Effect of an experimental oligosaccharide on bacterial populations in the large bowel of healthy piglets

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The intestinal mucosa of pigs lacks the enzymes capable of cleaving a number of oligosaccharides. These oligosaccharides are readily fermented in the caecum and colon by the microflora and promote the growth of lactic acid bacteria such as *Bifidobacterium* and *Lactobacillus* species which inhibit colonisation by pathogens. Although there has been a growing interest in the beneficial effects of oligosaccharides there is limited information on the prebiotic properties of oligosaccharides in pigs. This study investigates the effect of an experimental oligosaccharide (OS), found in human milk, on bacterial populations in the large bowel of infant pigs.

Twelve three-day-old male piglets (1.4–2.4 kg) were randomly allocated to a standard diet (n = 6) of soy/whey/casein sow milk pig-replacer (55:9:36) or the standard diet supplemented with 215 mg/kg OS per day (n = 6) for 30 days. Animals were euthanased for collection of digesta from regions of the large bowel (caecum, asending colon, transverse colon, desending colon and sigmoid colon). Samples were homogenised and diluted 1:10 w/v in Wilkins-Chalgren (WC) anaerobe broth. Ten µL of serial dilutions (10^{-1} to 10^{-8}) were plated on WC anaerobe blood agar (total anaerobes) and supplemented WC anaerobe blood agar (*Bacteroides*), Reinforced Clostridial agar (*Clostridium*), Rogosa agar (*Lactobacillus*) and raffinose bifidobacteria agar (*Bifidobacterium*), Nutrient agar (total aerobes), and MacConkey agar (*Enterobacteriaceae*). Plates were incubated anaerobically for 72 h and aerobically for 24 h at 37°C.

	Oligosaccharide diet[1]		Standard diet[1]	
	Caecum	Colon	Caecum	Colon
Total aerobes	6.31[2]	6.32[2]	7.03	7.18
Enterobacteriaceae	6.44[2]	6.52	7.21	6.95
Total anaerobes	6.87	6.93	7.23	7.01
Bacteroides	5.83	6.93	7.15	6.43
Bifidobacteria	7.11	6.64[2]	6.35	6.31
Lactobacilli	6.70	6.83[2]	6.49	6.40
Clostridia	4.87	5.10	4.94	4.75

The bifidobacteria and lactobacilli populations were significantly higher in the colon of piglets fed the OS diet ($P < 0.05$). Total aerobes were lower in the caecum and colon of piglets fed OS compared with standard sow milk pig-replacer ($P < 0.05$). Oligosaccharide fed piglets also had lower counts of gram negative rods in the caecum ($P < 0.05$). This study showed that supplementation of diets with OS at this dose modifies bacterial populations in the large bowel of piglets, in particular increased numbers of bifidobacteria and lactobacilli.

Key words: oligosaccharides, bacterial populations, piglets