

221 The interactive effects between diet complexity, zinc oxide, and feed grade antibiotic on performance of segregated early weaned pigs. P. R. O'Quinn, J. R. Bergstrom*, J. L. Nelissen, M. D. Tokach, S. S. Dritz, and R. D. Goodband, *Kansas State University, Manhattan*.

A 27 d growth trial was conducted with 320 segregated early weaned (SEW) barrows (initially 4.5 kg BW and 12 to 15 d of age) to evaluate the interactive effects between diet complexity, zinc oxide, and feed grade antibiotic. Pigs were randomly allotted on the basis of initial weight to one of eight dietary treatments with five pigs per pen and eight replications per treatment. The experimental diets were fed in meal form in three phases (d 0 to 5, d 5 to 10, and d 10 to 20 postweaning, respectively). Treatments consisted of a $2 \times 2 \times 2$ factorial arrangement with main effects of diet complexity, added zinc oxide, and feed grade antibiotic. For the remainder of the trial (d 20 to 27), a common diet not containing antibiotic or zinc oxide was fed to all pigs. The simple diets were corn-soybean meal based, while the complex diets contained dried whey, lactose, fish meal, spray-dried blood meal, and spray-dried animal plasma. The amounts of specialty products in the complex diets were decreased as pig weights increased. There were no interactions ($P > .05$) of main effects when measured over the entire trial. For the overall trial, pigs fed complex diets, regardless of zinc oxide or antibiotic, grew faster ($P < .01$) and ate more feed ($P < .01$) than did pigs fed the simple diets. Pigs fed diets containing antibiotic had better ADG ($P = .01$) and ADFI ($P = .06$) than did pigs fed diets without antibiotic. Similar results were observed for pigs fed diets containing zinc oxide (ADG, $P = .02$, and ADFI, $P = .07$). However, feed efficiency was not affected ($P > .10$) by treatment over the entire trial. The responses to antibiotic occurred in the latter half of the growth trial, while the responses to zinc oxide occurred primarily during the first 10 d of the experiment. These data indicate that both zinc oxide and antibiotic are beneficial in the diets of SEW pigs.

Key Words: SEW pigs, Antibiotic, Zinc oxide

222 Growth performance, apparent nutrient digestibility, blood chemistry, and body composition of artificially reared neonatal pigs receiving goat or cow milk. A. C. Murry¹*, S. Gelaye², J. Casey¹, T. Foutz¹, A. Grider¹, and B. Kouakou², ¹The University of Georgia, Athens and ²Ft. Valley State University, Ft. Valley, GA.

There is increased interest in the nutritive value of goat milk and its suitability as an alternative milk substitute for human infants experiencing allergic responses to cow milk. A total of 22 crossbred intact male Yorkshire \times Hampshire \times Duroc pigs, 72-h old, were used to compare the effect of goat or cow milk on weight gain, apparent nutrient digestibility, body composition, and blood chemistry. Pigs were allowed to receive colostrum from their dams prior to initiation of the study. They were housed separately in stainless steel metabolism cages. Fresh, nonfortified, goat milk was obtained from Ft. Valley Goat Research and Extension Center, and cow milk from The University of Georgia Dairy Research Farm. Pigs were randomly divided into two groups and assigned to receive pasteurized goat or cow milk at a predetermined level of 250 ml/kg BW per day for 28 d. A robotic-based semiautomatic feeding system was used to dispense the milk to each pig at 60 min intervals. Blood was taken by jugular puncture at 72 h, d 7, 14, 21, and 28. A balance trial was conducted during the last four days of the experiment. Body composition was determined on d 28, using dual energy x-ray absorptiometry (DXA; QDR-2000/W, Hologic Inc., Waltham, MA). Type of milk did not affect ($P > .05$) weight gain, percent body fat, lean body mass, bone mineral content, or serum concentration of Zn, Na, and K. Apparent digestibility of DM, or retention of N, energy, Zn, Na, and K was not affected ($P > .05$) by type of milk. Red blood cell and white blood cell (monocyte and eosinophil) counts were not affected ($P > .05$) by type of milk. However, white blood cell (lymphocyte and neutrophil) count was higher ($P < .02$) in pigs fed cow milk compared to those fed goat milk ($13.95 \times 10^8/L$ vs. $6.55 \times 10^8/L$ and $8.81 \times 10^8/L$ vs. $4.71 \times 10^8/L$, respectively). This study suggests that baby pigs performed well when fed both goat and cow milk. However, future studies will focus on identifying factors associated with an increase in white blood cell count.

Key Words: Pigs, Goat milk, Cow milk

223 Effect of endotoxin on trace minerals and immunological parameters in weanling pigs. S. Mandal¹*, B. Z. de Rodas, C. V. Maxwell, A. B. Arquitt, and B. J. Stoecker, *Oklahoma State University, Stillwater*.

Two experiments were conducted to determine the minimum dose of lipopolysaccharide (LPS; from *E. coli* 0111: B₄) required to produce an immune response in early weaned pigs (13 d of age). Effects of level of LPS on plasma Fe and Zn were also investigated. After weaning, pigs were housed in an off site nursery in individual pens for 7 d. In Exp. 1, 20 pigs (5 kg BW) 7 d postweaning were fasted 4 h and injected i.p. with a .9% saline solution containing 0, .25, .50, 25 or 50 μ g LPS/kg BW. Blood samples were collected and body temperature (BT) was recorded at 0, 3, and 6 h postinjection (PI). Pigs injected with LPS had higher ($P < .10$) BT than pigs in the control group (CG). There was a greater ($P < .05$) drop in plasma Fe from 0 to 6 h in pigs injected with LPS than in pigs in the CG. Plasma Zn decreased ($P < .05$) from 0 to 6 h only in pigs injected with LPS at 25 or 50 μ g/kg BW. In Exp. 2, twelve 4-h fasted pigs (5 kg BW) 7 d postweaning were injected i.p. with a saline solution containing 0, 12.5 or 25 μ g LPS/kg BW. Blood samples were collected and BT recorded at 0, 1.5 and 3 h PI. At 1.5 and 3 h PI, pigs injected with 25 μ g LPS/kg BW had higher ($P < .05$) BT than control pigs and pigs injected with 12.5 μ g LPS/kg BW. Similarly at 3 h, pigs injected with 12.5 μ g LPS/kg BW had higher ($P < .05$) BT than pigs in the CG. At 1.5 h PI, pigs injected with 25 μ g LPS/kg BW had greater ($P < .01$) tumour necrosis factor alpha (TNF α) concentrations than pigs injected with 12.5 μ g/kg BW or those injected with saline. Tumour necrosis factor increased at 1.5 h and then decreased at 3 h in pigs injected with 12.5 or 25 μ g LPS/kg BW ($P < .05$ and $P < .0001$, respectively). However, no change was observed in pigs in the CG. There was no time or treatment effect on plasma Fe or Zn. Endotoxin elevated TNF α by 1.5 h, but plasma Fe and Zn did not decline significantly until 6 h indicating that variable time periods are required to alter parameters classified as acute phase responses.

Key Words: Pigs, Endotoxin, Acute Phase Response

224 Effect of the addition of *Tenebrio molitor* to starter diets on the performance of weaned pigs. B. P. Gamboa, A. G. Borbolla¹, J. Ramos-Elorduy, and G. Villar, *Universidad Nacional Autonoma de Mexico, Mexico City*.

The objective of this study was to evaluate the performance of weaned pigs under a diet containing the larvae of the insect *Tenebrio molitor*. Eighteen, 21 \pm 3 days old pigs were randomly assigned to three different treatment groups. Group 1 received a milo-soybean base diet (C), the second group received a diet containing 8% of dried *T. molitor* (T), and pigs in the third treatment group were fed a diet containing 8% spray-dried porcine plasma (PP). All diets were formulated to have the same levels of energy (3.3 Mcal), protein (20%), and lysine (1.3%). Diets were fed for 22 days after weaning. The performance parameters ADG, ADFI and F/G were measured twice weekly for each treatment group. The data was grouped by treatments and statistically analyzed using a random design. Throughout the feeding trial, total weight gain (kg) was not different ($P > .05$) in pigs that received the T or PP diets (9.44 vs. 10.54), with both values being greater ($P < .05$) than the one observed in the C group (7.96). Pigs fed the T diet had bigger ($P < .05$) gains at 5, 8 and 15 days when compared with pigs fed the C diet. Although not significant, pigs receiving the diets containing T or PP had better ADG (kg) than pigs fed the C diet (0.429, 0.479, and 0.362, respectively). ADFI was greater in pigs fed PP, followed by pigs receiving the T and C diets (0.762, 0.714, and 0.686 kg, respectively), although no difference ($P > .05$) among treatment groups was found. Feed efficiency between pigs fed the PP diet was better ($P < .05$) than the one observed in the C group (1.59 vs. 1.90). In the T group, F/G was greater (1.67) than in the C group, and lower than the PP group, although they were not significantly different. These results support our hypothesis that the addition of *Tenebrio molitor* to starter diets can give similar performance to the one observed when feeding pigs with a more expensive protein such as porcine plasma. Larvae protein may be a good alternative protein source for use in the pork industry.

Key Words: Weaned pigs, *Tenebrio molitor*, Pig performance