A high amylose (amylomaize) starch and fructooligosaccharide increase faecal excretion of bifidobacteria in pigs fed live Bifidobacterium longum

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High amylose (amylomaize) starches resist small intestinal amylolysis and contribute to resistant starch (RS) intake. We have shown that ingestion of one such starch (*Hi-maize*™) functions as a prebiotic and is effective in raising faecal excretion of bifidobacteria in pigs fed a probiotic supplement (*Bifidobacterium longum*) (1). Given that fructooligosaccharides (FOS) are well-established prebiotics, it was important to compare their effectiveness relative to this RS.

Sixteen young male pigs (average age 14 wk) were housed individually and fed twice daily a basal diet (70 g/kg $BW^{.75}$) comprising low amylose starch (50% by wt), sucrose (10%), safflower oil (4%, equivalent to 8.4 % of energy), casein (16%), and wheat bran (20%, equivalent to 8% as NSP), and a freeze-dried inoculum of *Bifidobacterium longum* CSCC 1941. Pigs were randomised into four groups of equal number which were fed each of the following diets: basal diet (Control), a resistant starch (RS) diet, in which high amylose maize starch was substituted for low amylose starch, or each of these diets supplemented with FOS (Raftulose at 1 g/kg BW). The feeding periods were of 7 days, and there was a 7-day period between treatments during which pigs were given the basal diet (without probiotic). On the final 2 days of each treatment period, faecal samples were weighed, enumerated for bifidobacterium, and analysed for pH and short-chain fatty acids (SCFA). At the end of one test period, diets, devoid of probiotic, were continued for a further 6 days and faecal samples collected daily for bacterial enumeration before the cycle was recommenced.

Amylose	-FOS	+FOS
	Number of bifidobacteria (log_{10}cfu/d)	
Low	10.35	11.00
High	11.74	12.02

Pooled SE = 0.29; n=16; FOS, fructooligosaccharide; amylose effect, P<0.01; FOS effect, P<0.01

Neither feed intake nor live weight gain were affected by diet. Faecal bifidobacteria counts were highest in pigs fed RS+FOS, intermediate and comparable for RS and FOS treatments, and lowest in animals fed the low amylose diet without FOS (see Table). Compared to controls, faecal mass was increased by RS (by 30%) and FOS+RS (by 37%), and faecal pH was less when pigs were fed either RS or RS+FOS diets. Only RS ingestion raised faecal SCFA (P<0.05). During the first 4 days of the washout phase, FOS and RS, especially when combined in the diet, maintained higher faecal bifidobacteria levels compared to controls. The results suggest that manipulation of dietary FOS and RS offers substantial scope for enhancing probiotics such as *B. longum* but only RS appears to increase faecal SCFA.

1. Brown, IL, Warhurst, M, Arcot, J, Playne, M, Illman, RJ and Topping, DL. Faecal numbers of bifidobacteria are higher in pigs fed *Bifidobacterium longum* with a high amylose (amylomaize) starch than with a low amylose starch. J Nutr 1997 (in press).