Increasing dietary cystine decreases gastrointestinal parameters in early weaned piglets

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Early-weaning (EW) is a management strategy currently utilized by the swine industry. Due to EW conditions, piglets have specialized dietary requirements. Currently, NRC (1998) recommends that the ratio of methionine (MET) and cystine (CYS) for EW piglets is 50:50 and the recommended concentration of total sulphur amino acids (TSAA) is 0.50 g/kg/day (0.76% of diet). A dietary relationship of 1:1, MET: CYS, is not reflective of carcass composition (Mahan et al.1998) nor of sow milk (Wu et al. 1994) which is reported to be 2:1. The objective of this trial was to examine the effects of differing ratios and concentrations of MET: CYS on the gastrointestinal development of EW piglets.

42, 10d-old, male piglets (3.5 kg SD 0.37) were adapted to solid feed for 2 days and were then randomly assigned to one of seven diets: (25:25), (25:50), (50:25), (50:50), (50:100), (100:50) and (100:100) (%MET: %CYS of TSAA). Piglets were maintained on test diets for 7 days. On the morning of the 8th day piglets were euthanised and samples taken. The addition of dietary cystine beyond 25% of TSAA resulted in a significant decrease in mid-jejunal weights ($p<0.05$). A similar pattern of decreasing mid-jejunal crypt depth, villus height, feed intake and average daily gain was observed; decreases were dependent upon increasing dietary cystine. Diet 50:25 resulted in growth parameters and gastrointestinal development that were not different from diet 50:50 that provided 100% of NRC (1998) SAA requirement and ratio of 1:1 MET: CYS.

Implications:
A MET:CYS ratio of 2:1 appeared to support improved gut health and structure. The addition of cystine above 25% of TSAA requirement decreased gut weight and structure and may therefore interfere with EW piglets' ability to adapt to the new environment and diet of the weaning barn. NRC (1998) may have over-estimated the requirement of the EW pig because diet 50:25 supported similar growth, mucosal development and histological results as diet 50:50. (Supported by Alberta Pork, A.A.R.I. and Degussa AG)