

Nonruminant Nutrition: Feedstuffs and Processing

T131 The effects of fermented soy protein in creep diet on growth performance in piglets and backfat loss in lactating sows. B. J. Min^{*1}, O. S. Kwon¹, K. S. Son¹, J. H. Cho¹, Y. J. Chen¹, I. H. Kim¹, S. S. Lee², and W. T. Cho², ¹*Department of Animal Resource & Science, Dankook University, Cheonan, Korea*, ²*Genebiotech Co. Ltd., Korea*.

This study was conducted to evaluate the effects of fermented soy protein in creep diet on growth performance in piglets and backfat loss in lactating sows. Thirty sows (Yorkshire x Landrace x Duroc, 4.52 ± 0.54 parities) and their 344 progenies (average body weight, 2.04 ± 0.11 kg) were used in 21 days (from farrowing to weaning). Piglets were allowed freely consume creep diet and sow's milk after farrowing. Dietary treatments included: 1) FSP0 (no added fermented soy protein), 2) FSP5 (added 5% fermented soy protein as protein source), and 3) FSP10 (added 10% fermented soy protein as protein source). At weaning day (21 d), body weight and weight gain of piglets fed fermented soy protein were increased compared with FSP0 treatment (6.88 and 4.78 vs. 6.28 and 4.36, respectively). However, there were no statistically significant differences ($P > 0.05$). Feed intake was not affected by treatments. Survivability of piglets tended to increase in FSP5 (94.10%) and FSP10 (93.55%) treatments compared with FSP0 (90.98%) without statistically significant differences ($P > 0.05$). In sows, fermented soy protein didn't affect sow's backfat thickness losses from farrowing to weaning. Results suggest that feeding fermented soy protein in piglets may increase the weight gain and survivability.

Key Words: Fermented Soy Protein, Piglets, Growth Performance

T132 Effect of wheat gluten and spray-dried egg protein on growth performance of nursery pigs. H. Yang¹, T. Shipp^{*2}, J. Less³, T. Radke¹, M. Cecava¹, and D. Holzgraefe¹, ¹*ADM Alliance Nutrition, Quincy, IL*, ²*ADM Animal Health and Nutrition, Quincy, IL*, ³*ADM Specialty Feed Ingredients, Decatur, IL*.

Two 26-d trials were conducted to compare the effects of adding wheat gluten (WG) or spray-dried egg protein (SDEP) on nursery performance. In Exp. 1, pigs ($n = 160$; 5.30 kg BW) were blocked by initial weight to one of five dietary treatments (trt), which consisted of: 1) negative control (NC, containing no WG or SDEP), 2) NC + 1.5% WG (Provim ESPTM), 3) NC + 3.0% WG, 4) NC + 6.0% WG, and 5) NC + SDEP (3.0 and 1.5% SDEP in phases 1 and 2, respectively). In Exp. 2, pigs ($n = 70$; 4.32 kg BW) were blocked by initial weight to one of two dietary trts, which were either 3% WG or 3% SDEP. There were seven pens per trt and four or five pigs per pen in both studies. The three phases (P) ended at d 6, 13, and 26. Pelleted treatment diets were fed in P1 and P2, and a common meal diet was fed in P3. Diets contained 1.75%, 1.50% and 1.40% lysine (ideal protein ratio) for P1, P2, and P3, respectively. In Exp. 1, polynomial analysis using trt 1 to 4 found that WG had a cubic effect on ADG ($P = 0.11$) from d 0 to 13 (262, 249, 271, 251, and 252 g/d for trt 1 to 5, respectively) and a quadratic effect on ADG ($P = 0.01$) from d 0 to 26 (415, 435, 449, 419, and 435 g/d for trt 1 to 5, respectively), suggesting 3% WG was the optimal inclusion level. WG linearly improved G/F ($P = 0.05$) from d 0 to 13 (0.95, 0.95, 0.97, 1.00, and 0.90 for trt 1 to 5, respectively) and d 0 to 26 (0.82, 0.84, 0.84, 0.85, and 0.83 for trt 1 to 5, respectively). Statistical contrast between SDEP and the average of the three WG diets indicated that G/F improved for pigs fed WG vs. SDEP from d 0 to 13 ($P < 0.01$). In Exp. 2, pigs fed 3% WG tended to grow faster than pigs fed 3% SDEP (222 vs. 208 g/d; $P < 0.10$) and had a greater G/F (0.83 vs. 0.77; $P < 0.05$) from d 0 to 13 but similar thereafter (data not shown; $P > 0.10$). In summary, data suggest that 3% WG is optimal for performance benefits and that WG may result in better G/F compared with SDEP.

Key Words: Pigs, Wheat Gluten, Egg

T133 Productive performance of early-weaned pigs fed different vegetable protein sources. D. G. Valencia, M. P. Serrano, R. Lázaro, and G. G. Mateos^{*}, *Universidad Politécnica de Madrid, Spain*.

A trial was conducted to test the influence of the inclusion of several vegetable protein sources in the diet on productivity of young piglets (26 to 56 d of age) in the absence of in-feed growth promoters. From 26 to 49 d of age, piglets were fed one of seven experimental diets in which the main difference was the nature of the vegetable protein used; soybean meal 45.2% CP (SBM; average particle size of 883, 400, or 137 μm), full fat soybean 34.9% CP (FFSB; average particle size of 780 or 82 μm), soy protein concentrate 56% CP (SPC), and pea protein concentrate 52.5% CP (PPC). The protein source tested supplied in all cases 5.5% of the total dietary protein. From 49 to 56 d of age, all pigs received a common starter diet based on cereals and soybean meal. Each treatment was replicated five times (six piglets penned together). From 26 to 36 d of age piglets fed the diet with SPC grew faster (267 vs. 242 vs. 214 g/d; $P \leq 0.05$) and had better feed to gain ratio (0.87 vs. 0.92 vs. 0.98; $P \leq 0.05$) than piglets fed diets with FFSB or PPC. Productivity of piglets fed diets containing SBM was intermediate but close to that of piglets fed SPC. Reducing the particle size of SBM or FFSB did not improve piglet performance ($P \geq 0.10$). The differences in productivity observed among treatments disappeared with age and were not significant at 49 d or 56 d of age ($P \geq 0.10$). The reasons for the poor performance observed in piglets fed PPC or FFSB meal for the first ten days of trial are not known but might be related to the high trypsin inhibitor content found in these diets. We concluded that soy protein concentrate is a vegetable protein source of choice for weaning piglets from 26 to 36 d of age. However, in piglets weighing 10 kg or more, the soy protein concentrate can be substituted for soy bean meal or pea protein sources reducing the diet cost.

Key Words: Piglet Performance, Soybean Protein, Pea Protein.

T134 The effect of dietary crude protein level, cereal type and exogenous enzyme supplementation on nutrient digestibility, nitrogen excretion, faecal volatile fatty acid concentration and ammonia emissions from pigs. J. M. O'Connell, J. J. Callan, and J. V. O'Doherty^{*}, *University College Dublin, Ireland*.

A 2 x 2 x 2 factorial was used to investigate the interaction between dietary crude protein (CP) level (220 vs. 160 g/kg), cereal type (wheat vs. barley) and exogenous enzyme supplementation (with or without a glucanase/xylanase mix) on nutrient digestibility, nitrogen (N) balance and manure ammonia emission. Urine and faeces were collected over 7 days from 32 boars (four/treatment, 80.0 kg live weight) that were housed in metabolism crates. There was an interaction ($P < 0.05$) between cereal type and enzyme supplementation in gross energy digestibility (GED) and total faecal volatile fatty acid concentration. Pigs offered the barley diets containing an enzyme had a higher GED and a lower concentration of total faecal volatile fatty acids than unsupplemented barley diets. However, there was no effect of enzyme supplementation in wheat diets. Pigs offered diets containing 220 g/kg CP excreted ($P < 0.05$) more N, urinary N and faecal N than those offered diets containing 160 g/kg CP. Pigs offered barley-based diets excreted less urinary N ($P < 0.05$) and more faecal N ($P < 0.05$) and had a lower N digestibility ($P < 0.05$) than pigs offered wheat based diets. There was a significant 3-way interaction in ammonia emissions from 0 to 240 h ($P < 0.05$). Enzyme supplementation increased ammonia emissions in the barley diet at the 220 g/kg CP level while it had no effect on the wheat diet. However, at the 160 g/kg CP level, enzyme supplementation had no effect on ammonia emissions. In conclusion, it was found that the excretion of pollutants viz. nitrogen, ammonia, and volatile fatty acids could be beneficially affected by reducing dietary CP level and/or by increasing the level of barley in the diet. Enzyme supplementation increased ammonia production in barley diets at 220 g/kg CP.

Key Words: Cereal, Enzyme, Crude Protein

T135 Effect of ground flaxseeds on the performance and carcass traits of finishing pigs. K. Sasaki¹, S. K. Baidoo², and Q. Yang², ¹Akita Prefectural Livestock Experiment Station, Jinguji-aza, Kamioka-machi, Senboku-gun, Akita-ken 019-1701, Japan, ²University of Minnesota, Waseca.

The objective of this study was to determine the effects of dietary supplementation of ground flaxseeds (FS) on the growth performance and carcass traits of finishing pigs. One hundred and twelve pigs (barrow: 71, gilt: 49) with the average body weight at 101 kg were allotted to three dietary treatments, a control (CTL) diet, 5% and 10% ground flaxseed supplemented diets, for the final 4 weeks before slaughter. The pigs were group-fed with eight pigs per pen and five pens (replicates) per treatment. Pigs were allowed access to feed and water ad libitum. Pig weight was recorded at the both of beginning and finishing of the feeding period and the feed consumption was recorded. There was no dietary effect on growth performance. The average daily gain of pigs fed the CTL, 5% and 10% flaxseed diets was, respectively, 994, 1,018 and 988 grams ($P = 0.64$). The gain/feed for the CTL, 5% and 10% flaxseed diets was, respectively, 0.30, 0.31 and 0.30 ($P = 0.38$). The average body weight of pigs fed the CTL, 5% and 10% flaxseed diets was, respectively, 128.8, 129.2 and 128.7 kg ($P = 0.97$) at the end of trial. For the carcass traits, the thickness of back fat for the CTL, 5% and 10% flaxseed diets was, respectively, 21.2, 20.0 and 22.1 mm, and the dressing percentage for the CTL, 5% and 10% flaxseed diets was, respectively, 76.1%, 75.7% and 76.4%. The back fat thickness ($P = 0.13$) and dressing percentage ($P = 0.14$) for the 5% flaxseed added diet tended to be lower than those for the CTL and 10% flaxseed diets. The loin depth for the CTL, 5% and 10% flaxseed diets was, respectively, 7.33, 7.25 and 7.32 cm ($P = 0.78$) and the lean percentage for the CTL, 5% and 10% flaxseed diets was, respectively, 55.2, 55.4 and 55.0% ($P = 0.43$). The carcass grade for the CTL, 5% and 10% flaxseed diets was, respectively, 7.18, 7.14 and 7.18 ($P = 0.99$). In conclusion, feeding ground flaxseed during the last 28 days before slaughter did not affect growth performance or carcass traits in this experiment.

Key Words: Flaxseeds, Performance and Carcass Traits, Finishing Pig

T136 Effect of barley substitution for corn on pigs fed diets containing ractopamine. B. Kremer¹ and B. Zimprich², ¹Elanco Animal Health, Greenfield, IN, ²Ransom County Extension Service, Ransom County, ND.

Numerous studies have shown the effect of ractopamine (RAC; Paylean®; Elanco Animal Health) in pigs fed diets containing corn and soybean meal (SBM) as the primary components. Ractopamine has been shown to increase average daily gain (ADG) and gain:feed (GF). The inclusion of RAC has also been shown to increase the loin muscle area in finishing pigs. This trial was designed to determine if pigs fed RAC in diets that were based on barley and SBM would respond the same as pigs fed corn and SBM based diets. This project was conducted at the North Dakota State University Swine Unit. The pigs were housed in the research room at the swine unit where there were 24 pens that held eight pigs per pen for a total of 192 pigs. Pens were randomly assigned to four treatments: 1) corn-based diet with 10 ppm RAC, 2) corn-based control diet, 3) barley-based diet with 10 ppm RAC, and 4) a barley-based control diet. The diets were formulated to be isocaloric, isonitrogenous, and isolytic. Each diet was formulated to 16% crude protein and 1.05% lysine. The barley diets had vegetable oil added to increase energy levels to be the level of the corn diets. There were no RAC by grain source interactions ($P > 0.10$). Pigs fed RAC had increased ($P < 0.01$) ADG, while pigs fed barley based diets had lower ADG (corn + RAC = 1.02 kg/d, corn control = 0.87 kg/d, barley + RAC = 0.91 kg/d, and barley control = 0.83 kg/d). Ractopamine feeding improved ($P < 0.01$) GF in corn- and barley-based diets. Ractopamine-fed pigs had larger ($P < 0.01$) loin eye areas when pigs received either corn or barley diets. Pigs fed RAC also had increased ($P < 0.01$) dressing percentage on skinned carcasses in both corn and barley diets. Minolta color scores for redness and yellowness were reduced ($P < 0.01$) with RAC feeding; however, there was no effect of RAC on the Minolta color scores for lightness. In summary, pigs fed diets containing barley as the primary cereal grain responded to RAC in similar manner as pigs fed a corn based diet.

Key Words: Ractopamine, Barley, Corn

T137 Condensed corn distillers' solubles in swine liquid feeding: growth performance and carcass quality. J. M. Squire*, C. L. Zhu, E. A. Jeaurond, and C. F. M. de Lange, University of Guelph, Guelph, ON, Canada.

Condensed corn distillers' solubles (CDS), a co-product from the ethanol industry, has become available as feedstuff for swine liquid feeding. CDS has a pH of about 3.5, contains about 28% dry matter, and, on a dry matter basis, 24% protein, 21% fat and 9% ash. Studies were conducted to evaluate the influence of feeding fresh and fermented CDS (fermCDS) on pig growth performance and carcass quality. Optimum fermentation conditions were established previously and involved raising pH to about 6.0, inoculation with *L. acidophilus* and *B. subtilis*, and a minimum of 2 days storage. In a palatability study, it was established that increasing the dietary inclusion level of CDS from 15.0 to 22.5% of diet DM reduced feed intake ($P < 0.05$). In a performance study (23 to 50 kg BW), six pens with 10 pigs per pen were assigned to a corn and soybean meal based diet (control), or diets containing either 15% CDS or 15% fermCDS. Diets were formulated to be similar in DE and digestible amino acid contents. Pigs were fed semi-ad libitum using a Big Dutchman Hydrojet® computerized liquid feeding system. Only pigs on control and CDS were raised to market weight for carcass evaluation. At slaughter, back fat and loin depth were measured using a Hennessy grading probe for estimation of carcass lean yield according to the Canadian pig carcass grading system. Feeding CDS reduced growth rates (898 vs. 952 g/d; SEM, 22) and daily feed intake (1.49 vs. 1.62 g/d; SEM, 0.03) as compared to the control ($P < 0.05$). Pigs on fermCDS had intermediate growth performance (898 g/d gain and 1.61 kg/d intake). Feeding CDS did not impact ($P > 0.05$) carcass dressing percentage (82.6 vs. 82.1%; SEM, 0.3), backfat depth (17.1 vs. 16.6 mm; SEM, 0.4), muscle depth (53.7 vs. 54.3 mm; SEM, 0.8), and estimated carcass lean yield (60.8 vs. 61.1 kg; SEM, 0.2). The feeding value of CDS can be enhanced by controlled fermentation. Feeding CDS slightly reduced pig growth performance, but did not influence routine carcass measurements.

Key Words: Liquid Feeding, Corn Distillers' Solubles, Pig Growth

T138 Ileal amino acid digestibility in wheat dried distillers' grains with solubles fed to growing pigs. Y. Lan*, F. O. Opapeju, and C. M. Nyachoti, University of Manitoba, Winnipeg, MB, Canada.

As dried distillers' grains with solubles (DDGS) derived from wheat become increasingly available in western Canada, there is great interest in evaluating its potential as a feedstuff for pigs. Thus, the apparent, standardized and true ileal crude protein (CP) and amino acid (AA) digestibilities in wheat DDGS were determined. Six finishing pigs (82 kg initial BW) with a T-cannula at the distal ileum were fed a diet containing either wheat DDGS or 5% casein as the sole protein source in a simple crossover design. Chromic oxide (CO, 0.3%) and acid insoluble ash (AIA, 1.0%) were included as digestibility markers. The casein diet was used to estimate endogenous protein and AA losses for determining true digestibilities. Standardized digestibilities were calculated using published basal endogenous protein and AA losses. A 5-d adaptation period was followed by a 12-h digesta collection period each on d 6 and 7. Endogenous flow of CP, Arg, His, Ile, Leu, Lys, Met, Phe, Thr, and Val averaged 24.18, 0.44, 0.43, 0.49, 0.62, 0.57, 0.10, 0.33, 0.94, and 0.62 g/kg DMI, respectively. Ileal digestibilities (mean \pm SD) of CP and AA in wheat DDGS as determined with CO as a marker are shown in the Table. Ileal digestibility values obtained with the AIA as a marker were similar to those obtained with CO ($P > 0.05$). Among the essential AA, the digestibility of Lys was lowest, which suggest its reduced availability, perhaps due to the effects of the drying procedures used in producing the DDGS sample evaluated.

Item	Digestibility measurement		
	Apparent	Standardized	True
CP	64.13 ± 2.53	71.81 ± 3.11	81.14 ± 3.11
Arg	73.01 ± 2.47	82.70 ± 2.86	91.68 ± 3.17
His	68.03 ± 1.35	74.64 ± 2.98	79.03 ± 2.35
Ile	72.71 ± 1.47	79.75 ± 2.54	81.00 ± 2.42
Leu	77.40 ± 1.07	84.92 ± 3.07	83.02 ± 1.68
Lys	35.51 ± 2.94	47.74 ± 5.08	56.96 ± 4.01
Met	70.92 ± 1.65	76.33 ± 3.03	77.06 ± 2.05
Phe	81.77 ± 0.89	89.68 ± 3.03	85.98 ± 1.56
Thr	62.18 ± 2.35	69.61 ± 3.88	78.96 ± 2.65
Val	71.02 ± 1.20	79.04 ± 3.34	79.15 ± 2.37

Key Words: Amino Acid Digestibility, Pigs, Wheat Dried Distillers' Grains with Solubles

T139 True phosphorus digestibility associated with lentils for growing pigs. Z. R. Wang^{*1}, C. B. Yang², Y. Shen³, Y. L. Yin², T. Archbold³, and M. Z. Fan³, ¹College of Animal Science, Xinjiang Agricultural University, Urumqi, Xinjiang, China, ²The Chinese Academy of Sciences, Changsha, Hunan, China, ³University of Guelph, Guelph, Ontario, Canada.

The objectives of this study were to determine true phosphorus (P) digestibility and the endogenous P outputs associated with conventional lentils for growing pigs by using the regression analysis technique. Four barrows, an average initial BW of 22 kg, were fitted with a T-cannula and fed four diets according to a 4 x 4 Latin square design. Four cornstarch-based lentil diets, containing four levels of lentils at 20, 40, 60 and 80%, were formulated. Each experimental period comprised 8 d with 4-d adaptation and 4-d collection of ileal digesta and fecal samples. The apparent ileal and fecal P digestibility values in lentils were affected ($P < 0.05$) by P contents in the assay diets. Linear relationships ($P < 0.05$), expressed as g/kg DMI, between the apparent ileal and fecal digestible P and the total intake of dietary P, suggested that true P digestibility and the endogenous P outputs associated with lentils for growing pigs could be determined by the regression analysis technique. There were no differences ($P > 0.05$) in true P digestibility values (47.2 ± 7.0 vs. $41.9 \pm 6.9\%$) between the ileal and the fecal levels. About 40% of the total P in lentils is digestible in growing pigs.

Key Words: True Phosphorus Digestibility, Lentils, Growing Pigs

T140 Additivity of apparent and true fecal phosphorus digestibility measured in soybean meal, peas, faba bean, corn, oats, broken rice meal, rough rice meal, buckwheat, and sorghum for growing pigs. R. J. Fang^{*1}, K. N. Wang², C. H. Huang¹, J. H. He³, J. R. Wang¹, Y. L. Yin¹, and M. Z. Fan⁴, ¹The Chinese Academy of Sciences, Changsha, Hunan, China, ²Sichuan University of Agriculture, Yaan, Sichuan, China, ³Hunan Agricultural University, Changsha, Hunan, China, ⁴University of Guelph, Guelph, Ontario, Canada.

Two digestion experiments were conducted to determine the apparent and true fecal P digestibility in soybean meal, peas, faba bean, corn, oats, broken rice meal, rough rice meal, buckwheat, and sorghum for growing pigs. In experiment 1, six diets were formulated with the soybean meal (SBM)-based as the basal, and four other diets were substituted with corn, oats, rough rice meal, and broken rice meal at the expense of SBM, respectively. In experiment 2, six diets were formulated with the soybean meal (SBM)-based as the basal, and four other diets were substituted with buckwheat, sorghum, peas, and faba bean at the expense of SBM, respectively. The last diet was a mixture of soybean meal, buckwheat, sorghum, peas, and faba bean. Chromic oxide (0.3%) was used as a digestibility marker in both experiments. Each period lasted for 8 d with a 4-d adaptation to the diets and 4 d of fecal collection. In both experiments, six barrows, with average initial BW of 20.5 ± 2.0 kg, were used and fed

the six diets according to a 6 x 6 Latin square design. The apparent and true fecal P digestibility values in the nine tested ingredients were measured by the substitution method. There were differences ($P < 0.05$) between the directly determined and the predicted apparent fecal P digestibility values in the mixture of the experiment 1 but no differences ($P > 0.05$) between the directly determined and the predicted apparent fecal P digestibility values in the mixture of the experiment 2. However, there were no differences ($P < 0.05$) between the directly determined and the predicted true fecal P digestibility values in both experiments. These results have indicated that true fecal P digestibility values are additive, whereas the apparent fecal P digestibility values measured in single feed ingredients are not always additive in growing pigs.

Key Words: Additivity, Phosphorus Digestibility, Growing Pigs

T141 Nutritional evaluation of sorghum for pigs and broiler chicks. E. K. D. Nyannor^{*1}, S. A. Adedokun¹, B. R. Hamaker², G. Ejeta³, and O. Adeola¹, ¹Purdue University, West Lafayette, IN, ²Purdue University, West Lafayette, IN, ³Purdue University, West Lafayette, IN.

Two experiments were conducted to evaluate three varieties of sorghum (Axtell 4, Axtell 5, and P721N) when compared with corn in the diets of pigs and broiler chicks. In the first study, 12 pigs were fed diets containing 94% sorghum or corn in a 2-period cross-over design to determine total tract or ileal digestibility of nutrients. There was no difference in either ileal or total tract digestibility of percent DM, Energy, P, Ca, or N. A total of 192 broiler chicks grouped by weight into eight blocks of four cages with six birds per cage were used in the second study. Chicks were fed either a corn-soybean or sorghum-soybean diet for 21 d and switched onto diets containing 93% of the corresponding corn or sorghum for 7 d. Weight gain, feed intake and feed efficiencies were not different for the chicks fed either the sorghum-soybean or corn-soybean diets. Total tract digestibility of DM and metabolizable energy (ME) were not different between the corn-soybean and Axtell 4 or Axtell 5-soybean diets but were higher ($P < 0.05$) than the P721N-soybean diet. There was no difference in the P digestibility between corn and Axtell 4 which was also not different from the other two sorghum varieties, Axtell 5 and P721N. Ileal digestibility of DM, energy and P as well as ME were not different in chicks fed the straight grain diets. However, total tract digestibility of DM, energy and P as well as ME of corn was higher ($P < 0.05$) than the three sorghum varieties. Total tract P digestibility of Axtell 4 was better ($P < 0.05$) than P721N but not different from Axtell 5. Sorghum could serve as an excellent substitute for corn in corn-soybean diets for pigs and broiler chicks.

Key Words: Sorghum, Pigs, Broiler Chicks

T142 Amino acid digestibility in dry extruded-expelled soybean meal fed to pigs and poultry. F. O. Opapeju^{*}, C. M. Nyachoti, A. Golian, and L. D. Campbell, *University of Manitoba, Winnipeg, MB, Canada.*

The digestibility of amino acids (AA) in dry extruded-expelled soybean meal (DESB) and regular solvent extracted soybean meal (RSB) was determined in pigs and poultry. In the pig assay, four Cotswold barrows (average initial BW of 80.4 kg) equipped with a T-cannula at the distal ileum were allotted to four semi-purified diets in a 4 x 4 Latin square design. Diet 1, a low protein diet (5% casein), was used to quantify endogenous crude protein (CP) and AA losses. Diets 2, 3 and 4 contained 35% of RSB, sample one of DESB (DESB-1) and sample two of DESB (DESB-2), respectively, as the sole source of protein. The DESB samples were obtained from two different batches. Chromic oxide (0.3%) was included as a digestibility marker in all diets. Apparent and true ileal digestibilities of CP and AA in RSB, DESB-1 and DESB-2 were not different ($P > 0.05$). True ileal lysine digestibility (%) in RSB, DESB-1, and DESB-2 was 91, 88 and 88, respectively. In the poultry assay, four dietary treatments were each assigned to sixty adult cecectomized roosters in a completely randomized design. Treatment 1, a non-nitrogen diet (NND) (90% sucrose and 10% vegetable oil), was used to estimate endogenous AA losses. Treatments 2, 3 and 4 contained RSB, DESB-1 and DESB-2 as the only source of protein.

Each of these diets was tube-fed in 25 g quantities as a mixture with NND formulated to provide 5 g of CP from the respective soybean meal source. Except for Cys, true digestibility (TD, %) values of all AA in RSB and DESB-2 were similar ($P > 0.05$). Compared with DESB-1, TD of AA in RSB was only higher ($P < 0.05$) for Ile (98 vs. 92), Leu (97 vs. 94) and Cys (91 vs. 82). Compared with pigs, TD of Ile, Leu, and Phe in RSB, Val, Leu, Lys and Phe in

DESB-1, and Leu, Lys, Met and Phe in DESB-2, were higher ($P < 0.05$) in poultry than in pigs. The results suggest that CP and AA digestibility in dry extruded soybean meal are comparable to RSB in pigs and that AA digestibility in soybean meal was different for pigs and poultry.

Key Words: Pigs, Poultry, Extruded Soybean Meal

Physiology and Endocrinology II

T143 Daylength induces changes in leptin and leptin receptors gene expression in adipose tissue of lactating dairy cows. U. Bernabucci^{*1}, N. Lacetera¹, L. Basiricò¹, F. Rueca², D. Pirazzi¹, B. Ronchi¹, E. Seren³, and A. Nardone¹, ¹Dipartimento Produzioni Animali, Viterbo, Italy, ²Dipartimento Patologia, Diagnostica e Clinica Veterinaria, Perugia, Italy, ³Dipartimento Morfofisiologia Veterinaria e Produzioni Animali, Bologna, Italy.

Leptin is mainly secreted by adipocytes and is implicated in the regulation of numerous physiological processes. Effects of daylength on adipose tissue gene expression of leptin in ruminants have been studied mainly on sheep, and no information are available on lactating dairy cows. The aim of the present research was to verify the effect of DL on adipose tissue gene expression of leptin and leptin receptors. Four lactating and pregnant Holstein cows were used. The animals were housed in a climatic chamber. The trial lasted 51 d. The first 30 d were used to adapt animals to the new housing conditions. During that period the DL adopted was 12 h light/12 h dark (12/12). The experimental period lasted 21 d. Phase (Ph) 1: 7 d neutral DL 12/12; Ph2: 7 d long DL (18 h light/6 h dark); Ph3: 7 d short DL (6 h light/18 h dark). During the experimental period milk yield and feed intake were recorded, and blood samples were taken. In addition, at the end of each phase, subcutaneous adipose tissue biopsy was carried out. On plasma samples glucose, NEFA and BHBA were determined. Abundance of leptin mRNA, and ObRa and ObRb leptin receptors were determined by ribonuclease protection assay. Daylength did not affect feed intake. Exposure to short DL reduced significantly milk yield ($P < 0.05$). NEFA were slightly reduced by short DL, and glucose and BHBA were not affected by DL. Gene expression of leptin and its receptors were strongly ($P < 0.01$) affected by DL. Both leptin and leptin receptors mRNA increased ($P < 0.05$) with long DL and declined ($P < 0.05$) with short DL. Results of the present study seem to exclude an effect of feed intake and metabolic status on leptin gene expression. A possible direct effect of photoperiod on leptin modulation may be hypothesized in dairy cows.

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Key Words: Leptin, Dairy Cow, Photoperiod

T144 Relationship between serum leptin concentration and BW, feed intake, ultrasound traits and carcass merit of hybrid beef cattle. J. D. Nkrumah^{*1}, C. Hansen¹, D. H. Keisler², C. Li¹, B. Irving¹, Z. Wang¹, and S. S. Moore¹, ¹University of Alberta, Edmonton, Alberta, Canada, ²University of Missouri, Columbia.

Leptin is the hormone product of the obese gene synthesized and secreted predominantly by adipocytes. It functions as a lipostatic signal regulating body weight, food intake, energy expenditure, reproduction and certain immune system functions. This study determined the relationship of serum leptin concentration with BW, DMI, ultrasound traits ($n = 307$) and carcass merit ($n = 243$) of beef cattle sired by Angus, Charolais or Hybrid bulls at the Kinsella Research Station of the University of Alberta. Serum leptin concentration averaged 13.33 (SD = 6.27) ng/ml and ranged from 2.19 to 39.70 ng/ml. Compared to Charolais-sired steers, Angus sired steers, respectively tended to have a higher serum leptin (14.0 ± 0.6 vs. 11.9 ± 0.9 , $P = 0.06$), higher ultrasound backfat thickness (8.90 ± 0.31 vs. 7.01 ± 0.44 , $P < 0.01$) and marbling score (5.30 ± 0.10 vs. 4.62 ± 0.13 , $P < 0.01$). Serum leptin concentration was correlated ($P < 0.05$) with DMI ($r = 0.20$, $P < 0.05$), residual feed intake ($r = 0.15$, $P < 0.05$), mid-point

weight ($r = 0.26$, $P < 0.05$), final BW ($r = 0.25$, $P < 0.05$), ultrasound marbling score ($r = 0.32$) and backfat thickness ($r = 0.45$). Serum leptin was unrelated to ADG or FCR ($P > 0.20$). There were correlations between serum leptin and carcass grade fat ($r = 0.37$, $P < 0.01$), carcass marbling score ($r = 0.25$, $P < 0.01$), lean meat yield ($r = -0.33$, $P < 0.01$) and carcass rib eye area ($r = -0.13$, $P < 0.05$). Ultrasound backfat thickness was correlated with ultrasound marbling score ($r = 0.49$, $P < 0.001$) but not with rib eye area ($r = -0.02$). In addition, carcass grade fat and carcass marbling score were correlated with each other ($r = 0.52$, $P < 0.001$) and were respectively correlated with lean meat yield ($r = -0.90$ and -0.55 , $P < 0.01$) and carcass rib eye area ($r = -0.29$ and -0.21 , $P < 0.01$). These phenotypic associations indicate that serum leptin concentration is related to the body weight, feed intake and body composition of cattle. However, the relationships with body fatness were stronger than those with DMI or BW.

Key Words: Beef Cattle, Carcass Merit, Performance

T145 Failure of short term feed restriction to effect leptin secretion and subcutaneous adipose tissue expression of leptin or long form leptin receptor (Ob-r) in the prepuberal gilt. H. A. Hart^{*1}, M. J. Azain¹, G. J. Hausman², D. E. Reeves¹, and C. R. Barb¹, ¹University of Georgia, Athens, ²USDA-ARS, Athens, GA.

Ovariectomized prepuberal gilts averaging 164 days of age and 79.2 ± 3.8 kg body weight (BW) were either fed to appetite (FA; $n = 6$) or feed restricted (RST; 40% of FA diet; $n = 6$) for 7 seven days to determine the effects of feed RST on serum leptin concentrations, metabolism, leptin, Ob-r and transcription factor expression in subcutaneous back fat (BF). On day 8, blood samples were collected every 15 min for 8 h. Serum concentrations of glucose, T3, T4, NEFA, insulin, and leptin were determined. Real-time PCR was performed on mRNA extracted from subcutaneous adipose tissue collected on day 0 (start RST) and day 9. FA gilts gained ($P < 0.0001$) more BW (8.3 ± 6 kg) than RST (-2.5 ± 6 kg) gilts, however BF thickness did not change. A treatment x time interaction ($P < 0.009$) was detected for serum glucose concentrations. Serum insulin ($P < 0.07$), T3 ($P < 0.08$), and T4 ($P < 0.04$) concentrations were reduced and NEFA levels ($P < 0.05$) were greater during h 1, 6, 7 and 8 in RST gilts compared to FA animals demonstrating a metabolic response to RST. Serum leptin concentrations, leptin pulse amplitude, and leptin pulse frequency were not effected by RST. RST failed to effect subcutaneous BF leptin, Ob-r, AFABP (adipocyte fatty acid binding protein), C/EBP-alpha (CCAAT/enhancer binding protein alpha), or PPAR- gamma 2 (peroxisome proliferator activated receptor gamma 2) mRNA expression compared to FA gilts. These results may in part be related to the failure of RST of this duration to influence subcutaneous BF. Thus, the leptin response to RST may require energy levels and (or) BF reduction reaching a putative inhibitory threshold.

Key Words: Pig, Feed Restriction, Leptin

T146 Sequencing, chromosomal mapping and expression of the bovine deiodinase type II (DIO2) and deiodinase type III (DIO3) genes. E. E. Connor^{*1}, E. C. Laiakis¹, V. M. Fernandes¹, J. L. Williams², and A. V. Capuco¹,