Effect of immune system stimulation and divergent selection for residual feed intake on digestive capacity of the small intestine in growing pigs

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Key Words: hindgut, fermentation, energy

1124 Effect of immune system stimulation and divergent selection for residual feed intake on digestive capacity of the small intestine in growing pigs. A. Rakhshandeh1, T. E. Weber2, J. C. M. Dekkers1, B. J. Kerr3, J. English1, and N. K. Gabler1, 1Iowa State University, Ames, IA, USA, 2USDA-ARS, Ames, IA, USA.

Residual feed intake (RFI) is a measure of feed efficiency that reflects differences in the efficiency of the use of feed for maintenance and growth. The consequences of genetic selection for RFI on intestinal nutrient digestion capacity, particularly during immune system stimulation (ISS), are poorly documented. Our objective was to evaluate the impact of ISS and genetic selection for RFI on apparent ileal digestibility (AID) of nutrients, and intestinal nutrient transport and barrier function. Twenty 8 gilts (BW 63 ± 4 kg) from lines of Yorkshire pigs selected for low RFI (n = 14) and high RFI (n = 14) were randomly selected from the Iowa State University RFI herd and used in the current study. Following adaptation, 8 pigs in each line were injected intramuscularly and every 48 h, for 7 d, with increasing doses of Escherichia coli lipopolysaccharide (ISS+). Remaining pigs were injected with saline (ISS-). Pigs were then euthanized, ileal digesta collected for measuring nutrient digestibility, and jejunum used to measure glucose transport (GLU) and transepithelial resistance/barrier integrity (TER) from hindgut fermentation. As expected, ISS increased ileal temperature (ISS- vs. ISS+: 37.6 vs. 38.4°C, SE 0.04), plasma levels of haptoglobin (2.6 vs. 3.5 g/L, SE 0.38) and interleukin-1β (1 vs. 152 ng/L, SE 35), indicating effective immune system stimulation (ISS+). No effects of line or its interaction with ISS on AID of crude protein (CP) and organic matter (OM), TER and active glucose (GLU) transport were observed (P > 0.10). However, ISS decreased and tended to decrease AID of CP (ISS- vs. ISS+: 83 vs. 74%, SE 3; P < 0.05) and OM (88 vs. 79%, SE 4; P < 0.08), respectively. No effect of ISS on TER was observed (P > 0.10). Relative to ISS-, active GLU transport was greater in ISS+ pigs (7 vs. 11 A/cm², SE 1.5; P < 0.05), indicating increased intestinal GLU absorption during ISS. Collectively, these results suggest that intestinal digestive capacity is affected by ISS but not by genetic selection for RFI. Supported by USDA-AFRI grant# 2011–68004–30336.

Key Words: residual feed intake, immune system stimulation, intestinal digestive capacity

1125 Post-weaning evolution of plasma levels of zinc from different sources and doses in a commercial farm. R. Davin1, E. G. Manzanilla2, S. Durossy2, and J. F. Perez4, 1Universitat Autònoma de Barcelona, Bellaterra, Barcelona, Spain, 2Animine, SILLINGY, France.

Post-weaning diarrhea could be related to a Zn deficiency. Plasma level of Zn in weaned pigs is lower than in unweaned littermates at the same age. Therapeutic levels of in-feed ZnO re-establish pre-weaning levels of plasma Zn. We studied different sources and doses of Zn to check their ability to maintain plasma levels of Zn after weaning. A total of 200 pigs were weaned at 26 d of age and allocated to 20 pens. Pigs were randomly allocated to 10 dietary treatments. Treatments were: a commercial diet including colistin and 3100 ppm of ZnO (COM); an experimental diet without any source of zinc other than the ingredients (33 ppm of Zn) considered zinc deficient compared with NRC recommended levels (100 ppm of Zn) (DEFIC); DEFIC supplemented to NRC levels of Zn with either ZnO (NRCZnO) or ZnSO4 (NRCZnS); DEFIC supplemented to 150 ppm of Zn (EU maximum inclusion level) with either ZnO (150ZnO) or ZnSO4 (150ZnS); DEFIC supplemented to 250ppm and 700 ppm of Zn with ZnSO4 (250ZnS and 700ZnS); DEFIC supplemented to 2500 ppm of Zn with ZnO (2500ZnO); and an extra treatment using NRCZnO but fasting animals for 24 h hours after weaning to increase deficiency (FAST). Two animals per pen were bled on days −1, 1, 2, 3, and 5 post weaning and plasma was analyzed for Zn. Plasma levels of Zn on day −1 were 0.82 mg/L. Most animals (75%) showed plasma levels of Zn considered deficient (<0.60 mg/L) in the first 2 d after weaning with a slight recovery after d 3 post weaning. Animals on DEFIC and FAST diets did not show lower plasma levels of Zn compared with animals on NRC diets even when a strong decrease was expected. The Zn source of choice for diarrhea treatment in humans (ZnSO4) was expected to be better absorbed by the animal than ZnO; however none of the treatments including ZnSO4 increased plasma levels of Zn compared with ZnO. Both treatments including therapeutic levels of Zn, COM and 2500ZnO, reached pre-weaning plasma levels of Zn on d 2 or 3 post-weaning. Early weaning reduces plasma levels of Zn acutely in pigs. Currently used therapeutic levels of ZnO were the only treatments able to bring plasma levels of Zn close to pre-weaning levels.

Key Words: zinc, plasma, diarrhea

1126 Dynamic changes in digestive capability may contribute to compensatory growth following a nutritional insult in newly weaned pigs. C. L. Levesque1, L. Skinner, J. Zhu, and C. F. M. de Lange, University of Guelph, Guelph, Ontario, Canada.

Using low complexity diets may reduce feeding costs but can result in reduced starter pig growth performance. We have previously demonstrated that feeding low complexity diets compromises growth performance of pigs during the