

Estimates were made from a sub-population for total number of muscle fibers in the semitendinosus muscle. In Exp. 1, 21 d old pigs (n = 22) from sows fed 50 ppm L-carnitine tended to have larger (P < .20) cross-sectional area of the semitendinosus muscle than pigs from control sows. Analysis of newborn pigs (n = 97) in Exp. 2 indicated a larger (P < .01) cross-sectional area and more (P < .10) total muscle fibers in the semitendinosus muscle for pigs from sows fed 50 ppm L-carnitine compared to control sows. This research indicates that sows fed added L-carnitine, possibly due to differences in maternal energy status, could produce offspring with greater muscle fiber diameter and total number of muscle fibers.

	0 ppm	50 ppm	100 ppm	200 ppm
Exp. 1, 21 d-old pigs				
Fibers / mm ²	1,222	1,243	1,428	1,387
Area, mm ²	295	381	244	322
Total muscle fibers	356,712	456,208	375,866	430,089
Exp. 2, 1 d-old pigs				
Fibers / mm ²	3,458	3,481	3,484	3,635
Area, mm ²	144	156	148	129
Total muscle fibers	492,376	524,269	493,318	460,643

Key Words: L-carnitine, Sow, Muscle fiber

158 Supplemental dietary phytase improves bioavailabilities of organic phosphorus and other nutrients in corn-soybean diets for sows. S.K. Baidoo^{*1}, Q.M. Yang¹, R.D. Walker¹, and J.L. Boychuk², ¹SROC, *University of Minnesota, Waseca*, ²BASF (Canada).

Thirty multiparous sows were used to investigate the effects of two dietary inorganic phosphorus regimens on P utilization and performance using corn-soybean meal based supplemented with microbial phytase (Natuphos, BASF) during gestation and lactation. The control diet contained 0.74% P without added phytase and the treatment diet contained 0.54% with added phytase at 500 FTU/kg. Chromic oxide (0.2%) was added to the diets as a marker to determine nutrient digestibility. Blood samples were collected from anterior vena cava at farrowing and weaning to determine inorganic phosphorus in the serum. The digestibility of total phosphorus, organic phosphorus, crude protein and organic matter in the diet with added phytase were, 72.9%, 60.5%, 72.8% and 83.0%, respectively, which was higher (P<.01) than 58.9%, 28.3%, 61.6% and 77.2% in the control diet. Total phosphorus content in the feces of the sows fed diets with phytase decreased by 27.1% compared with the feces of sows fed the control diet (P<.01). The serum inorganic phosphorus (IP) concentrations at farrowing (107.1 and 103.1 mg/L for control and phytase supplemented diets, respectively) were higher (P<.05) than the serum levels of IP at weaning (89.8 and 90.6 mg/l for the control and phytase supplemented diets respectively). The lactation performance of the sows, such as body weight and backfat changes, litter size and litter weight at weaning were not influenced by a reduction in IP with addition of phytase.

Key Words: Sows, Phosphorus, Phytase

159 Replacement value of field peas for soybean meal in sow lactation diets. D.G. Landblom^{*1}, W.W. Poland¹, R.L. Harrold², and K. Miller², ¹Dickinson Research Extension Center, ²North Dakota State University, Fargo.

One hundred ninety-two lactating sows were used to evaluate the effect on sow and litter performance, sow body condition change, milk composition, and days to first estrous when field peas (*Pisum sativum*) replaced 10, 20, and 30% of the dietary soybean meal. Parity and lactation days for the four treatments were 3.10, 3.27, 2.96, and 2.90, and 19.2, 18.7, 19.0, and 19.2 days, respectively. Daily feed intake and calculated metabolizable energy (ME) consumption of 19.3, 20.9, 19.4, and 20.2 Mcal/day were similar across treatments suggesting field pea replacements for soybean meal up to 30% of the diet did not compromise diet acceptance or dietary energy consumption. Sow performance was unaffected by the level of pea grain in the lactation diet, and, as such, lactation sow weight change from farrowing to weaning, and days to first estrous did not differ. Mid-lactation milk composition on d 14 to include milk solids, protein, and fat, and body fat depth change did not differ between the corn/soy control and test diets containing 10 to 30% peas.

Litter performance favored pigs nursing sows receiving the 10% pea test diet. Sows receiving the 10% pea diet weaned more (P<.05), and heavier (P<.05) pigs, and had a numerically greater, but non-significant, increase in pig survival than the corn/soy control and other test diets containing 20 and 30% peas. Results suggest pork producers can effectively use up to 30% field peas as a dietary protein and energy substitute for soybean meal in sow lactation diets without compromising sow performance, milk composition, return to estrous, litter performance, and litter survival rate. The decision for replacing up to 30% of the soybean meal in sow lactation diets with peas would be based on the comparative per unit cost of protein and energy.

Key Words: Sows, Field peas, Lactation

160 Variation in international soybean meal quality. C. M. Grieshop^{*}, A. B. Batal, D. H. Baker, C. M. Parsons, and G. C. Fahey, Jr., *University of Illinois, Urbana*.

Soybean meal (SBM) is a key protein source in monogastric diets worldwide. The nutritional quality of SBM is determined by soybean (SB) cultivar usage, environmental factors, and processing conditions used to prepare the SBM. High, moderate, and low quality SBMs were collected from processors in Argentina, Brazil, China, India, and the United States. In addition a common variety SB sample was collected from each country and converted to SBM under uniform conditions in the U.S. Soybean meal crude protein concentration (% of DM) varied from 59.5 in high quality India SBM to 48.8 in low quality Chinese SBM. Crude protein concentration also varied considerably (47.4 to 58.5% of DM) in SBM produced in the U.S. from international SBs. Argentinean low quality SBM contained the highest concentration of lipid (5.9% of DM) while low quality U.S. SBM contained only (3.2% of DM). Lipid concentration of SBMs produced in the U.S. from international SB ranged from 2.9 to 5.6% of DM. Total dietary fiber concentration was highest in Argentinean moderate quality SBM and U.S. SB processed under uniform conditions. Protein quality of SBM samples was determined using the protein efficiency ratio (PER) assay. Eight-day-old male chicks were fed 10% crude protein diets (as-fed basis), with the only source of protein being the SBM of interest. Chicks fed the high quality U.S. SBM gained faster (P<.05) and had a numerically higher PER (4.1 g wt. gain/g CP intake) than chicks fed any other SBM diet. The results of this study indicate that the nutrient composition and protein quality of soybeans and SBM vary depending on country of origin.

Key Words: Soybean meal, International, Chick PER

161 Use of dry extruded-expelled soybean meal for swine diets. M. J. Webster¹, J. C. Woodworth^{*1}, M. D. Tokach¹, R. D. Goodband¹, J. L. Nelssen¹, S. S. Dritz¹, and N. W. Said², ¹Kansas State University, Manhattan, ²Insta-Pro International, Des Moines, IA.

Two experiments were conducted to determine the effects of different extruder temperatures and meal manufacturers on the feeding value of dry extruded-expelled soybean meal (EESoy) for swine. In Exp. 1, pigs (n=330, 13.2 kg BW) were fed a control diet containing solvent-extracted soybean meal (SBM) or one of five diets containing EESoy extruded at 143.3, 148.9, 154.4, 160.0 or 165.6 °C. All diets were formulated on an equal digestible lysine: ME ratio. From d 0 to 20, ADG was 570, 525, 528, 553, 535, 551 g/d and G/F was 0.61, 0.56, 0.59, 0.60, 0.57, 0.59 for pigs fed either SBM or EESoy with processing temperatures of 143.3 through 165.6 °C, respectively. No differences were observed in ADG or ADFI (P>0.32). However, G/F improved (quadratic, P<0.01) with increasing processing temperature and the greatest improvement was observed at 154.4 °C. In Exp. 2, pigs (n=150, 9.9 kg BW) were used to determine the variation in EESoy supplied from different manufacturers. Pigs were randomly allotted to one of five diets consisting of a negative control diet containing SBM and no added fat (1.1% total lys), three diets containing EESoy from one of three different manufacturers (1.14% total lys), and a positive control diet containing SBM and 3.29% soy oil (1.14% total lys). All diets were formulated to the same lysine:ME ratio (3.31 g/Mcal). Overall, ADG was not influenced by treatment; however, ADFI was greater (P < .005) and G/F was lower (P < .007) for the negative control compared to all other treatments. These experiments suggest that there were no differences in the quality

of EESoy from the commercial manufacturers tested and that processing temperature should be 154.4 °C.

Key Words: Nursery pig, Soybean meal, Processing

162 Grower-finisher growth performance and carcass characteristics including attempts to detect transgenic plant DNA and protein in muscle from pigs fed genetically modified "Bt" corn. T. E. Weber* and B. T. Richert, *Purdue University, West Lafayette, IN.*

A feeding experiment was conducted to demonstrate similar growth performance and carcass quality in grow-finish pigs fed diets containing "Bt" corn as compared to "non-Bt" corn. Bt corn resists the European Corn Borer by expressing the Cry1Ab selective insecticidal protein from *Bacillus thuringiensis*. Pigs (n=180; DeKalb EB x 45; 30 5.2 kg BW) were randomly assigned to one of three dietary treatments: diets containing 1) Bt corn (Bt); 2) the near isogenic control to the Bt corn (NIC); or 3) commingled conventional, non-genetically modified, corn hybrids (CC). The experimental diets were fed in four phases, and were formulated to contain equal percentages of each corn source within each phase. Pig growth rates were similar between corn sources ($P > .10$) at all time points. Barrows had greater overall ADG, ADFI, and lower feed efficiency (G:F) than gilts ($P < .01$). Pigs were harvested at 121 kg and carcass data collected. Pigs fed CC had greater HCW and dressing percentage ($P < .05$) than pigs fed NIC or Bt. Pigs fed NIC had greater 10th rib fat depth than either Bt or CC fed pigs ($P < .05$). Pigs fed the NIC corn had lower predicted percent lean than CC fed pigs ($P < .05$), but similar percent lean to Bt fed pigs. Pigs fed NIC had greater visible loin marbling than CC fed pigs ($P < .05$) and barrows had greater visible loin marbling than gilts ($P < .05$). Gilts had greater loin eye area and less backfat at the 10th and last rib ($P < .05$) and greater predicted percent lean than barrows ($P < .05$). DNA was extracted from loins of 12 pigs fed Bt and 12 pigs fed NIC diets. Southern blot analysis of PCR products was performed to screen for the presence of specific fragments of the cry1Ab and the endogenous corn protein Shrunken-2 (sh-2) genes. None of the extracted DNA samples were positive for cry1Ab or sh-2 genes. Also, using a competitive immunoassay cry1Ab protein was not detected in the extracts of loin samples from pigs fed Bt corn. Results indicate pig growth performance and carcass characteristics are similar in pigs fed diets containing "Bt" or "non-Bt" corn. Furthermore, no evidence of passage of the transgene from the corn to the pigs tissue was found.

Key Words: Bt corn, Pigs, Growth

163 Comparison of two methods to determine DE content of barley for grower pigs. M.N. Casano*^{1,2} and R.T. Zijlstra¹, ¹*Prairie Swine Centre Inc.*, ²*University of Saskatchewan, Saskatoon, Canada.*

The DE content of cereal grains is measured generally in a protein-deficient diet to which pigs have restricted access. The method does not reflect practical conditions and prevents measurement of voluntary feed intake. The DE content of five barley samples was measured using two methods, in a 2x5 factorial arrangement, in 6 blocks of 10 pigs (202.6kg) penned individually. The restricted-standard diet (RSD)-method consisted of a 95.5%-barley mash-diet (2950 kcal DE/kg, 10.1% CP, 0.81 g d Lys/Mcal DE) fed at 3xDE Maintenance requirement for 12 d after a 4-d acclimation. The ad lib-modified diet (AMD)-method consisted of a barley (75%), soybean meal (18%), and canola oil (2%) mash-diet (3165 kcal DE/kg, 16.5% CP, 2.24 g d Lys/Mcal DE) fed with free access for 16 d. Feces were collected on the final 3 d. The ADFI and daily DE intake were higher ($P < 0.05$) in AMD- vs RSD-pigs, resulting in a 260% increase in ADG (851 vs 239 g/d; $P < 0.05$). Likewise, apparent energy digestibility of diets and calculated barley DE were higher ($P < 0.05$) in AMD- (75.1%, 3066 kcal/kg DM) vs RSD-pigs (74.1%, 2999 kcal/kg DM). For DE content, method and barley sample interacted ($P = 0.12$), indicating that barley samples were ranked differently for each method. The DE intake of RSD-pigs was correlated to ADF ($r = -0.92$), NDF ($r = -0.91$), density ($r = 0.84$), and water-holding capacity ($r = -0.78$). In AMD-pigs, ADFI ranged from 1.36 to 1.51 kg/d for d 1 to 8, and from 1.68 to 1.78 kg/d overall, but DE intake was similar ($P > 0.10$) among barley samples. The DE intake of AMD-pigs was correlated to barley DE ($r = -0.82$), particle size ($r = -0.73$), ADF ($r = -0.66$), and NDF ($r = -0.59$). Fiber predicted barley DE content in the RSD- (ADF, $R^2 = 0.61$; NDF, $R^2 = 0.58$; $P < 0.05$) and AMD-method (NDF, $R^2 = 0.66$; ADF, $R^2 = 0.62$;

$P < 0.05$). In summary, an increase in fiber was related to a reduction in DE content of barley and DE intake. Method to analyze DE content affected the measured barley DE content, and voluntary feed intake might differ among barley samples.

Key Words: Pig, Barley, Digestible energy

164 A comparison between feeding plasma and peptide proteins on nursery pig growth performance and intestinal health. C. A. Boren*¹, M. S. Carlson¹, T. L. Veum¹, J. R. Turk¹, and G. W. Tibbetts², ¹*University of Missouri-Columbia*, ²*Alltech Biotechnology, Inc., Nicholasville, KY.*

Two 28-d studies were conducted to evaluate the effectiveness of peptide protein compared to plasma protein fed during the nursery period with and without carbadox on growth performance and intestinal morphology. In Exp.1, 144 pigs (19 2 d of age; 5.72 kg) were weaned and allotted to 3 dietary treatments (containing 50g/ton carbadox) utilizing 8 replications of 6 pigs/pen. In Exp.2, 84 pigs (20 2 d of age; 6.17 kg) were weaned and allotted to 3 dietary treatments (without carbadox) with 7 replications of 4 pigs/pen. The basal Phase 1 (d 1 14) and Phase 2 (d 15 28) diets contained no animal plasma or blood products. Two more diets were made by the addition of either 5 % (Phase 1) or 2.5 % (Phase 2) of animal plasma or peptide proteins (Ultimate Protein 1672). In Exp.1, there was a trend ($P = .08$) for pigs fed plasma protein to have the highest overall ADG with pigs fed peptide protein being intermediate, and pigs fed the control diet having the lowest ADG (392, 378, and 359 g/d, respectively). In Exp.2, pigs fed either plasma or peptide proteins had the highest overall ADG ($P < .004$) when compared to pigs fed the control diet (395, 385, 338 g/d, respectively). In both Exp. 1 and 2, feed intake was improved ($P < .05$) by the addition of either plasma protein or peptide protein during Phase 1, Phase 2 and overall. Duodenal morphology was not different on d 7 or d 14 of Exp. 1 and d 7 or d 28 of Exp.2 ($P > .05$). On d 28 of Exp. 1, pigs fed either peptide protein or animal plasma had reduced crypt depth and total wall thickness ($P < .04$). Also, on d 28, pigs fed the peptide protein diet had decreased ($P = .04$) villous width and a trend for thinner ($P = .09$) lamina propria area compared to pigs fed the control or animal plasma diets. In conclusion, feeding either animal plasma or peptide proteins with or without carbadox post-weaning improved overall pig performance and to a lesser degree intestinal health.

Key Words: Nursery pigs, Peptide proteins, Duodenum

165 Effects of gamma ray and electron beam irradiation levels in spray-dried blood meal on nursery pig performance. J.M. DeRouchey*, J.L. Nelssen, M.D. Tokach, R.D. Goodband, S.S. Dritz, J.C. Woodworth, M.J. Webster, B.J. James, and D.E. Real, *Kansas State University, Manhattan.*

Recent research conducted at our experiment station has shown improved growth performance of nursery pigs that have consumed dried blood products that have undergone irradiation treatment. However, different types and dosage levels of irradiation have not been thoroughly investigated. Thus, 300 weanling pigs (initially 10.7 kg and 17 ± 6 d of age) were used in a 19-d growth assay to determine the effects of increasing levels (2.5, 5.0, 10.0, or 20.0 kGy) of gamma ray or electron beam irradiation of spray-dried blood meal (BM) on nursery pig performance. All pigs were fed the same pelleted SEW and Transition diets to 4 d post-weaning. At d 4, pigs were switched to experimental diets, which included a control diet with no added BM, a diet with 5% regular BM or 5% BM with irradiation treatment. Irradiation treatments included BM subjected to either gamma ray (cobalt-60 source) or electron beam irradiation at increasing dosage levels (2.5, 5.0, 10.0 or 20.0 kGy). All BM used in this experiment was from the same lot. Treatment diets were fed in meal form and formulated to contain 1.40% lysine, 0.90 Ca, and 0.54 available P. Irradiation of BM proved effective in the reduction of aerobic bacteria, *E. coli*, mold, and yeast concentrations. Overall, (d 5 to 19 post-weaning), the inclusion of irradiated BM tended ($P < .09$) to improve feed efficiency (G/F). However, ADG (318 vs 343 g) and ADFI (459 vs 465 g) were similar ($P < .26$) when comparing the nonirradiated versus the irradiated BM treatments. In addition, the inclusion of BM did not improve growth performance over the control diet without BM. These results indicate that irradiation is an effective technology to reduce or eliminate bacteria, molds, and yeast in BM. Increasing the dosage level above 2.5 kGy, regardless of source, did not