



Figure S1 FT-IR spectra of *Brassica rapa L.* polysaccharides.

Table S1 Primary experimental materials, reagents, and their sources.

Main materials and reagents	Sources
Brassica rapa L.	(Lhasa, Xizang, China)
Whey	(Lhasa, Xizang, China)
kefirMild lactic acid bacteria	(Danisco Deutschland GmbH, Germany)
Sucrose	(Nanjing, China)
Carboxymethylcellulose	(Shanghai, China)
Propyleneglycol alginate	(Qingdao, China)
Tripolyphosphate	(Chongqing, China)
Forage	(Ain-93M; Xietong Pharmaceutical Bio-engineering Co., Ltd., Jiangsu, China)
Formaldehyde	(Solarbio, Beijing, China)
Hematoxylin and Eosin (H&E) reagents	(Servicebio, Wuhan, China)
Alcian Blue and Periodic Acid-Schiff (AB-PAS) kit	(Servicebio, Wuhan, China)
Terminal deoxynucleotidyl transferase dUTP nick end labeling	(Servicebio, Wuhan, China)

(TUNEL) kit	
Total antioxidant capacity (T-AOC) kit	(Solarbio, Beijing, China)
Superoxide dismutase (SOD) kit	(Solarbio, Beijing, China)
Glutathione peroxidase (GSH-Px) kit	(Solarbio, Beijing, China)
Myeloperoxidase (MPO) kit	(Solarbio, Beijing, China)
Malondialdehyde (MDA) kit	(Solarbio, Beijing, China)
Tumor necrosis factor-alpha (TNF- α) kit	(Mlbio, Shanghai, China)
Interleukin-6 (IL-6) kit	(Mlbio, Shanghai, China)
Interleukin-17 (IL-17) kit	(Mlbio, Shanghai, China)
Interleukin-1 beta (IL-1 β) kit	(Mlbio, Shanghai, China)

Table S2 Dietary formulations employed in animal experiments.

Ingredient	gm	kcal
Casein, 30Mesh	140	560
L-Cystine	1.8	7.2
Corn Starch	495.692	1983
Maltodextrin 10	125	500
Sucrose	100	400
Cellulose	50	0
Soybean Oil	40	360
t-Butylhydroquinone	0.008	0
Mineral Mix S10022M	35	0
Vitamin Mix V10037	10	40
Choline Bitartrate	2.5	0
Total	1000	3850

Table S3 Data on daily food and water intake.

Time	Condition	Group			
		N	NB	H	HB
Day 1	Food intake (g)	10.24	10.46	0.2	0.26
	Water intake (ml)	22	22	1	1.33
Day 2	Food intake (g)	10.30	10.85	2.78	3.19
	Water intake (ml)	24	23	1.67	1.67
Day 3	Food intake (g)	11.09	10.64	1.10	1.49
	Water intake (ml)	24	20.67	1.67	2
Day 4	Food intake (g)	10.95	9.95	2.41	1.84
	Water intake (ml)	21.67	22.33	2	2
Day 5	Food intake (g)	12.75	10.22	2.11	1.94
	Water intake (ml)	20.33	22	2.33	2
Day 6	Food intake (g)	9.71	10.02	2.63	2.48
	Water intake (ml)	22	21	3.33	3.67
Day 7	Food intake (g)	12.97	12.49	3.10	3.65
	Water intake (ml)	28	25	5	5
Day 8	Food intake (g)	11.54	11.71	4.12	4.37
	Water intake (ml)	23	23	5.33	7
Day 9	Food intake (g)	11.55	11.52	4.23	3.31
	Water intake (ml)	26	24	9.67	6.33
Day 10	Food intake (g)	11.17	11.21	4.53	4.55
	Water intake (ml)	23	22.33	3.33	5.67
Day 11	Food intake (g)	10.89	12.26	4.63	5.09
	Water intake (ml)	25	23.67	8	7.67
Day 12	Food intake (g)	11.28	11.54	6.93	2.97
	Water intake (ml)	24.33	22.33	11	13
Day 13	Food intake (g)	11.64	11.81	5.29	2.81
	Water intake (ml)	25.67	26.33	2.33	4.33
Day 14	Food intake (g)	11.24	10.45	2.19	2.26

Water intake (ml)	25.22	22	1	1.33
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Table S4 Nutrient composition of fermented beverages.

Norm	Mean ± SD	Norm	Mean ± SD
Fat (%)	0.52±0.01	Casein (%)	1.41±0.01
Protein (%)	1.30±0.02	Citric Acid (%)	0.09±0.01
Lactose (%)	7.13±0.02	SNF (%)	14.87±0.03
Low Lactose (%)	7.02±0.12	TS (%)	12.76±0.03
Galactose (%)	5.07±0.04	Acidity- Dornic	4.38±0.03

Table S5 Relative changes in the abundance of 11 metabolites.

Metabolites	KEGG ID	H-N				HB-H			
		VIP	P-value	Fold_Change	Trend	VIP	P-value	Fold_Change	Trend
1D-myo-inositol 1,4-bisphosphate	C01220	1.74	0.00	7.04	↑	2.29	0.01	0.40	↓
Ketoleucine	C00233	1.36	0.01	0.39	↓	1.94	0.02	2.61	↑
12(S)-HPETE	C05965	1.46	0.01	0.55	↓	2.06	0.01	1.36	↑
Nicotinic acid	C00253	1.33	0.02	0.41	↓	1.88	0.02	1.62	↑
Ortophosphate	C00009	1.34	0.00	0.52	↓	2.07	0.01	1.75	↑
L-Carnitine	C00318	1.29	0.02	0.55	↓	1.66	0.05	1.37	↑
Sorbitol	C00794	1.22	0.02	1.76	↑	1.77	0.04	0.62	↓
Sucrose	C00089	1.25	0.02	2.00	↑	1.78	0.02	1.35	↑
Irinotecan	C16641	1.64	0.00	8.60	↑	1.58	0.04	0.50	↓
Berberine	C00757	1.18	0.01	0.48	↓	1.36	0.04	1.59	↑
Quercetin	C00389	1.02	0.04	0.62	↓	2.99	0.00	0.22	↓