

The 21-d experiment employed weanling pigs with an average initial weight of 6.5 kg. There was no effect of diet on average daily gain or average daily feed. However, during the first week of the experiment, CY increased feed conversion compared with NC and PC ($P < 0.05$). PC reduced feed conversion (0.73) compared with NC (0.77), FSM (0.80), CY (0.82) and FSM and CY (0.79; $P < 0.05$). Over the 21-d experiment, CY increased feed conversion (0.69) compared with NC (0.66), PC (0.65) and FSM plus CY (0.66; $P < 0.05$). There was no difference between CY and FSM (0.67; $P > 0.05$). In conclusion, FSM replaced fish meal or part of the soybean meal with no loss in performance, while the use of CY improved feed efficiency.

Key Words: swine, weanlings, fermented soybean meal, candida utilis yeast

204 The influence of the mannan oligosaccharide Bio-Mos® on sow and piglet performance. W. H. Close¹, J. A. Pickard², and K. A. Jacques^{*3}, ¹Close Consultancy, Wokingham, Berkshire, United Kingdom, ²Alltech Inc., Dunboyne, Co. Meath, Ireland, ³Alltech Inc., Nicholasville, KY.

A review of 12 studies has been carried out and a summary prepared on the effects of Bio-Mos® in sow diets on both sow and piglet performance. Bio-Mos® had been included at 1 kg/ton during both gestation and lactation, or 2 kg during late gestation and lactation. The number of sows on the various commercial and university trials in several countries was 2,996 and varied between 24 and 1,028 sows over a range of parities in the different trials. Data were analyzed with Bio-Mos® inclusion as the main effect to determine its impact on sow and pre-weaning piglet performance. Including Bio-Mos® in the diet of the sow did not influence the number of piglets born alive (11.24 vs 11.14) ($P > 0.05$), but the number of piglets weaned was numerically higher in all studies: 10.11 (± 1.09) vs 9.67 (± 0.74) ($P > 0.05$). This increase resulted from a 21.0% decrease in pre-weaning mortality, from 11.56 (± 1.85) to 9.13 (± 1.60)%, respectively ($P < 0.05$). The birth weight of the piglets from sows fed Bio-Mos® was similar to that from control fed sows, but weaning weight was increased from 6.87 to 7.17 kg ($P > 0.05$). However, the difference was significant ($P < 0.05$) in 4 of the studies. Colostrum samples were collected in 5 of the studies and Ig concentrations measured. The concentration of IgA, IgM and IgG (mg/dl) was considerably increased when Bio-Mos® was included in the diet of the sow and in several studies the difference was significant ($P < 0.05$). In 2 studies, piglet growth rate was measured during the first 24 h of life and was increased from 83 to 123 g/day and 138 to 164 g/day, respectively ($P < 0.05$), when Bio-Mos® was included in the diet. The responses to Bio-Mos® in sow diets are therefore consistent, with considerable benefits for both sow and piglet productivity.

Key Words: mannan oligosaccharide, pre-weaning mortality, piglets, sows

205 The effects of Biomin Product A and vomitoxin on growth performance of nursery pigs. H. L. Frobose^{*1}, M. D. Tokach¹, K. Soltwedel², J. M. DeRouchey¹, S. S. Dritz¹, R. D. Goodband¹, and J. L. Nelssen¹, ¹Kansas State University, Manhattan, ²Biomin USA, San Antonio, TX.

A total of 340 barrows (initially 11.6 kg BW and 35 d of age) were used in a 28-d growth trial examining the effects of adding Biomin Product A (Biomin; Herzogenburg, Austria) to diets contaminated with vomitoxin on nursery pig growth performance. Also, 5% water was

added in a diet with Product A as a means of potentially enhancing the activity of the product. Pigs were allotted to pens by weight, and pens were assigned to 1 of 8 treatments in a randomized complete block design. There were 9 pens per treatment and 4 to 5 pigs per pen. Based on initial mycotoxin analysis, dietary treatments were formulated to contain: (1) no vomitoxin or Product A, (2) 1.5 mg/kg vomitoxin and no Product A, (3) 1.5 mg/kg vomitoxin and 0.15% Product A, (4) 1.5 mg/kg vomitoxin and 0.30% Product A, (5) 3.0 mg/kg vomitoxin and no Product A, (6) 3.0 mg/kg vomitoxin and 0.30% Product A, (7) 3.0 mg/kg and 0.45% Product A, and (8) 3.0 mg/kg vomitoxin and 0.45% Product A with 5% water added to the diet. Corn dried distillers grains with solubles containing vomitoxin were used to increase vomitoxin concentrations in the treatment diets. After feed manufacturing, ingredients and diets were analyzed at 2 separate labs. Vomitoxin levels for the low- (1.5 mg/kg) and high- (3.0 mg/kg) vomitoxin diets were determined to average 2.5 and 5.2 mg/kg, respectively. Experimental diets were fed in meal form from d 0 to 21. Overall (d 0 to 21), pigs fed high-vomitoxin diets had decreased ($P < 0.01$) ADG (518 vs 565 g) and ADFI (838 vs 913 g) compared with pigs fed diets lower in vomitoxin concentration. Adding Biomin Product A to vomitoxin diets had no effect ($P \geq 0.24$) on ADG; however, adding Product A to low-vomitoxin diets increased (quadratic, $P < 0.01$) ADFI, resulting in poorer (quadratic, $P < 0.01$) G:F. Furthermore, there were no differences ($P \geq 0.38$) in performance or feed efficiency when 5% water was added. In conclusion, adding Biomin Product A to the diet did not improve nursery pig performance during the 3-week period during which diets containing low or high concentrations of vomitoxin were fed.

Key Words: mycotoxin, nursery, vomitoxin

206 The effects of feed budgeting, complete diet blending, and corn supplement blending on finishing pig growth performance in a commercial environment. H. L. Frobose^{*1}, J. M. DeRouchey¹, D. Ryder², M. D. Tokach¹, S. S. Dritz¹, R. D. Goodband¹, and J. L. Nelssen¹, ¹Kansas State University, Manhattan, ²Feedlogic Corp., Willmar, MN.

A total of 808 pigs (initial BW = 35.6 kg) were used to compare feed-blending strategies for finishing pigs using the FEEDPro system (Feedlogic Corp., Willmar, MN). FEEDPro is a feed dispensing system that can deliver and blend 2 diets while dispensing. There were 10 pens/treatment and 26 to 27 pigs per pen in a completely randomized design. There were 3 experimental treatments: (1) standard 4-phase complete feed program (Phase), (2) blending a high- and low-lysine complete diet (Curve; daily blending of the 2 complete diets to meet the estimated daily SID lys requirement from d 0 to d 88), and (3) blending ground corn and a supplement to mimic diets fed in 4 phases in treatment 1 (Blend). Experimental diets were fed from d 0 to 88 (~35 to 108 kg BW) with a common diet containing ractopamine HCl fed from d 88 to 110 (~108 to 127 kg BW). Overall (d 0 to 110), pigs phase-fed had greater ($P < 0.04$) ADG than pigs fed the curve or the blend. Pigs fed the curve had lower ($P < 0.05$) ADFI than pigs phase-fed or fed the blend. However, pigs fed the curve had improved ($P < 0.04$) G:F compared with the blend. Pigs phase-fed had heavier (95.3 vs. 92.5 kg; $P < 0.03$) HCW than pigs fed the blend and tended to have heavier (95.3 vs. 93.3 kg; $P < 0.07$) HCW than curve pigs. However, there were no differences ($P \geq 0.11$) in percentage yield, percentage lean, fat depth, or loin depth. There were no differences ($P \geq 0.11$) in total revenue or income over feed costs (IOFC). In conclusion, finishing pigs fed the various feeding strategies had differences in growth performance, however revenue and profitability as measured by IOFC was not affected.

Table 1. Effects of feeding method using FEEDPRO on overall performance

Criteria	Phase feeding	Diet blending	Corn-supplement	SEM
ADG, kg	0.86 ^b	0.83 ^a	0.84 ^a	0.008
ADFI, kg	2.51 ^b	2.37 ^a	2.45 ^b	0.027
G:F	0.34 ^a	0.35 ^b	0.34 ^a	0.003
Feed cost, \$	52.38 ^a	50.06 ^b	51.94 ^a	0.467
Revenue/ pig, \$	147.35	145.94	144.87	1.365
IOFC, \$	94.40	95.88	93.45	1.253

^{a,b}. $P < 0.05$.

Key Words: feed blending, growth, carcass characteristics

207 Effect of increasing concentrations of two thermal stable strains of beta-mannanase in corn-soybean meal based diets on individually housed nursery pig performance. Z. Rambo^{*1}, J. Ferrel², D. Anderson², D. Kelly¹, and B. Richert¹, ¹*Purdue University, West Lafayette, IN*, ²*ChemGen Corp, Gaithersburg, MD*.

Forty 8 pigs (initial BW = 5.9 ± 0.01 kg; 20 d age) were used to evaluate the effect of 2 strains of thermal stable β-mannanase enzymes (HTs1 and HTs2), titrated at 3 concentrations in a corn-soybean meal based diets on pig growth, feed efficiency, and overall performance during the nursery period. Pigs were allocated in a randomized complete block design into individual pens, stratified by litter and initial BW, to 7 treatments, with 6 (T1) or 7 (T2-T7) pens/treatment. Dietary treatments were: Negative Control (T1; 3.5, 1.0, and 1.0% added fat phase 1, 2, and 3, respectively), T1 plus enzymes for treatments T2 (HTs2, 0.02 MU/kg), T3 (HTs2, 0.04 MU/kg), T4 (HTs2, 0.06 MU/kg), T5 (HTs1, 0.02 MU/kg), T6 (HTs1, 0.04 MU/kg), T7 (HTs1, 0.06 MU/kg). Pigs were fed 3 dietary phases, a common phase 1 (d 0 to 7) to acclimate from weaning onto dry feed, phase 2 (d 7 to 17), phase 3 (d 17 to 31). Individual BW and feed disappearance were recorded weekly. Phase 2 ADG and G:F numerically improved with increasing concentrations of HTs1 and HTs2. Phase 3 ADG tended to increase (linear, $P < 0.09$) with increasing concentrations of HTs1. Phase 3 ADFI decreased linearly with increasing concentrations of HTs2 ($P < 0.04$) and HTs1 ($P < 0.01$) with G:F tending to improve (quadratic, $P < 0.09$) with HTs1 while HTs2 numerically ($P > 0.16$) improved G:F. Overall, inclusion of HTs2 significantly improved G:F (linear, $P < 0.03$) while HTs1 tended to improve G:F (quadratic, $P < 0.06$) (0.644, 0.679, 0.704, 0.711, 0.723, 0.722, 0.710 ± 0.023, treatments 1–7, respectively). While additional work is needed to precisely define the response surface in relation to dietary composition, the improvements in G:F and gain indicate the enzyme's potential in nursery pig diets. These data also demonstrate minimal differences in the nursery pig performance response between the 2 thermal stable strains of β-mannanase.

Key Words: Beta-mannanase, thermal stable, swine, growth

208 Evaluation of lipid peroxidation level in corn dried distillers grains with solubles (DDGS). R. Song,^{*} A. S. Csallany, and G. C. Shurson, *University of Minnesota, Saint Paul*.

Lipid peroxidation in animal feed has been shown to have a negative impact on health, growth performance and meat quality. The objective of this study was to evaluate the lipid peroxidation level

in DDGS samples from 31 ethanol plants in the US, and the correlation among indicators of lipid peroxidation. An unaltered corn sample was obtained from a corn processing plant to use as a reference. Oils were extracted with hexane and analyzed for thiobarbituric acid reactive substances (TBARS) and peroxide value (PV). Extracted oil from DDGS samples ranged from 7.3 to 12.0% with an average of 10.4%. The TBARS assay was conducted in triplicate for each sample, and results were reported as ng malondialdehyde (MDA) equivalents/mg oil. The TBARS values for DDGS samples ranged from 1.0 to 5.2 ng MDA equivalents/mg oil. The DDGS sample with the highest TBARS value was 25 times greater than that of the reference corn sample (0.2 ng MDA equivalents/mg oil). Peroxide values of DDGS samples ranged from 4.2 to 84.1 mEq/kg oil. The highest PV among DDGS samples was 27 times greater than that of the reference corn sample (3.1 mEq/kg oil). Color of DDGS samples was measured by Minolta L*, a* and b* corresponding to the degree of lightness, redness and yellowness, respectively. The correlations between TBARS, PV, and color were determined using the Corr procedure of SAS. Values of TBARS and PV were positively correlated ($r = 0.81$; $P < 0.0001$). Both TBARS and PV were negatively correlated with L* ($r = -0.73$; $P < 0.0001$, and $r = -0.63$; $P < 0.0002$, respectively) and b* ($r = -0.67$; $P < 0.0001$, and $r = -0.57$; $P < 0.001$, respectively), which means that darker and less yellow colored DDGS is more likely to have a higher lipid peroxidation level, as measured by TBARS and PV, compared with lighter colored DDGS samples. However, a* was not correlated with either TBARS ($P = 0.66$) or PV ($P = 0.97$). These results indicate that color can be a preliminary indicator of lipid peroxidation level in DDGS, but the exact level of peroxidation is more accurately measured by TBARS and PV.

Key Words: DDGS, lipid peroxidation, TBARS, PV

209 Determining the optimum dietary SID isoleucine and valine to lysine ratios in weaned pigs. S. A. Hansen^{*1}, E. L. Hansen², and K. A. Frerichs¹, ¹*Hubbard Feeds Inc., Mankato, MN*, ²*New Fashion Pork, Jackson, MN*.

Dietary SID valine (Val) and isoleucine (Ile) to lysine (Lys) ratios are important to refine due to the commercial availability of L-Val and the variability of specialty proteins. Pigs (FAST X TR4; n = 1008; BW = 5.94 kg) were randomly allotted to 6 dietary treatments, 6 replicate pens/ treatment with 28 mixed gender pigs/pen. Feed disappearance and pig weights were taken on d 5, 16, and 27. A common phase 1 diet was fed d 0 to 5. The negative control (NC) diet in phases 2 and 3 used mostly intact protein sources to meet the desired lysine level (1.4, 1.25% SID Lys, respectively). The positive control (PC) diet was as NC plus added crystalline amino acids to meet the minimum amino acid requirement ratios (1.55, 1.4% SID Lys, respectively). Remaining diets were formulated to the same Lys level as the NC with varying SID Ile and Val:Lys ratios as shown in Table 1. Pigs fed diets formulated to either 0.50 Ile:Lys or 0.65 Val:Lys ratios had improved ADG in phase 2 ($P < 0.05$). This indicates that 0.45 and 0.60 SID Ile and Val ratios were below the requirement in this phase. There were no performance differences for pigs fed 0.55 vs. 0.50 SID Ile:Lys in phase 3. Pigs fed diets containing 0.67 SID Val:Lys had improved ADG over pigs fed a ratio of 0.62 ($P < 0.05$). The SID Ile:Lys ratio for pigs 5–27 d post-weaning is no greater than 0.50. The SID Val:Lys requirement was found to be between 0.65 and 0.67:1.