had higher ADFI (P<0.05) compared to pigs fed the NC and DS diets, but G:F was not affected. Pigs fed the PP diet also had higher ADFI (P<0.05) compared to pigs fed the YC, RS, and AB diets. Daily fecal, urinary, and total N excretion was not affected by treatment. However, pigs fed the RS, AB, and PC diets tended to retain more N (P=0.10) compared to pigs fed the NC and YC diets. Urinary and fecal energy excretion was not affected by treatment. However, the YC and PP diets had lower digestible and metabolizable energy (P<0.05) compared to the DS and RS diets. Results from this study suggest that feeding diets containing distillers solubles by-products resulted in similar growth performance compared to pigs fed the negative control and carbadox diets, but poorer performance compared to pigs fed PP and PC diets. The high digestible and metabolizable energy value of the DS and RS diets, along with N retention, suggests that DS and RS are acceptable alternative ingredients in phase 1 nursery diets.

Key Words: distillers solubles, nutrient balance, early-weaned pigs

181 Effect of sex and slaughter weight on carcass measurements.

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The aim here was to examine the effect of sex and slaughter weight on carcass measurements in pigs of a lean genotype. Forty five single sex pairs of pigs (meatline Landrace sire on Landrace x Large White sows) were used in a 3 (sex) x 3 (slaughter weight) factorial design with 5 pairs per treatment. The experimental period was from weaning (mean = 26 d) to slaughter. Sexes were boar (B), castrate (C) and gilt (G) and the slaughter weights were 80, 100 and 120 kg liveweight. All pigs were fed the same diets based on wheat, barley and soybean meal ad libitum as dry pellets. Sex x slaughter weight interaction effects were not significant (P>0.05). Carcass length, leg length and ham circumference were 845, 832 and 836 mm (s.e. 3.3; P<0.05), 388, 383 and 383 mm (s.e. 2.5; P>0.05) and 712, 720 and 719 mm (s.e. 3.4; P>0.05) for B, C and G respectively. Weight of cold carcass, hind leg, shoulder, loin and belly were 77.7, 78.6 and 77.4 kg (s.e. 0.74; P>0.05); 9.30, 9.73 and 9.59 kg (s.e. 0.153; P>0.05); 5.48, 5.56 and 5.40 kg (s.e. 0.096; P>0.05); 6.39, 7.17 and 6.59 kg (s.e. 0.159; P<0.01) and 3.46, 3.67 and 3.47 kg (s.e. 0.060, P<0.05) for B, C and G respectively. Carcass length, leg length and ham circumference were 793, 837 and 884 mm (s.e. 3.3; P<0.01); 364, 385 and 405 mm (s.e. 2.5; P<0.01) and 672, 720 and 760 mm (s.e. 3.4; P<0.01) for slaughter weights of 80, 100 and 120 kg respectively. Weight of cold carcass, hind leg, shoulder, loin and belly were 63.1, 78.6 and 91.8 kg (s.e. 0.74; P<0.01); 7.88, 9.54 and 11.2 kg (s.e. 0.153; P<0.01); 4.56, 5.45 and 6.41 kg (s.e. 0.096; P<0.01); 5.40, 6.64 and 8.10 kg (s.e. 0.159; P<0.01) and 2.84, 3.56 and 4.19 kg (s.e. 0.060, P<0.01) for slaughter weights of 80, 100 and 120 kg respectively. Carcases were longer for boars than gilts or castrates and the four primal cuts were heavier for castrates than boars. All measurements increased sequentially as slaughter weight increased.

Key Words: Castration, Slaughter weight, Carcass

182 Yearling horse growth and development: acceptability and replacement value of field peas for oats.

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Forty-eight yearling growing horses (colts: n=18; fillies: n=30) averaging 349.9 kg were used in a two year study to evaluate acceptability and replacement value of field peas for oats in an 84d feeding study. Field peas replaced 0, 33.3 and 67.7% of the oats in a complete pelleted supplement that was divided into two feedings and fed twice daily at 8:00 a.m. and 2:00 p.m. Forage was a 15% CP hay pellet [60% alfalfa (*Medicago sativa*) and 40% bromegrass (*Bromus inermis*)]; DE value of 0.477 Mcal/kg. Oat grain(*Avena sativa*) was 13.3% CP with an energy value of 0.658 Mcal/kg. Field peas (*Pisum sativum*) contained 23.0% CP and had an energy value of 0.713 Mcal/kg. Experimental supplement DM, CP, LYS, NEg, ADF and NDF were 86.75%,19.81%, 0.85%, 0.245 Mcal/kg, 13.74%, 27.18%; 87.55%, 20.8%, 0.84%, 0.256 Mcal/kg, 12.30%, 24.83% and 88.49%, 21.13%, 0.86%, 0.267 Mcal/kg, 10.86%, 22.59% for 0, 33 and 67.7% field pea, respectively. Average 84d hay cube consumption was 5.23, 5.44 and 5.09 kg/d and experimental supplement consumption was 3.26, 3.05 and 2.86 kg/d for 0, 33.3 and 67.7% field pea replacement, respectively. Horses readily consumed all experimental pea replacement supplements without noticeable signs of digestive disorder. Growth measurements included body weight change and physical measurements for body length, hip and wither height, heart girth, forearm, cannon bone and gaskin muscle circumferences. Treatment means did not differ for final weight (P=0.395), ADG (P=0.419), body length (P=0.392), hip height (P=0.536), wither height (P=0.584) heart girth (P=0.414), forearm circ. (P=0.648), cannon bone circ. (P=0.255) and gaskin muscle (P=0.633). Results of this experiment suggest that field peas can replace up to 67.7% of the oats in yearling growing horse supplements without development of digestive disorders. In addition, due to the higher protein/energy content of field peas, 12.4% less supplement was needed to achieve a similar growth response.

Key Words: Equine, Yearling Development, Field Peas

183 Effect of dietary phosphorus and genetic background on growth performance and IGF-1 levels in young gilts.

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Costs associated with inorganic phosphorus (P) levels in animal diets have driven research to more accurately define requirements in order to minimize P excretion while maintaining growth rate. We examined the influence of 2 sire lines, selected primarily for either meat quality (MQ) or growth performance (GP), on P utilization by 36 young gilts (21d of age, 6.63 ± 0.78 kg) from 6 litters (3 pigs/litter) for each sire line. Pigs were allotted into three dietary treatment groups: P adequate (+P, 0.41% available P for 2 wks), P repletion (RP, 0.14% available P for wk 1, 0.41% available P for wk 2), or P deficient (-P, 0.14% available P for 2 wks). A significant reduction (P < .05) in ADG was seen in MQ sired -P pigs when compared with either RP or +P pigs, whereas this reduction was not seen in GP sired pigs. Both MQ and GP sired -P pigs had lower (P<.05) G:F than their siblings in either the +P or RP groups. Plasma inorganic P concentrations were reduced (P<.05) and plasma alkaline phosphatase activities elevated (P<.05) in P deficient groups at wk1 and 2. The RP group returned to normal levels after 1 wk on a P adequate diet. Total plasma IGF-1 concentrations were determined by RIA. Regardless of sire line pigs in the -P group had lower plasma IGF-1 concentrations (P<.05) than +P pigs. The depression of circulating IGF-1 levels in -P MQ sired animals was greater (P<.05) than that seen in GP sired animals. There were, however, no significant differences in the relative expression of IGF-1, IGFBP-2, and IGFBP-3 mRNA in liver tissue among any of the treatment groups as determined by real-time PCR. These results suggest that genetic background dramatically influences inorganic P requirements and that genotype specific P supplementation could reduce the environmental impact of swine production without detriment to performance.

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Key Words: Pigs, IGF-1, Phosphorus

184 Effects of intermittent ractopamine use on pig growth performance in late finishing.

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A total of 342 finishing pigs (PIC L 327 x L42; 228 barrows and 96 gilts; initially 67.55 ± 1.87 kg) were used in a 56 d feeding trial to determine effects of intermittent Ractopamine use on pig growth performance in late finishing. There were four experimental treatments with 11 or 12 pigs per pen and seven pens per treatment in a randomized complete block design. Diets were sorghum-soybean meal-based and formulated to contain 1.0% lysine with or without 10 ppm Ractopamine. Experimental treatments consisted of: 1) a control diet (no Ractopamine) fed for 56-d before marketing; 2) Ractopamine fed for the first 21-d and then control diet for the last 35-d; 3) Ractopamine fed for the first 21-d, then control for 14-d, then Ractopamine the last 21-d; and 4) control diet fed for the first 35-d then Ractopamine fed for the last 21-d before market. Pigs were weighed on d 21, 28, 35, 42, 49, and 56 to determine ADG, ADFI, and G:F. From d 0 to 21, pigs fed Ractopamine had increased (P<0.001) ADG and improved G:F compared to pigs fed the control diet (1.06 kg and 0.40 vs 0.96 kg and 0.37, respectively). However, from d 21 to 35 (when no Ractopamine was fed), control pigs had greater

(P<0.009) ADG than pigs previously fed Ractopamine (0.98 and 0.88 kg, respectively). During the last 21-d, and for the overall 56-d trial, pigs fed Ractopamine the last 21-d of the study or those fed Ractopamine from d 0 to 21 and then d 35 to 56, had greater (P<0.0004) ADG and improved (P<0.0001) G:F than control pigs or those fed Ractopamine from d 0 to 21 (1.02 kg and 0.34 vs 0.89 kg and 0.29 from d 35 to 56, respectively, and 1.00 kg and 0.36 vs 0.95 kg and 0.33 from d 0 to 56, respectively). These results indicate that feeding 10 ppm Ractopamine increases ADG and G:F. Furthermore, the response to Ractopamine appears to be similar among pigs fed Ractopamine for the first time and those fed Ractopamine intermittently.

Key Words: Ractopamine, Withdrawal, Finishing pig

185 Effects of a solid-state fermented phytase on growth performance and nutrient digestibility of growing pigs fed barley-soybean meal based diets.

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Previous reports from our lab found that the addition of a solid-state fermented (SSF) phytase complex to corn-soybean meal diets improved P digestibility, but had little effect on digestibility of other nutrients. This enzyme complex contains side-enzyme activities other than phytase that could improve the digestibility of other nutrients (i.e., DM, N, energy) in lower quality feedstuffs. Thus, an experiment utilizing 24 barrows (24.3 kg) was conducted to determine the effects of adding SSF phytase complex (Allzyme SSF; Alltech, Inc.) to low available P, barley-soybean meal diets on growth performance and nutrient digestibility in a 21-d study. Pigs were blocked by BW and allotted randomly to four dietary treatments (6 pigs/trt). Diet 1 was a fortified barley-soybean meal based diet (0.77% dig. Lys; 1.2:1 Ca:total P) adequate in all nutrients, except available P. This diet contained 0.42% total P (0.11% available P), all of which was provided by barley and soybean meal. Diets 2, 3, and 4 were as Diet 1 plus SSF phytase to provide 250, 500, and 1,000 phytase units (PU)/kg, respectively. Pigs were housed individually and diets were fed at 3.0 maintenance with *ad libitum* access to water. There was a 7-d period (d 14 - 21) for collection of feces and urine. The addition of SSF phytase complex improved (linear, P < 0.05) ADG and F:G. Digestibility of P and ash was dramatically improved (linear, P < 0.01) with addition of SSF phytase. The increase in P digestibility led to a 17% decrease in absolute P excretion for pigs fed 1,000 PU/kg. Digestibility of GE improved (linear, P < 0.01) with SSF phytase resulting in an approximate 75 kcal/kg increase in DE concentration of the diet for pigs fed 1,000 PU/kg. Also, SSF phytase improved (P < 0.05) DM, OM, and N digestibility. These results indicate that the addition of SSF phytase complex to low P, barley-soybean meal diets markedly improved nutrient digestibility of growing pigs.

Key Words: Pigs, Phytase, Digestibility

186 Inadequate diet mixing time greatly reduces nursery pig performance.

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While the importance of thoroughly mixing diets is often emphasized, little data is available to quantify the impact of adequate mixing on pig growth performance. Therefore, a 28 d trial was conducted to evaluate the effects of mixing time on growth performance of nursery pigs. A total of 180 weanling pigs (6.31± 0.84 kg BW, 21±3 d of age) were used with 6 pigs/pen and 6 pens/treatment. Experimental treatments consisted of mixing a diet for 0, 30, 60, 120 or 330 s in a horizontal ribbon mixer. Diets were fed in two phases (d 0 to 14 and d 14 to 28) with diets in both phases containing high levels of synthetic amino acids. Diets in phase 1 also contained 3.75% fish meal, 15% dried whey, and 2,500 ppm zinc from zinc oxide. Eight samples were collected from the mixer at the completion of the respective mixing time for each batch of feed to determine a CV. Each bag (22.5 kg) was labeled (first to last) and sampled to determine the degree of mixing that occurred as feed was conveyed from the mixer to the bagger. Mixer CV values were 178, 38, 26, 21, and 5% for phase 1 and 172, 79, 60, 48, and 26% for phase 2 as mixing time increased. Bag CV values were 26, 20, 16, 11, and 7% for phase 1 and 56, 45, 40, 33, and 12% for phase 2 as mixing time increased. Each pen was then assigned a bag of feed. Bags were distributed across pens within the specific treatments in the order they were filled. As needed, the next chronological bag of feed was used. Growth performance was linearly (P<0.01) improved in both phases. From d 0 to 28, increasing mix time increased (linear and quadratic, P< 0.01) ADG (331, 405, 407, 426, 463 g for 0, 30, 60, 120, and 330 s, respectively). Increasing mix time also increased G:F (linear P<0.01, quadratic P<0.10; 0.67, 0.72, 0.76, 0.75, 0.77 for 0, 30, 60, 120, and 330 s, respectively). With greater use of low inclusion ingredients such as synthetic amino acids in swine diets, these data clearly demonstrate that inadequate mixing reduces nursery pig performance.

Key Words: Growth, Mixing efficiency, Nursery pigs

187 Growth performance of nursery pigs fed yeast alone or in combination with in-feed antimicrobial.

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Weaned pigs (initial BW 6.08 kg) were used in a 28 d growth study to evaluate the effects of feeding the combination antibiotic neomycin and oxytetracycline (Neo-Terra), varied levels of *Saccharomyces cerevisiae* (BIOSAF) yeast (0.15% or 0.3%) and the combination of Neo-Terra and BIOSAF in nursery diets. Pigs were blocked by weight and sex, and assigned randomly within blocks to five treatments. There were seven pigs per pen and six pens per treatment. Phase 1 diets were fed from d 0-14, and Phase 2 diets were fed from d 15-28. The negative control diet contained no added antibiotic or yeast, and the positive control diet contained Neo-Terra. Two diets contained BIOSAF yeast at 0.15 or 0.3 %, and a fifth diet contained the combination of 0.15 % BIOSAF and Neo-Terra. Diets were formulated without growth promoting levels of copper sulfate or zinc oxide. Growth performance data including ADG, ADFI, and feed efficiency (G/F) were calculated. Overall, pigs fed the diet containing both Neo-Terra and 0.15% BIOSAF® had greater ADG and ADFI than pigs fed the control diet and pigs fed either level of BIOSAF® alone (P < 0.05). Furthermore, over the entire trial, pigs fed the diet containing both Neo-Terra and BIOSAF® tended to also have greater ADG and ADFI than pigs fed only Neo-Terra (P = 0.15). Pigs fed Neo-Terra had greater ADG and ADFI than pigs fed the control diet and the diet containing 0.15 % BIOSAF®, but both ADG and ADFI were similar between pigs fed Neo-Terra and pigs fed 0.3 % BIOSAF. In summary, whereas BIOSAF® fed alone did not significantly improve growth performance over that of control pigs, overall, pigs fed the diet including both Neo-Terra and 0.15 % BIOSAF® had a 16 % improvement in ADG compared to pigs fed the control diet, and a trend for an improvement in ADG compared to the diet containing Neo-Terra without added yeast. Thus, in nursery settings where Neo-Terra will be added, addition of 0.15% BIOSAF® to diets could enhance growth performance. Additional research will be required to determine definitively if a level at or close to 0.3% BIOSAF® can be added to nursery diets to approach growth performance observed with Neo-Terra.

Key Words: Antimicrobials, BIOSAF®, Nursery pigs

188 Effect of milk supplementation with a direct-fed microbial during lactation on subsequent nursery performance.

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A total of 216 pigs were evaluated to determine the effect of pre-weaning milk supplementation with or without a direct-fed microbial (*Lactobacillus brevis*; 1E1) on subsequent nursery performance. At birth, 34 litters received either: 1) no milk supplement, 2) milk supplement devoid of 1E1, or 3) milk supplement with 1E1. At weaning, pigs were blocked by BW within previous lactation treatment groups and allotted to 12 pens/treatment. During the nursery, pigs were fed common Phase 1 (d 0 to 14), Phase 2 (d 14 to 28), and Phase 3 (d 28 to 42) diets. One pig/litter/treatment was euthanized on d -10, d 0 (weaning), and d 5 post-weaning to obtain duodenum, jejunum, and ileum tissue samples for intestinal morphology measurements. On d -10, pigs provided milk supplement with or without 1E1 had longer (P<0.05) jejunal villi than unsupplemented pigs. Pigs provided milk with and without 1E1 had longer (P<0.05) duodenal villi and greater (P<0.05) villus area at weaning than unsupplemented pigs. Pig BW at weaning was greater (P<0.01) with 1E1 supplementation compared to unsupplemented pigs, whereas BW of pigs provided milk tended to be greater (P=0.06) than unsupplemented pigs. From d 0 to 5 after weaning, ADG was greater