

Based on results, the quality of bone produced by rapidly growing pigs was the same as bones from animals that were restricted-fed; however, these results were confounded with animal age.

Key Words: Bone, Diet Restriction, Mechanical Properties

139 Effectiveness of Tylan or a direct fed microbial to reduce pig variation. C.A. Elmore*, G.A. Apgar, and K.E. Griswold, *Southern Illinois University, Carbondale.*

One hundred and eight pigs (crossbred sow x PIC 337) were used to evaluate the effect of an antimicrobial (Tylan) or a direct fed microbial (*B. coagulans*) to pig to pig variation during finishing. Pigs were weighed and allotted to outcome groups based on sex (approximately 4 females and 5 males per pen), weight and genetic background, and were randomly assigned to one of three dietary treatments. Treatments were as follows: 1) control, 2) Control + Tylan (40 g/ton), and 3) Control + *B. coagulans* (9.98 x 10¹¹ CFU/ton). Pigs were allowed ad libitum access to feed and water at all times. All pigs were weighed and feed intake and feed efficiency calculated bi-monthly, or intermittently depending upon diet change. Data were analyzed using the GLM procedure of SAS and differences among dietary treatments were analyzed using contrast statements. There were no significant differences between dietary treatments during the first 8 d for weight, ADG or G:F. Coefficients of variation for these criteria also were not altered by dietary treatment. From d 8 to d 19, pigs fed diet 3 tended (P < .07) to be heavier, than pigs fed the control treatment, with pigs fed diet 2 falling intermediate. Average daily gain was numerically greater for pigs fed diet 3 as compared with controls. Coefficients of variation tended (P < .08) to be lower for ADG during this period for pigs fed treatment 3 when compared with pigs fed the control. Pigs fed treatment 2 were intermediate. Variation in BW for pigs fed the control treatment numerically increased over time, while BW of pigs fed treatments 2 and 3 numerically decreased. Our initial data suggest feeding a direct-fed microbial may reduce variation in growth rate.

Key Words: Finishing, Direct Fed Microbial, Tylan

140 Influence of crystalline or protein-bound lysine on lysine utilization for growth in nursery pigs. J. J. Colina*, P. S. Miller, A. J. Lewis, and R. L. Fischer, *University of Nebraska, Lincoln.*

A 4-wk experiment was conducted to determine the efficiency of utilization of crystalline lysine relative to the lysine in soybean meal for growth performance and effects on plasma urea concentrations in nursery pigs. Pigs were 23 to 24 d old and had an initial BW of 6 kg. Pigs were blocked by sex and weight (three blocks of barrows and three blocks of gilts) and randomly allotted to one of five dietary treatments. Pigs were individually penned in two nursery facilities and each treatment was replicated six times. The dietary treatments consisted of a basal diet (1.05% lysine) and diets containing 1.15 and 1.25% lysine that were achieved by adding lysine to the basal diet from either soybean meal (SBM) or L-lysine-HCl (CRYST). Average daily gain and ADFI were measured weekly. Blood samples were collected on the last day of the experiment and plasma was analyzed for urea concentration. Data were analyzed as a randomized complete block design with repeated measurements in time. Feed efficiency (ADG/ADFI) was similar (P > 0.1) among treatments. By the 4th wk, ADG was greater (P < 0.05) for pigs fed the diet supplemented with 1.15% lysine from SBM in comparison with pigs fed the diet supplemented with 1.25% lysine from CRYST. In addition, ADFI was greater (P < 0.1) for pigs fed the 1.25% lysine supplemented from SBM vs CRYST (1.20 vs 1.06 kg). Pigs fed diets supplemented with SBM had greater (P < 0.001) plasma urea concentrations than pigs supplemented with CRYST. Although preliminary data (not shown) and lysine requirements derived from NRC (1998) support that the aforementioned lysine concentrations were within the deficient range for nursery pigs (5 to 10 kg), data from this experiment do not indicate that lysine intake was limiting growth. Therefore, conclusions regarding the efficiency of lysine utilization for growth from L-lysine-HCl and soybean meal can not be made.

Key Words: Pigs, Lysine, Growth

141 Evaluation of the lysine requirement for 11 to 25 kg barrows. D. C. Kendall*¹, G. Yi¹, A. M. Gaines¹, G. L. Allee¹, J. L. Usry², M. Steidinger, and W. Cast, ¹*University of Missouri-Columbia,* ²*Ajinimoto Heartland Inc.*

A 21d experiment was conducted to determine the lysine requirement for 11 to 25 kg barrows (n=252, Dalland x PIC C-22). Pigs were allotted in a randomized complete block design and were fed one of 7 dietary treatments with 9 replicates/treatment and housed at 4 pigs/pen. Dietary true ileal digestible (TID) lysine levels were 1.05, 1.13, 1.19, 1.26, 1.33, and 1.40% TID lys with all diets containing the same inclusion of soybean meal (33.1%). Dietary lysine content was increased by adding Lys-HCl (0, .09, .178, .267, .356 and .445%, respectively). A positive control diet was formulated at 1.40% TID lys, containing .15% added Lys-HCl and 42.0% soybean meal. All diets were formulated to be equal on a ME basis (3.42 Mcal ME/kg) with additional synthetic amino acids supplied as necessary to meet minimum amino acid ratio requirements. Pigs were weighed weekly to determine average daily gain, average daily feed intake and feed efficiency. During d 0-7, there was a linear improvement in ADG and G:F (P < .05) with increasing TID lysine level, up to 1.33%. During d 7-14, there was a linear improvement in G:F (P < .05) with a plateau occurring at 1.33% TID lys. From d 14-21, a linear trend (P < .10) existed for ADG and G:F with improvements up to 1.19% TID lys. For the overall period, ADG and G:F were linearly improved (P < .05) with increasing lysine levels, up to 1.33% TID lys. The 1.40% TID lys diet did not differ from the positive control diet in any criteria measured. This experiment demonstrates that the lysine requirement for pigs from 11 to 25 kg BW may be as high as 1.33% TID lys and the inclusion Lys-HCl up to .445% does not affect performance of nursery pigs.

Key Words: Pigs, Lysine, Nursery

142 Effects of plasma grade, irradiation or formaldehyde treatment of plasma, or whole diet irradiation on growth performance of weaned pigs. D. R. Cook*, M. M. Ward, and N. D. Paton, *Akey Inc. Lewisburg, OH.*

Two experiments were conducted to determine the impact of reducing colony-forming units (CFU) in plasma or whole diet on weaned pig growth performance. In Exp. 1 (1760 18-d old pigs, 5.4 kg, 22 pigs/pen, 0.25 m²/pig), two sources of plasma (human grade, HGP; and technical grade, TGP), and three processes (non-processed, NP; irradiated, IR; or Termin-8, T8) were tested in a 2 x 3 factorial arrangement of treatments. Plasma sources were added to diets on an equal protein basis at approximately 5% and 2% of the diet from 0-7 and 8-14 d post weaning, respectively. Irradiation for IR treatment was 5-20 kGy. T8 (a formaldehyde product) was atomized and added directly to the plasma at 0.3% for the T8 treatment. Pigs were blocked based on BW and sex and pens were allotted to treatment within block. TGP and HGP had pre-IR total CFU/g of 21,700 and 375, respectively. IR reduced CFU/g to 135 and 60 for TGP and HGP, respectively. Pigs fed TGP plasma tended to have greater ADG (P < .10) and ADFI (P < .08) versus pigs fed HGP. There were no significant performance differences (P > .10) among NP, IR or T8-fed pigs during the 14 d feeding period. No interactions were observed between plasma source and processing method. In Exp. 2, 880 pigs were reared under the same conditions as in Exp. 1. Pigs were fed NP or IR diets for 22 d followed by a common NP diet. Irradiating whole diet reduced CFU/g but also decreased growth performance d 0 to 5 post-weaning (ADG 159 vs. 174 g; P < .10) and feed intake (149 vs. 165 g/d; P < .06). Similar results were observed d 15 to 23 post-weaning for ADG (365 vs. 379 g; P < .08) and G/F (0.73 vs. 0.76; P < .001). For the 45-d trial, IR did not alter growth performance. In conclusion, irradiation of plasma was an effective tool in reducing microbial contamination but did not improve growth performance in these experiments. Whole diet IR appears to have a negative impact on early nursery growth performance.

Key Words: Pigs, Irradiate, Termin-8

143 Effects of ingredient and whole diet irradiation on nursery pig performance. J.M. DeRouchey*, M.D. Tokach, J.L. Nelssen, R.D. Goodband, S.S. Dritz, J.C. Woodworth, M.J. Webster, and B.W. James, *Kansas State University, Manhattan.*

A total of 880 pigs (15 ± 2 d of age) were used in two experiments to determine the effects of irradiation of individual ingredients or whole diet

on growth performance of nursery pigs. Pigs had an initial BW of 4.9 kg in Exp. 1 and 5.1 kg in Exp. 2. There were eight pigs/pen in both experiments with five pens/treatment in Exp. 1 and six pens/treatment in Exp. 2. Pigs were blocked by weight and allotted to one of ten dietary treatments. Both experiments contained similar treatments that first included a control diet that contained ingredients that were not irradiated. Other treatments included diets that had specific ingredients irradiated: corn, soybean meal, spray-dried whey, spray-dried animal plasma, fishmeal, soybean oil, or all microingredients combined (antibiotic, vitamins, minerals, crystalline amino acids). The final two treatments included a diet that contained all ingredients that had been irradiated and a diet that was manufactured with nonirradiated ingredients and subsequently irradiated. An average irradiation dose of 8.5 kGy was used. No experiment \times treatment interactions were observed. Overall (d 0 to 14 in trial 1 and d 0 to 12 in trial 2), pigs fed diets containing irradiated spray-dried animal plasma or soybean meal had increased ($P < 0.05$) ADG compared to the control diet with no irradiated ingredients and the complete diet that was irradiated. Also, ADFI ($P < 0.05$) was greater for pigs consuming the diet with irradiated soybean meal compared to those fed the irradiated whole diet. Finally, pigs fed irradiated spray-dried animal plasma had improved gain/feed ($P < 0.05$) compared to those fed diets containing irradiated microingredients or if all ingredients had been irradiated before manufacturing. In summary, irradiation of certain feed ingredients (spray-dried animal plasma or soybean meal in these experiments) can improve growth performance in nursery pigs, whereas irradiation of all ingredients or the whole diet does not enhance performance.

Key Words: Nursery Pig, Feed Ingredients, Irradiation

144 Comparison of irradiated feed and food grade spray-dried animal plasma on nursery pig performance. J.M. DeRouchey*, M.D. Tokach, J.L. Nelssen, R.D. Goodband, S.S. Dritz, J.C. Woodworth, and C.W. Hastad, *Kansas State University, Manhattan.*

A total of 535 weaning pigs (17 ± 2 d of age) were used (initial BW of 6.3 kg in Exp. 1 and 6.1 kg in Exp. 2) to determine the effects of initial bacterial concentrations of spray-dried animal plasma on growth performance. Previous research indicates that pigs fed irradiated feed-grade animal plasma (initially high bacteria) have improved growth performance compared to those fed non-irradiated feed-grade animal plasma. Therefore, we hypothesized that irradiation of food grade plasma (initially low bacteria) may lead to a lower growth performance response. All pigs were blocked by weight with five pigs per pen and six and seven pens/treatment in Exp. 1 and 2, respectively. In Exp. 1, pigs were allotted to one of nine treatments including a control diet or the control with 5% plasma from one of four different sources either fed irradiated or as-is. Plasma sources were from American Protein Corporation, Ames, IA (feed grade, AP 920 and AP 820; and food grade, source 1 and 2). In Exp. 2, five diets were used from Exp. 1, which included the control, and plasma sources, AP 820 and food grade, fed irradiated or as-is. Pigs fed animal plasma had increased ADG (Exp. 1 & 2), ADFI (Exp. 1) and G:F (Exp. 2; $P < 0.05$) compared to pigs fed the control diet. In Exp. 1, pigs fed irradiated AP 920 feed grade plasma had increased ADG ($P < 0.05$) compared to those fed the control diet. Also, pigs fed irradiated AP 920, regular AP 820, regular and irradiated source 1 food grade and regular source 2 food grade had improved ADFI compared to pigs fed the control diet. In Exp. 2, pigs fed irradiated AP 820 had increased ADG ($P < 0.05$) compared to those fed the control diet and pigs fed regular AP 820. Irradiation of food grade plasma did not influence ($P > 0.12$) pig performance in either experiment. These studies indicate that reducing initial bacterial levels in animal plasma leads to increased growth of nursery pigs, and may explain the variation in response when animal plasma is included in diets for nursery pigs.

Key Words: Nursery Pig, Animal Plasma, Irradiation

145 The effect of varying levels of spray-dried animal plasma in nursery pig diets. C. S. Stovall*, G. A. Apgar, and K. E. Griswold, *Southern Illinois University, Carbondale.*

A total of 193 crossbred weaning pigs (avg 24 ± 0.5 d and 6.5 ± 1.5 kg in Trial 1, and 19 ± 0.7 d and 5.6 ± 0.9 kg in Trial 2) were used in two trials to determine the effect of adding varying levels of spray-dried animal plasma (SDAP) to phase one nursery diets. Pigs were blocked by initial

weight, sex and litter, and were randomly assigned to one of four treatment diets. Pigs were housed in an environmentally controlled modular nursery with 12 pens and an average of 12 pigs per pen (Trial 1) and 7 pigs per pen (Trial 2). Pigs were allowed ad-libitum access to feed and water for the duration of each trial. All diets met or exceeded current nutrient requirement estimates (NRC, 1998). Lysine levels were equalized across dietary treatments by substitution with blood meal. Choice white grease was added when needed to make the diets isocaloric. The dietary treatments were as follows: 1) 0% SDAP (control), 2) 3% SDAP, 3) 6% SDAP, 4) 9% SDAP. Pigs were weighed, feed intake and feed efficiency calculated weekly. The treatment diets were fed from d 0-14 post-weaning after which a common corn-soybean meal diet was fed to all pigs d 14-35 post-weaning. Data from the two trials were analyzed using the GLM procedure of SAS and orthogonal contrasts were used to estimate linear, quadratic and cubic treatment effects and individual means were separated by the LSD procedure. In Trial 1, there were no significant effects of SDAP addition on ADG or ADFI. Feed efficiency was affected in a quadratic manner ($P < .05$) during wk 3, 5 and 3 through 5 with pigs fed 0 and 9% SDAP having numerically similar G:F and pigs fed 3% and 6% SDAP having numerically lower efficiencies. In Trial 2, ADG and ADFI were improved linearly ($P < .05$) during wk 1, and ADFI was improved linearly ($P < .05$) during wk 4. Efficiency of gain was improved in a linear manner ($P < .05$) during wk 1, 1 through 2 and 1 through 5. These data suggest that SDAP addition improves performance of pigs weaned at 19 days of age as compared with pigs weaned at 24 days of age.

Key Words: Spray-Dried Animal Plasma, Weaning Pig, Performance

146 A comparison of roller-dried whey and spray-dried whey in swine starter diets. G. F. Yi*¹, G. L. Allee¹, A. M. Gaines¹, D. C. Kendall¹, K. M. Halpin², and M. Trotter², ¹*University of Missouri-Columbia*, ²*International Ingredient Corporation, Inc.*

A total of 200 weaned barrows and gilts ($5.360.3$ kg, 100 each) at 19 2 days of age were used to compare the effects of roller-dried whey (RDW) and extra grade spray-dried whey (SDW) on the growth performance of young pigs. The pigs were randomly allotted by initial BW and sex to five dietary treatments in a RCBD, with ten replicate pens per trt and four pigs per pen. During day 0 14, 14 28 and 28 42, the pigs were fed Phase I, Phase II and Phase III diets respectively. During Phase I, a corn-soy diet without any whey product served as a control (Trt A). Treatments B to E contained 10%SDW, 10%RDW, or 20%SDW or 20%RDW respectively. In Phase II treatments B to E contained 5%SDW, 5%RDW, or 10%SDW or 10%RDW respectively with a corn-soy diet without any whey as the control (Trt A). In Phase III, all the pigs were fed the common diet. Pigs were weighed and feed intake recorded on d 7, 14, 28, and 42. BW, ADG, ADFI and G:F were used to evaluate growth performance. In the first week, ADFI and ADG were increased by whey addition, with the 20% whey diets, resulting in a greater response than that of 10% whey ($P < 0.05$). There were no differences due to whey source (RDW vs. SDW) ($P > 0.05$). During Phase I, compared to the control, the ADFI was linearly increased with the increasing level of either RDW or SDW ($P < 0.05$). In Phase II, there were no differences in growth performance ($P > 0.05$). However, in Phase III, pigs fed 10% or 20% whey in Phase I tended to gain faster ($P < 0.10$) with an improved feed efficiency ($P < 0.05$) compared to the pigs fed the control diet. Overall, pigs fed 20% whey in Phase I diets were approximately 1.0 kg heavier after the 42 d nursery period compared to the pigs fed the control diet. These results indicate that both RDW and extra grade SDW improved the growth performance of weaned pig with no differences between whey processing methods.

Key Words: Weaned pigs, Whey, Starter diets

147 Non-pasturized, spray-dried egg treated with Termin-8 as a protein source for phase 1 nursery diets. M.E. Davis*¹, C.V. Maxwell¹, Z.B. Johnson¹, D.C. Brown¹, S. Singh¹, K.J. Touchette², and J.A. Coalson², ¹*University of Arkansas, Fayetteville*, ²*Merrick's Inc., Union Center, WI.*

A conventional nursery trial with 144 crossbred weaning pigs was conducted to determine the efficacy of non-pasteurized, spray-dried egg product (EGG) with and without treatment with Termin-8 (a formaldehyde-based antimicrobial preservative; T-8) to replace spray-dried plasma (SDP) in the Phase 1 (d 0 to 14) nursery diet. Pigs (21 ± 1 d of age; 6.6 kg BW) were assigned by initial weight and sex to 1