**249 The intestinal immune system: Gut reactions (or thereof) and growth of the pig.** H. R. Gaskins, *University of is at Urbana-Champaign.*

natal morbidity and mortality and growth stasis at weaning lt in major productive losses in the swine industry. Problems non to newborn and weanling pigs include reduced feed ke, digestive inefficiency, malabsorption, and predisposition to rhea and enteric infection. These digestive maladies largely ct integrated responses to environmental insults first encoun- d at gut mucosal surfaces. Thus, a complete understanding of nse mechanisms that prevent or respond to mucosal insults, ther pathogenic microorganisms or dietary antigens, may lead ovel strategies to optimize neonatal pig performance. Intesti- defense mechanisms are generally classified as being either -immunologic or immunologic in nature. Prominent nonim- nologic barriers in the intestine contributing to a "front line" of nse include the indigenous microbiota, the mechanical barrier ned by the epithelial monolayer, and the mucus coat that udes toxin and bacterial receptors present on individual helial cells. Actively acquired immunological components are well represented in the intestine, both as diffuse cell ulations in the lamina propria and as organized cell aggregates eyer's patches, to ensure the elimination of specific pathogens. newborn pig is particularly susceptible to enteric pathogens ause active immune components in the intestine are anatomi- ly and functionally immature. An overview of the development structure ofintestinal defense mechanisms will be provided followed by a discussion of interactions between the normal microbiota and host immunological components that may ntribute to the development of activeimmunity in the pig estine.

**y Words:** Pig, Intestinal Immune System, Gut Microbiota

**250 The effect of carbohydrate source and extrusion ocessing on growth performance of segregated early- eaned pigs.** K. Hongtrakul*, J. R. Bergstrom, R. D. Goodband, K. Behnke, W. B. Nessmith, M. D. Tokach, and J. L. Nelssen, *Kansas ate University, Manhattan.*

total of 350 segregated early-weaned pigs (initially 4.4 kg and ± 2 d of age) was used to investigate the interactive effects of fferent carbohydrate sources and moist extrusion processing on owth performance. Treatments were arranged in a 5 × 2 ctorial with main effects including carbohydrate source (corn, rn starch, wheat flour, rice, and grain sorghum) with or without oist extrusion processing. From d 0 to 7 postweaning, all diets ntained 42% of the respective carbohydrate source, 20% dried hey, 10% moist extruded soy protein concentrate, 6.7% spray- ried plasma protein, and 6% select menhaden fish. Diets were rmulated to 1.70% total lysine with all other amino acids above ggested estimates based on current ratios relative to lysine. The mounts of synthetic lysine and methionine varied slightly among xperimental diets based on differences in lysine concentration of he carbohydrate sources. From d 7 to 21 postweaning, pigs were ed diets containing 47% of their respective carbohydrate source, 5.5% soybean meal, 10% dried whey, 5% select menhaden fish neal , and 3% spray-dried plasma protein. Diets were formulated o 1.5% total lysine. Surprisingly, from d 0 to 7 postweaning, pigs ed diets containing corn had decreased (P < .01) ADG compared vith pigs fed other carbohydrate sources. Moist extrusion processing of the carbohydrate sources did not improve growth performance. For the cumulative study (d 0 to 21 postweaning), pigs fed corn had decreased (P < .01) ADG and G/F compared with those fed other carbohydrate sources. There were no differences in growth performance among pigs fed the other carbohydrate sources. Moist extrusion processing had no effect on growth performance. Under the conditions used in this study, moist extrusion processing of carbohydrate sources did not influence pig performance.

**Key Words:** Pigs, Extrusion, Carbohydrates

**251 Protein source influences segregated early-weaned pig performance.** W. B. Nessmith*, Jr, M. D. Tokach, R. D. Goodband J. L. Nelssen, J. R. Bergstrom, S. S. Dritz, J. A. Loughmiller, and J. W. Smith, II. *Kansas State University, Manhattan.*

A total of 390 pigs (initially 4.2 kg and 13 ± 2 d) was used in a 26 d growth assay to evaluate different protein sources as replacements for spray-dried plasma. Dietary treatments (d 0 to 14 postweaning) were arranged in a 2 × 6 factorial with an additional control treatment. All diets contained 25% dried whey, 5% lactose, and 6% select menhaden fish meal (SMF) All experimental diets were formulated to contain 1.7% lysine and at least .48% methionine. The control diet contained 7 5% plasma and 15.7% soybean meal (SBM). Main effects included six protein sources (spray-dried blood meal (SDBM), spray-dried egg protein (SDEP), spray-dried wheat gluten (SDWG), extruded soy protein concentrate (ESPC), SMF, and SBM and two protein source levels. The protein sources replaced 2.5 or 5.0% plasma in the control diet on a lysine basis except in the diets containing SDWG. In these diets, plasma was replaced on a protein basis and synthetic lysine was added to compensate for the lysine difference From d 0 to 14, pigs fed diets containing SMF or ESPC had increased (P < .05) ADG compared to pigs fed diets containing SDBM, SDEP or SDWG. In addition, pigs fed SBM had similar ADG to pigs fed other protein sources, but greater (P < .05) than pigs fed diets containing SDEP. Protein source level did not affect ADG or feed efficiency (G/F). A protein source x level interaction (P < .05) was observed for ADFI. Pigs fed increasing levels of SDBM, SDEP, or SBM had decreased ADFI; however, increasing levels of SMF, ESPC, and SDWG had no influence or increased ADFI. Feed efficiency (G/F) was decreased (P < .05) for pigs fed diets containing SDEP as compared to pigs fed diets containing SDBM, SMF, or ESPC. For the high-health pigs used in this trial, SMF, ESPC, and SBM appear to be effective in replacing a portion of the spray-dried plasma in the SEW diet.

**Key Words:** Protein source, Weanling pigs

**252 Effect of dietary carbohydrate source and level on early-weaned pig growth performance.** B. T. Richert[1], K. R. Cera[2], A. P. Schinckel[1]. [1]*Purdue University, West Lafayette,* [2]*Countrymark Cooperative, Inc., Indianapolis, IN.*

Five hundred thirty-one pigs weaned between 10 and 14 d of age were used in two experiments. Experiment 1 (n=341) evaluated two levels of lysine and three levels of simple sugars provided by either lactose (lact)or lact+dextrose (dext). Phase 1 diets were fed from d 0 to 14 postweaning and contained 1.5 or 1.7% lysine and either 24 or 36% lact, or 24% lact +12% dext. Phase 2 diets were fed from d 14 to 21 postweaning and contained the same lysine levels as Phase 1 diets but simple sugar levels were reduced to 16 or 24% lact or 16% lact+8% dext. Phase 3 diets were fed from d 21 to 28 postweaning and contained 1.25 or 1.5% lysine and either 12 or 18% lact or 12% lact+6% dext. Dietary lysine level had no effect on pig growth performance during Phase 1. As dietary simple sugar levels increased, ADG (P <.07) increased during the second and third weeks (+30 g/d) postweaning. Substituting dextrose for part of the dietary lactose increased ADG (P <.10) during the second and third weeks postweaning. At the start of Phase 3, pigs were realloted across treatments. Increasing dietary lysine and simple sugar level during Phase 3 increased ADG (P < .001, .02, respectively). Increasing simple sugar level increased ADFI (P <.05), whether it was provided by either lact or dext. Experiment 2 (n=180) evaluated combinations of oats and lactose. The six Phase 1 diets contained either 17.5 or 35% oats and either 20, 28, or 36% lact and were fed from d 0 to 14 postweaning. Phase 2 diets were fed d 14 to 21 postweaning and contained either 0 or 17.5% oats and either 12, 18, or 24% lact. Increasing dietary lactose increased ADG (linear, P < .06) and ADFI (linear, P < .009) from d 0 to 7 postweaning. Increasing dietary oats decreased ADFI (P < .05) but improved feed efficiency (P < .09) during the first and second weeks postweaning. Increasing dietary simple sugars increased pig growth rate and feed intake up to 42 d of age.

**Key Words:** Lactose, Oats, Weanling pig