SIZE AND pH OF THE LARGE INTESTINE IN PIGS FED DIETS BASED ON RICE, WHEAT AND LUPIN, AND THEIR INFLUENCE ON THE EXPRESSION OF SWINE DYSENTERY

P.M. SIBA, D.W. PETHICK, and D.J. HAMPSON

The anatomy, size of the volatile fatty acid pool and pH of the pig large intestine (LI) are key parameters which respond to diets that promote fermentation (Topping et al. 1992). A ration low in fermentable nutrients based on rice and animal protein has been shown to inhibit the growth of *Serpulina hyodysenteriae* (Siba et al. 1993), a large intestinal spirochaete responsible for swine dysentery. The aim of this study was to test the effect of lupin and/or wheat based diets on indices of fermentation and on the pathogenesis of swine dysentery.

Four groups of pigs were fed diets made to weaner specifications; cooked white rice and animal protein (77:21); cooked white rice and dehulled lupins (64:15); wheat and animal protein (75:20) and wheat and dehulled lupins (62:15). Animal protein consisted of meat, blood and fish meal. One group of pigs (n=27) were fed from 4-8 weeks of age and then slaughtered for characterisation of the LI. At eight weeks another group (n=44) were orally challenged with *S. hyodysenteriae.*

	Rice/Animal protein n=9	Rice/Lupin n=5	Wheat/Animal protein n=6	Wheat/Lupin n=7	Effects (P)* Energy	Protein
$[H^+]$ (μM)						
Caecum	0.08± 0.26	2.51± 0.87	2.79± 0.58	4.03± 0.47	0.002	0.009
Proximal colon	0.64± 0.19	1.11± 0.34	2.68± 0.41	2.67± 1.1	0.02	0.39
Rectum	0.13± 0.01	0.30± 0.10	0.36± 0.07	0.45± 0.05	0.003	0.03
Weight of large intestine (% body wt)						
	1.87± 0.16	4.72± 0.17	5.04± 0.20	4.59± 0.38	<0.001	<0.001
Incidence of disease (%)						
	0 (n=16)	83 (n=6)	50 (n=6)	63 (n=16)		

* Two way ANOVA; n equals number of animals

Changing the major energy component from cooked rice to ground wheat resulted in a significant increase of $[H^+]$ and size of the LI. Inclusion of lupin grain to replace some of the animal protein resulted in similar effects. The effects of energy source and protein were additive in the caecum and rectum (i.e. no interaction). However the size of the LI was similar whenever wheat or lupin were part of the diet. The rice/animal protein diet was the only one to provide complete protection against swine dysentery.

The results indicate that both lupin and wheat grains contain highly fermentable components that can increase the $[H^+]$ of the LI. The pattern of disease expression indicated that only diets promoting very low rates of fermentation in the LI are capable of preventing the expression of disease caused by *Serpulina hyodysenteriae.*

SIBA, P.M., PETHICK, D.W. and HAMPSON, D.J. (1993). Proc. XV International Congress of Nutrition, Adelaide. pp 878.

TOPPING, D.L., ILLMAN, R.J., CLARKE, J.M., TRIMBLE, R.P., JACKSON, K.A. and MARSONO, Y. (1992). J. Nutr. 12: 3133.

School of Veterinary Studies, Murdoch University, WA Australia 6150