

Tests	Parameters		NS-PBS	S-PBS	NS-Probio	S-Probio	Kruskal-Wallis test P value
OF	Number of visits	Periphery	39.00 (14.00)	34.50 (27.25)	37.50 (12.50)	42.00 (16.00)	0.339
		Centre	38.50 (14.00)	33.50 (28.25)	37.00 (12.50)	41.00 (16.25)	0.369
		Corners	58.00 (16.50)	59.50 (12.75)	57.00 (12.75)	58.00 (11.75)	0.932
	Time (s)	Periphery	306.90 (34.30)	310.10 (46.20)	310.10 (15.90)	296.70 (40.00)	0.374
		Centre	53.15 (34.30)	49.95 (46.20)	49.30 (28.08)	63.30 (40.00)	0.324
		Corners	112.1 (39.32)	110.6 (60.02)	112.2 (40.50)	98.90 (36.50)	0.305
	Total distance (m)		26.70 (5.46)	26.41 (6.90)	26.43 (9.94)	27.02 (7.26)	0.992
	Rearing		39.00 (21.50)	20.00 (26.50)	29.50 (36.25)	14.50 (36.50)	0.108
	Grooming		1.00 (1.75)	1.00 (0.25)	1.00 (1.00)	1.00 (2.00)	0.604
	Faeces		6.50 (2.75)	7.00 (3.00)	6.00 (5.00)	6.50 (4.50)	0.766
EPM	Number of visits	% open arms	57.50 (18.75)	60.50 (33.75)	56.00 (21.25)	71.00 (15.00)	0.164
		Centre	36.50 (9.25)	30.00 (7.00)	35.50 (9.75)	32.00 (18.00)	0.064
		End of the arms	13.00 (10.75)	11.50 (4.75)	7.50 (10.00)	11.00 (8.50)	0.366
	Time (s)	% open arms	65.05 (24.55)	68.85 (22.25)	54.85 (39.55)	72.00 (22.60)	0.422
		Centre	90.75 (42.10)	60.20 (24.75)	84.10 (49.30)	56.90 (60.65)	0.267
		End of the arms	35.55 (54.00)	55.35 (38.87)	21.60 (22.21)	36.20 (58.15)	0.058
	Head bents	Centre	5.00 (5.50)	2.00 (5.00)	4.50 (7.00)	4.00 (5.50)	0.285
		Open arms	6.50 (5.50)	5.00 (13.00)	7.00 (10.50)	8.00 (11.50)	0.761
	Faeces		4.00 (3.75)	5.50 (4.00)	4.00 (2.50)	5.00 (2.50)	0.699

Table S1 : Kruskal-Wallis test analysis of the results obtained in the OF and EPM tests. Results are expressed as median (interquartile range), n = 12-14.

	NS-PBS	S-PBS	NS-Probio	S-Probio	Kruskal-Wallis test P value
Serotonin (µg/ml)	1.7 (0.4)	1.3 (0.3)	1.6 (0.3)	1.4 (0.3)	0.0009
Kynurenin (ng/ml)	177.6 (151.3)	228.5 (90.8)	197.1 (100.4)	227.7 (121.5)	0.70
Tryptophan (µg/ml)	22.6 (10.6)	20.3 (8.5)	20.3 (11.3)	21.3 (11.7)	0.62
Kynurenin/Tryptophan	0.8 (0.4)	1.2 (0.4)	1.0 (0.5)	0.9 (0.5)	0.29
Adrenaline (µg/ml)	3.3 (2.3)	2.0 (1.4)	2.6 (1.3)	2.7 (2.0)	0.11
Corticosterone (ng/ml)	36.1 (13.5)	35.5 (48.4)	24.9 (29.9)	126.7 (79.4)	< 0.0001

Table S2 : Comparison of blood markers in serum using the Kruskal-Wallis test. Results are expressed as median (interquartile range), n = 11-14.

Brain regions	Marker	NS-PBS	S-PBS	NS-Probio	S-Probio	Kruskal-Wallis test P value
Hypothalamus	CRH	0.9 (0.6)	1.2 (0.4)	1.0 (0.4)	1.2 (0.5)	0.66
Prefrontal cortex	GR	1.0 (0.4)	1.0 (0.2)	1.0 (0.3)	1.0 (0.1)	0.54
	GABAaR	1.0 (0.3)	1.1 (0.3)	1.1 (0.3)	1.1 (0.1)	0.66
	TPH2	1.1 (0.4)	1.1 (0.3)	1.1 (0.5)	0.9 (0.2)	0.50
	5HT1AR	1.0 (0.4)	0.9 (0.3)	1.0 (0.4)	0.9 (0.3)	0.78
	SERT	1.1 (0.3)	1.3 (0.5)	1.3 (0.8)	1.0 (0.4)	0.24
	TH	1.1 (1.4)	0.7 (2.1)	0.5 (0.8)	0.3 (1.3)	0.51
	DAT	1.0 (1.3)	0.7 (2.1)	0.4 (0.7)	0.3 (1.3)	0.41
	BDNF	1.1 (0.6)	1.1 (0.7)	0.9 (0.4)	1.0 (0.5)	0.55
	CREB	1.1 (0.3)	1.0 (0.1)	0.9 (0.3)	1.0 (0.3)	0.14
	IFN γ	0.9 (0.7)	0.8 (1.0)	1.0 (0.7)	0.5 (0.7)	0.19
	IL-1 β	0.9 (0.4)	1.0 (0.3)	1.2 (0.8)	1.0 (0.4)	0.79
	TNF α	1.1 (0.4)	1.0 (0.6)	0.8 (0.2)	0.9 (0.7)	0.35
Hippocampus	GR	0.9 (0.4)	0.8 (0.3)	0.9 (0.2)	0.9 (0.4)	0.73
	GABAaR	1.0 (0.2)	1.0 (0.3)	1.0 (0.4)	1.0 (0.5)	0.90
	TPH2	1.0 (0.2)	1.1 (0.2)	1.0 (0.3)	1.0 (0.3)	0.10

	5HT1AR	1.0 (0.6)	1.2 (0.6)	1.2 (0.6)	1.1 (0.5)	0.50
	SERT	1.0 (0.5)	1.1 (0.5)	1.0 (0.9)	0.9 (0.6)	0.03
	TH	0.9 (0.7)	0.9 (0.5)	0.9 (1.0)	0.9 (0.6)	0.97
	DAT	0.6 (1.2)	1.2 (1.3)	0.8 (0.5)	0.4 (0.1)	0.0009
	BDNF	1.1 (0.2)	1.0 (0.2)	1.0 (0.2)	1.0 (0.3)	0.34
	CREB	1.0 (0.3)	1.1 (0.3)	1.1 (0.5)	1.0 (0.4)	0.52
	IFN γ	0.9 (1.3)	0.4 (0.2)	0.8 (1.0)	0.9 (1.0)	0.16
	IL-1 β	1.0 (0.6)	0.5 (0.4)	0.8 (0.8)	0.4 (0.5)	0.02 ^a
	TNF α	0.9 (0.4)	1.0 (0.5)	1.0 (0.5)	0.7 (0.9)	0.18

Table S3 : Comparison of brain markers using the Kruskal-Wallis test. Results are expressed as median of $2e\Delta\Delta Ct$ (interquartile range), n = 11-14. ^a Despite the Kruskal-Wallis significance, the Dunn post hoc test did not reveal any significant difference between groups.

Gut regions	Marker	NS-PBS	S-PBS	NS-Probio	S-Probio	Kruskal-Wallis test P value
Ileum	IL-1 β	0.9 (1.2)	1.0 (0.6)	1.2 (0.7)	1.0 (1.2)	0.81
	TNF α	0.8 (0.8)	0.8 (0.6)	1.1 (0.9)	0.5 (0.8)	0.23
	IFN γ	0.8 (1.3)	0.9 (1.2)	0.6 (0.6)	0.8 (0.6)	0.73
	Claudin-2	1.0 (0.2)	0.9 (0.4)	0.9 (0.6)	0.9 (0.3)	0.78
	Occludin	1.0 (0.6)	1.3 (0.5)	1.2 (0.6)	1.3 (0.8)	0.65
	ZO-1	1.3 (0.3)	1.0 (0.1)	1.0 (0.3)	1.1 (0.3)	0.13
	MLCK	1.0 (0.6)	0.8 (0.9)	1.0 (0.7)	1.0 (1.1)	0.97
Colon	IL-1 β	1.0 (0.6)	0.9 (0.4)	1.2 (0.8)	0.8 (0.5)	0.19
	TNF α	0.9 (0.7)	0.8 (0.6)	1.3 (1.3)	0.8 (0.5)	0.26
	IFN γ	1.0 (0.4)	1.1 (0.4)	1.5 (1.4)	1.0 (0.5)	0.18
	Claudin-2	0.9 (0.6)	0.9 (0.4)	1.0 (0.6)	1.3 (0.7)	0.066
	Occludin	1.0 (0.5)	0.9 (0.5)	0.9 (0.6)	1.1 (0.5)	0.51
	ZO-1	1.0 (0.2)	1.0 (0.3)	0.9 (0.3)	1.1 (0.2)	0.15
	MLCK	1.0 (0.6)	0.6 (0.6)	0.6 (0.3)	0.5 (0.7)	0.17

Table S4 : Comparison of inflammation and gut permeability using the Kruskal-Wallis test. Results are expressed as median of 2e $\Delta\Delta$ Ct (interquartile range), n = 12-14.

Taxa level	Taxa	S-PBS vs NS-PBS p-value	Taxa	S-Probio vs NS-Probio p-value	Taxa	S-Probio vs S-PBS p-value
Family	Verrucomicrobiaceae	p= 0.007	Bacteroidaceae	p= 0.0001 *	Rikenellaceae	p= 0.0072
	Bacteroidaceae	p= 0.014	Bdellovibrionaceae	p= 0.0123	Staphylococcaceae	p= 0.0085
			Desulfovibrionaceae	p= 0.258		
			Staphylococcaceae	p= 0.0313		
Genus	<i>Akkermansia</i>	p= 0.007	Bacteroides	p= 0.0001 *	<i>Ruminococcus</i>	p= 0.0203
	<i>Allobaculum</i>	p= 0.0079	Ruminococcus2	p= 0.0082	<i>Alistipes</i>	p= 0.0072
	Bacteroides	p= 0.014	Coprobacter	p= 0.0063	Staphylococcus	p= 0.0085
	<i>Olsenella</i>	p= 0.0194	<i>Olsenella</i>	p= 0.0096		
	<i>Gemmiger</i>	p= 0.0258	Catenibacterium	p= 0.0104		
	Butyrivibrio	p= 0.0291	<i>Vampirovibrio</i>	p= 0.0123		
	<i>Coprococcus</i>	p= 0.0326	<i>Bilophila</i>	p= 0.0203		
			<i>Anaerosporbacter</i>	p= 0.0228		
			Macellibacteroides	p= 0.0256		
			<i>Clostridium IV</i>	p= 0.0291		
			Staphylococcus	p= 0.0313		
			<i>Coprococcus</i>	p= 0.0366		
			<i>Murimonas</i>	p= 0.0366		
			<i>Sporobacter</i>	p= 0.0456		

Table S5 : Relative abundance significantly regulated between treatments at week 6. * indicates a (FDR-adjusted p-value) q-value <0.01, bold indicates a higher relative abundance in the first group

	Marker	NS-PBS	S-PBS	NS-Probio	S-Probio	Kruskal-Wallis test P value
Faeces	Total SCFAs ($\mu\text{mol/g}$ caecal content)	11.4 (4.7)	8.5 (5.4)	12.9 (9.6)	6.9 (5.2)	0.019
	% Acetate	74.9 (3.7)	80.0 (8.9)	75.1 (6.0)	81.3 (16.4)	0.17
	% Propionate	13.0 (6.3)	10.1 (4.2)	10.3 (6.3)	10.8 (5.9)	0.24
	% Butyrate	8.4 (4.8)	8.0 (5.3)	12.4 (6.2)	8.4 (10.5)	0.20
	% Iso-SCFAs	1.1 (1.2)	0.9 (0.8)	1.2 (1.0)	0.7 (0.5)	0.49
Caecum content	Total SCFAs ($\mu\text{mol/g}$ caecal content)	42.3 (20.7)	32.7 (19.4)	32.7 (10.8)	30.6 (10.0)	0.28
	% Acetate	65.7 (2.7)	60.9 (4.8)	63.6 (4.9)	60.9 (4.7)	0.014
	% Propionate	10,68 (2.2)	11,73 (3.8)	13,72 (3.7)	12,49 (4.6)	0.044
	% Butyrate	0.7 (0.2)	0.8 (0.4)	0.9 (0.3)	0.8 (0.5)	0.21
	% Iso-SCFAs	1.3 (0.4)	1.4 (0.8)	1.7 (0.6)	1.5 (1.1)	0.16

Table S6 : Comparison of total SCFAs and percentages of acetate, propionate, butyrate and iso-SCFAs using the Kruskal-Wallis test. Results are expressed as median (interquartile range), n = 13-14.