Pigs were assigned to 3 dietary treatments: P adequate (0.41% available P for 2 wks), repletion (0.14% available P for wk 1, 0.41% available P for wk 2), or P deficient (0.14% available P for 2 wks). After 14-d, pigs were harvested and bone marrow was collected for analysis of gene expression by real-time PCR, and radial bones were collected for breaking strength analysis. In the LB line, repletion pigs had higher ADG (P<0.01) than the other treatments, and in HB pigs P deficiency caused a decrease in ADG (P<0.01) compared to the other treatments. In LB pigs P deficiency did not affect ADG. The radial bone strength of P deficient pigs was less (P<0.01) than that of the other treatments in both sire lines. In HB, but not LB pigs, treatment affected the expression of calcitonin receptor (P<0.05), IL-6 (P<0.05), oxytocin receptor (P<0.11), IGFBP-3 (P<0.06), and vitamin D receptor (P<0.04). Expression of osteocalcin and osteoprotegerin was not affected by sire or treatment. Bone traits and expression levels were analyzed using a mixed model with sire line, treatment and the interaction between sire line and treatment fit as fixed effects. Based on this study, the HB line appears to be more responsive to dietary P deficiency than the LB line. A better understanding of the role genetics plays in P homeorhesis will enable selection for pigs that will require and excrete less P, as well as allow for the recommendation of specific genetic lines for producers with different waste management strategies.
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Key Words: Phosphorous, Gene expression, Bone

177 A comparison of whey protein concentrate and spray-dried animal plasma in diets for weanling pigs.

R. O. Gottlob*, J. M. DeRouchey, M. D. Tokach, R. D. Goodband, S. S. Dritz, J. L. Nelssen, and C. W. Hastad, *Kansas State University*.

A total of 180 weanling pigs (initially 6.2 kg and 21 ± 3 d of age) were used to evaluate the effects of whey protein concentrate (WPC) or spray-dried animal plasma (SDAP) on growth performance of weanling pigs. Pigs were blocked by initial weight and sex and allotted to one of five dietary treatments. There were six pigs per pen and six pens per treatment. Pigs were fed one of 5 experimental diets; a negative control with no specialty protein sources, or the negative control diet with 2.5 or 5.0% SDAP or 2.5 or 5% WPC. All experimental diets contained 15% spray-dried whey with no added antimicrobial or pharmacological levels of ZnO. The WPC contained 80.2% CP and 7.5% lysine (as-fed). Experimental diets were fed from d 0 to 14 after weaning, with all pigs fed a common phase 2 diet from d 14 to 27 after weaning. From d 0 to 14, increasing SDAP increased ADG and ADFI (linear, P<0.01). Increasing WPC had no effect on ADG or ADFI, but increased G/F (quadratic, P<0.01). Pigs fed diets containing SDAP had greater (P<0.01) ADG and ADFI than pigs fed diets containing WPC. Overall (d 0 to 27 after weaning), increasing SDAP from d 0 to 14 increased ADG (linear, P<0.03) and tended to increase ADFI (linear, P<0.11). Pigs fed diets containing SDAP also had greater overall ADG (P<0.03) and tended to have increased G/F (P<0.12) compared to pigs fed WPC. Increasing WPC from d 0 to 14 had no effect on overall ADG or G/F. In conclusion, pigs fed diets containing SDAP during the first 14 d after weaning had improved overall growth performance while pigs fed WPC did not compared to pigs fed the diet without SDAP or WPC. Previous data suggested similar growth performance among pigs fed SDAP or WPC. The lack of WPC response in this study may be an indication of product variation and manufacturing processes between sources. Therefore, further research is needed to determine differences in growth performance as a result of variation between WPC sources.

Key Words: Nursery pigs, Spray-dried animal plasma, Whey protein concentrate

178 Chelated minerals in diets for weaned piglets.

M. Muniz[1], D. Berto[1], F. Wechsler[1], A. Passos*[2], and G. Lima[3], [1]*UNESP*, [2]*TORTUGA*, [3]*EMBRAPA*.

The use of mineral contents in diets above NRC (1998) requirements is a common practice in swine production. The search for highly available mineral sources, the antagonism between minerals and the concern about environmental pollution have motivated research on organic forms of minerals. The objective of this experiment was to compare a trace mineral supplement containing Zn (80 ppm), Cu (5 ppm), Mn (20 ppm), Se (0.25 ppm) and Fe (80 ppm) in organic form (carbochelate, Tortuga), with a supplement containing the same minerals in inorganic form (sulphate, except for Se, which was added as sodium selenite), by measuring piglet performance and red cell count. Fifty-six male and female piglets, 21-day-old in average, were used in a randomized block design with two treatments (organic vs. inorganic mineral source) and ten replicates. During the experimental period (33 days), all animals received similar diets, except for micromineral source. Data indicated higher average daily gain (ADG, P=0.06) and better feed conversion (AFC, P=0.008), during the whole experimental period, as well as higher red cell count (RC, P=0.10), for animals fed organic minerals. In conclusion, piglets fed organic minerals showed better performance.

Performance and blood variables

Treatment	ADG (g/day)	AFC	RC (10^6/mm^3)
Inorganic minerals	474[a]	1.79[a]	6.512[a]
Organic minerals	503[b]	1.73[b]	6.695[b]
CV (%)	10.73	3.46	5.32

[ab]Means in the same column followed by different letters are different.

Key Words: performance, blood, organic minerals

179 Phytobiotics and organic acids as alternatives to the use of antibiotics in nursery pig diets.

R. D. Mateo*[1], F. Ji[1], F. Neher[2], and S. W. Kim[1], [1]*Texas Tech University*, [2]*BioMin Inc.*.

Two experiments were conducted to evaluate the use of phytobiotics in nursery pig diets as an alternative to the use of antibiotics. In Exp 1, 144 pigs, weaned at 23.4±0.3 d of age, were fed three diets: negative control (NC) without antibiotics, positive control (PC) with carbadox (50 mg/kg), or a test diet (PEP) with 0.1% PEP (Biomin Inc). PEP contains a blend of essential oils and prebiotics. Each treatment had 6 replicate with 8 pigs per replicate. Pigs were fed experimental diets for 5 wks based on 3 phase feeding program with 1.51, 1.36, and 1.15% lysine for each phase. Pigs had free access to feed and water. Feed intake and weight gain were measured weekly. In Exp 2, 192 pigs, weaned at 19.2±0.3 d of age, were fed three diets: NC, PC, or a test diet (PBT) with 0.02% PEP and 0.4% Biotronic (Biomin Inc.) for the phase 1 (2 wks, 1.47% lysine) and 0.01% PEP and 0.2% Biotronic for the phase 2 (3 wks, 1.21% lysine). Biotronic contains phosphoric acid, lactic acid, sorbic acid, and citric acid. All other methods were identical to Exp 1. In Exp 1, ADG of PC was greater (P<.05) than NC during the entire period, whereas ADG of PEP did not differ (P>.05) from NC or PC. ADFI and gain:feed did not differ among the treatments during the entire period. Pigs in PC had higher (P<.05) diarrhea score (harder stools) than NC, whereas PEP did not differ from NC or PC. In Exp 2, there was no difference (P>.05) in ADG, ADFI, and gain:feed among the treatments. Diarrhea score was higher (P<.05) in PC than in NC and that of PBT did not differ from PC or NC. Collectively, when phytobiotics with or without organic acids were supplemented to nursery pig diets, the growth performance of pigs did not differ from antibiotics fed pigs nor from no antibiotics fed pigs during 5 week nursery period. Further research is needed to evaluate if phytobiotics improve growth and immune status of pigs under stress or sub-clinical challenges.

Key Words: Phytobiotics, Organic acids, Nursery pigs

180 Assessment of growth performance and nutrient balance of early-weaned pigs fed diets containing spray dried corn distillers solubles by-products, carbadox, and porcine plasma.

J Knott* and G Shurson, *University of Minnesota*.

Barrows (n = 63; 17-d of age) were used in a 10-d growth performance and nutrient balance trial. Pigs were housed in individual stainless steel metabolism crates to determine energy and N balance. Dietary treatments included: control diet (NC), NC + 15% condensed distillers solubles (DS), NC + 7.5% yeast cream (YC), NC + 15% residual solubles (RS), NC + 55 ppm carbadox (AB), NC + 6% porcine plasma (PP), and NC + AB + PP (PC). All diets were formulated to 1.60% total lysine, 3440 kcal/kg of metabolizable energy, 0.87% Ca, and 0.80% P. Growth performance (ADG, ADFI, G:F) was determined during the first 10-d period in which pigs had ad libitum access to feed. After the initial 10-d period, pigs were weighed and their daily feeding level was standardized to 4% of their body weight, fed in two equal meals. After a 5-d acclimation period, total feces and urine were collected and analyzed to determine the effects of treatment on energy and N balance. Pigs fed the PP and PC diets tended to have higher ADG (P=0.10) and