Supplementary Information

Modification of *Ganoderma lucidum* spore shells into probiotic carrier: selective loading and colonic delivery of *Lacticaseibacillus rhamnosus* and effective therapy of inflammatory bowel disease

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Score	Weight loss	Feces appearance	Blood in feces
0	0%	Normal	No blood
1	1-5%	Loose	
2	5-10%	Watery diarrhea	Observed blood
3	10-20%	Slimy diarrhea, little blood	
4	>20%	Severe watery diarrhea with blood	Gross bleeding

Table S1 Scoring system for IBD index.

Table S2 Annotations of the detected FTIR peaks.

	1	
Wave number (cm ⁻¹)	Assignment	Components
3403	O–H stretch (hydrogen-bonded)	Carboxylic acids,
		carbohydrates
2925	Asymmetric CH ₃ stretch	Fatty acid and lipid
2854	Asymmetric CH ₂ stretch	Fatty acid and lipid
1745	C=O stretch	Ester, amide
1642	C=O stretch	Ester, amide
1541	N–H bending and C–N stretching	Proteins
1377	C-H bending vibration	Lipids or carbohydrates
1155	C–O stretch	Proteins and carbohydrates
1078	C–O–C stretch	Polysaccharides
1037	C–O–C stretch	Polysaccharides

Table S3 Effect of the prepared bGLS carrier on the body weight of mice.

Samples	Body weight (g)		Death rate (%)
	Day 0 (g)	Day 14 (g)	
СК	38.27 ± 0.21	42.63 ± 0.70	0
IA+HCl-treated bGLS	38.36 ± 0.12	42.60 ± 1.49	0

The data are reported as mean \pm SD (n = 3).

Blood routine parameters**	СК	IA+HCl-treated bGLS
WBC (10 ⁹ /L)	5.30 ± 0.50	5.23 ± 1.03
NEUT (%)	7.67 ± 2.00	7.40 ± 1.74
LYMPH (%)	75.40 ± 3.86	77.40 ± 3.90
MONO (%)	0.23 ± 0.06	0.23 ± 0.06
EO (%)	0.67 ± 0.12	0.57 ± 0.06
BASO (%)	22.97 ± 3.13	22.90 ± 2.27
RBC (10 ¹² /L)	11.00 ± 1.59	10.70 ± 0.90
HCT (%)	52.90 ± 3.86	54.20 ± 2.55
MCV (fL)	48.97 ± 2.94	48.77 ± 1.14
RDW-SD (fL)	24.03 ± 2.30	23.30 ± 2.55
RDW-CV (%)	19.33 ± 1.31	19.03 ± 2.36
HGB (g/L)	148.67 ± 8.08	152.33 ± 8.62
MCH (pg)	14.17 ± 0.46	14.03 ± 0.29
MCHC (g/L)	285.67 ± 13.32	282.67 ± 12.58
PLT (10 ⁹ /L)	949.67 ± 24.54	946.00 ± 23.52
MPV (fL)	5.47 ± 0.96	5.63 ± 1.14
PCT (%)	0.48 ± 0.08	0.48 ± 0.10
PDW (fL)	6.57 ± 0.87	6.37 ± 0.81
P-LCR (%)	3.13 ± 0.49	3.20 ± 0.44

Table S4 Effect of the prepared bGLS carrier on the blood parameters of mice*

The data are reported as mean \pm SD (n = 3).

*The blood samples were collected from the mice 14 days after they were fed with the bGLS carriers. **Full names of abbreviates: WBC, white blood cells; NEUT, neutrophils; LYMPH, lymphocytes; MONO, monocytes; EO, eosinophils; BASO, basophils; RBC, red blood cells; HCT, hematocrit; MCV, mean corpuscular volume; RDW-SD, red blood cell distribution width-standard deviation; RDW-CV, red blood cell distribution width-coefficient of variation; HGB, hemoglobin; MCH, mean corpuscular hemoglobin; MCHC, mean corpuscular hemoglobin concentration; PLT, platelets; MPV, mean platelet volume; PCT, platelet crit; PDW , platelet distribution width; P-LCR, platelet larger cell ratio.

Parameters**	СК	IA+HCl-treated bGLS
TBIL (µmol/L)	1.97 ± 0.21	2.03 ± 0.21
TP (g/L)	62.57 ± 2.53	62.83 ± 2.21
ALB (g/L)	24.10 ± 0.89	24.63 ± 1.25
GLB (g/L)	36.63 ± 2.80	36.97 ± 2.42
ALT (U/L)	42.73 ± 1.46	42.10 ± 1.90
AST (U/L)	134.30 ± 5.23	134.60 ± 5.15
ALP (U/L)	95.30 ± 4.79	95.00 ± 4.71
GGT (U/L)	0.43 ± 0.06	0.43 ± 0.06
UA (µmol/L)	147.27 ± 4.02	146.17 ± 6.84
BUN (mmol/L)	9.97 ± 3.29	9.53 ± 1.38
CREA (µmol/L)	27.54 ± 2.70	27.40 ± 2.44
FGLU (mmol/L)	3.37 ± 0.56	3.25 ± 0.27

Table S5 Effect of the prepared bGLS on the chemical paremeters in the blood of mice*.

The data are reported as mean \pm SD (n = 3).

*The blood samples were collected from the mice 14 days after they were fed with bGLS carriers.

** Full names of abbreviates: TBIL, total bilirubin; TP, total protein; ALB, albumin; GLB, globulin; ALT, alanine aminotransferase; AST, aspartate transaminase; ALP, alkaline phosphatase; GGT, gamma-glutamyl transpeptidase; UA, blood uric acid; BUN, blood urea nitrogen; CREA, creatinine; FGLU, fasting plasma glucose.



Figure S1. Scanning electron microscopy images of the untreated bGLS (a) and HCl-treated bGLS (b).



Figure S2. The loading capacity of *Lactobacillus rhamnosus* SHA113 in different bGLS carriers. Data are reported as mean \pm SD (n = 3).



Figure S3. The standard curve of living LAC amount vs OD_{600nm} value. Data are reported as mean \pm SD (*n* = 3).



Figure S4. Peak heights of FTIR spectra of the bGLS and IA+HCl-treated bGLS at the region around 3403 cm⁻¹.



Figure S5. Effect of different treatments on the FTIR spectra of bGLS samples at the wavenumbers around 2925 cm⁻¹ and 2854 cm⁻¹. (a) IA and IA extract; (b) bGLS and IA-treated bGLS.



Figure S6. Chang of the body weight of mice within 14 days after feeding (IA + HCl)-treated bGLS carriers. Data are reported as mean \pm SD (n = 3).