

## Non-starch polysaccharides in diets for pigs and their role in the expression of swine dysentery

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Our previous experiments (1, 2) have demonstrated that the clinical expression of swine dysentery (SD), a mucohaemorrhagic colitis caused by the anaerobic spirochaete *Serpulina hyodysenteriae*, can be reduced by feeding a diet low in soluble non-starch polysaccharides (NSP) and/or resistant starch (RS). Pigs fed this diet show reduced microbial fermentation in the large intestine, as evidenced by higher pH values, reduced VFA concentrations, and lighter gut weights than pigs fed conventional diets. However, the precise contribution of NSP and/or RS to the aetiology of SD is unknown. In this experiment we tested the hypothesis that the soluble fraction of foodstuffs entering the large intestine, ie, soluble NSP and RS, would predispose pigs to swine dysentery.

Five diets were used in this study. The first was based on cooked white rice and animal protein, and is known to be protective against SD (1). The remaining four were based on this diet with the addition of either a source of (i) insoluble NSP (oaten chaff), (ii) RS (retrograde maize starch), (iii) soluble NSP (guar gum), or (iv) a combination of soluble NSP and RS. None of the diets contained antibiotic. Twenty-five grower pigs (n = 5/treatment) were killed at an average weight of 34.5 ± 1.8 kg (mean ± SE) to study the effect of these diets on fermentation in the large intestine. Another 25 pigs (n = 5/treatment) were fed the same diets and then infected with a virulent strain of *S. hyodysenteriae* to determine the efficacy of these diets in preventing SD.

Diet <sup>1</sup>	pH			Empty weight of large intestine (% BW)	Colonisation <sup>3</sup>	Incidence of SD (%)
	Caecum	Colon 1	Colon 2			
R-AP <sup>2</sup>	6.4 <sup>a</sup>	6.6 <sup>a</sup>	7.2 <sup>a</sup>	1.2 <sup>a</sup>	-	0
R-OC	6.8 <sup>b</sup>	6.7 <sup>a</sup>	7.1 <sup>a</sup>	1.7 <sup>b</sup>	-	0
R-RS	5.6 <sup>c</sup>	6.1 <sup>c</sup>	6.5 <sup>c</sup>	1.8 <sup>b</sup>	+	0
R-GG	5.8 <sup>c</sup>	5.8 <sup>b</sup>	5.9 <sup>b</sup>	2.0 <sup>b</sup>	+	80
R-GG+RS	5.6 <sup>c</sup>	5.8 <sup>b</sup>	6.3 <sup>c</sup>	2.5 <sup>c</sup>	+	80
SED	0.13	0.15	0.19	0.27	-	-

<sup>1</sup> R-AP= rice+animal protein; R-OC= rice+oaten chaff; R-RS= rice+RS; R-GG= rice+guar gum; R-GG+RS= rice+guar gum+RS

<sup>2</sup> Within columns, values not followed by the same superscript differ significantly (P<0.001)

<sup>3</sup> *S. hyodysenteriae* isolated from large intestine at post-mortem

The pH of digesta in the caecum, proximal colon (Colon 1) and distal colon (Colon 2) was highest in pigs fed diets R-AP and R-OC and lowest in pigs fed diets R-GG (P<0.001). Pigs fed diets R-RS and R-GG+RS had intermediate pH values and gut weights. Spirochaetes colonised the colonic epithelium of pigs fed diets R-GG, R-RS and R-GG+RS, however only pigs fed diets R-GG and R-GG+RS developed SD. These data (a) implicate the presence of soluble NSP (guar gum) in the clinical expression of SD in pigs, and (b) suggest that although the addition of RS permitted *S. hyodysenteriae* to colonise the large intestine, it did not allow the clinical expression of SD.

1. Siba PM, Pethick DW, Hampson DJ. Pigs experimentally infected with *Serpulina hyodysenteriae* can be protected from developing swine dysentery by feeding them a highly digestible diet. *Epidem Infect* 1996;116:207-16.
2. Pluske JR, Siba PM, Pethick DW, Mullan BP, Hampson DJ. Fermentation in the large gut and swine dysentery. In: Hennessy DP, Cranwell PD, eds. *Manipulating Pig Production V*. Werribee, Australia: Australasian Pig Science Association, 1995:170.