Dietary effects on the presence of ulcers and urease producing organisms in the stomach of weaner pigs

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Introduction
Oesophagogastric ulceration (OGU) occurs frequently in swine, and numerous dietary factors have been incriminated in its aetiology (3). Helicobacter pylori and Helicobacter heilmannii are recognized as causative agents of gastritis and gastrointestinal ulcers in humans (2). Recently a strong association between the presence of Helicobacter heilmannii and the occurrence of OGU was demonstrated in pigs (1,5).

Helicobacter species produce large quantities of the enzyme urease (2). As mammalian cells are unable to produce this enzyme, a positive urease activity in gastric biopsies can be interpreted as indicating the presence of urease producing microorganisms (UPM).

In this study a combined dietary and microbiological experiment was carried out to investigate the relationship between diet, the presence of UPM and the incidence of gastric lesions in weaner pigs.

Material and methods
Twenty five pigs were fed one of three isoproteic diets based on raw wheat (RW, n=8), extruded wheat (EW, n=8), and cooked rice (CR, n=9). The diets used had a similar composition to commercial weaner diets, with the CR diet having its composition balanced by the addition of an animal protein supplement. The diets were offered as creep feed from one week of age. At 35 days of age the pigs were euthanased, the stomachs cut open along the greater curvature and examined for the presence and severity of macroscopic lesions (O=normal, !=hyperkeratosis, 2=erosions, 3=ulcers). Biopsies were taken from the pars oesophagea-cardiac junction and fundic areas and placed in urease test slides (CLOtest- Delta West Pty Ltd, Australia) for detection of urease activity in gastric biopsies can be interpreted as indicating the presence of urease producing microorganisms (upm).

At 35 days of age the pigs were euthanased, and the stomachs cut open along the greater curvature and examined for the presence and severity of macroscopic lesions. A scoring system was used to grade the severity of the lesions (0=normal, 1=hyperkeratosis, 2=erosions, 3=ulcers). Biopsies were taken from the pars oesophagea-cardiac junction and fundic areas and placed in urease test slides (CLOtest - DeltaWest Pty Ltd, Australia) for detection of urease activity, and consequently presence of UPM.

Results
Stomach lesions were found in 100%, 33.3%, and 12.5% of pigs in the RW, CR, and EW groups respectively. Ulcers were found in 100% of the pigs on the RW diet, and 11.1% on the CR diet, while none of the pigs on EW had ulcers.

Urease activity in the biopsies from the pars oesophagea-cardiac junction and fundic areas respectively, were positive in 100%, and 12.5% for the RW fed pigs; 33.3% and 55% for the CR fed pigs and 12.5% in both sites for the EW pigs.

There was a highly significant (P<.005) effect of diet on the occurrence of lesions and on the presence of UPM. Lesions were significantly more common (P<.01) in stomachs which harboured UPM than in those that did not. There was no significant differences in daily weight gain in pigs on the three diets.

Discussion
In this study the RW diet was found to have a deleterious effect on the stomachs of the pigs. This was in agreement with previous studies which suggested the existence of a relationship between feeding wheat and the occurrence of gastric lesions (4,6).

Furthermore the deleterious effect of the RW diet was associated with an increased presence of UPM.

Interestingly, extrusion of the wheat decreased the UPM population and had a protective effect in the stomachs. Pigs on the CR diet had an intermediate lesion outcome which also correlated with the UPM gastric population.

Our findings support a microbial link in the aetiology of OGU, demonstrate that quite severe lesions can be present in the stomachs of young weaner pigs, and point to a link between diet, the presence of urease producing microorganisms, and the occurrence of OGU.

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References