**INTERACTION OF DIETARY NON-STARCH POLYSACCHARIDES WITH WEANER PIG GROWTH AND POSTWEANING COLIBACILLOSIS**

D.E. McDonald1, J.R. Pluske1, D.W. Pethick1, and D.J. Hamson1
1Division of Veterinary and Biomedical Sciences, Murdoch University, Perth, Western Australia 6150
2Monogastric Research Centre, Palmerston North, New Zealand

**Introduction**

Postweaning colibacillosis remains an important production-limiting condition in many piggeries. Its occurrence can be influenced by many factors, including the composition of the weaner diet (1). There is some evidence that feeding diets high in non-starch polysaccharides (NSP) may alleviate postweaning colibacillosis (2,3). In this study we examined the effect of dietary NSP in the weaner pig on body growth and the interaction with experimentally reproduced post-weaning colibacillosis.

**Materials and Methods**

Large white X piglets weaned at 21–25 days of age with an average weight of 7.2kg were selected, and then randomly assigned to remain “uninfected” (n=30) or be “experimentally infected” (n=39). Each pig was fed one of the following three diets: ad libitum for 7 days after weaning: pregelatinised rice fortified with an animal protein supplement (R), the same rice diet with 10% guar gum added (GG), or a typical wheat and barley-based weaner diet which served as a reference diet (W).

The “experimentally-infected” group was orally inoculated with a strain of enterotoxigenic E. coli (O8;K88;K87) at 48, 72 and 96 hours post-weaning. Infected pigs all exhibited diarrhoea, lethargy and weight loss after infection. All pigs were weighed 7 days after weaning, euthanased and samples taken from the intestinal contents at this time.

**Results**

Table 1. Growth rate, large intestinal weight and pH in uninfected weaner pigs, and small intestinal haemolytic E. coli populations in infected pigs

<table>
<thead>
<tr>
<th></th>
<th>R</th>
<th>GG</th>
<th>W</th>
<th>s.e.d.</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Uninfected pigs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Growth g/day</td>
<td>141±</td>
<td>85±</td>
<td>57±</td>
<td>53</td>
<td>*</td>
</tr>
<tr>
<td>Large intestine (g)</td>
<td>95±</td>
<td>125±</td>
<td>128±</td>
<td>17</td>
<td>*</td>
</tr>
<tr>
<td>pH upper colon</td>
<td>6.3±</td>
<td>5.3±</td>
<td>5.9±</td>
<td>****</td>
<td></td>
</tr>
<tr>
<td><strong>Infected pigs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Growth g/day</td>
<td>54±</td>
<td>-52±</td>
<td>-114±</td>
<td>69</td>
<td>****</td>
</tr>
<tr>
<td>log cfu E. coli/g</td>
<td>2.22±</td>
<td>4.92±</td>
<td>2.93±</td>
<td>2.3±</td>
<td>*</td>
</tr>
</tbody>
</table>

R, rice/animal protein; GG, rice+guar gum; W, wheat/barley diet.

Significance: * P<0.05, ** P<0.01, *** P<0.001, **** P<0.0001

<sup>1</sup>Within rows, means not followed by a common superscript differ significantly, cfu, colony-forming units.

All pigs offered the rice/animal protein diet R, the diet low in NSP, grew significantly faster than those fed either the GG diet or the W diet (P<0.05). Within the infected group the only group of pigs which gained weight were those fed the R diet. Pigs offered R had lighter large intestines (P<0.05) than pigs fed the other diets, and less fermentation was occurring in the large intestine, shown by a more acidic pH (P<0.0001). Measurements of volatile fatty acid production in the colon also reflected the reduced fermentation. The pool of volatile fatty acids was significantly lower in the pigs fed the R diet (7.53 mmol/l; P<0.05) than those fed the GG (16.22 mmol/l) or W diet (17.59 mmol/l).

The endotoxin and death rate in pigs fed the R diet was associated with a significant increase in E. coli numbers in the small intestine (P<0.05). Small intestinal E. coli numbers in pigs fed the W diet were not significantly higher than those from pigs offered the R diet, although additional swabs taken from the intestines showed that the distribution of colostrum covered a greater length of the small intestine in those pigs fed the W diet.

**Discussion**

The R diet was very low in soluble and insoluble NSP and was highly digestible, leaving little residue of digesta throughout the gut. This is consistent with the low levels of fermentation occurring in the intestines of pigs fed this diet. The adaption of pigs fed the GG and W diets to the inclusion of NSP in their diet was demonstrated by the heavier large intestinal weights, indicating structural development, and by enhanced large intestinal fermentation. It is possible that physicochemical characteristics within the small intestine of the pigs fed GG, such as increased viscosity of digesta and altered intestinal motility, provided an environment which encouraged proliferation of E. coli.

**Conclusion**

The results from this study indicate that highly digestible diets with low levels of soluble NSP, as in the rice+animal protein diet, can reduce the proliferation of enterotoxigenic E. coli in the small intestine of weaner pigs. The rice+animal protein diet also encouraged the greatest increase in growth in the first week post-weaning, indicating that gelatinised rice may be a useful cereal component for incorporation in weaner diets.

This study was supported by a grant from the Australian Research Council.

**References**

