CAECAL STARCH CONCENTRATIONS ARE HIGHER IN PIGS FED COARSE RICE THAN IN THOSE FED FINE RICE

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Particle size is an important determinant of food digestibility. Muir and O'Dea (1992) reported that chewing increases in vitro starch hydrolysis through increasing accessibility to amylases. However, determination of the passage of undigested starch into the human colon in vivo and consequent changes in bacterial fermentation and volatile fatty acid (VFA) production is difficult. It is possible in surgically-modified animals and, of the species available, the pig appears to be optimal in terms of dietary intakes and gut physiology. Thus, we have examined effect of particle size of brown and white rice in pigs with large bowel cannulae.

Four adult male Large White pigs were intubated with a 500 mm silastic tube (13 mm OD, 8 mm ID) which was inserted into the caecum to a depth of approximately 90 mm through an incision in the abdomen. The cannula was exteriorised dorsal to the incision, anchored to the skin with sutures and sealed with a removable plastic plug. After recovery, the animals were fed diets containing whole or fine brown or white rice for eight days. On the eighth day, they were fed polyethylene glycol (PEG) as a fluid phase marker and sampling started. Food was given at 8-10 am and samples were withdrawn by syringe every two hours from two to 16 hours after feeding and analysed for starch, VFA, ammonia and PEG.

Average starch concentrations were three to five fold higher in pigs fed whole rice than those fed fine rice although there was some individual variation which reduced statistical significance. There was no difference between white or brown rice. Starch was present from two hours after feeding but PEG concentrations rose only after four to six hours which appears to be the time taken for food to reach the porcine large bowel after feeding. This suggests that starch may have remained in the caecum after the previous meal. Nevertheless, the data support the view that chewing is an important determinant of small intestinal rice starch digestibility. Total and individual VFA concentrations were lower at four to 24 hours than at two hours and were unaffected by diet. Ammonia concentrations also declined from the two hour value before returning to the pretreatment value at 24 hours. Both of these profiles are consistent with expansion of gut volume due to entry of food and proliferation of bacteria. Concentration does not always reflect total VFA availability and, under these circumstances, pool size (ie concentration x digesta mass) is probably a better index (Topping et al. 1993).

MUIR, J.G. and O'DEA, K. (1992). Am. J. Clin. Nutr. 56: 123.
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