Feeding a Lower Protein Diet Reduces Nitrogen Content in the Intestinal Tract but Does not Influence Apparent Nitrogen Digestibility

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Post-weaning diarrhoea (PWD) reduces production efficiency through increased morbidity and mortality and poorer efficiency of growth (Halas *et al.*, 2007). Dietary proteins that are not digested and absorbed in the small intestine are fermented by the intestinal microbiota to produce a number of potentially toxic epithelial irritants such as ammonia, which are thought to increase the incidence of PWD. Limiting the amount of protein available for microbial fermentation has been proposed as a strategy to reduce the risk of PWD in weaner pigs without using in-feed antibiotics (Halas *et al.*, 2007). In this experiment, we hypothesised that feeding a lower protein diet for a short period of time after weaning would reduce PWD by reducing the amount of protein entering the hindgut from the small intestine, thereby reducing protein fermentation in the colon.

Forty-eight 21 d old male pigs (Landrace × Large White) weighing 6.9±0.11 kg (mean±SEM) were used in a 2x2x2 factorial experiment (n=6) with the respective factors being (i) infected vs. non-infected, (ii) high protein (HP, 239 g/kg CP) vs. low protein (LP, 190 g/kg CP) and (iii) feeding duration (7 vs. 14 d after weaning). Pigs in the infection group were challenged with enterotoxigenic *Escherichia coli* (ETEC; 8 ml of soy broth containing $1.84x10^8$ colony-forming units/ml of ETEC serotype O149; K91; K88) at 72, 96 and 120 h after arrival. All diets were formulated to at least contain an ideal pattern of ileal digestible amino acids. Pigs were euthanased at the end of each feeding regimen for harvesting of digesta, and thereafter the apparent nitrogen (N) digestibility was measured at the terminal ileum and ammonia-N (NH_3-N) was measured at the ileum and colon. Ileal N flow of dietary origin was calculated based on daily N intake and the apparent ileal N digestibility. PWD was observed for the 14 d after weaning and is expressed as the mean proportion of days with diarrhoea. Data were analysed using the GLM procedure of SPSS (SPSS Inc., Chicago, Illinois, USA).

Table 1. *Effect of feeding a lower protein diet on total nitrogen (N) intake, apparent ileal digestibility (AID) of N, ileal N flow of dietary origin, ammonia-N (NH_3-N) in the intestine, and post-weaning diarrhoea (PWD).*

Item	Non-Infected				Infected					P-value		
	HP7	HP14	LP7	LP14	HP7	HP14	LP7	LP14	SEM	PL	I	FD
Total N intake (g/d)[1]	53	118	43	95	51	122	41	97	4.7	***	NS	***
AID of N (%)	56	65	53	62	47	60	46	58	1.5	NS	*	***
Ileal N (g/d)[1,2]	26	41	23	36	32	45	27	40	1.6	*	*	***
Ileum (mg/kg)[3]	47	57	32	38	55	65	35	43	1.9	***	*	***
Colon (mg/kg)[3]	273	350	186	233	362	406	246	289	11.5	***	***	***
PWD[4] (%)	1.2[a]	0.0[a]	0.0[a]	2.4[a]	7.1[c]	3.6[b]	1.2[a]	1.2[a]	0.44	*	**	NS

SEM, Pooled standard error of mean; NS, Not significant; * P<0.05; ** P<0.01; *** P<0.001; PL, protein level; I, infection; FD, feeding duration; [1]Calculated on pen basis; [2]Dietary origin N flow; [3]NH_3-N contents; [4]Interactive effect (PLxI and PLxFD, P<0.05); [abc]Mean values within a row with different superscripts differ significantly (P<0.05).

Feeding an LP diet decreased total N intake, ileal dietary-origin N flow and NH_3-N contents at the ileum and colon but did not alter (P>0.05) the AID of N at either 7 or 14 d after weaning. Although ETEC infection decreased overall AID of N, feeding the LP diet consistently reduced ileal N flow along with ileal and colonic NH3-N contents. The ETEC infection increased PWD only in pigs fed a HP diet, and feeding a HP diet increased the incidence of PWD at day 7 only (Table 1). These data suggest that feeding an LP diet immediately after weaning reduces the flow of N of dietary origin into the large intestine, thereby decreasing protein fermentation. This in turn was associated with a reduction in the incidence of PWD.

HALAS, D., HEO, J.M., HANSEN, C.F., KIM, J.C., HAMPSON, D.J., MULLAN, B.P. and PLUSKE, J.R. (2007). CAB Reviews: *Perspectives in Agriculture, Veterinary Science, Nutrition and Natural Resources*. **2**:079.

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