Supplementary information

Table S1. Composition of experimental diet for gut dysbiosis rat model.

Ingredient	g/kg
Lactic casein (cow)[1]	120
Vitamin mixture[2]	50
Mineral mixture[3]	50
Corn oil[4]	100
Starch[5]	555
Sucrose[6]	50
Cellulose[7]	75

[1]Acid casein, New Zealand Milk Products Ltd., Wellington, New Zealand.
[2]Mixture contains: (mg/kg diet) – retinol acetate 5.0, DL-α-tocopherol acetate 100.0, menadione 3.0, thiamin hydrochloride 5.0, riboflavin 7.0, pyridoxine hydrochloride 8.0, D-pantothenic acid 20.0, folic acid 2.0, nicotinic acid 20.0, D-biotin 1.0, myo-inositol 200.0, and choline chloride 1500.0; (μg/kg diet) – ergocalciferol 25.0 and cyanocobalamin 50.0.
[3]Mixture contains: (g/kg diet) – Ca 6.29, Cl 7.79, Mg 1.06, P 4.86, K 5.24, and Na 1.97; (mg/kg diet) – Cr 1.97, Cu 10.7, Fe 424.0, Mn 78.0, and Zn 48.2; (μg/kg diet) – Co 29.0, I 151.0, Mo 152.0, and Se 151.0.
[4]Essente, Davis Trading Company, Palmerston North, New Zealand.
[5]Wheat starch, Allied Mills Ltd., Tamworth, Australia.
[6]Caster sugar, Chelsea, New Zealand Sugar Company Ltd., Auckland, New Zealand.
[7]Ceolus PH-102, Asahi Kasei Chemicals Corporation, Tokyo, Japan.

Table S2. Composition of experimental diets to evaluate the effects of cow and goat milk on gut dysbiosis in rats (g/kg).

Ingredient	Goat milk	Cow milk
Goat whole milk powder[1]	454.6	
Cow whole milk powder[2]		468.8
Vitamin mixture[3]	50	50
Mineral mixture[4]	50	50
Corn oil[5]	22.7	13.11
Starch[6]	333.5	342.4
Lactose[7]	14.2	0.69
Cellulose[8]	75	75

[1]Dairy Goat Co-operative (NZ) Ltd., Hamilton, New Zealand. Milk powder contains 26.4% protein, 28% fat, 35.6% carbohydrate, 7% ash and 3% moisture.
[2]Dairy Goat Co-operative (NZ) Ltd., Hamilton, New Zealand. Milk powder contains 25.6% protein, 29.2% fat, 37.4% carbohydrate, 5.4% ash and 2.4% moisture.
[3]Mixture contains: (mg/kg diet) – retinol acetate 5.0, DL-α-tocopherol acetate 100.0, menadione 3.0, thiamin hydrochloride 5.0, riboflavin 7.0, pyridoxine hydrochloride 8.0, D-pantothenic acid 20.0, folic acid 2.0, nicotinic acid 20.0, D-biotin 1.0, myo-inositol 200.0, and choline chloride 1500.0; (µg/kg diet) – ergocalciferol 25.0 and cyanocobalamin 50.0.
[4]Mixture contains: (g/kg diet) – Ca 6.29, Cl 7.79, Mg 1.06, P 4.86, K 5.24, and Na 1.97; (mg/kg diet) – Cr 1.97, Cu 10.7, Fe 424.0, Mn 78.0, and Zn 48.2; (µg/kg diet) – Co 29.0, I 151.0, Mo 152.0, and Se 151.0.
[5]Essente, Davis Trading Company, Palmerston North, New Zealand.
[6]Wheat starch, Allied Mills Ltd., Tamworth, Australia.
[7]Dairy Goat Co-operative (NZ) Ltd., Hamilton, New Zealand.
[8]Ceolus PH-102, Asahi Kasei Chemicals Corporation, Tokyo, Japan.

Table S3. Real-time PCR primers used for bacterial quantification.

	Primer sequence (5' → 3')	Annealing temperature (°C)	Reference
Bacteroides-Prevotella-Porphyromonas group	F: GGTGTCGGCTTAAGTGCCAT R: CGGA(C/T)GTAAGGGCCGTGC	63	1
Bifidobacterium spp.	F: TCGCGTC(C/T)GGTGTGAAAG R: CCACATCCAGC(A/G)TCCAC	63	1
Clostridium perfringens group	F: ATGCAAGTCGAGCGA(G/T)G R: TATGCGGTATTAATCT(C/T)CCTTT	55	1
Enterococcus spp.	F: CCCTTATTGTTAGTTGCCATCATT R: ACTCGTTGTACTTCCCATTGT	64	1
Lachnospiraceae	F: GACGGTACCTGACTAAGAAGCR: AGTTTCATTCTTGCGAACGT	63	2
Lactobacillus spp.	F: CGATGAGTGCTAGGTGTTGGA R: CAAGATGTCAAGACCTGGTAAG	60	3
Total bacteria	F: TCCTACGGGAGGCAGCAGT R: GACTACCAGGGTATCTAATCCTGTT	60	4

Table S4. Limit of detection of organic acids quantified by gas chromatography.

	µmol/g of caecum or colon contents	µmol/g of faeces
Acetic	2.00	1.00
Butyric	2.00	1.00
Isobutyric	0.60	0.30
Formic	0.60	0.30
Lactic	0.50	0.25
Propionic	0.80	0.40
Succinic	0.50	0.25
Valeric	0.20	0.10
Isovaleric	0.20	0.10

Table S5. Initial body weights of rats fed cow and goat milk diets.

	Week 0
Cow milk (no antibiotic)	67.4
Goat milk (no antibiotic)	68.1
Cow milk (antibiotic - week 2)	67.2
Goat milk (antibiotic - week 2)	68.8
Cow milk (antibiotic - week 4)	68.7
Goat milk (antibiotic - week 4)	67.8
Least significant difference	1.5
P values	
Milk	0.305
Antibiotic	0.634
Milk × Antibiotic	0.055

Body weights are presented in grams.

Table S6. Weekly body weights of rats fed cow and goat milk diets.

	Week 1	Week 2	Week 3	Week 4
Cow milk (no antibiotic)	97.8	137.8	174.0^{a}	210.6^{a}
Goat milk (no antibiotic)	99.4	138.7	181.2^{ab}	223.4^{b}
Cow milk (antibiotic - week 2)	103.6	137.8	182.4^{ab}	226.3^{b}
Goat milk (antibiotic - week 2)	103.7	141.5	181.1^{ab}	222.2^{b}
Cow milk (antibiotic - week 4)	104.6	142.5	192.1^{b}	229.7^{b}
Goat milk (antibiotic - week 4)	96.6	132.4	179.6^{a}	218.2^{ab}
P values				
Week	<0.001			
Milk	0.558			
Antibiotic	0.413			
Week × Milk	0.964			
Week × Antibiotic	0.046			
Milk × Antibiotic	0.097			
Week × Milk × Antibiotic	0.053			

Body weights are presented in grams.
Least significant difference between Milk × Antibiotic combinations is 12 and between weeks within Milk × Antibiotic combinations is 6.
Mean values with a different letter differ significantly.

Table S7. Food intakes of rats fed cow and goat milk diets.

	Week 1	Week 2	Week 3	Week 4
Cow milk (no antibiotic)	74.1	104.6[a]	119.7[a]	125.3[a]
Goat milk (no antibiotic)	72.0	101.9[a]	122.5[a]	135.5[b]
Cow milk (antibiotic - week 2)	79.7	103.7[a]	125.1[ab]	134.5[b]
Goat milk (antibiotic - week 2)	76.4	97.2[a]	123.5[ab]	131.9[b]
Cow milk (antibiotic - week 4)	78.5	118.2[b]	133.0[b]	126.3[ab]
Goat milk (antibiotic - week 4)	70.4	99.3[a]	118.6[a]	119.3[a]
P values				
Week	<0.001			
Milk	0.051			
Antibiotic	0.758			
Week × Milk	0.047			
Week × Antibiotic	<0.001			
Milk × Antibiotic	0.044			
Week × Milk × Antibiotic	0.607			

Food intakes are presented in grams.
Least significant difference between Milk × Antibiotic combinations is 10 and between weeks within Milk × Antibiotic combinations is 8.
Mean values with a different letter differ significantly.

Table S8. Faecal output of rats fed cow and goat milk diets.

	Week 1	Week 2	Week 3	Week 4
Cow milk (no antibiotic)	11.2^{ab}	17.1^{ab}	20.4^{a}	20.2^{b}
Goat milk (no antibiotic)	10.7^{ab}	15.8^{a}	20.9^{ab}	22.5^{b}
Cow milk (antibiotic - week 2)	11.7^{b}	15.3^{a}	20.8^{a}	22.3^{b}
Goat milk (antibiotic - week 2)	11.0^{ab}	13.9^{a}	21.4^{a}	21.2^{b}
Cow milk (antibiotic - week 4)	11.2^{ab}	18.0^{b}	22.9^{b}	19.5^{a}
Goat milk (antibiotic - week 4)	9.4^{a}	15.9^{a}	19.8^{a}	17.7^{a}
P values				
Week	<0.001			
Milk	0.079			
Antibiotic	0.641			
Week × Milk	0.166			
Week × Antibiotic	<0.001			
Milk × Antibiotic	0.129			
Week × Milk × Antibiotic	0.047			

Faecal output are presented in grams.
Least significant difference between Milk × Antibiotic combinations is 2 and between weeks within Milk × Antibiotic combinations is 1.
Mean values with a different letter differ significantly.

Table S9. Gut length and caecum weight of rats fed cow and goat milk diets.

	Gut length	Caecum weight
Cow milk (no antibiotic)	111	3.8[a]
Goat milk (no antibiotic)	113	4.6[ab]
Cow milk (antibiotic - week 2)	113	4.5[a]
Goat milk (antibiotic - week 2)	108	5.1[ab]
Cow milk (antibiotic - week 4)	113	5.5[ab]
Goat milk (antibiotic - week 4)	108	6.4[bc]
Least significant difference	7	0.9
P values		
Milk	0.197	0.005
Antibiotic	0.792	<0.001
Milk × Antibiotic	0.278	0.884

Gut length are presented in centimetres and caecum weight are presented in grams.
Mean values with a different letter differ significantly.

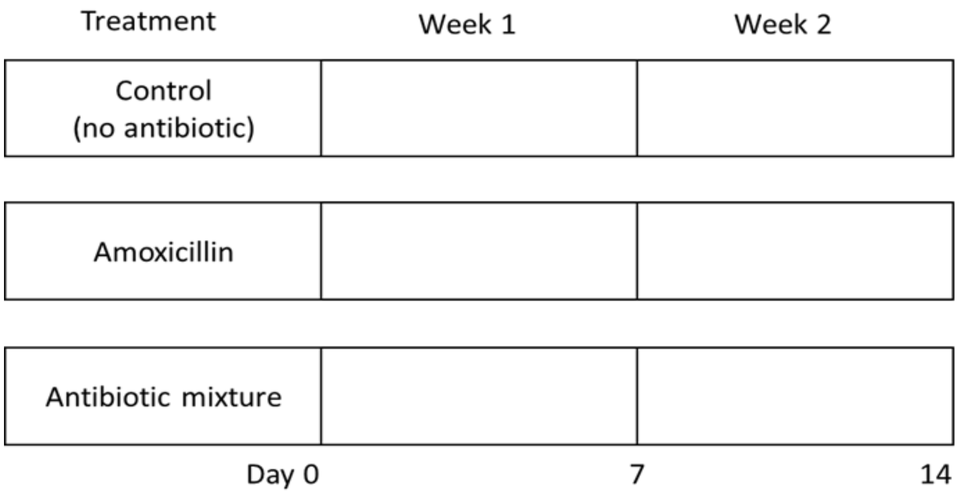

Figure S1. Schematic representation of the experimental design for antibiotic-induced gut dysbiosis in rats. Antibiotics were added to the drinking water for 7 or 14 days. Animals were euthanised at day 7 or day 14. The antibiotic mixture consisted of ampicillin, gentamicin and metronidazole.

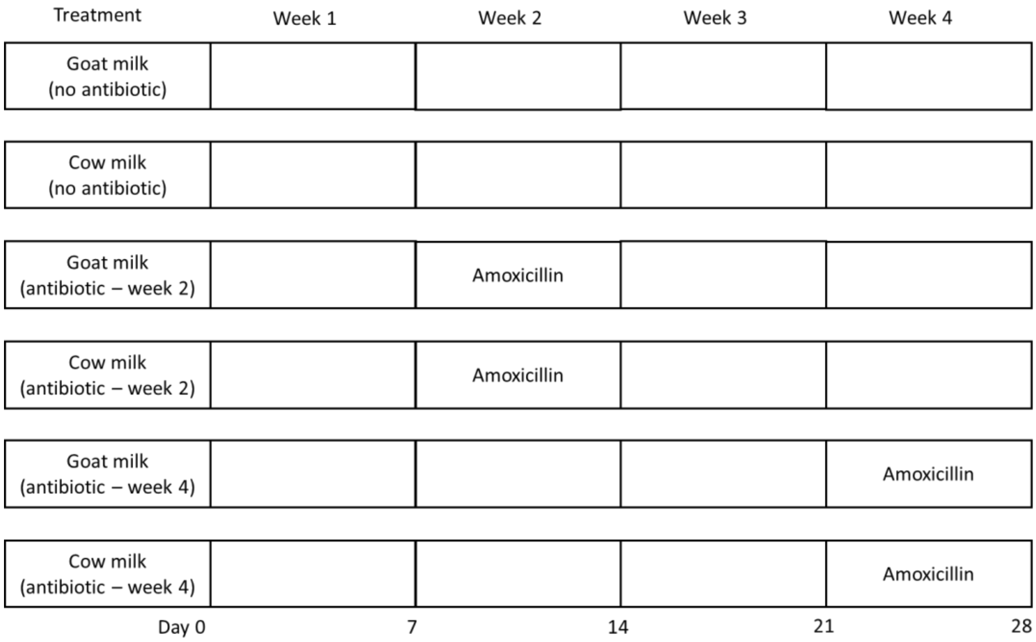

Figure S2. Schematic representation of the experimental design to evaluate the effects of cow and goat milk in amoxicillin-induced gut dysbiosis in rats. Amoxicillin was given daily for 7 days by oral gavage during week 2 or 4.

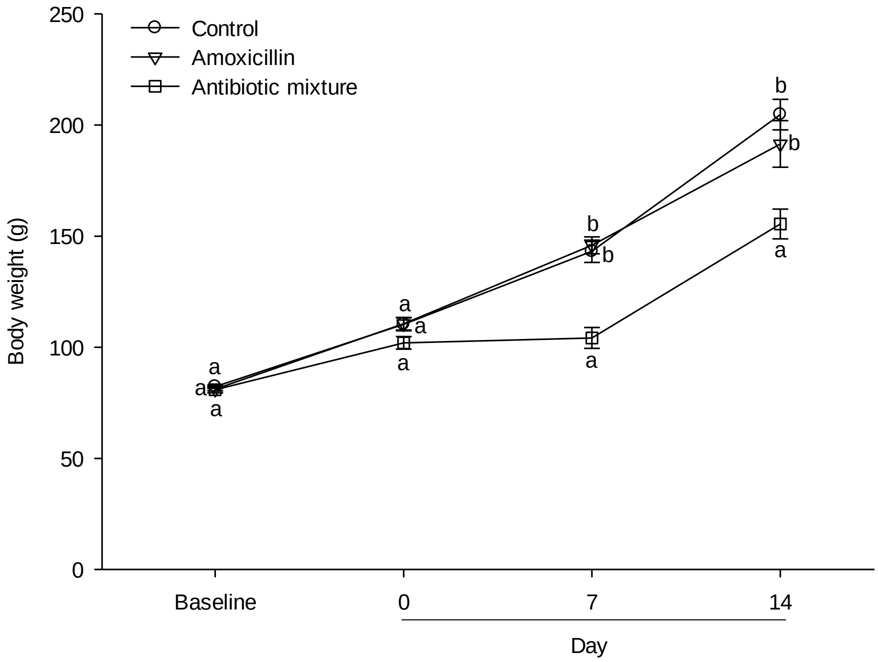

Figure S3. Body weight of rats in antibiotic-induced dysbiosis study. Body weight are presented in grams (g). Data expressed as mean ± standard error of the mean. Mean values with a different letter differ significantly within the same time point (*P* < 0.05). Day 0 is the end of acclimatisation.

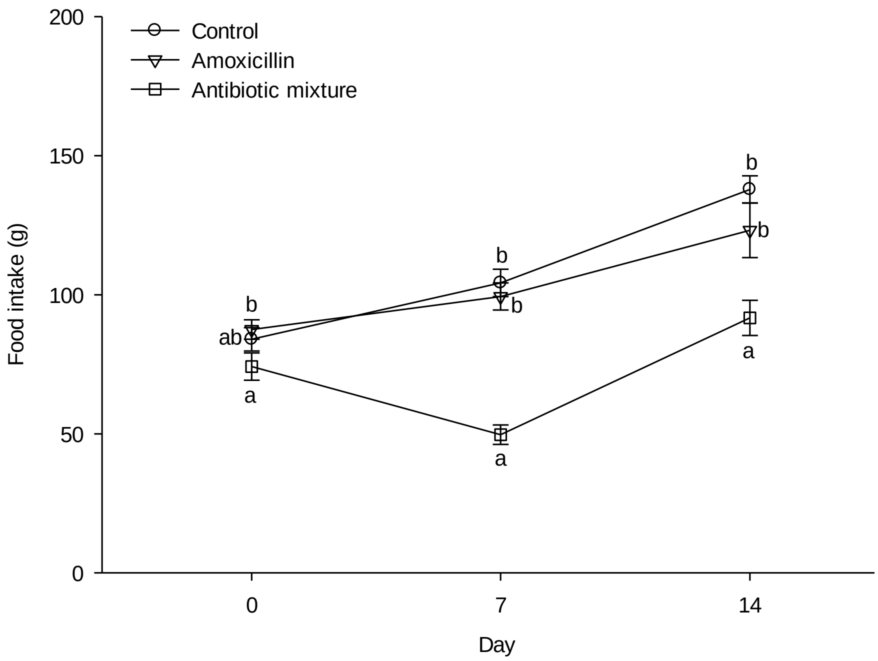

Figure S4. Food intake of rats in antibiotic-induced dysbiosis study. Food intake are presented in grams (g). Data expressed as mean ± standard error of the mean. Mean values with a different letter differ significantly within the same time point (*P* < 0.05). Day 0 is the end of acclimatisation**.**

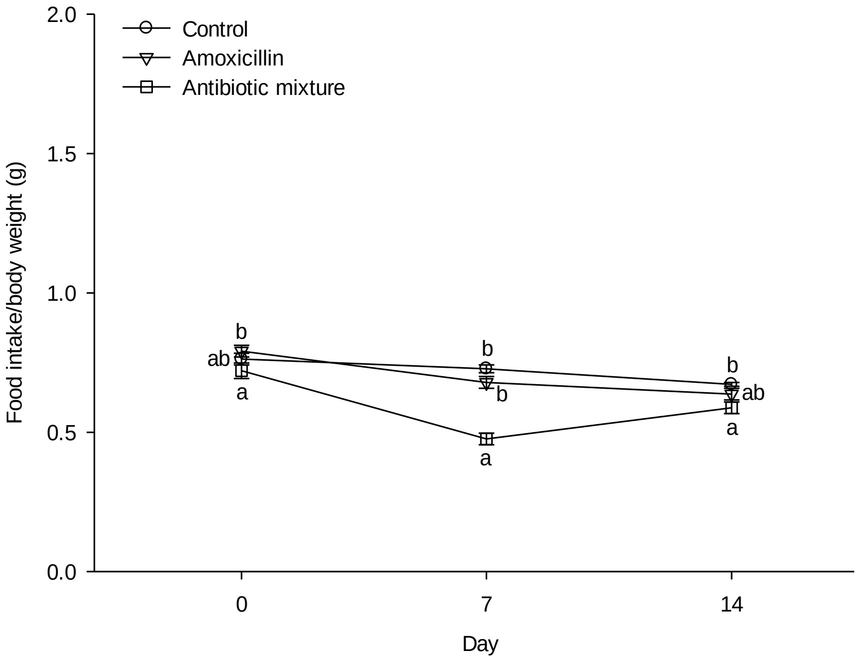

Figure S5. Food intake adjusted to body weight of rats in antibiotic-induced dysbiosis study. Data presented in grams (g) and expressed as mean ± standard error of the mean. Mean values with a different letter differ significantly within the same time point (*P* < 0.05). Day 0 is the end of acclimatisation.

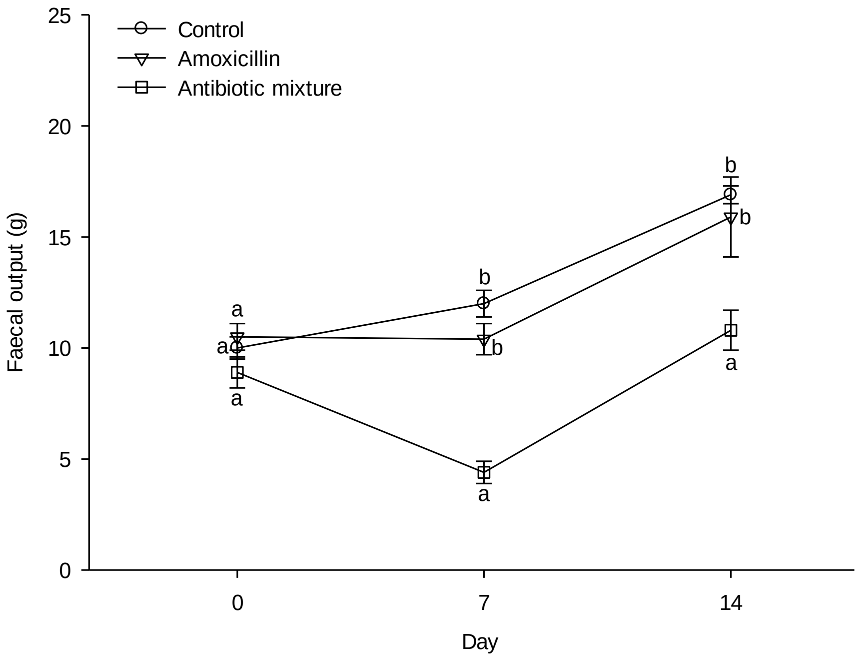

Figure S6. Faecal output of rats in antibiotic-induced dysbiosis study. Faecal output are presented in grams (g). Data expressed as mean ± standard error of the mean. Mean values with a different letter differ significantly within the same time point (*P* < 0.05). Day 0 is the end of acclimatisation**.**

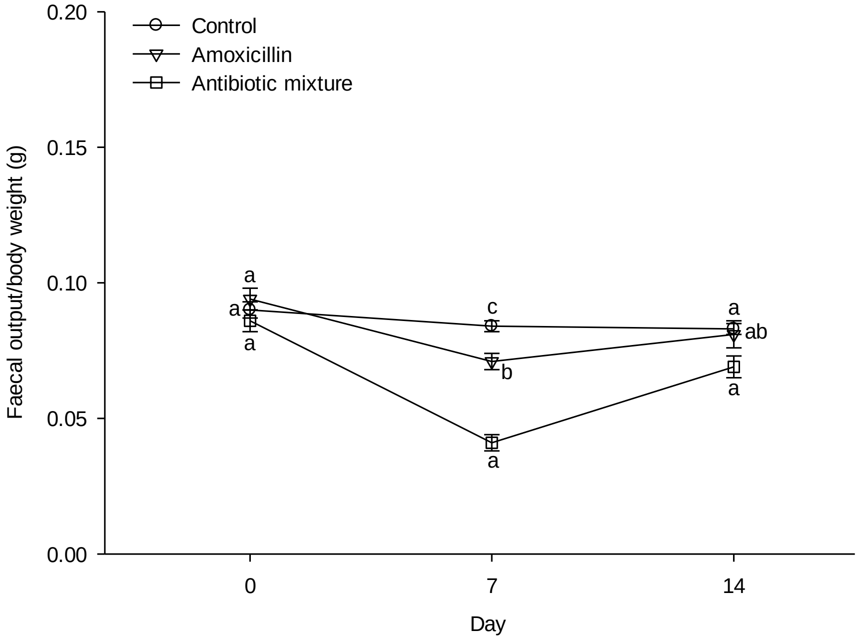

Figure S7. Faecal output adjusted to body weight of rats in antibiotic-induced dysbiosis study. Data presented in grams (g) and expressed as mean ± standard error of the mean. Mean values with a different letter differ significantly within the same time point (*P* < 0.05). Day 0 is the end of acclimatisation**.**

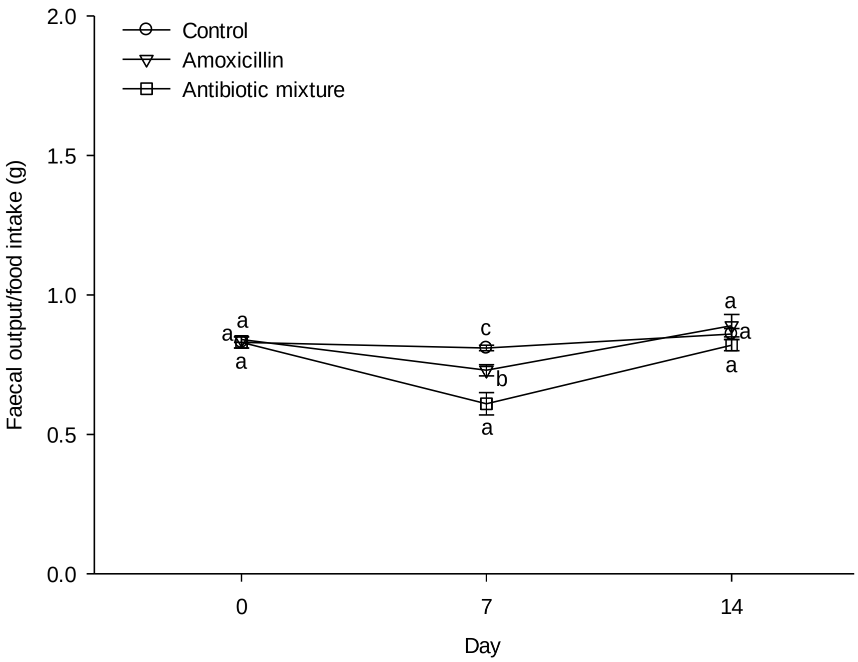

Figure S8. Faecal output adjusted to food intake of rats in antibiotic-induced dysbiosis study. Data presented in grams (g) and expressed as mean ± standard error of the mean. Mean values with a different letter differ significantly within the same time point (*P* < 0.05). Day 0 is the end of acclimatisation.

References

1. T. Rinttila, A. Kassinen, E. Malinen, L. Krogius and A. Palva, Development of an extensive set of 16S rDNA-targeted primers for quantification of pathogenic and indigenous bacteria in faecal samples by real-time PCR, *J. Appl. Microbiol.*, 2004, **97**, 1166-1177.
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