

## Supplementary material

**Table S1** Levels of gastrointestinal regulatory peptides in serum of mice

Group	gastrointestinal regulatory peptides in serum (ng/L)				
	MTL	GAS	SP	VIP	ET-1
Control	265.62±50.47 <sup>a</sup>	41.38±2.46 <sup>abc</sup>	135.25±7.20 <sup>a</sup>	41.08±4.05 <sup>bc</sup>	60.12±8.36 <sup>a</sup>
Model	208.88±24.74 <sup>a</sup>	31.88±7.70 <sup>cd</sup>	109.99±6.09 <sup>c</sup>	46.86±4.90 <sup>ab</sup>	65.11±5.13 <sup>a</sup>
BC.7050 vegetative cell	224.46±61.24 <sup>a</sup>	46.00±0.24 <sup>ab</sup>	124.48±2.05 <sup>abc</sup>	39.82±1.67 <sup>c</sup>	64.07±2.46 <sup>a</sup>
BC.7050 spore	195.13±41.50 <sup>a</sup>	41.72±4.12 <sup>abc</sup>	118.72±8.22 <sup>abc</sup>	49.38±3.47 <sup>a</sup>	62.75±5.81 <sup>a</sup>
BC.30 vegetative cell	257.38±72.26 <sup>a</sup>	52.76±5.36 <sup>a</sup>	106.76±15.92 <sup>c</sup>	46.33±2.09 <sup>abc</sup>	67.89±4.51 <sup>a</sup>
BC.30 spore	213.56±45.31 <sup>a</sup>	41.23±6.50 <sup>abc</sup>	106.66±7.40 <sup>c</sup>	47.59±2.00 <sup>ab</sup>	60.78±2.63 <sup>a</sup>
BC.90 vegetative cell	180.81±37.61 <sup>a</sup>	36.01±9.02 <sup>bcd</sup>	112.07±6.87 <sup>bc</sup>	44.59±2.19 <sup>abc</sup>	63.58±1.97 <sup>a</sup>
BC.90 spore	260.03±55.87 <sup>a</sup>	27.13±6.45 <sup>d</sup>	127.54±5.96 <sup>ab</sup>	46.35±0.99 <sup>abc</sup>	58.26±3.68 <sup>a</sup>

N = 5 in control group, and N = 6 in the other groups. Different letters (a-d) of the same shoulder mark indicate significant differences between different groups ( $p < 0.05$ ).

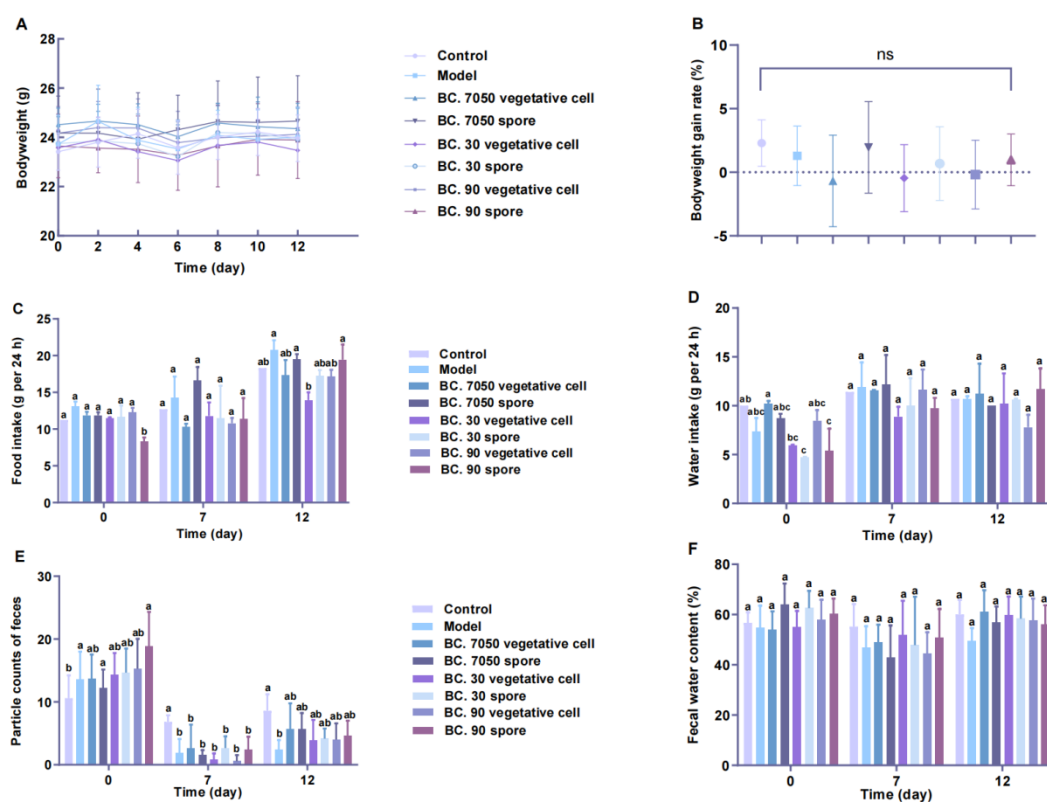


Fig.S1 Changes in health indices in mice with constipation induced by loperamide during experiments. (A) Bodyweight change curve of mice in 12 days; (B) Bodyweight gain rate of mice

in 12 days. (C) Food intake on days 0, 7, and 12; (D) Water intake on days 0, 7, and 12; (E) Particle counts of feces on days 0, 7, and 12; (F) Fecal water content on days 0, 7 and 12; In (C, D), N = 1 in control group, and N = 2 in the other groups; In (A, B, E, F), N = 5 in control group, and N = 6 in the other groups. Different letters (a-b) at the same time indicated a significant difference between the groups ( $p < 0.05$ ).

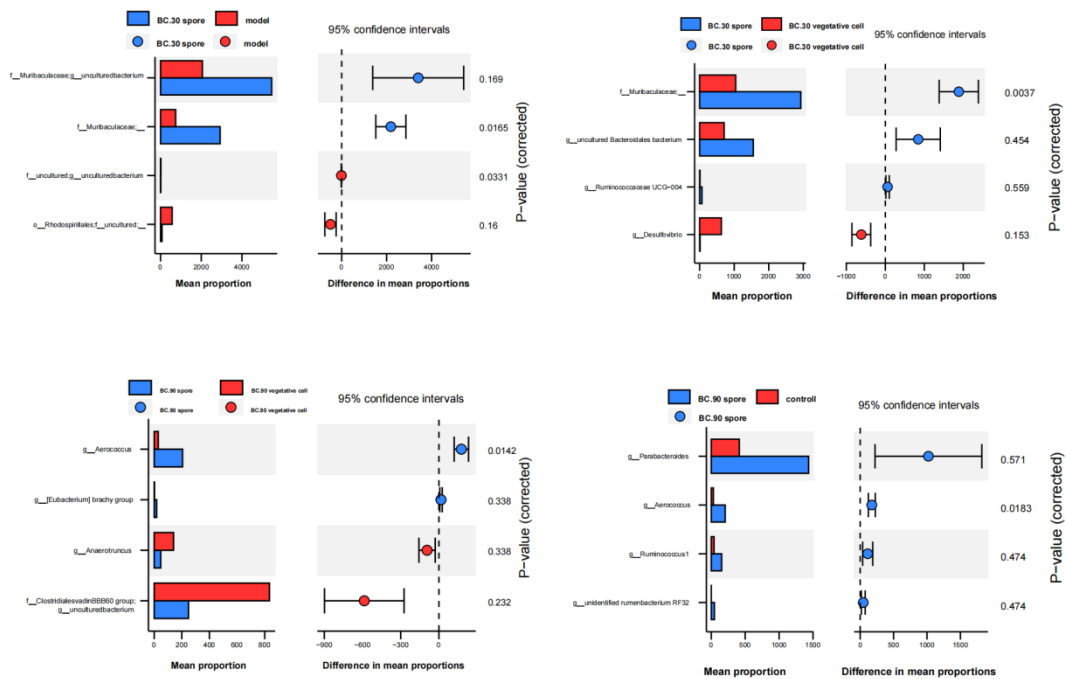


Fig.S2 The STAMP analysis of the experimental groups and the control group. (A) BC.30 spore group vs model group; (B) BC.30 spore group vs BC.30 vegetative cell group; (C) BC.90 spore group vs BC.90 vegetative cell group; (D) BC.90 spore group vs control group. Other groups did not show significant difference between each other. The statistical test and the multiple test correction were set to two-sided Welch's t-test and FDR, respectively. N = 5 in each group.

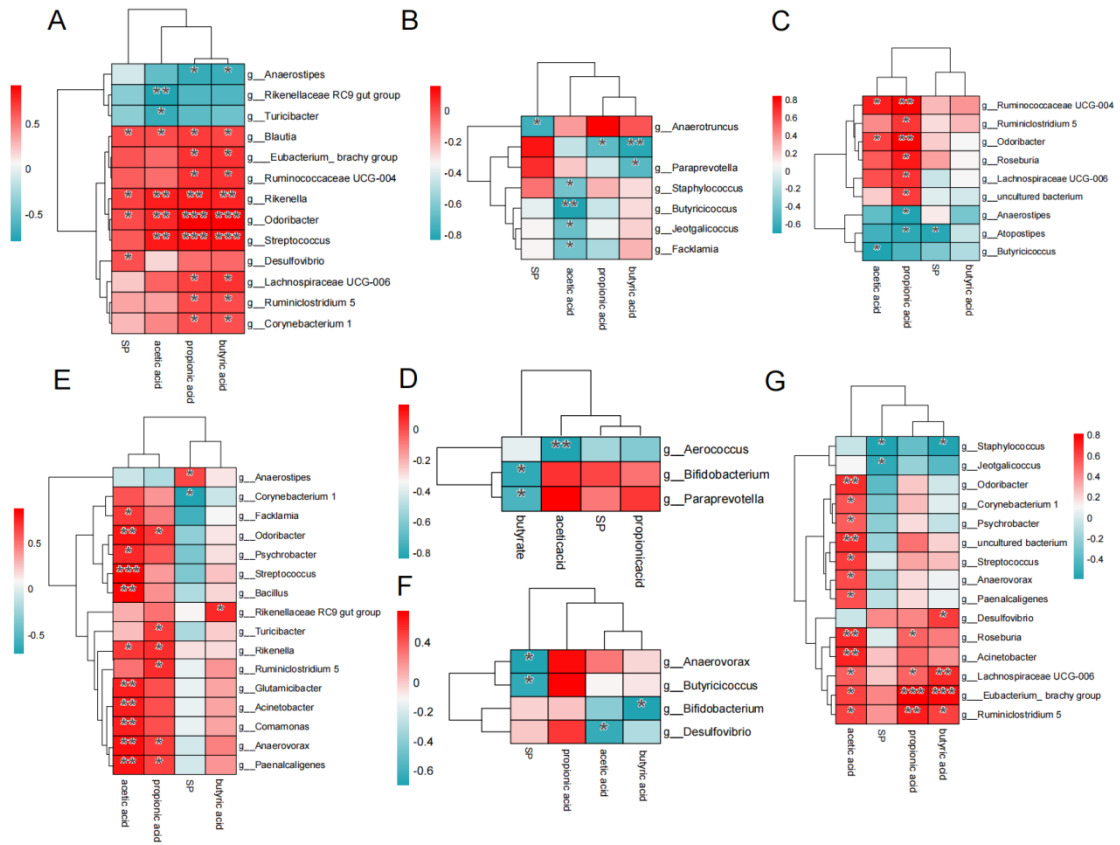


Fig.S3 Correlation analysis between differential bacteria and metabolites in model group and other treatment groups at the genus level. (A) Control group; (B) BC.7050 vegetative group; (C) BC.7050 spore group; (D) BC.30 spore group; (E) BC.30 vegetative group; (F) BC.90 vegetative group; (G) BC.30 and BC.90 spore groups. N = 5 in each group.