Table S1 The Component of Standard Laboratory Chow.

Component	Content (g/kg)
Water	98.0
Crude ash	51.4
Crude protein	190.1
Crude fat	49.6
Crude fiber	25.7
Calcium	11.3
Phosphorus	7.0

Table S2 The Fatty Acid Component of Standard Laboratory Chow.

Component	Content (%, fatty acid/total fatty acids)
C14:0	0.63±0.08
C16:0	13.61±0.19
C16:1	0.76±0.05
C18:0	3.01±0.02
C18:1	23.60±0.41
C18:2	51.10±0.05
C18:3 ω-3	4.26±0.06
C18:4 ω-3	ND
C20:0	0.39±0.01
C20:1	0.30±0.05
C20:4 ω-6	ND
C20:4 ω-3	ND
C20:5	1.09±0.08
C22:0	ND
C22:5 ω-6	ND
C22:5 ω-3	ND
C22:6	1.25±0.06

Table S3 Standard for Evaluation of Histological Injury.

In ammation	Mucosal injury	Crypt distortion	Area of lesions (%)	Score
None	None	None	None	0
Mild	Mucous layer	1/3	1–25	1
Moderate	Submucosa	2/3	26–50	2
Severe	Muscularis and serosa	100%	26–50	3
—	—	Entire crypt and surface epithelium destroyed	76–10	4

Table S4 The different CLA Isomers Produced by *B. pseudocatenulatum* Strains in mMRS Broth Plus 0.502 mg/mL Linoleic Acid.

	*c*9,*t*11-CLA	%	*t*10,*c*12-CLA	%	*t*9,*t*11-CLA	%	CLA (%)
MY40C	0.2318±0.0033	46.17	0.0014±0.0000	0.27	0.0150±0.0007	2.99	49.43
CCFM680	0.1332±0.0019	26.52	0.0022±0.0001	0.45	0.0480±0.0023	9.56	36.53

Table S5 Co-occurrence Network Topological Features Statistics in Four Groups.

Network Indexes	**Group**			
	Control (0.80)	DSS (0.92)	MY40C (0.89)	CCFM680 (0.843)
Total nodes	26	32	22	27
Total links	53	53	58	58
R square of power-law	0.61	0.775	0.54	0.716
Average degree (avgK)	3.926	3.118	4.833	4.143
Average clustering coefficient (avgCC)	0.38	0.204	0.303	0.317
Average path distance (GD)	2.701	3	2.42	2.421
Geodesic efficiency (E)	0.457	0.411	0.52	0.494
Harmonic geodesic distance (HD)	2.188	2.431	1.924	2.025
Maximal degree	7	9	11	13
Nodes with max degree	Desulfovibrio;Trabulsiella	Eubacterium	Streptococcus	Acinetobacter
Centralization of degree (CD)	0.128	0.189	0.292	0.353
Maximal betweenness	97.814	156.478	122.374	117.032
Nodes with max betweenness	Trabulsiella	Prevotella	Blautia	SMB53
Centralization of betweenness (CB)	0.242	0.248	0.437	0.289
Maximal stress centrality	189	340	239	266
Nodes with max stress centrality	Trabulsiella	Prevotella	Blautia	SMB53
Centralization of stress centrality (CS)	0.447	0.542	0.824	0.644
Maximal eigenvector centrality	0.423	0.447	0.373	0.408
Nodes with max eigenvector centrality	Desulfovibrio	Eubacterium	Dehalobacterium	Acinetobacter
Centralization of eigenvector centrality (CE)	0.289	0.325	0.216	0.264
Density (D)	0.151	0.094	0.21	0.153
Reciprocity	1	1	1	1
Transitivity (Trans)	0.385	0.222	0.445	0.273

Connectedness (Con)	1	0.886	1	1
Efficiency	0.882	0.923	0.824	0.878
Hierarchy	0	0	0	0
Lubness	1	1	1	1

Table S6 Co-occurrence Network Topological Features Statistics for Node. (A) Control; (B) DSS; (C) *B. pseudocatenulatum* MY40C; (D) *B. pseudocatenulatum* CCFM680.

(A) Control group

Node Name	Phylum	node. degree	node. betw	node. stress	node. evcent	Clustering. Coefficient	No. module	Zi	Pi	Module
Adlercreutzia	Actinobacteria	1	0	0	0.043	0	1	-1.881	0	Peripherals
Allobaculum	Firmicutes	3	1.602	8	0.067	0.666	1	-0.348	0	Peripherals
Anaeroplasma	Tenericutes	3	19.055	34	0.061	0.333	2	0	0.444	Peripherals
Anaerotruncus	Firmicutes	6	12.693	52	0.38	0.6	0	1.521	0	Peripherals
Anaerovorax	Firmicutes	6	64.109	164	0.257	0.133	2	0	0.611	Peripherals
Bacteroides	Bacteroidetes	4	19.225	50	0.219	0.5	0	0.234	0	Peripherals
Bifidobacterium	Actinobacteria	4	8.888	29	0.103	0.5	1	0.418	0	Peripherals
Blautia	Firmicutes	3	31.3	43	0.055	0	0	-1.053	0.444	Peripherals
Clostridium	Firmicutes	4	32.908	48	0.046	0.333	1	-0.348	0.375	Peripherals
Coprococcus	Firmicutes	3	1.602	8	0.062	0.666	1	-0.348	0	Peripherals
Dehalobacterium	Firmicutes	4	22.302	44	0.077	0.333	1	-0.348	0.375	Peripherals
Desulfovibrio	Proteobacteria	7	45.173	130	0.422	0.476	0	0.877	0.448	Peripherals
Dorea	Firmicutes	6	41.606	96	0.36	0.466	0	0.877	0.277	Peripherals
Enterococcus	Firmicutes	3	34.866	54	0.09	0	0	-1.053	0.444	Peripherals
Eubacterium	Firmicutes	6	30.559	57	0.085	0.2	1	1.95	0	Peripherals
Lactobacillus	Firmicutes	1	0	0	0.05	0	2	-1.581	0	Peripherals
Mucispirillum	Deferribacteres	5	5.54	30	0.339	0.8	0	0.877	0	Peripherals
Odoribacter	Bacteroidetes	5	5.54	30	0.339	0.8	0	0.877	0	Peripherals

Oscillospira	Firmicutes	6	46.642	108	0.155	0.2	1	1.184	0.277	Peripherals
Parabacteroides	Bacteroidetes	2	5.5	6	0.014	0	0	-1.053	0	Peripherals
Pseudomonas	Proteobacteria	3	14.069	31	0.067	0.333	2	1.581	0	Peripherals
Ruminococcus	Firmicutes	4	10.833	44	0.252	0.5	1	-1.053	0.625	Connectors
Streptococcus	Firmicutes	2	0	0	0.025	1	2	0	0	Peripherals
Sutterella	Proteobacteria	2	9.25	11	0.02	0	0	-1.053	0	Peripherals
Trabulsiella	Proteobacteria	7	97.814	189	0.219	0.095	1	0.418	0.571	Peripherals
Turicibacter	Firmicutes	4	35.915	62	0.073	0.333	1	0.418	0	Peripherals

(B) DSS grouop

Name	**Phylum**	**node. degree**	**node. betw**	**node. stress**	**node. evcent**	**Clustering. Coefficient**	**No. module**	**Zi**	**Pi**	**Module**
Acinetobacter	Proteobacteria	2	5.416	9	0.044	0	1	0.5	0	Peripherals
Adlercreutzia	Actinobacteria	3	24.083	49	0.141	0.333	2	-0.496	0.444	Peripherals
Aggregatibacter	Proteobacteria	3	26.416	33	0.042	0	1	1.75	0	Peripherals
Akkermansia	Verrucomicrobia	2	8.27	30	0.095	0	4	0	0	Peripherals
Allobaculum	Firmicutes	3	0	0	0.08	1	2	0.062	0	Peripherals
Anaerotruncus	Firmicutes	1	0	0	0.023	0	0	-1.012	0	Peripherals
Anaerovorax	Firmicutes	3	30.749	69	0.156	0	1	-0.75	0.566	Peripherals
Bacteroides	Bacteroidetes	3	35.015	77	0.175	0	0	0.04	0	Peripherals
Bifidobacterium	Actinobacteria	3	11.106	34	0.08	0.666	2	-0.496	0.444	Peripherals
Blautia	Firmicutes	2	22.333	27	0.108	0	1	-0.75	0.5	Peripherals
Clostridium	Firmicutes	1	0	0	0.031	0	2	-1.054	0	Peripherals
Comamonas	Proteobacteria	4	47.938	110	0.107	0.333	3	0	0	Peripherals
Coprobacillus	Firmicutes	8	117.68	209	0.142	0.142	2	2.294	0.218	Peripherals
Coprococcus	Firmicutes	1	0	0	0.099	0	0	-1.012	0	Peripherals

Dehalobacterium	Firmicutes	2	30	48	0.104	0	0	-0.485	0	Peripherals
Desulfovibrio	Proteobacteria	4	83.979	173	0.158	0.166	2	-0.496	0.625	Connectors
Dorea	Firmicutes	1	0	0	0.084	0	0	-1.012	0	Peripherals
Epulopiscium	Firmicutes	5	68.416	168	0.216	0.2	3	0	0	Peripherals
Eubacterium	Firmicutes	9	151.414	288	0.447	0.138	0	2.145	0.345	Peripherals
Lactobacillus	Firmicutes	1	0	0	0.038	0	0	-1.012	0	Peripherals
Mucispirillum	Deferribacteres	2	4.699	20	0.141	0	0	-0.485	0	Peripherals
Odoribacter	Bacteroidetes	2	24.416	32	0.041	0	1	-0.75	0.5	Peripherals
Oscillospira	Firmicutes	4	19.198	60	0.262	0.333	0	0.04	0.375	Peripherals
Prevotella	Bacteroidetes	8	156.477	340	0.374	0.107	0	1.093	0.531	Peripherals
Proteus	Proteobacteria	7	70.596	182	0.38	0.19	0	1.619	0.244	Peripherals
Pseudomonas	Proteobacteria	5	25.981	56	0.114	0.5	2	0.62	0.32	Peripherals
Ruminococcus	Firmicutes	3	5.015	30	0.266	0.666	0	0.04	0	Peripherals
Sarcina	Firmicutes	1	0	0	2.011E-90	0	5	0	0	Peripherals
Serratia	Proteobacteria	2	3.833	10	0.056	0	4	0	0	Peripherals
SMB53	Firmicutes	1	0	0	2.011E-90	0	5	0	0	Peripherals
Streptococcus	Firmicutes	2	0	0	0.071	1	3	0	0	Peripherals
Sutterella	Proteobacteria	4	15.941	36	0.106	0.5	2	0.62	0	Peripherals

(C) *B. pseudocatenulatum* MY40C group

Node Name	Phylum	node. degree	node. betw	node. stress	node. evcent	Clustering. Coefficient	No. module	Zi	Pi	Module
Adlercreutzia	Actinobacteria	6	1.985	11	0.253	0.8	0	0.444	0.277	Peripherals
Anaeroplasma	Tenericutes	1	0	0	0	0	2	0	0	Peripherals
Bacteroides	Bacteroidetes	7	13.937	49	0.287	0.666	0	0.444	0.408	Peripherals
Bifidobacterium	Actinobacteria	3	6.233	23	0.1	0	0	-1.27	0.444	Peripherals

Bilophila	Proteobacteria	8	28.301	87	0.257	0.285	0	1.016	0.375	Peripherals
Blautia	Firmicutes	10	122.373	239	0.272	0.222	1	0.588	0.64	Connectors
Clostridium	Firmicutes	5	7.6	20	0.196	0.5	1	-0.392	0.48	Peripherals
Coprococcus	Firmicutes	2	42	76	0.039	0	2	0	0	Peripherals
Dehalobacterium	Firmicutes	10	27.251	92	0.372	0.488	0	1.016	0.48	Peripherals
Desulfovibrio	Proteobacteria	6	16.316	30	0.198	0.533	1	1.078	0	Peripherals
Dorea	Firmicutes	6	2.315	9	0.229	0.666	0	1.016	0	Peripherals
Eubacterium	Firmicutes	1	0	0	0.052	0	1	-1.372	0	Peripherals
Lactobacillus	Firmicutes	1	0	0	0.036	0	0	-1.841	0	Peripherals
Mucispirillum	Deferribacteres	2	22	39	0.005	0	2	0	0	Peripherals
Odoribacter	Bacteroidetes	1	0	0	0.005	0	3	0	0	Peripherals
Oscillospira	Firmicutes	9	23.245	74	0.316	0.444	1	1.078	0.444	Peripherals
Parabacteroides	Bacteroidetes	2	22	39	0.039	0	3	0	0	Peripherals
Ruminococcus	Firmicutes	6	6.031	24	0.225	0.4	1	-0.392	0.5	Peripherals
Sarcina	Firmicutes	7	4.427	16	0.273	0.571	0	-0.127	0.489	Peripherals
Staphylococcus	Firmicutes	5	3.369	15	0.176	0.3	0	-0.698	0.48	Peripherals
Streptococcus	Firmicutes	11	42.278	98	0.369	0.381	1	1.568	0.462	Peripherals
Turicibacter	Firmicutes	2	0.333	1	0.055	0	1	-0.882	0	Peripherals

(D) *B. pseudocatenulatum* CCFM680 group

Node Name	**phylum**	**node. degree**	**node. betw**	**node. stress**	**node. evcent**	**Clustering. Coefficient**	**No. module**	**Zi**	**Pi**	**Module**
Acinetobacter	Proteobacteria	13	108.755	241	0.407	0.153	0	2.335	0.615	Peripherals
Adlercreutzia	Actinobacteria	3	0	0	0.181	1	0	-0.755	0.666	Connectors
Akkermansia	Verrucomicrobia	3	3.428	15	0.157	0.666	2	-0.507	0.444	Peripherals
Allobaculum	Firmicutes	1	0	0	0.065	0	0	-0.755	0	Peripherals

Anaeroplasma	Tenericutes	4	52.342	97	0.083	0	1	0.697	0	Peripherals
Anaerostipes	Firmicutes	4	7.833	20	0.086	0	1	0.697	0	Peripherals
Anaerovorax	Firmicutes	6	34.758	92	0.198	0.266	0	0.48	0.611	Peripherals
Bacteroides	Bacteroidetes	4	15.078	47	0.165	0.166	1	-0.581	0.605	Peripherals
Bifidobacterium	Actinobacteria	1	0	0	0.065	0	0	-0.755	0	Peripherals
Blautia	Firmicutes	1	0	0	0.013	0	1	-1.22	0	Peripherals
Clostridium	Firmicutes	2	0	0	0.048	1	2	-0.507	0	Peripherals
Coprobacillus	Firmicutes	8	40.501	105	0.315	0.357	2	0.845	0.593	Peripherals
Coprococcus	Firmicutes	3	9.805	26	0.117	0	1	-1.22	0.444	Peripherals
Dehalobacterium	Firmicutes	5	12.144	46	0.24	0.5	1	-0.581	0.48	Peripherals
Desulfovibrio	Proteobacteria	5	15.818	66	0.257	0.6	0	0.48	0.56	Peripherals
Enterococcus	Firmicutes	2	1.958	8	0.086	0	2	-1.183	0.5	Peripherals
Eubacterium	Firmicutes	1	0	0	0.013	0	1	-1.22	0	Peripherals
Lactobacillus	Firmicutes	2	0	0	0.048	1	2	-0.507	0	Peripherals
Mucispirillum	Deferribacteres	4	6.944	26	0.168	0.333	1	0.058	0.375	Peripherals
Odoribacter	Bacteroidetes	1	0	0	0.065	0	0	-0.755	0	Peripherals
Oscillospira	Firmicutes	4	8.967	22	0.121	0.166	1	0.697	0	Peripherals
Pseudomonas	Proteobacteria	4	13.342	26	0.132	0.166	2	0.169	0.375	Peripherals
Ruminococcus	Firmicutes	7	20.623	83	0.334	0.571	1	0.48	0.653	Connectors
SMB53	Firmicutes	12	117.032	266	0.403	0.212	1	1.976	0.611	Peripherals
Staphylococcus	Firmicutes	2	0	0	0.091	1	2	-0.507	0	Peripherals
Streptococcus	Firmicutes	1	0	0	0.031	0	0	-0.755	0	Peripherals
Sutterella	Proteobacteria	9	65.997	152	0.254	0.222	2	2.197	0.444	Peripherals
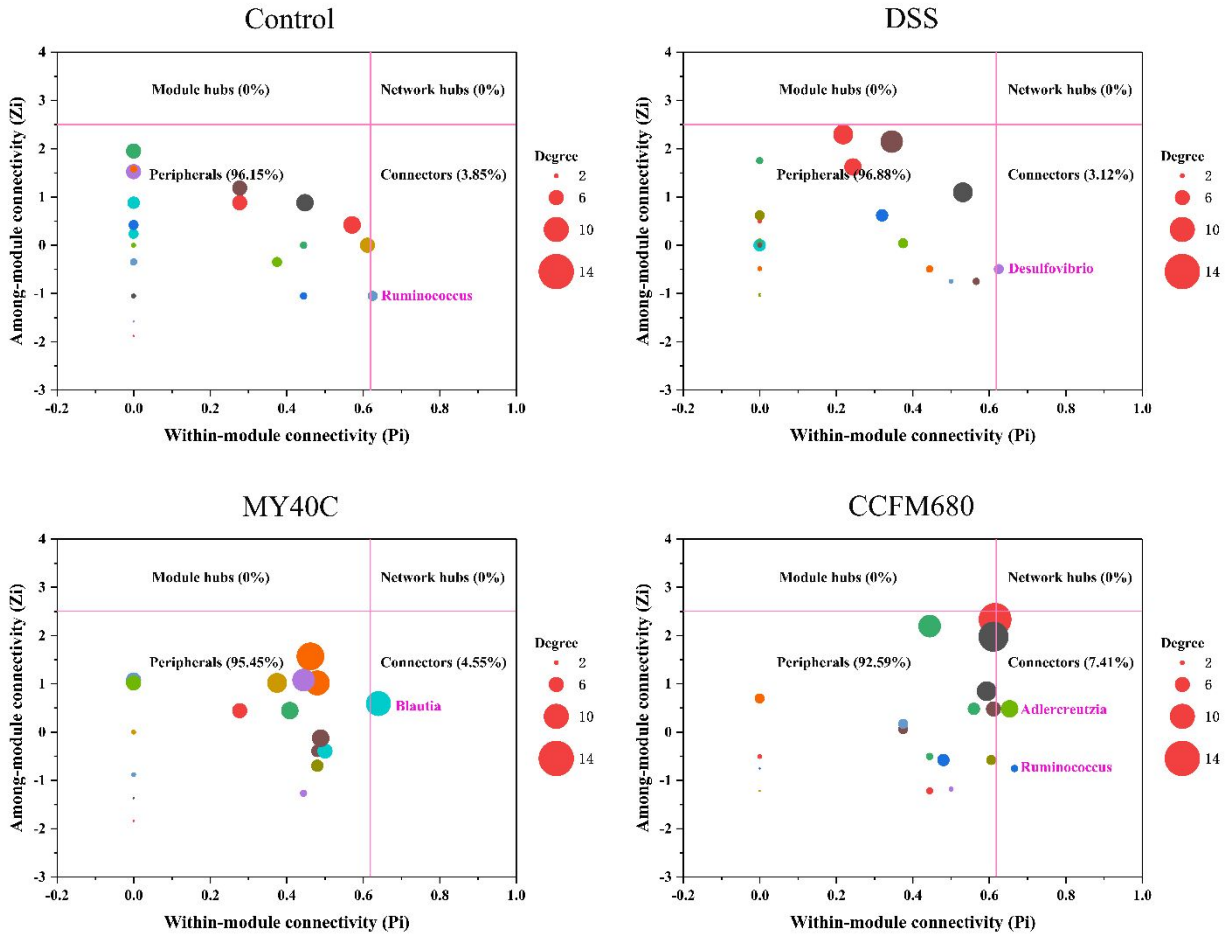
Fig. S1 Zi-Pi plot showing the distribution of genus based on their topological roles in networks. Each symbol represented a genu in the bacterial network. The threshold values of Zi and Pi for categorizing genus were 2.5 and 0.62, respectively.