derivatives	Amino acids, peptides, and analogues	9962825.248	491879.955	0.70
Benzoic acid, 3-[[3-carboxycyclohexyl)amino]carbonyl]-4-[3-[4-[4-(cyclohexyloxy)butoxy]phenyl]propoxy]-	618.3133	406.863	Organic acids and derivatives	Carboxylic acids and derivatives	Amino acids, peptides, and analogues	9251703.236	763560.8159	0.65
Pro-asn	230.1099	332.21	Organic acids and derivatives	Carboxylic acids and derivatives	Amino acids, peptides, and analogues	8382691.684	3647574.532	0.59

Phe-Asn-Arg	436.2091	295.278	Organic acids and derivatives	Carboxylic acids and derivatives	Amino acids, peptides, and analogues	8285591.78	1173337.457	0.58
S-methyl-5'-thioadenosine	298.0922	102.272	Nucleosides, nucleotides, and analogues	5'-deoxyribonucleosides	5'-deoxy-5'-thionucleosides	8213109.962	1146334.953	0.58
Glycerophosphocholine	258.1062	375.638	Lipids and lipid-like molecules	Glycerophospholipids	Glycerophosphocholines	7957690.726	442829.2585	0.56
Cis-11,14-eicosadienoic acid	309.2749	32.95	Lipids and lipid-like molecules	Fatty Acyls	Fatty acids and conjugates	7863464.617	99119.0027	0.55
13[(2r,3s)-3-pentylxiranyl]-8z-tridecenoic acid	307.2598	32.9975	Lipids and lipid-like molecules	Fatty Acyls	Fatty acids and conjugates	7425318.128	927709.7466	0.52
Solamargine	868.4965	148.19	Lipids and lipid-like molecules	Steroids and steroid derivatives	Steroidal glycosides	6828298.98	416093.001	0.48
15s-hydroperoxy-11z,13e-eicosadienoic acid	323.2537	40.579	Lipids and lipid-like molecules	Fatty Acyls	Eicosanoids	6811187.18	688915.6864	0.48
Methasterone	283.2604	32.391	Lipids and lipid-like molecules	Steroids and steroid derivatives	Androstane steroids	6172002.668	583853.2789	0.43
Leukotriene f4	569.3075	119.574	Lipids and lipid-like molecules	Fatty Acyls	Eicosanoids	6096161.317	166001.0572	0.43
7-(triethylsilyl)-10-deacetylbaecatin iii	641.3239	429.437	Lipids and lipid-like molecules	Prenol lipids	Diterpenoids	5927105.105	817861.1914	0.42
N-myristoylsphinganine	512.4983	32.32	Lipids and lipid-like molecules	Sphingolipids	Ceramides	5897253.099	1761759.734	0.41
Erucamide	338.3378	32.95	Lipids and lipid-like molecules	Fatty Acyls	Fatty amides	5616791.91	767706.6396	0.39
Cimicifugoside h 2	657.3576	131.701	Lipids and lipid-like molecules	Steroids and steroid derivatives	Cycloartanols and derivatives	5530127.289	381630.4451	0.39
1-monolinoleoyl-rac-glycerol	263.2342	50.3065	Lipids and lipid-like molecules	Fatty Acyls	Lineolic acids and derivatives	5219750.017	341038.9136	0.37
Fenpropidin	274.2708	67.227	Benzenoids	Benzene substituted derivatives	and Phenylpropanes	5183842.814	82150.85672	0.36
Benzeneethanamine, 3,5-dimethoxy-.alpha.-methyl-4-propoxy-	254.1571	323.796	Benzenoids	Benzene substituted derivatives	and Phenethylamines	5108743.516	2572548.094	0.36
DL-octopamine	136.0729	292.073	Benzenoids	Phenols	1-hydroxy-2-unsubstituted benzenoids	5101121.31	613232.6079	0.36
Lavandulol	309.2753	77.328				5087715.506	685821.4727	0.36
(Z)-6-Octadecenoic acid	283.2604	53.811				5033326.221	528067.8566	0.35
5-methylbenzotriazole	134.0577	112.542				4898182.557	570701.003	0.34
2-piperidinecarboxylic acid, 1-(3,3-dimethyl-1,2-dioxopentyl)-, (1r)-1-(3-aminophenyl)-3-(3,4-	525.2808	113.182				4757664.227	383905.1411	0.33

dimethoxyphenyl)propyl ester, (2s)-								
Glu-Pro	286.1465	378.838				4553512.368	712201.9267	0.32
trans-2-Hydroxycinnamic acid	165.0513	292.073				4516747.254	344611.9678	0.32
Bendiocarb	167.0905	130.432				4130091.965	529334.3482	0.29

**neg**

Citrate	191.0209	451.0525	Organic acids and derivatives	Carboxylic acids and derivatives	Tricarboxylic acids and derivatives	37683272.8	7014301.11	10.55
Linoleic acid	279.2339	37.361	Lipids and lipid-like molecules	Fatty Acyls	Lineolic acids and derivatives	24664568.6	15396194.8	6.90
DL-lactate	89.0242	218.375	Organic acids and derivatives	Hydroxy acids and derivatives	Alpha hydroxy acids and derivatives	22616226.9	1635008.22	6.33
Oleic acid	281.2496	37.457	Lipids and lipid-like molecules	Fatty Acyls	Fatty acids and conjugates	21929073.4	3979797.43	6.14
Hydroxyisocaproic acid	131.0715	128.961	Lipids and lipid-like molecules	Fatty Acyls	Fatty acids and conjugates	21308647.9	1101132.41	5.96
Phenyllactic acid	165.0562	112.289	Phenylpropanoids and polyketides	Phenylpropanoic acids	16499997.2	1219419.83	4.62	
L-pyroglutamic acid	128.0358	283.165	Organic acids and derivatives	Carboxylic acids and derivatives	Amino acids, peptides, and analogues	13531408.7	2302461.37	3.79
Arachidonic acid (peroxide free)	303.2317	37.981	Lipids and lipid-like molecules	Fatty Acyls	Fatty acids and conjugates	13216136.9	22800674.1	3.70
Leucine	130.0872	253.563	Organic acids and derivatives	Carboxylic acids and derivatives	Amino acids, peptides, and analogues	10370981	625708.205	2.90
D-Mannose	179.0565	327.355	Organic oxygen compounds	Organooxygen compounds	Carbohydrates and carbohydrate conjugates	8893013.49	235372.367	2.49
N-acetyl-L-tyrosine	180.0665	290.125	Organic acids and derivatives	Carboxylic acids and derivatives	Amino acids, peptides, and analogues	7743854.08	447348.445	2.17
Cyclo(tyrosyl-prolyl)	259.1093	58.7725	Organic acids and derivatives	Carboxylic acids and derivatives	Amino acids, peptides, and analogues	7615396.64	720122.667	2.13
Phenylalanine	164.0724	247.893	Organic acids and derivatives	Carboxylic acids and derivatives	Amino acids, peptides, and analogues	7123647.6	493180.269	1.99
Hydroquinidine	325.1841	26.012				5688097.25	2902551.39	1.59
Thymol-beta-d-glucoside	311.1692	26.012	Lipids and lipid-like molecules	Prenol lipids	Terpene glycosides	5504865.44	3264607.84	1.54
Palmitic acid	255.2338	36.827	Lipids and lipid-like molecules	Fatty Acyls	Fatty acids and conjugates	5150427.05	1410071.64	1.44
Cis,cis-muconic acid	141.0164	362.173	Lipids and lipid-like molecules	Fatty Acyls	Fatty acids and conjugates	4947522.95	515132.479	1.38
3-hydroxyglutaric acid	147.0446	112.526	Organic acids and derivatives	Hydroxy acids and derivatives	Beta hydroxy acids and derivatives	4902188.43	1479732.02	1.37
Indinavir	612.3381	292.655	Organic acids and derivatives	Carboxylic acids and derivatives	Amino acids, peptides, and analogues	4513253.9	229005.874	1.26

Gly-His-Lys	339.1996	25.518	Organic acids and derivatives	Carboxylic acids and derivatives	Amino acids, peptides, and analogues	4028796.81	1900086.91	1.13
Taurine	124.0071	282.535	Organic acids and derivatives	Organic sulfonic acids and derivatives	Organosulfonic acids and derivatives	3653474.37	4164846.35	1.02
2-hydroxyadenine	150.0559	110.022	Organoheterocyclic compounds	Imidazopyrimidines	Purines and purine derivatives	3491522.34	85395.4906	0.98
2-hydroxy-6-methylquinoline-3-carbaldehyde	186.0454	24.792	Organoheterocyclic compounds	Quinolines and derivatives	Quinolones and derivatives	3361071.95	114382.421	0.94
Octadecanoic acid	283.2636	36.827	Lipids and lipid-like molecules	Fatty Acyls	Fatty acids and conjugates	3333451.56	1171095.58	0.93
Uracil	111.0197	85.943	Organoheterocyclic compounds	Diazines	Pyrimidines and pyrimidine derivatives	3289033.74	568873.77	0.92
Thymine	185.0562	286.3425	Organoheterocyclic compounds	Diazines	Pyrimidines and pyrimidine derivatives	2520404.23	99785.3325	0.71
Propanoic acid, 3-[[[2-[(aminoiminomethyl)amino]-4-thiazolyl]methyl]thio]-	294.9937	450.415	Organoheterocyclic compounds	Azoles	Thiazoles	2370808.48	284265.931	0.66
Trans-3'-hydroxycotinine glucuronide	367.1054	268.656	Organic oxygen compounds	Organooxygen compounds	Carbohydrates and carbohydrate conjugates	2135017.76	277492.935	0.60
Ostruthin	297.1527	26.622	Lipids and lipid-like molecules	Prenol lipids	Terpene lactones	1658904.38	999359.71	0.46
5-Hydroxyhexanoic acid	131.0824	528.235	Lipids and lipid-like molecules	Fatty Acyls	Fatty acids and conjugates	1614808.2	318869.48	0.45
(1-acetyloxy-3-hydroxy-6,8a-dimethyl-7-oxo-3-propan-2-yl-2,3a,4,8-tetrahydro-1h-azulen-4-yl) 4-hydroxybenzoate	429.2108	338.724	Lipids and lipid-like molecules	Prenol lipids	Sesquiterpenoids	1560264.55	89895.7118	0.44
2-cis-4-trans-abscisic acid	527.2828	288.235	Lipids and lipid-like molecules	Prenol lipids	Sesquiterpenoids	1506733.57	66500.237	0.42
L-Leucine	130.0869	300.23	Organic acids and derivatives	Carboxylic acids and derivatives	Amino acids, peptides, and analogues	1448506.15	93342.5536	0.41
Telmisartan	469.2418	296.434	Benzenoids	Benzenoids and substituted derivatives	Biphenyls and derivatives	1344812.28	69598.2001	0.38
Zinniol	265.1477	24.182	Benzenoids	Benzenoids and substituted derivatives	Benzyl alcohols	1334028.74	537783.514	0.37
Citraconic acid	129.0189	413.507	Lipids and lipid-like molecules	Fatty Acyls	Fatty acids and conjugates	1206262.43	108701.619	0.34
Cis-7,10,13,16-docosatetraenoic acid	331.2643	37.714	Lipids and lipid-like molecules	Fatty Acyls	Fatty acids and conjugates	1173675.09	2024670.29	0.33
N-acetyl-d-galactosamine 4-sulfate	282.0288	120.731	Organic oxygen compounds	Organooxygen compounds	Carbohydrates and carbohydrate conjugates	1153255.44	147378.269	0.32
6,8-dihydroxy-2,2,4,4-tetramethyl-7-(3-methylbutanoyl)-9-(2-methylpropyl)-9h-xanthen-1,3-dione	441.2102	341.8745	Organoheterocyclic compounds	Benzopyrans	1-benzopyrans	1105589.29	462223.592	0.31

2-dehydro-3-deoxy-d-gluconate	177.0399	378.834				1094823.4	360237.427	0.31
Piriprost	456.2446	292.655	Organoheterocyclic compounds	Pyrroles	Substituted pyrroles	1043817.28	60918.5876	0.29
2-hydroxy-2-methylbutyric acid	117.0554	146.1305	Lipids and lipid-like molecules	Fatty Acyls	Fatty acids and conjugates	1011081.75	194986.633	0.28
Xanthine	151.0258	207.88	Organoheterocyclic compounds	Imidazopyrimidines	Purines and purine derivatives	983200.311	467977.531	0.28
L-Tyrosine	180.066	320.443				945925.668	367987.529	0.26
N-acetylglutamine	187.0721	292.655	Organic acids and derivatives	Carboxylic acids and derivatives	Amino acids, peptides, and analogues	887490.171	145348.703	0.25
Tryptophan	203.0826	249.153	Organoheterocyclic compounds	Indoles and derivatives	Indolyl carboxylic acids and derivatives	858452.658	72229.143	0.24
Pyruvate	87.0086	120.756	Organic acids and derivatives	Keto acids and derivatives	Alpha-keto acids and derivatives	805222.254	33424.023	0.23
Cis-aconitate	173.0088	413.507	Organic acids and derivatives	Carboxylic acids and derivatives	Tricarboxylic acids and derivatives	787708.042	59947.2458	0.22
sn-Glycerol 3-phosphoethanolamine	214.0486	380.062	Lipids and lipid-like molecules	Glycerophospholipids	Glycerophosphoethanolamines	781224.053	133933.913	0.22
Valeric acid	101.0604	97.393	Lipids and lipid-like molecules	Fatty Acyls	Fatty acids and conjugates	772180.994	196958.449	0.22

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