was assigned randomly to two pens, and two pens served as the control, receiving no 25-OHD. A blood sample was collected at harvest for control and all treatment groups. A 2.54-cm loin steak was removed at 48 h postmortem, vacuum packaged, and aged at 2°C to d 6 postmortem. Steaks from one-half of the cattle in each pen were used for measurement of Warner-Bratzler shear force and troponin-T degradation as indicators of muscle tenderness. Average DM intake, ADG, and feed efficiency did not differ ($P > 0.05$) as a result of 25-OHD treatment. The one-time oral bolus of 25-OHD, regardless of time of administration, did not elevate ($P > 0.05$) the calcium concentration of plasma collected at harvest. Warner-Bratzler shear force averaged 4.0 kg among treatments and did not differ ($P > 0.05$) as a result of 25-OHD treatment. The intensity of the 30 kDa protein component of troponin-T degradation was not different ($P > 0.05$) as a result of 25-OHD treatment. Additionally, hot carcass weight, fat thickness, quality grade, yield grade, and longissimus area were not different ($P > 0.05$) as a result of 25-OHD treatment. Administration of a one-time oral bolus of 25-OHD 35, 21, 7, or 4 d before harvest was not sufficient to result in elevated plasma calcium concentration at harvest or in the improved tenderness of the loin steak at 6 d postmortem.

Key Words: 25-Hydroxyvitamin D_3, Beef, Tenderness

863 The effect of antemortem harvest conditions on stress and meat quality in Muskox. A.L. Schaefer*[1], W.M. Robertson[1], J.L. Aalhus[1], J.A. Nagy[2], and B. Elkin[3], [1]*Agriculture and Agri-Food Canada, Lacombe, AB,* [2]*Dept. Resources, Wildlife and Economic Development, Inuvik, NWT,* [3]*Dept. of Resources, Wildlife and Economic Development, Yellowknife, NWT.*

Banks Inland, Northwest Territories supports a large population of muskoxen (Ovibos moschatus). Muskoxen are harvested for subsistence use and for export of meat, quiviut and hides. The purpose of the present study was to examine the impact of harvest conditions (gathered or field shot) on indicies of stress and meat quality. Data are reported from 36 animals from 2 to 4 years of age and represented both males and females. For gathered animals (n=20) the muskoxen were herded from approximately 22 km distance in one day prior to holding overnight in a capture pen. The animals were provided with hay treated with glucose, amino acids and electrolytes in the preslaughter capture pen. The animals were allowed to rest for 12 hours prior to slaughter. For field shot animals (n=16), the muskoxen were located on their natural range and shot within minutes of discovery. Immediately postmortem blood samples were collected into EDTA tubes from which blood smears were prepared and differential white blood cell counts measured. For gathered animals, one carcass side was frozen and one side held at approximately 4 to 5°C for 24 h postmortem. Muscle pH in the longissimus lumborum (LL) was measured at the 12th rib approximately 24 h postmortem. Muscle colour on thawed samples was measured on the longissimus thoracis (LT) at 7 days postmortem. Neutrophile/lymphocite ratios (N/L) in gathered animals averaged 2.17 (0.95 SD) which were higher ($P < 0.01$) than the N/L ratios seen in the field shot animals 0.59 (0.29). Muscle pH also was relatively high in gathered animals averaging 6.59 (0.19). Objective colour in the LT was slightly dark, displaying L*, a* and b* values of 29.52 (2.0), 16.66 (2.56), and 6.26 (1.73), respectively. The data suggest that gathering and lairage can be stressful events for wild muskox with detrimental effects on meat quality attributes.

Key Words: Muskox, Stress, Meat Quality

864 Effect of cooking methods on camel meat quality. I.B. Hashim*, *United Arab Emirates University, Al-Ain, UAE.*

In the Gulf region, during the pre-oil period the camel (Camelus dromedaries) was the main source of food (meat and milk). Due to the socio-economic changes in the United Arab Emirates camel meat is consumed mainly during social ceremonies. Meat of young camels, below 3 years, is comparable in taste and texture to beef. But usually camels are slaughtered at an older age, which results in greater meat toughness. The objectives of the study were to investigate the effect of cooking methods (roasting, braising, grilling and microwaving) on: cooking loss, moisture and fat content, sensory quality (appearance, color, odor, taste, tenderness, and juiciness) and overall acceptance of cooked camel meat. Sixty-four female students were selected to evaluate the cooked meat using 9-point hedonic scale (1=extremely dislike and 9=extremely like). Fat content was not affected ($P > 0.05$) by cooking method. Cooking loss (62.1 and 60.9%) was significantly higher ($P < 0.05$) while moisture content (36.4 and 38.2%) was significantly lower ($P < 0.05$) for grilled and roasted meat, respectively, compared to braising or microwaving. Roasted camel meat was significantly more ($P < 0.05$) juicy (7.8) and tender (7.5) compared to the meat cooked using other cooking methods (5.9 to 6.9 for juiciness) and (6.2 to 6.6 for tenderness). Roasted camel meat had the highest ratings for all sensory attributes, including overall acceptance (7.8), compared to meat cooked using the other methods, and thus, roasting is the best method for cooking camel meat.

Key Words: Camel meat, Cooking methods, Sensory quality

865 Pharmacological modulation of nitric oxide in beef longissimus lumborum causes chemical, not physiological changes to meat quality. J.J. Cottrell*[1,2], F.R. Dunshea[2], and R.D. Warner[1,2], [1]*Victoria University, Werribee, Victoria, Australia.,* [2]*Natural Resources and Environment, Werribee, Victoria, Australia.*

The *longissimus lumborum* (LL) was hot-boned at 25 min postmortem from 42 Hereford or Hereford cross beef carcasses (191 to 244 kg hot carcass weight) and injected with the nitric oxide (NO) donor sodium nitroprusside (SNP) and substrate inhibitors of nitric oxide synthase (NOS) to determine the effect of nitric oxide (NO) on meat quality. Solutions consisting of saline (0 mM), SNP (1, 10 and 100 mM) or the NOS inhibitors (90% L N^g-N-nitro-L-arginine methyl ester hydrochloride and 10% N-nitro-L-arginine, NOS-) (1, 10 and 100 mM) were randomly allocated to each LL and injected 10% w/w in a 2 x 1 cm matrix. Data were analysed using ANOVA within SNP and NOS- treatment concentrations (0, 1, 10, 100 mM). SNP and NOS- did not affect Warner-Bratzler shear force (5.2, 5.1, 6.5, and 5.9, P=0.46 and 5.2, 5.6 and 7.1 kg/cm^2, P=0.227 for 0 and 1, 10 and 100 mM NOS- and SNP) or myofibrillar fragmentation index (76, 83, 72, and 73, P=0.87 and 84, 88, 70 units P=0.65 0 and 1, 10 and 100 mM NOS- and SNP) after 14 d of aging. Meat oxidation, measured by thiobarbituric acid reactive substances (TBARS), was inversely proportional ($P < 0.001$) to SNP concentration (0.071, 0.686, 0.441, and 0.011 g malonaldehyde/kg meat, for 0 and 1, 10 and 100 mM SNP, respectively), while oxidation was unaffected by NOS- in LL aged for 14 days (0.062, 0.082, and 0.179, for 1, 10 and 100 mM NOS-; P=0.11). Since NO is an oxidant it should increase oxidation as seen by the 1mM SNP dose. However doses above 1mM may have resulted in reactions with cyanide, a breakdown product of SNP, thus, reducing the oxidation initiated by NO, and therefore, SNP caused chemical, not NO mediated, effects on meat quality. NOS activity is O_2 dependent and most likely maximally inhibited postmortem. If so, then substrate inhibitors will be unable to further reduce NOS activity. In conclusion, it appears that SNP is not suitable to use as a NO donor in meat because of its degradation to cyanide over time and its reduction of NOS activity in hot-boned beef LL. *Supported in part by Meat and Livestock Australia.*

Key Words: Nitric oxide, Meat quality, Bovine

Nonruminant Nutrition
Nutrient Metabolism and Feed Evaluation or Processing

866 Predicting amino acids in triticale by NIRS and simple regression equations. S. Jaikaran*, E. Prommer, D. Salmon, H. Hsu, and G. Recinos-Diaz, *Alberta Agriculture Food and Rural Development.*

The routine determination of amino acid composition of triticale is of major interest to animal nutritionists who use this data for the precise and accurate formulation of diets for monogastric animals. Chemical analysis for amino acids is labour intensive, costly and produces chemical effluents which are environmentally destructive. In addition, this method destroys the original sample. A new technology for nutrient analysis is available in the form of Near Infrared Spectroscopy (NIRS) which is rapid, cost effective, more accurate, environmentally friendly

(uses no chemicals) and requires less labor input than traditional chemical analysis methods. This study utilized 674 whole grain triticale samples from which 60 were selected by NIRS for chemical analysis using HPLC. The data were used to develop linear regression equations for calculating amino acids from crude protein and to calibrate the NIRSystem 6500 to measure protein, moisture and 18 amino acids in triticale. Regression equations for thirteen amino acids had R2 values of 0.80 and higher while two were between 0.70 and 0.80. Methionine, cystine and tryptophan had the lowest R2; 0.55, 0.59 and 0.55, respectively, with lysine at 0.74. R2 values for NIRS calibrations to predict amino acid content in both whole and ground triticale were slightly better than linear regression equations, being about ten points higher overall.

Key Words: Triticale, Amino acids, Near infrared spectroscopy

867 Evaluation of maternal muscle protein mobilization during lactation in first-litter sows of differing body size. E. J. Clowes*[1], F. X. Aherne[1], A. L. Schaefer[2], and V. E. Baracos[1], [1]*University of Alberta, Edmonton, AB, Canada,* [2]*Agriculture and Agri-Food Canada, Lacombe, AB, Canada.*

Our objective was to predict muscle mobilization in lactating first-litter sows using measures that can be made on live animals in real time. In a 2 x 2 factorial design, 77 Genex gilts were fed to achieve a standard or high body mass at parturition and to lose a moderate (MPL) or high (HPL) amount of muscle in lactation. Muscle mass was determined objectively by carcass cutout at slaughter (d 26) within a few hours of weaning. We measured body weight (BW), and used ultrasound to determine backfat depth (BF), loin muscle area, and loin depth (LD) at three sites throughout gestation and lactation. A chilled half-side of the carcass was divided into the primal cuts (shoulder, loin, ham and belly). The mass of muscle and fat tissue in all primal cuts, except the belly, was measured after dissection. A triceps muscle sample was collected at slaughter to determine various biochemical measures which were also used to formulate the prediction equations for muscle mass. The gestational feeding resulted in two clearly distinct groups of animals with mean body weights of respectively 193 and 165 kg at parturition. The HPL sows lost more ($P < 0.001$) muscle tissue in lactation (-17 vs -24 1.6% muscle mass at parturition) than MPL sows, but fat losses did not differ between treatments (-13% fat mass at parturition). Large losses of muscle protein mass were associated with decreased muscle RNA:DNA ratio ($P < 0.05$), protein:DNA ratio ($P < 0.01$) and muscle protein concentration ($P < 0.01$). The mass of fat ($r^2 = 0.79$) tissue could be predicted from body weight and backfat according to the equation: fat (kg) = -7.75 (2.69) + 0.078 (0.018) BW + 0.762 (0.074) BF. The mass of muscle tissue could be predicted from body weight and backfat alone ($r^2 = 0.83$), however this was improved by the addition of loin-eye area ($r^2 = 0.86$) and protein:DNA ratio ($r^2 = 0.84$). The best prediction of muscle mass was from body weight, backfat depth and loin depth ($r^2 = 0.87$): muscle (kg) = -2.23 (3.66) + 0.303 (0.031) BW + 0.494 (0.123) LD # 0.959 (0.127) BF.

Key Words: Sow lactation, Protein loss, Skeletal muscle

868 Ileal endogenous crude protein and amino acid outputs and true ileal amino acid digestibility values associated with soybean meal are affected by growth stages of pigs. K. Bregendahl*, L. Liu, T. Archbold, and M. Z. Fan, *University of Guelph, Guelph, Ontario, Canada.*

An experiment was conducted to determine distal ileal endogenous CP and AA outputs and true ileal CP and AA digestibility values associated with soybean meal (SBM, 48% CP) for post-weaned pigs by the regression analysis technique and to examine effects of growth stages on the endogenous CP and AA outputs and true AA digestibility values. Four barrows, with average initial and final BW of 7 and 21 kg, respectively, were fitted with a T-cannula at the distal ileum, and fed four cornstarch-based diets according to a 4 x 4 Latin square design. The four diets contained 6.5, 13.1, 19.7, and 26.3% CP (as-fed basis) from SBM, respectively. Chromic oxide (0.4%) was used as an indigestible marker. Each experimental period consisted of 4 d of adaptation and 4 d of ileal digesta collection. Data were compared with results reported in our previous study with growing-finishing (35-79 kg BW) pigs (Fan et al., 1995, J. Anim. Sci. 73:2319-2328) using a two-tailed t-test. The true ileal CP and AA digestibility values (%) of SBM were not different ($P > 0.05$) between post-weaned and growing-finishing pigs with the exception ($P < 0.05$) of Glu (89.8 ± 2.0 vs 88.3 ± 1.4), Leu (92.1 ± 1.5 vs 90.5 ± 0.8), Ser (93.1 ± 1.7 vs 89.2 ± 0.9), Thr (90.6 ± 1.7 vs 86.6 ± 1.2), and Tyr (90.3 ± 2.1 vs 92.7 ± 0.7). The ileal endogenous outputs (g/kg DMI) of CP (10.8 ± 3.0 vs 16.5 ± 2.1), Ala (0.38 ± 0.18 vs 0.59 ± 0.09), Asp (0.59 ± 0.35 vs 0.90 ± 0.18), Glu (0.38 ± 0.95 vs 1.06 ± 0.35), Gly (0.77 ± 0.17 vs 1.17 ± 0.16), Ile (0.33 ± 0.12 vs 0.46 ± 0.08), and Lys (0.17 ± 0.35 vs 0.47 ± 0.10) were lower ($P < 0.05$), whereas Met (0.17 ± 0.05 vs 0.13 ± 0.02) and Phe (0.52 ± 0.23 vs 0.31 ± 0.10) were higher ($P < 0.05$) in post-weaned than in growing-finishing pigs. No effects ($P > 0.05$) of growth stages on the ileal endogenous outputs of Leu, Ser, Thr, and Tyr were observed. In conclusion, distal ileal endogenous CP and AA outputs and true ileal AA digestibility values associated with SBM are affected by the growth stages of pigs.

Key Words: Endogenous outputs, True ileal AA digestibility, Pigs

869 Ileal amino acid digestibilities by pigs fed soybean meal samples from five different countries. K. Karr-Lilienthal*, N. R. Merchen, C. M. Greishop, M. A. Flahaven, and G. C. Fahey, Jr., *University of Illinois, Urbana-Champaign.*

Conditions used in the processing of soybeans (SB) have an effect on digestibilities of amino acids (AA) found in the resultant soybean meal (SBM). This study evaluated SBM from five major SB-producing countries (US, Brazil, Argentina, China, and India). An industry representative in each country collected samples of unprocessed SB, and SBM subjectively determined to be of high, intermediate, and low quality. The SB from each country were processed under uniform conditions to SBM in the US. Five experiments (each examining SBM from one country) were conducted to determine apparent and true AA digestibilities in diets containing these SBM. Pigs were fitted with simple T-cannulas at the terminal ileum and allotted to treatments in Latin square designs. Within each experiment, diets included the respective SBM processed in the US, the high, intermediate, or low quality SBM processed within the country, and a common SBM used as a control. Data from pigs fed a low protein casein diet in each study were used to calculate true AA digestibilities. Within each country comparison, pigs fed the SBM processed in the US had lower ($P < 0.05$) true N and lys digestibilities than pigs fed any of the SBM processed within the country of origin except the US. This indicates that conditions at the US processing plant were not appropriate for SB from other countries. True N and lys digestibilities of the diets containing the high, intermediate, and low quality SBM did not follow expected patterns. There were no differences ($P > 0.05$) in N and lys digestibilities of the different quality SBM from India or Brazil. Pigs fed low quality SBM from the US and China had lower ($P < 0.05$) digestibilities of N and lys than pigs fed the intermediate and high quality SBM from these countries. Pigs fed the low and intermediate quality SBM from Argentina had higher ($P < 0.05$) digestibilities of lys than pigs fed the high quality SBM. These results indicate that differences in digestibilities of AA existed among SBM from these countries, but subjective quality estimations did not accurately reflect these differences.

Key Words: Swine, Soybean meal, Amino acid digestibilities

870 Ileal nutrient digestibilities by pigs fed selected soybean meals. E.L. Propst*, D.M. Albin, M.R. Smiricky, C.M. Grieshop, V.M. Gabert, N.R. Merchen, and G.C. Fahey, Jr., *University of Illinois, Urbana, IL 61801.*

An experiment was conducted to evaluate apparent and true ileal nutrient digestibilities by growing pigs fed soybean meals (SBM) produced from soybeans (SB) collected from the major SB-producing countries and processed under uniform conditions at one location in the United States (US). Seven pigs were surgically fitted with a simple T-cannula at the distal ileum and fed semipurified diets in a 7 x 7 Latin square design. Treatments included five diets containing SBM produced from SB grown in Argentina, Brazil, China, India, or US, and two diets containing either a control SBM or casein. The SB were collected by an American Soybean Association representative located within each country and brought to the US where processing conditions were standardized. All SBM diets were formulated to contain 17% crude protein (CP), excluding the casein diet (4.43% CP), which was used to estimate endogenous nitrogen losses for calculation of true ileal amino acid digestibilities. Apparent and true ileal digestibilities of CP, total essential amino acids (TEAA), total non-essential amino acids (TNEAA), and total amino acids (TAA) were lower ($P<0.05$) for pigs fed diets containing SBM from India SB

compared to all other diets. Conversely, pigs fed the US and control diets had the highest (P<0.05) ileal digestibilities of CP, TEAA, TNEAA, and TAA. Pigs fed SBM from India SB also had the lowest (P<0.05) apparent and true digestibilities of the sulfur amino acids (methionine and cysteine) and threonine, the first- and second-limiting amino acids (AA) in SBM, respectively. The US and control SBM diets had the highest (P<0.05) true digestibilities of methionine and threonine. Oligosaccharide intakes varied (P<0.05) among pigs fed SBM from different countries; however, only raffinose digestibilities were significantly different among diets, with SBM from Brazil SB exhibiting the highest (P<0.05) digestibility. Soybean meals made from SB grown in different regions of the world vary widely in nutrient intakes and digestibility at the ileum of swine.

Key Words: Swine, SBM, Digestibility

871 Effect of dietary L-carnitine and oil supplementation on the metabolic response to handling in finishing pigs. T. M. Bertol*[1,2], M. Ellis[1], D. N. Hamilton[1], and E. W. Johnson[1], [1]*University of Illinois at Urbana-Champaign,* [2]*CNPq-Brazil.*

A study was carried out to evaluate the effect of dietary L-carnitine and oil supplementation on acid-base balance and energy source utilization in slaughter weight pigs. The study was carried out as a 2 x 2 factorial with two levels of L-carnitine (0, 150 ppm) and two levels of oil (0, 5%). Pigs (BW = 91 6.04 kg) were housed in mixed-sex groups of five and had ad libitum access to corn/soybean meal based diets (0.68% digestible lysine, 3340 kcal ME/kg) for three weeks. At the end of the feeding period (BW = 110.4 6.78 kg), pigs were subjected to a standard handling procedure, which consisted of moving the pigs individually through a facility (12.2 x 0.91 m) for eight laps (up and down the facility), using electric prods (2 times/lap). Blood was collected from the jugular vein one h before (to establish baseline values) and immediately after handling. Pigs fed 150 ppm L-carnitine had lower baseline glucose values (83.57 vs 78.48 mg/dL; P < 0.01). Base line values for the 5% oil treatment were higher (P < 0.05) for non-esterified fatty acids (42.26 vs 59.05 μEQ/L) and lower (P < 0.05) for pH (7.39 vs 7.35), and base excess (9.10 vs 5.35 mmol/L). The difference between the baseline and post-handling values suggest that L-carnitine reduced (P < 0.05) the extent of changes in blood pH (-0.28 vs -0.22) and SO_2 (13.16 vs 0.44%), while 5% oil supplementation was associated with a greater increase in SO_2 (-1.14 vs14.74%). There was an interaction (P < 0.05) between oil and L-carnitine for blood glucose and PO_2 levels. In pigs fed diets with 0% oil, there was no effect of L-carnitine on changes in these parameters, however, for the 5% oil treatment changes in blood glucose and PO_2 levels as a result of handling were lower for pigs on the 150 ppm L-carnitine level. In conclusion, dietary supplementation with L-carnitine produced a moderate improvement in blood acid-base balance during handling, whereas oil supplementation had no effect.

Key Words: Acid-base, Finishing swine, L-carnitine

872 Effect of dietary lysine and leucine levels on carcass composition, meat quality, and growth performance in finishing pigs. J. D. Kim*, Y. Hyun, D. N. Hamilton, D. H. Baker, F. K. McKeith, and M. Ellis, *University of Illinois, Urbana.*

The objective of this study was to determine the effect of dietary levels of lysine and leucine on carcass composition, meat quality and growth performance in finishing pigs (73.2±0.77 to 126±1.95 kg live weight). A total of 36 individually-fed barrows were used in a 2×3 factorial with the dietary treatments as follow: 1) Lysine level (Reduced [0.5%] vs Required [0.7%]), and 2) Leucine level (Low [1.0%] vs Moderate [2.0%] vs High [3.0%]). Pigs were given *ad libitum* access to feed and water for a 6 wk-period at the end of which they were slaughtered at a commercial facility and carcass and meat quality measurements obtained. Dietary leucine level had no effect (P > 0.05) on growth performance. Pigs fed diets with 0.7% compared to 0.5% lysine had lower ADFI (4.82 vs 5.12 kg; SE 0.073; P < 0.05), however, there was no effect (P > 0.05) of lysine level on ADG (1.17 vs 1.15 kg; SE 0.035) or G:F (0.24 vs 0.22; SE 0.006). Loin-eye area was increased (43.1 vs 38.8 cm^2; SE 0.72; P < 0.01) and muscle firmness scores were lower (2.0 vs 2.5; SE 0.13; P < 0.05) for pigs fed the Required lysine diet. Dietary leucine level had no effect (P > 0.05) on carcass measurements. There were interactions (P < 0.05) between dietary lysine and leucine level for longissimus marbling and chemical fat content. For pigs fed the Required lysine level, there was no effect (P > 0.05) of leucine level on either marbling (2.5 vs 1.8 vs 1.8 for the Low, Moderate, and High leucine levels, resp.; SE 1.03) or fat content (2.0 vs 2.0 vs 2.1 %, resp.; SE 1.00). However, on the Reduced lysine diet both marbling (2.7 vs 3.7 vs 4.0, resp; SE 1.03) and fat content (2.4 vs 4.4 vs 3.7 %, resp.; SE 1.00) increased (P < 0.05) with increasing dietary leucine level. In conclusion, dietary leucine level increased longissimus fat content in lysine deficient diets but not in lysine-adequate diets.

Key Words: Lysine, Leucine, Meat quality

873 The effect of ractopamine dose and duration of feeding on growth performance and carcass characteristics of finishing pigs. T. A. Armstrong*[1], D. J. Ivers[1], J. R. Wagner[1], D. B. Anderson[1], D. J. Jones[1], W. C. Weldon[1], K. R. Maddock[2], and E. P. Berg[2], [1]*Elanco Animal Health, Greenfield, IN,* [2]*Univ. of Missouri, Columbia.*

A total of 400 Dekalb EB sired barrows were used to evaluate effects of dietary ractopamine (RAC, Paylean®, Elanco Animal Health) concentrations (0, 5, 10, or 20 ppm) and feeding durations (1 to 5 wk) on growth performance and carcass characteristics. Barrows were randomly assigned to pens (5 per pen) based on weight to achieve five weight blocks of 16 pens, representing one to five weeks of feeding. The lightest block averaged 79.8 kg and the heaviest block averaged 103.8 kg at trial initiation, to target an experiment-wide average final slaughter weight of 109 kg. Within each weight block, pens were randomly assigned to a control diet (18.5% CP, 1.13% lysine) containing one of the four dietary concentrations of RAC. Pigs and feeders were weighed weekly, and the weight blocks (80 barrows per block) were sent to a commercial packing plant after 6, 13, 20, 27, or 35d on test. Overall, RAC improved (P < 0.05) ADG during each time period; however, the response was not consistent over time. During each time period, RAC fed pigs had an improved (P < 0.05) gain:feed (G:F), and after 3, 4, and 5 wk of feeding, pigs fed 20 ppm RAC had improved (P < 0.05) G:F compared to lower dietary RAC concentrations. Hot carcass weight (HCW) was increased (P < 0.05) by RAC after 2 to 5 wk of feeding. After 4 and 5 wk, 20 ppm pigs had increased (P < 0.05) HCW compared to pigs fed 5 and 10 ppm, respectively. The NPPC fat-free lean estimate and the 10th rib loin muscle area were increased (P < 0.05) by 10 and 20 ppm RAC after 4 wk and by 20 ppm RAC after 5 wk. Japanese and NPPC color scores and Hunter color values for the fresh loin were not affected (P > 0.05) by RAC. Dietary RAC addition improved ADG, HCW, and G:F, and barrows fed higher RAC concentrations were more efficient at utilizing feed for gain. In addition, feeding RAC for 4 to 5 wk resulted in more consistent carcass results.

Key Words: Ractopamine, Pigs, Pork

874 Apparent ileal amino acid digestibility in sorghum, corn and wheat for growing pigs. B.A. Araiza, M. Cervantes*, S. Espinoza, V.M. González, M. Cervantes, N. Torrentera, and L. Avendaño, *ICA, Universidad Autónoma de Baja California, Mexicali.*

One experiment was conducted to determine the apparent ileal digestibility (AID) of amino acids (AA) in corn, grain sorghum and wheat for growing pigs. Six pigs fitted with cannulas in terminal ileum were used during three experimental periods, according to a replicated 3 x 3 Latin Square design. Pigs were adapted for seven days to the experimental diets, followed by two days of ileal sample collection in each period. The experimental diets were formulated with each of the evaluated cereal grains, and supplemented with vitamins and minerals. Digestibility (%) and grain content (g/kg) of digestible amino acids in corn, grain sorghum, and wheat were: Arginine 80.9, 70.6, 83.9, and 3.6, 2.6, 4.4; Histidine, 82.0, 71.3, 84.0, and 2.3, 1.6, 2.1; isoleucine, 70.6, 68.0, 77,2, and 2.1, 2.4, 2.8; leucine, 80.4, 76.1, 80.6, and 8.4, 8.8, 5.7; lysine, 67.6, 55.3, 73.0, and 1.9, 1.2, 2.3; methionine, 81.3, 74.7, 84.6, and 1.2, 1.0, 1.4; phenylalanine, 77.6, 73.5, 83.4, and 3.3, 3.4, 4.0; threonine, 61.8, 55.7, 67.5, and 2.0, 1.7, 2.2; valine, 73.6, 69.2, 77.3, and 3.5, 3.5, 3.8, respectively. The AID of all the essential AA was higher (P<0.05) in pigs fed the wheat-based diet, as compared with the grain sorghum diet. No difference (P>.10) was found in the AID of arginine, histidine, and leucine, between wheat and corn, but the AID of the remaining essential AA was higher (P<.05) in wheat. Also, the AID of all the essential AA was higher (P<.05) in corn, as compared with grain sorghum. Threonine had the lowest AID values in the three cereals, whereas arginine, histidine, leucine, and methionine had the highest digestibility values.

The content of digestible leucine in corn and grain sorghum, and that of histidine in grain sorghum was higher, as compared with wheat, but the content of the remaining essential AA was higher in wheat. The AID, and the total and digestible content of essential AA suggest that the nutritional value of wheat is from 41 to 92% and from 11 to 27% superior to that of grain sorghum and corn, respectively.

Key Words: Pigs, Cereal grains, Amino acid digestibility

875 Influence of nucleotides and glutamine dietary supplementation on gut health of weanling piglets.

V. Dell'Orto, A. Di Giancamillo, G. Savoini*, R. Paratte, C.M. Domeneghini, and V. Bontempo, *University of Milan, Italy*.

The aim of the experiment was to evaluate the effects of nucleotides and glutamine dietary supplementation on promoting gut growth and health of weanling piglets. Twelve weanling female piglets (21 days old; 5 ± 0.5 kg LW) were grouped three per pen in an environmentally controlled room and fed one of four diets for 28 d. Diet 1 was control diet (C); diet 2 was C + 0.05% nucleotides (N); diet 3 was C + 0.5)% L-glutamine (G); diet 4 was C + N + G (NG). Nucleotides were a combination of nucleosides, nucleotides, and bases (Prosol S.p.A., Bergamo, Italy). Nucleotides and crystalline L-glutamine (Merk, Darmstad, Germany) were mixed into the daily ration of the treated groups. Piglets weight was recorded at the beginning of the experimental diets administration and weekly during the trial. Feed intake of each group was measured weekly. At the end of the trial piglets were sacrificed. The distal ileum and the liver were collected for the histological study, and distal ileum for the histometric examination. In addition, anti-PCNA (proliferating cell nuclear antigen) serum and anti-human macrophage serum were used to analyse ileum immunoreactivity. The treatments did not affect average daily gain (C= 203 g; G= 233 g; N= 214 g; NG= 257 g). Glutamine and nucleotides dietary supplementation significantly affected villus height (C= 147.78 μm; G= 200.26 μm; N= 188.58 μm; NG= 215.00 μm; $P < 0.01$) and cripth depth (C= 80.31 μm; G= 152.47 μm; N= 139.16 μm; NG= 179.79 μm; $P < 0.01$). No difference was observed on macrophage-like activity. Anti-PCNA activity revealed a higher mitotic activity in the ileum of piglets supplemented with nucleotides and glutamine. These data suggest that the inclusion of nucleotides and glutamine to weanling piglet diets has a positive effect on growth and maturation of ileal mucosa.

Key Words: Nucleotides, Glutamine, Piglets

876 Compensatory growth and nitrogen balance in grower-finisher pigs.

J. Fabian*, L. I. Chiba, L. T. Frobish, W. H. McElhenney, D. L. Kuhlers, and K. Nadarajah, *Auburn University, Auburn University, AL*.

A total of 16 castrated male pigs weighing approximately 20 kg were used in two trials to investigate the effect of grower (G) diets [5.0 or 11.0 g lysine (Lys)/kg] on growth performance and nitrogen (N) balance. Common finisher 1 (F1) and 2 (F2) diets were offered when pigs reached approximately 50 and 80 kg, respectively. Pigs were placed in metabolism crates three times (43, 70, and 91 kg for the G, F1, and F2 phases, respectively) for the total collection of feces and urine. There were no diet x trial interactions of interest. Pigs fed the low-Lys grower diet grew more slowly and less efficiently ($P < 0.001$) during the G phase and had more ultrasound backfat ($P < 0.01$) at the end of the G phase than those fed the high-Lys grower diet. During the F1 phase, pigs previously fed the low-Lys diet grew more efficiently ($P < 0.05$) than those fed the high-Lys diet. The G diet had no effect on overall weight gain, carcass traits, lean accretion, or meat quality. At 43 kg, pigs fed the low-Lys diet had less serum urea N ($P < 0.001$), triglycerides ($P < 0.05$) and total protein ($P = 0.07$), and more glucose ($P < 0.01$) than those fed the high-Lys diet. During the G phase, pigs fed the high-Lys diet consumed more N ($P < 0.001$) and had higher N digestibility ($P < 0.05$), retention ($P < 0.001$), and utilization ($P < 0.05$), but they excreted more fecal ($P < 0.05$) and urinary ($P < 0.001$) N than those fed the low-Lys diet. Pigs fed the low-Lys grower diet had greater N utilization ($P < 0.05$) and retention ($P = 0.08$) during the F1 phase, and excreted less ($P < 0.05$) urinary N during the F1 and F2 phases than those fed the high-lysine grower diet. The results indicate that pigs subjected to early amino acid restrictions compensated completely in terms of growth rate and body composition. In addition, restricted pigs exhibited compensatory N retention and reduced N excretion. Compensatory growth can, therefore, have a positive impact not only on the overall efficiency of pig production but also on the environment.

Key Words: Pigs, Amino acid restrictions, Nitrogen balance

877 Effect of a protein source derived from yeast extract on performance and health of weanling piglets.

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The aim of this study was to evaluate the effect of a protein source derived from yeast extract (NuPro^{TM}, Alltech Inc.) on performance and health of weanling piglets. Eighty piglets (Swiss Large White) were assigned by genetics and weight to 16 groups of 5 piglets in a block design with 2 treatments (8 replicates per treatment). The control groups received a barley/wheat/soy/potato protein-based starter diet with 14.0 MJ DE, 17% CP and 1.19% lysine. In the second treatment 4% of the soy was replaced by 4% NuPro^{TM}. Mineral and amino acid concentrations were adjusted to be equal across diets. The piglets averaged 30 days of age and 9.5 kg at the beginning of the 28 day trial. Feed intake, weight gain and FCR were recorded for two 14-day periods. Medical treatments and fecal scores were recorded daily. Data were analyzed by ANOVA. Means were compared using the Tukey-Kramer test. No health-related problems occurred during the trial; and fecal scores were similar between treatments. NuPro^{TM} substitution did not affect weight gain, however there was a trend toward improved feed conversion ($P = 0.051$) (Table 1). Performance data are summarized in table 1.

Table. 1: Effect of yeast extract on performance of weanling piglets.

Parameter		Control	NuPro^{TM}	SE
Feed intake (d1-14)	g	338	345	13.8
Feed intake (d15-28)	g	794	786	22.5
Feed intake (d1-28)	g	566	566	15.1
ADG (d1-14)	g	365	375	15.8
ADG (d15-28)	g	562	570	16.3
ADG (d1-28)	g	414	422	13.5
FCR (d1-14)		1.28	1.26	0.03
FCR (d15-28)		1.42	1.38	0.02
FCR (d1-28)		1.37^{A}	1.34^{B}	0.01

^{A,B} $P < 0.10$

Key Words: Yeast extract, Weanling piglets, Nupro

878 Molecular cloning of a turkey intestinal peptide transporter (tPepT1) and developmental regulation of PepT1 expression in turkey and broiler embryos.

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A cDNA clone encoding a turkey intestinal peptide transporter, tPepT1, was isolated from a turkey small intestinal cDNA library by screening with our chicken PepT1 cDNA probe. The tPepT1 cDNA is approximately 2.9 kb long and encodes a 79.4 kDa protein of 714 amino acids with 12 predicted transmembrane domains. The isoelectric point (pI) of tPepT1 is 5.88, which is much lower than that of PepT1 in chicken (pI = 7.48), rat (pI = 7.39), sheep (pI = 6.57), rabbit (pI = 7.47), and human (pI = 8.58). The amino acid sequence of tPepT1 is 94.3% identical to cPepT1 and 64.9%, 64.6%, 63.4%, and 62.8% identical to PepT1 from rat, sheep, rabbit, and human, respectively. To study developmental regulation of PepT1 in broiler and turkey embryos, 12 Cobb x Cobb broiler embryos (six males and six females) from embryonic d 16 (E16) to the day of hatch (d0) and 12 turkey embryos (six males and six females) from embryonic d 23 (E23) to the day of hatch (d0) were sampled daily. The small intestine was removed, total RNA was extracted, and abundance of PepT1 mRNA was quantified densitometrically from northern blots after hybridization with our full-length cPepT1 and tPepT1 cDNA as probes. An 18s-rRNA cDNA probe was used as an internal control to evaluate the amount of RNA loaded and transferred. In broiler embryos, there was a quadratic increase ($P \leq 0.001$) in cPepT1 mRNA abundance with age. cPepT1 mRNA abundance at d0 was approximately 20-fold that at E16. There was also a quadratic increase ($P \leq 0.001$) in tPepT1 mRNA abundance with age. However, the relative increase in abundance of tPepT1 mRNA from E23 to d0 was much less than in broilers (fivefold vs 20-fold). No differences were observed in PepT1 mRNA abundance between male and female birds. The dramatic increase in PepT1 mRNA abundance in the small intestine of broilers and turkeys from the late embryo stage to day of hatch

indicates that there is developmental regulation of the PepT1 gene and that there may be a crucial role for PepT1 in the neonatal chick and poult.

Key Words: Peptide transporter, Developmental regulation, Small intestine

879 Effect of protein sources on cholesterol and amino acid levels in Pacific white shrimp (*Litopenaeus vannamei*). Zongjia Cheng* and R.W. Hardy, *University of Idaho, Hagerman Fish Culture Experiment Station*.

Shrimp contain higher cholesterol levels in their body compared to most other farm animals. Manipulating dietary protein sources may change cholesterol level in shrimp body. In this experiment, seven diets were made such that diets 1 to 3 contained 25% fishmeal (FM), 25% soybean meal (SBM), and 25% casein (C), respectively. Diets 4 to 7 contained 12.5% FM + 12.5% SBM, 12.5% FM + 12.5% C, 12.5% SBM + 12.5% C, and 8.3% FM + 8.4% SBM + 8.3% C, respectively. All diets contained 0.2% supplemental cholesterol. One hundred eighty-nine shrimp, average body weight 0.57 g, were stocked into twenty-one 60 L tanks with 9 shrimp per tank, and 3 tanks per dietary treatment. Shrimp were fed twice per day to apparent satiation for 4 weeks. After the experiment was terminated, shrimp hepatopancreas were dissected and freeze dried, and cholesterol levels were measured in hepatopancreas and whole body. Average cholesterol levels in hepatopancreas were 2.87, 2.51, 3.26, 2.87, 3.13, 2.86, 3.04 g/100 g, for shrimp fed diets 1 to 7, respectively (P = 0.2743, n = 3). Average cholesterol levels in whole body minus hepatopancreas were 0.81, 0.74, 0.64, 0.71, 0.71, 0.72, 0.72 g/100 g, for shrimp fed diets 1 to 7, respectively (P = 0.0004, n = 3). Results indicated that shrimp fed casein based diets had the lowest cholesterol levels in their body, followed by those fed SBM, and shrimp fed FM based diets had the highest cholesterol levels. There were no significant differences in whole body amino acid levels for shrimp fed diets containing the different protein sources.

Key Words: Cholesterol, Shrimp, Soybean meal

880 Evaluating apparent digestibility coefficients of nutrients in alternative animal protein sources for rainbow trout (*Oncorhynchus mykiss*). Zongjia Cheng* and R.W. Hardy, *University of Idaho, Hagerman Fish Culture Experiment Station*.

Developing alternative protein sources to fishmeal for fish feeds requires a thorough evaluation of all alternatives, including by-products from the rendering industry. In this study, five experimental diets were pelleted with 0.5% chromium oxide as an inert marker. One diet was a casein-gelatin, semi-purified reference diet, which constituted 70% of the other 4 diets to which 4 types of animal protein meals, spent hen meal (SHM), poultry by-product meal (PBM), feather meal (FTM), and spray dried porcine plasma (SDPP), were added. A total of 300 rainbow trout (initial mean body weight 140.8 11.1 g) were stocked into ten 40-L digestibility tanks with 30 fish per tank. Fish were assigned randomly to these five diets. The collection of feces lasted for 2 weeks, feces were collected by the sedimentation technique. Fish were force-fed once daily at 1330 h, tanks were completely cleaned after feeding, and feces were collected the next day at 1300 h. The average apparent digestibility coefficients (ADCs, %) of nutrients in SHM, PBM, FTM, and SDPP were: dry matter, 70.6, 65.1, 80.1, 99.7, respectively (P < 0.0001); crude protein, 87.8, 82.5, 76.6, 99.2, respectively (P < 0.0001); crude fat, 97.7, 79.3, 79.4, 99.2, respectively (P = 0.0008); and gross energy, 74.9, 74.5, 76.9, 98.5, respectively (P = 0.0003). Results showed that significant differences existed in ADCs of nutrients among fish fed diets containing all types of ingredients, and SDPP had the highest ADCs of nutrients.

Key Words: Apparent digestibility coefficients, Alternative animal protein source, Rainbow trout

881 Synthetic lysine and methionine supplementation into distillers dried grain based diets improves growth and feed conversion ratio for rainbow trout *Oncorhynchus mykiss*. Zongjia J. Cheng* and R.W. Hardy, *Hagerman Fish Culture Experiment Station, University of Idaho*.

Commercial trout diets contain high levels of fishmeal and relatively low levels of grain by-products such as distillers dried grain (DDG). DDG has relatively high level of crude protein, good palatability, and is less expensive than fishmeal. In this study, DDG diets were made such that DDG was used to replace 25% (diet 2), 50% (diet 3), and 75% (diet 4) of fishmeal (herring meal) without lysine and methionine supplementation, and to replace 25% (diet 5), 50% (diet 6), and 75% (diet 7) of fishmeal with lysine and methionine supplementation, in rainbow trout diets according to a 2 x 3 factorial design. In addition, a fishmeal diet (diet 1) was used as a control. The control diet contained 30% fishmeal; control and lysine and methionine supplemented diets contained 2.24% lysine, and 0.73% methionine. All diets contained 42% CP and 3600 Kcal DE /kg diet. A total of 630 fish (initial mean BW 49.84 ± 0.05 g) were randomly stocked into twenty-one 150-L tanks with 30 fish per tank and 3 tanks per diet. Fish were fed to apparent satiation 3 times per day and 7 days per week. Diets were pelleted using a CPM laboratory pellet mill. After a 6-week growth period, average weight gain (WG) of fish fed diets 1 to 7 was: 49.0, 43.9, 46.5, 42.9, 51.3, 54.3, and 46.4 g, respectively; average FCR of fish fed diets 1 to 7 was: 1.21, 1.35, 1.25, 1.34, 1.20, 1.11, and 1.29 g feed/g gain, respectively. Survival was > 98% for fish fed all diets. Two-way ANOVA showed that lysine and methionine supplementation improved WG (P = 0.0002) and FCR (P = 0.0011). Results also showed that fish fed DDG diets to replace up to 50% fishmeal on isonitrogenous and isocaloric basis were not significantly different compared to fish fed the fishmeal control diet in terms of WG, FCR, survival (P > 0.05), indicating that DDG could be used at the 15% inclusion rate in trout feed formulations when lysine and methionine were supplemented.

Key Words: Lysine and methionine, Distiller's dried grain, Rainbow trout

882 Apparent digestibility of the nutrients with growing rabbits fed diets with different starch levels and fiber sources. Alex M.V. Arruda*[1], Darci C. Lopes[2], Augusto C. Queiroz[2], Horacio S. Rostagno[2], Walter M. Ferreira[3], Luiz F.T. Albino[2], and Elzania S. Pereira[1], [1]*UNIOESTE Universidade Estadual do Oeste do Parana,* [2]*Universidade Federal de Vicosa,* [3]*Universidade Federal de Minas Gerais*.

The objective of the present study was to evaluate the apparent digestibility of the nutrients of growing rabbits fed diets with different starch levels (averaging 22.00 or 32.00 percent), that was accomplished by using low or high corn grain inclusion and different sources of fiber (alfalfa hay or soybean hulls). Sixty-four New Zealand White rabbits were weaned at 35 days of age, individually housed in metabolism cages and distributed to a complete randomized design in a 2 and 2 (starch level and source of fiber) factorial arrangement with 16 rabbits per treatment. The rabbits were fed with diets in pellets form. No significant effects were observed for the interaction between the starch levels and the sources of fiber (0.05 probability percentage) for the evaluated characteristics. The best apparent digestibility of the nutrients was observed in the diets with high starch level (DM "73.56" ; OM "74.30" ; CP "71.51" ; GE "63.89" ; starch "95.08" ; NDF "45.87" ; ADF "37.78" ; hemicellulose "55.57" and cellulose "39.86" ; in percentage for all parameters), except for the ether extract apparent digestibility. By the way, the best apparent digestibility of the nutrients was observed on diet with soybean hulls as the source of fiber (DM "72.37" ; OM "73.06" ; CP "69.10" ; GE "61.74" ; EE "76.84" ; starch "95.10" ; NDF "47.00" ; ADF "38.42" ; hemicellulose "55.51" and cellulose "42.42" ; in percentage for all parameters). These results suggest that diets with high starch levels or soybean hulls could be efficiently used by New Zealand White growing rabbits.

Key Words: Alfalfa hay, Corn grain, Soybean hulls

883 Performance and carcass characteristics of growing rabbits fed diets with different starch levels and sources of fiber. Alex M.V. Arruda*[1], Darci C. Lopes[2], Augusto C. Queiroz[2], Walter M. Ferreira[3], Horacio S. Rostagno[2], Luiz F.T. Albino[2], Elzania S. Pereira[1], and Aloizio S. Ferreira[2], [1]*UNIOESTE Universidade Estadual do Oeste do Parana,* [2]*Universidade Federal de Vicosa,* [3]*Universidade Federal de Minas Gerais*.

The objective of the present study was to evaluate the performance and the quantity and quality characteristics of the carcass of growing rabbits full fed diets with different starch levels (averaging 22.00 or 32.00 percent), that was accomplished by using low or high corn grain inclusion and different sources of fiber (alfalfa hay or soybean hulls). Forty New Zealand white rabbits were weaned at 35 days of age, individually housed and distributed to a complete randomized design in a 2 and

2 (starch level and source of fiber) factorial arrangement with 10 rabbits per treatment. The rabbits were full fed with diets in the pellets form from 45 to 85 days of age. No significant effects was observed for the interaction between the starch levels and the sources of fiber (0.05 probability percentage) for the evaluated characteristics. A larger feed intake was observed in diets with alfalfa hay ("91.27" grams for day) as a source of fiber, but the weight gain and food conversion was not influenced by the dietary treatments (overall average of "30.18" grams for day and "2.94", respectively). The carcass yield, protein content, and energy and protein efficiency of the carcass was larger for the diets with high starch levels ("50.20" ; "62.36" ; "56.38" and "30.04", respectively, and in percentage for all parameters). The diets with high starch level or with soybean hulls showed a better food conversion and carcass characteristics as a consequence response of a better efficiency in the nutrient utilization.

Key Words: Alfalfa hay, Corn grain, Soybean hulls

884 Caecal microbial activity and caecotrophy nutritional contribution of growing rabbits fed diets with different starch levels and sources of fiber. Alex M.V. Arruda*[1], Darci C. Lopes[2], Walter M. Ferreira[3], Augusto C. Queiroz[2], Horacio S. Rostagno[2], Luiz F.T. Albino[2], Elzania S. Pereira[1], and Aloizio S. Ferreira[2], [1]*UNIOESTE Universidade Estadual do Oeste do Parana,* [2]*Universidade Federal de Vicosa,* [3]*Universidade Federal de Minas Gerais*.

The objective of the present study was to evaluate the caecal microbial activity and caecotrophy nutritional contribution of growing rabbits full fed diets with different starch levels (averaging 22.00 or 32.00 percent), that was accomplished by using low or high corn grain inclusion and different sources of fiber (alfalfa hay or soybean hulls). This was carried out in two experiments. In the first experiment, forty New Zealand white rabbits were weaned at 35 days of age, individually housed and distributed to a complete randomized design in a 2 and 2 (starch level and source of fiber) factorial arrangement with 10 rabbits per treatment. The rabbits were full fed with diets in the pellets form from 45 to 85 days of age. The rabbits were slaughtered and the ileal and caecal contents were collected. A significant effect was observed for the interaction between the starch levels and the fiber sources (0.05 probability percentage) for the total VFA concentration. A VFA concentration of "93.82" mmol/l and "80.03" mmol/l was observed for the diets with high starch level and soybean hulls and diets with low starch level and alfalfa hay, respectively. In the second experiment, forty New Zealand white rabbits were weaned at 35 days of age, individually housed and distributed to a complete randomized design in a 2 and 2 (starch level and source of fiber) factorial arrangement with 10 rabbits per treatment. The rabbits were full fed with diets in the pellets form from 65 to 75 days of age, and subsequently for 48 hours, each animal received a wood necklace. A significant effect was observed for the interaction between the starch levels and the sources of fiber (0.05 probability percentage) for the caecotrophes protein and energy contents. The caecotrophes protein and energy contents of "29.66" percent and "4204.87" kcal for kg and "27.98" percent, "4080.46" kcal for kg was observed for the diets with high starch level and soybean hulls, and diets with low starch level and alfalfa hay, respectively. The diets with high starch level and soybean hulls as a source of fiber promoted a larger enhancement of the caecal contents and the best nutritional support for the growing rabbits.

Key Words: Alfalfa hay, Corn grain, Soybean hulls

885 Hormonal and reproductive performance of young hybrid boars fed rations supplemented with soybean oil as a source of fatty acids. L. D. S. Murgas[1], L. F. Uribe-Velásquez*[2], and E. T. Fialho[1], [1]*Federal University of Lavras-UFLA-Lavras-Minas Gerais-Brazil.,* [2]*University of Caldas-Manizales-Caldas-Colombia*.

Essential fatty acids in the testes could play an important role in the testicular membranes. So, they can influence the testicular hormonal synthesis. An experiment was conducted at the Animal Science Department of Lavras University (UFLA) in order to evaluate the hormonal concentrations and its relation with reproductive performance of young hybrid boars fed with rations supplemented with soybean oil as a source of fatty acids. A total of 36 boars in growing phase (47.3 kg/BW) from AGROCERES-PIC were randomly assigned on the 3 treatments of isoproteic and isoenergetic rations with different levels of linoleic acid (1.5, 2.5 and 3.5%). At age of five months the pigs were submitted to training for semen collection. The blood collection were realized at 47.3, 72.0, 103.0 and 128.7 kg/BW. The plasma was stored at -20°C. Then testosterone and oestradiol were dosaged by RIA. Sexual behavior was recorded in two times. In order to evaluate the reproductive performance, the following records were taken: ejaculation volume, motility and spermatic vigor, spermatic concentration, total number of spermatozoa, percentage of live and dead spermatozoa. The values for testosterone concentration between treatments were: 1.33±0.10; 1.12±0.08; 1.31±0.09 ng/mL for T1, T2 and T3, respectively. The values for oestradiol were: 578.24±78.52 (T1); 465.42±68.38 (T2) and 760.82±77.29 pg/mL. Dietary supplementation of soybean oil as source of fatty acid did not alter hormonal plasma concentrations. It was observed significative linear effect (P<0.01) of weight gain on testosterone and oestradiol plasma levels. The testicular volume showed significative correlation on testosterone (0.79)and oestradiol (0.67). There was no difference for spermatic concentration, total of spermatozoa, spermatic motility and vigor as well as percentage of live or dead spermatozoa between pigs fed with the rations. It would appear that dietary supplementation of soybean oil, as source of fatty acids does not alter reproductive performance and hormonal plasma concentrations of young hybrid boars.

Key Words: Boars, Testosterone, Fatty acids

886 Effect of lipid sources on cholesterol and ω-3 fatty acid levels in Pacific white shrimp (*Litopenaeus vannamei*). Zongjia Cheng* and R.W. Hardy, *University of Idaho, Hagerman Fish Culture Experiment Station*.

Reducing shrimp body cholesterol is of great importance because shrimp contain higher cholesterol levels than most other farm animals. In this study, seven diets were made such that diets 1 to 3 contained 3% fish oil (FO), 3% soy oil (SO), and 3% poultry fat (PF), respectively. Diets 4 to 7 contained 1.5% FO + 1.5% SO, 1.5% FO + 1.5% PF, 1.5% SO + 1.5% PF, and 1% FO + 1% SO + 1% PF, respectively. All diets contained 0.2% supplemental cholesterol. One hundred eighty-nine shrimp, average body weight 0.57 g, were stocked into twenty-one 60 L tanks with 9 shrimp per tank, and 3 tanks per dietary treatment. Shrimp were fed twice per day to apparent satiation for 4 weeks. After the experiment was terminated, shrimp hepatopancreas were dissected and freeze dried, and cholesterol levels were measured in hepatopancreas and whole body. Average cholesterol levels in hepatopancreas were 3.04, 2.96, 2.70, 2.78, 3.04, 3.25, 2.67 g/100 g, for shrimp fed diets 1 to 7, respectively ($P = 0.0869$, $n = 3$). Average cholesterol levels in whole body minus hepatopancreas were 0.76, 0.66, 0.65, 0.69, 0.70, 0.73, 0.72 g/100 g, for shrimp fed diets 1 to 7, respectively ($P < 0.0001$, $n = 3$). Results indicated that shrimp fed SO based diet had the lowest cholesterol level in their body, those fed PF were intermediate, and shrimp fed FO based diet had the highest cholesterol level. Furthermore, significant differences were found in ω20:5 ($P = 0.0047$) and ω22:5 ($P = 0.0014$), but not in ω18:3 ($P = 0.2345$) and ω22:6 ($P = 0.3073$) fatty acid levels in whole body minus hepatopancreas for shrimp fed different lipid sources.

Key Words: Cholesterol, Shrimp, Soy oil

887 Effects of extrusion processing on apparent digestibility coefficients of nutrients in soybeans for rainbow trout *Oncorhynchus mykiss*. Zongjia J. Cheng* and R.W. Hardy, *Hagerman Fish Culture Experiment Station, University of Idaho*.

An experiment was conducted to evaluate the effects of extrusion processing on apparent digestibility coefficients (ADCs) of nutrients in soybeans for rainbow trout. Raw soybeans were either dry extruded of expelled using an Instra-Pro extruder. Raw soybeans, extruded soybeans, and expelled soybeans were mixed with a casein-gelatin reference diet at 3 : 7 ratio to determine the ADCs of nutrients for these ingredients. A total of 240 fish (mean BW 170.8± 5.5 g) were stocked into eight 150-L fish tanks with 30 fish per tank. Duplicate tanks were assigned randomly to each of the 3 diets and the reference diet. Fecal materials were collected by hand-stripping, and the process lasted for 2 weeks. Yttrium oxide (0.01%) was used as an inert marker. The average ADCs (%) of nutrients for raw soybeans, extruded soybeans, and expelled soybeans were: dry matter, 74.5, 73.8, and 75.9 ($P = 0.3829$); crude protein, 88.0, 97.2, and 97.9 ($P = 0.0005$); potassium, 99.6, 99.4, and 99.5 ($P > 0.05$); magnesium, 68.5, 59.6, and 68.0 ($P < 0.0001$); sulfur, 93.1, 97.0, and 97.3 ($P < 0.0001$); total-phosphorus, 21.1, 12.5, and 31.7 (P

< 0.0001); phytate-phosphorus, 29.9, 19.6, and 60.0 (P < 0.0001); copper, 89.9, 93.3, and 92.7 (P > 0.05); manganese, 20.3, 13.5, and 16.8 (P > 0.05); and zinc, 14.6, 7.2, and 15.7 (P > 0.05), respectively. Results showed that the dry extrusion processing improved ADCs of crude protein and S but not other nutrients in soybeans. Expelling processing improved ADCs of crude protein, sulfur, total-phosphorus, and phytate-phosphorus in soybeans. The improved ADCs of crude protein in extruded and expelled soybeans will have an important beneficial effect on fish growth and feed efficiency.

Key Words: Extrusion processing of soybeans, Apparent digestibility coefficients, Rainbow trout

888 Feed intake and performance of swine consuming barley-based diets with low levels of deoxynivalenol (DON) contamination. J.D. House*[1], G.H. Crow[1], D. Abramson[2], and C.M. Nyachoti[1], [1]*University of Manitoba, Winnipeg, MB,* [2]*Agriculture & Agri-Food Canada, Winnipeg, MB.*

The presence of DON in swine feeds has been shown to lead to reductions in feed intake, with subsequent negative impact on performance. The ubiquitous nature of DON in the eastern prairie region of Canada necessitates the development of strategies to cope with this mycotoxin. Of primary importance is the development of regionally-specific models for the determination of the impact of DON-contamination on the performance of improved pig genotypes. To this end, an experiment was designed to determine the impact of low levels of DON on feed intake and growth performance of swine. Cotswold pigs (n = 144, initial age & weight = 61 d, 23.4 kg) were randomly assigned to barley-soybean meal based diets, containing either 0, 1 or 2 ppm DON in the final feed (4 pens, each containing 6 barrows and 6 gilts, per treatment) and formulated to contain 13.4 MJ/kg DE, 16% CP, and 0.81% total lysine. The final DON content of the diets was derived by diluting clean barley (<0.2ppm DON) with DON-contaminated barley (DON = 4.9 ppm). Diets contained barley, soybean meal, vegetable oil and a complete vitamin-mineral premix. The same diets were used throughout the grow-finish period. Feed intake (ADFI; per pen basis; kg/day), body weight gains (ADG; kg/day) and feed intake:gain (FCR) were measured on a weekly basis. As shown in the table below, ADFI, at 2 ppm DON, is depressed by 7.5%, relative to 0 ppm DON, but with only a moderate impact on performance. Future studies are required to determine the impact of higher DON concentrations as well as their impact on carcass merit. Funding: ARDI and Manitoba Pork Council.

	0 ppm DON	1 ppm DON	2 ppm DON	SEM	P value
ADFI (total)	2.21^{a}	2.14^{ab}	2.04^{b}	0.04	0.04
ADG (total)	0.84	0.83	0.80	0.02	0.06
FCR	0.38	0.39	0.39	0.01	0.17
Days to 110 kg	162.9	164.0	165.5	1.8	0.59

Data are presented as lsmeans with standard errors of the mean (SEM). Values with different superscripts are significantly different (P<0.05) by the protected least squares difference procedure.

Key Words: Deoxynivalenol, Swine, Barley

889 Effect of harvest weight on performance and carcass quality of finishing pigs. P. G. Lawlor* and P. B. Lynch, *Teagasc, Moorepark Research Centre, Fermoy, Co. Cork, Ireland.*

The objective of this experiment was to assess the effect of harvest weight on the performance and carcass quality of finishing pigs. Thirty six single sex groups (boars or gilts) of 13 pigs with a mean weight of 39.5 3.3 kg were blocked on sex and weight and assigned at random to the following treatments: (1) harvest at 85 kg LW, (2) harvest at 95 kg LW, and (3) harvest at 105 kg LW. Each treatment group was liquid fed (3.3 kg water/kg feed) 3 times daily using a computerised wet feed system (Big Dutchman, Vechta, Germany). Feed was offered to approximate ad libitum intake. Diet 1 (13.7 MJ of DE/kg, 1.11 % lysine) was offered for 28 days after which diet 2 (13.2 MJ of DE/kg, 0.96 % lysine) was offered to harvest. Pigs were marketed once weekly. Pigs within a group were selected for harvest when they were within 5 kg of the target weight and all pigs in the group were harvested within the following two weeks. Days to slaughter was 62.0, 68.7 and 78.3 days (SEM = 0.81 ; P < 0.001) for treatments 1, 2 and 3. Live weight at harvest was 89.9, 96.2 and 103.2 kg (SEM = 0.66; P < 0.001) and carcass weight was 68.0, 73.6 and 79.2 kg (SEM = 0.56; P < 0.001) for treatments 1, 2 and 3 respectively. Intake was 2099, 2130 and 2154 g/d (SEM = 21.6; P < 0.10) and ADG was 814, 827 and 815 g/d (SEM = 9.3; P > 0.05) for treatments 1, 2 and 3, respectively. Fat depth was 10.9, 11.6, and 12.2 mm (SEM = 0.19; P < 0.001), muscle depth was 55.0, 56.4, 58.6 mm (SEM = 0.70; P < 0.01) and lean meat percentage as estimated by the Hennessy grading probe was 59.5, 59.3 and 59.4 % (SEM = 0.15; P > 0.05) for treatments 1, 2 and 3, respectively. Days to slaughter was 71.5 and 67.8 (SEM = 0.66; P < 0.001) for female and male pigs, respectively. Intake was 2162 and 2094 g/d (SEM = 17.6; P < 0.05) and ADG was 802 and 836 g/d (SEM = 7.6; P < 0.01) for females and males, respectively. Fat depth was 11.6 and 11.6 mm (SEM = 0.15; P > 0.05), muscle depth was 57.7 and 55.6 mm (SEM = 0.57; P < 0.01) and lean meat percentage was 59.7 and 59.1 % (SEM = 0.12; P < 0.01) for females and males respectively. It is concluded that increasing harvest weight does not effect pig performance. However, fat depth and muscle depth increased with increasing slaughter weight.

Key Words: Pigs, Harvest weight, Sex

890 Effect of protein and energy dense diets on feed intake and protein deposition in pigs from 20 to 65 kg bodyweight. A. Roy*[1,2], J.F. Bernier[2], and C. Pomar[1], [1]*Agriculture and Agri-Food Canada, Lennoxville, Quebec, Canada,* [2]*Université Laval, Sainte-Foy, Québec, Canada.*

It is frequently assumed that young pigs (under 50 kg BW) cannot eat enough feed to meet their energy requirements, limiting the expression of their full potential for protein deposition. This experiment was undertaken to investigate if increased levels of energy and protein in diets will affect voluntary feed intake, and protein and lipid deposition. Sixty-three entire males and 63 castrated males (Large White x Landrace) x Duroc weighing 22 ± 3.0 kg were randomly assigned to 9 blocks of 14 animals, 7 of each sex. Within each block, pigs were fed ad libitum one of seven experimental diets. Diets were formulated to contain one of three net energy levels (9.9, 10.8 and 11.5 MJ NE/kg) and one of three balanced protein levels (152, 165 and 178 g/kg). The 10.8 MJ NE/kg with 178 g/kg and 11.5 MJ NE/kg with 165 g/kg energy and protein combinations were omitted. Energy levels were raised by replacing cornstarch by dietary fat. Digestible lysine to balanced protein ratio was kept constant across experimental diets and equal to 8%. Pigs were slaughtered at the end of the experiment at 64 ± 5.7 kg BW. Feed intake decreased (P < .01) while digestible energy intake (MJ DE/d) remained constant when diet net energy level increased. However, net energy intake (MJ NE/d) increased linearly (P < .01) with the net energy content of the diet. This additional net energy tended to increase lipid deposition (P < .10) while protein gain remained unchanged. In contrast, the increase in dietary protein intake decreased protein deposition (P < .05) without affecting lipid deposition. These results indicate that pigs between 20 and 65 kg BW regulate digestible energy intake and that protein deposition does not appear to be limited by energy intake.

Key Words: Pigs, Feed intake, Protein retention

891 Energy of various soybean meal, rapeseed meal and coconut meal in finishing pigs. J. W. Hong[1], I. H. Kim*[1], Y. K. Han[2], J. H. Kim[3], O. S. Kwon[1], S. H. Lee[1], B. J. Min[1], and W. B. Lee[1], [1]*Department of Animal Resource & Science, Dankook University, Cheonan,,* [2]*Feed Res. Inst., National agri. Coop. Fed.,* [3]*Agribrands Purina Korea, Inc., Seoul, Koera.*

Five barrows (average initial body weight 66.4±0.7kg) were used to determine the apparent ileal digestibilities of amino acids, DM, N and energy in various soybean meal, rapeseed meal and coconut meal in finishing pigs. Dietary treatments included 1) KSBM (Korean soybean meal), 2) CSBM (Chinese soybean meal), 3) SSBM (South-American soybean meal), 4) RSM (Rapeseed meal), 5) CNM (Coconut meal). The diets were cornstarch-based and formulated so that each protein source provided the same amount of total ME (4,390 kcal/kg), CP (15.70 %), lysine (1.00 %), Ca (0.80 %) and P (0.60 %). Protein content of the KSBM was higher than the CSBM and SSBM, with all values similar to those expected (NRC, 1998), and protein content of the CNM was lower for the SBM preparation and RSM. The apparent ileal digestibilities of histidine, lysine, threonine, alanine, asparatic acid, cystine, glutamic acid and serine were greater for the KSBM, CSBM, SSBM and RSM than for the CNM (P<0.05). Also, apparent ileal digestibilities of methionine, leucine, phenylalanine, valine and tyrosine were greater for the KSBM

than for the CSBM, SSBM, RSM and CNM (P<0.05). Overall, apparent ileal digestibilities of total essential amino acids were greater for the KSBM than for the CSBM, SSBM, RSM and CNM (P<0.05), and apparent ileal digestibilities of total non essential amino acids was greater for the KSBM, CSBM, SSBM and RSM than for the CNM (P<0.05). No differences in apparent digestibility of DM at the small intestine was observed among the treatments. However, apparent digestibility of DM at the total tract was greater for the KSBM than for the CSBM, SSBM, RSM and CNM (P<0.05). Also, apparent digestibility of N and digestible energy at the small intestine and total tract were greater for the KSBM than for the RSM and CNM (P<0.05).

Key Words: Plant protein source, Ileal digestibility, Pigs

892 Effect of substitution of a corn-soybean meal blend with cull chickpeas on growth performance and carcass traits in pigs. J. F. Obregon*, H. R. Guemez, J. M. Uriarte, G. Contreras, and R. Barajas, *FMVZ-Universidad Autonoma de Sinaloa (Mexico)*.

To determine the effect of substitution of a corn-soybean meal blend with cull chickpeas on performance and carcass traits in pigs, an experiment was conducted. One hundred thirty six pigs (BW = 28.4± 1 kg; York x Land x Hamp x Pietrain) in groups of 10 to 12 were placed in 12 concrete floor pens (2.8 x 6.3 m). In a CRB design, pens were fed one of two diets: 1) Corn soybean meal with 16% CP and 3.3 Mcal of ME/kg (CONT) or 2) CONT but replacement of 14% corn and 6% soybean meal (a 70/30 blend) with 20% of cull chickpeas of the variety Blanco Sinaloa (CHP). Pigs were weighed at days 0, 28 and 77 of the experiment and feed intake was recorded daily; ADG and feed/gain ratio (F/G) were calculated from these data. After 77 days nine pigs from each treatment were killed in a slaughterhouse and carcass traits measured. Body weight at day 28 (43.83 vs 46.22 kg) and d 77 (89.98 vs 91.50 kg) were not affected by treatments (P = 0.41). ADG for d 1 - 28 (0.59 vs 0.60 kg/d), d 29 - 77 (0.94 vs 0.92 kg/d), and d 1 - 77 (0.81 vs 0.81 kg/d) were similar (P = 0.59) between dietary treatments. Feed intake was not modified (P = 0.35) by inclusion of CHP. F/G was not impacted (P = 0.29) during d 1 - 28 (2.66 vs 2.67), d 29 - 77 (2.99 vs 2.89), and d 1 - 77 (2.89 vs 2.83). Hot carcass weight was similar (P = 0.19) and carcass yield was not affected (P = 0.39) by treatments (81.1 vs 82.2%). Back fat was similar (P = 0.50); weight of loin (4.76 vs 4.82 kg) and shoulder (4.98 vs. 5.26 kg) were not affected (P = 0.22) by treatments. The CHP treatment increased (P = 0.04) the weight of leg (7.17 vs 7.82 kg) by 9%. It is concluded, that cull chickpeas can be used up to 20% in diets for pigs substituting for usual feed ingredients as corn or soybean meal without affecting performance and carcass merit.

Key Words: Chickpeas, Growth performance and carcass, Pigs

893 Effect of triticale on nutrient excretion in grow-finish pigs. Amy Lopez*, Walter Owsley, and Lowell Frobish, *Auburn University, Auburn, AL*.

Six crossbred barrows (initial average weight 48 kg) were used in a replicated 2X2 Latin Square designed experiment (α = 0.20) to determine the effects of grain on nutrient excretion. Pigs were housed in stainless steel metabolism crates to allow for collection of urine and feces. Each period consisted of 5 days of acclimation and 5 days of collection. Ferric oxide was added as a visible marker to identify the beginning and end of each collection period. After 2 periods, pigs were moved to conventional pens for 7 days, then returned to metabolism crates for two additional periods. Diet formulations were adjusted to account for changes in daily intake prior to the last 2 periods. The two diets, corn (C) and triticale (T), were formulated to be iso-lysine and iso-phosphorus, and to meet or exceed NRC recommendations. Feed samples were collected at time of mixing and stored for analysis. Fecal samples were collected and frozen hourly, then homogenized and frozen at the end of each period. Urine samples were acidified during collection, and frozen at 12h intervals. Feed and feces samples were analyzed for dry matter, nitrogen, and phosphorus. Data were analyzed using the General Linear Model procedure of SAS. Dry matter excretion (g/d) was greater for pigs fed C than for T (203.1 vs 189.4, P < 0.05.) Nitrogen excretion (g/d) was also greater for pigs fed C (20.6 vs 19.5, P < 0.01.) Nitrogen digestibility was greater for pigs fed T (82.58 vs 78.90%, P < 0.01.) Daily phosphorus excretion was greater for pigs fed C (16.3 vs 15.9 g, P < 0.10.) Fecal phosphorus excretion per kg of phosphorus intake was also greater for pigs fed C (859 vs 809 g, P < 0.01.) Based on the results of this experiment, feeding diets based on triticale to grow-finish pigs may significantly reduce nitrogen, phosphorus and dry matter excretion.

Key Words: Pigs, Excretion, Triticale

894 Comparison of swine performance when fed diets containing Roundup Ready Corn® (event NK603), control, or conventional corn grown during 2000 in Nebraska. R. L. Fischer[1], A. J. Lewis[1], P. S. Miller*[1], E. P. Stanisiewski[2], and G. F. Hartnell[2], [1]*University of Nebraska, Lincoln,* [2]*Monsanto Company, St. Louis, MO*.

This experiment was conducted to evaluate growth performance and carcass quality measurements in growing-finishing pigs fed diets containing either Roundup Ready corn with event NK603 (RR-NK603), a non-transgenic control corn (RX670), or two commercial sources of non-transgenic corn (RX740 and DK647). The experiment used 72 barrows and 72 gilts with an initial BW of 22.6 kg. Pigs were allotted to a randomized complete block design using a 2 × 4 factorial arrangement (two sexes × four corn hybrids). The experiment continued until the average BW was 116 kg, at which time all pigs were slaughtered. Real-time ultrasound measurements of backfat and longissimus muscle area were taken on the final day of the experiment. Carcass quality measurements were taken 24 h postmortem. Average daily gain, ADFI, and feed efficiency (ADG/ADFI) were not affected by diet (P > 0.60), but there was an effect of sex for all growth traits, with barrows having greater ADG (0.96 vs 0.87 kg; P < 0.05) and ADFI (2.53 vs 2.21 kg; P < 0.05) than gilts and gilts having better feed efficiency (0.39 vs 0.38; P < 0.05) than barrows. Real-time ultrasound measurements were similar among diets, however gilts had less backfat (1.83 vs 2.38 cm; P < 0.05) than barrows. Total body electrical conductivity measurements were not affected by diet (P > 0.30), but hot carcass weight was greater (92.11 vs 85.33 kg; P < 0.05) in barrows than gilts. Proximate analysis of longissimus muscle composition showed no effect (P > 0.05) of diet or sex on protein, fat, and water percentages. In summary, there were no differences in growth performance or carcass measurements in growing-finishing pigs fed diets containing either Roundup Ready corn, control corn, or two commercial sources of non-transgenic corn.

Key Words: Carcass measurements, Transgenic corn, Pigs

895 Fermented tuna fish sludge in diets for growing pigs: Intake, gain, and feed efficiency. R. Sanchez, C. S. Santana, A. A. Rodriguez*, V. Siberio, and A. E. Sanjuan, *University of Puerto Rico, Mayaguez Campus, P. R.*

Twenty-four crossbred (Yorkshire-Landrace) growing pigs (19 kg ± 0.57), were allocated to twelve groups (2 pigs/group) to determine the effects of the inclusion of fermented tuna fish sludge (FTFS) in isocaloric and isoproteic diets. The three treatments (4 repetitions) were either a control diet, or diets containing 10 and 20% of FTFS. Feeding was *ad libitum* both in the initial (19 ± 0.57 to 38 ± 1.05 kg BW) and second (38 ± 1.05 to 59 ± 1.86 kg BW) phases. During the initial phase, weekly feed intake was significantly lower for the pigs with the 20% FTFS diet versus both the control and 10% FTFS groups (20.04 ± 1.04 vs. 26.78 ± 1.29 and 30.88 ± 1.29 kg, P=0.002), as was weekly weight gain (6.28 ± 0.43 kg vs. 9.18 ± 0.58, 10.95 ± 0.58 kg, P<0.001), respectively. However, during the second phase weekly weight gains did not differ significantly (9.32 ± 0.75 kg vs. 10.60 ± 0.77 and 11.62 ± 0.75 kg, P>0.05), and the highest weekly feed intake was seen in pigs with the 10% FTFS diet vs. 0 and 20% FTFS levels (50.00 ± 2.00 vs. 42.11 ± 2.06 and 36.82 ± 1.96 kg, P<0.01, respectively). During the entire experimental period, no differences (P>0.05) were found between the control and 10% FTFS treatments for the variables: total feed intake, total weight gain, feed:gain ratio, and days in the experiment. However, pigs eating the 20% FTFS diet reached slaughter weight 16 days later (66 ± 1.82 vs. 50 ± 1.61, P=0.003) and had poorer feed:gain ratio (3.85 ± 0.20 vs. 2.86 ± 0.17, P<0.05) when compared to the control. Total feed intake was significantly higher for the pigs in the 20% FTFS diet (280.43 11.13 kg) vs. the control (217.90 ± 9.85 kg) and 10% FTFS group (235.84 ± 11.13 kg). These results indicate that FTFS can be effectively incorporated at levels up to 10% in commercial diets, but the 20% inclusion level may not be advantageous.

Key Words: Fermented tuna sludge, Growing pigs, Performance

896 Fermented tuna fish sludge in diets for growing pigs: Carcass characteristics. R. Sanchez, C. S. Santana, A. A. Rodriguez*, and V. Siberio, *University of Puerto Rico, Mayaguez Campus, P. R.*

Fermented tuna fish sludge (FTFS) was used as an ingredient in diets for growing pigs to evaluate its effects on carcass characteristics. Twenty-four crossbred (Yorkshire-Landrace) pigs (2 per pen) were assigned to one of three treatments: control (0% FTFS), 10% FTFS and 20% FTFS-containing diets. All diets were fed *ad libitum* and formulated to be isocaloric and isoproteic during the initial (19 ± 0.57 to 38 ± 1.05 kg BW) and second phases (38 ± 1.05 to 59 ± 1.86 kg BW). Pigs were slaughtered when they reached a final mean body weight per pen of 59 ± 1.86 kg. At slaughter, measures of carcass hot weight and yield were taken. After 24 hrs., carcass cold weight,carcass yield and length, weight and yield of principal cuts, and loin eye muscle area (polar planimeter) data were obtained. Backfat thickness was measured in both phases with a lean meter. No significant differences were found for carcass hot weight between treatments. However, the slaughter yield was lower ($P<0.05$) for pigs in the 20% FTFS group when compared to the control group (69.22 vs. 74.96 ± 1.23%, respectively). Carcass cold weight was different ($P<0.05$) between the 10% and 20% FTFS groups (43.47 vs. 39.52 ± 1.16 kg, respectively). No significant differences between treatments were found for the variables: carcass yield and length, weights and yield of principal cuts, loin eye muscle area, and backfat thickness in either phase between treatments. In summary, no adverse effects was seen on the carcass characteristics in the 10% FTFS group, which suggests that FTFS can be incorporated in levels up to 10% in diets for growing pigs.

Key Words: Fermented tuna sludge, Growing pigs, Carcass characteristics

897 Effects of dietary types and levels of fiber on digestive and post-absorptive utilization of dietary nutrients in pigs. Y. Gao, T. C. Rideout*, and M. Z. Fan, *University of Guelph.*

The objective of this study was to examine effects of dietary fiber levels and types on digestive and post-absorptive utilization of dietary crude protein (CP), calcium (Ca), and phosphorus (P) in pigs. Five Yorkshire barrows, initial BW of 24 kg, were fed five experimental diets for five periods according to a 5 x 5 Latin square design. The five diets were corn and soybean meal-based and formulated to contain similar levels of CP, Ca, and P from the same sources and three levels of cellulose, a water-insoluble fiber (12.0, 16.0, and 21.0%) and pectin, a water-soluble fiber (1.6, 6.1, and 10.6%), through supplementing exogenous solkafloc cellulose and apple pectin. Each experimental period lasted 14 d with 10-d adaptation and 4-d collection of fecal samples and total excretion of urine. Partitioned as the percentage of total nutrient intake, urinary loss (32.4-66.9%) was the major route of inefficiency of CP, followed by indigestible fecal loss and the endogenous fecal loss (14-19%). Indigestible fecal loss (39-53% and 42-46%), the endogenous fecal loss (8.5-9.4% and 9.1-10.4%), and the urinary loss (0.6-1.2% and 0.3-0.8%) were the major routes of Ca and P losses and inefficiency, respectively. Compared to the low cellulose and pectin levels (12% NDF, 1.6% pectin), high level (21%) of cellulose intake decreased ($P \leq 0.05$) CP digestibility and retention, whereas the intermediate (6.1%) and high (10.6%) levels of pectin intake improved ($P \leq 0.05$) CP retention through reducing ($P \leq 0.05$) urinary N losses. Dietary levels of both insoluble and soluble fiber had no effects on Ca (47.5-61.7%) or P (54.5-57.7%) retention. In conclusion, dietary levels and types of fiber intake have differential effects on nutrient utilization in pigs.

Key Words: Dietary fiber, Nutrient utilization, Pigs

898 A technique for endoscopic insertion of a percutaneous endoscopic gastrostomy tube in swine. J.S. Radcliffe*[1], J.P. Rice[1], and R.S. Pleasant[2], [1]*Purdue University, West Lafayette, IN,* [2]*Virginia-Maryland Regional College of Veterinary Medicine, Blacksburg, VA.*

A technique was developed using nine crossbred barrows (39 kg BW) for inserting percutaneous endoscopic gastrostomy (PEG) tubes to allow for continuous monitoring of gastric pH. Feed and water was withheld 12h prior to surgery. Anesthesia was induced with and i.m. injection of medetomadine (80 μg/kg BW), ketamine (10 mg/kg BW), and butorphanol (10 mg/kg BW). Pigs were laid in right lateral recumbency, and an endoscope was advanced through the mouth and esophagus, into the stomach. The stomach was insufflated and a 1 cm incision was made through the skin and subcutaneous tissue, ventral to the 10th intercostal space. An ultrasound was used to verify that no portion of the spleen or intestines was present between the abdominal wall and the stomach. An 18 gauge Seldinger needle was passed through the skin incision and used to puncture the body and stomach walls. The inner stylette of the needle was removed and a flexible guide wire was inserted through the lumen of the needle. One end of the guide wire was grasped using an endscopic snare and retracted from the stomach, esophagus and mouth. The other end of the guide wire remained exteriorized through the abdominal wall. A 28 french gastrostomy tube and dilator assembly were attached to the guide wire. Tension was placed on the end of the guide wire that remained exteriorized through the abdominal wall. This advanced the PEG tube through the mouth, down the esophagus, and into the gastric lumen. The dilator assembly helped facilitate exteriorization of the PEG tube through the stomach and body walls. An exterior retention sleeve was used to hold the PEG tube in place. All nine surgeries were successful and all pigs were used in a 12-wk experiment. At the end of the experiment, all pigs were killed and necropsied to assess post-surgical complications. No complications were observed. PEG tubes were located between the body and antral regions of the stomach, approximately equi-distant from the greater and lesser curvature. This technique is far less invasive and requires less time than other surgical techniques designed to access the gastric lumen.

Key Words: Pig, Gastrostomy, Endoscopy

899 Dry post-pellet application of heat-labile dry products to livestock diets. J. L. Pierce*, C. A. Moran, and A. E. Sefton, *Alltech, Inc., Nicholasville, KY.*

Enzymes and bacteria currently available will not completely survive the conditioning associated with pelleting and extrusion of feeds for livestock and poultry. To overcome this, post-pelleting application techniques have been used in recent years. The most successful application method to-date is liquid spray. However, there are many disadvantages to liquid sprays such as the effects of low temperature on liquids, clogging of spray nozzles, and calibration of minute amounts of liquid onto relatively large volumes of feed. A study was undertaken at a commercial feed mill to evaluate Allzyme Koji Phytase (Alltech, Inc., Nicholasville, KY) and bacterial adhesion to pelleted feed. The test material contained 1000 PU/g of phytase activity and 5.7 $\log_{10}$ cfu *Lactobacillus plantarum* /g. It was applied immediately after fat coating into a screw conveyor at a rate of 250 g/min. Feed flow was approximately 15 tonne/h. Ten replicate samples were taken at each of three treatment locations: 1, complete feed (CF) in a storage bin; 2, screened pellets from load out (LO); and 3, fines screened from load out. The feed contained 1.3% fines. Phytase activity (PU/kg) and CV (%) were 1770, 21; 1979, 13; and 2209, 2 for each location, respectively. Phytase adhered equally well to the screened LO feed as the complete feed ($P = .16$). Fines had more phytase activity than either the CF or LO ($P < .05$), however, that only represented 1% of total activity. *L. plantarum* counts ($\log_{10}$ cfu g-1 CF, LO and F respectively) were 5.79, 5.82 and 6.33; SE = 0.09. *L. plantarum* counts in the CF and LO did not differ. Furthermore, bacterial product recovery was considered to be 100%. A higher recovery was identified in the fines ($P=.01$) due to the greater surface area available. Based on these findings, it is anticipated that a variety of other important, heat-labile, feed additives may be applied to pelleted or extruded feeds with this technology.

Key Words: Phytase, Feed, Bacteria

900 The effect of pearling on the removal of deoxynivalenol (DON) from hulled barley. J.D. House*[1], C.M. Nyachoti[1], and D. Abramson[2], [1]*University of Manitoba, Winnipeg, MB, Canada,* [2]*Agriculture and Agri-Food Canada, Winnipeg, MB, Canada.*

The contamination of cereal grains with the mycotoxin deoxynivalenol (DON) presents a challenge to swine producers due to its anorectic effects when present in excess of 1 ppm in the diet. Effective strategies for the removal of DON from grains are critical, especially in regions where this mycotoxin is endemic. To this end, studies were conducted to test the following alternate hypothesis: The removal of the hull fraction of

DON-contaminated barley will reduce the DON content of the grain, thereby increasing its value as a feedstuff for swine. One hundred gram samples of hulled barley, with varying DON concentrations (4.8, 9.8, & 21.1 ppm), were subjected to an abrasive-type dehulling procedure, using a Strong-Scott pearling machine, for 0, 15, 30, 45, 60, 75, 90, 105, & 120 seconds (n=4 per time point per barley sample). Following the prescribed pearling times, the remaining grain fractions were analyzed for weight remaining (%), DON (ppm), crude protein (%CP), neutral detergent fibre (%NDF), ash (%ASH), gross energy (GE; kcal/kg), and calculated digestible energy values (DE; kcal/kg). Following the initial 15 seconds of pearling, 85.0±0.2 (lsmean±SEM)of the grain mass remained. Additional pearling resulted in a linear decline of 4.5% of grain mass per 15 seconds. The initial 15 seconds of pearling reduced the DON content of the grain to 34.0±0.7 % of the orginal value, irrespective of the initial level of contamination (ppm). Additionally, the initial 15 seconds of pearling produced a grain sample containing (as a % of un-pearled values) 103.6±0.4% CP, 70.8±1.1% ASH, 60.3±1.2% NDF, 101.2±0.5% GE, and 113.3±0.7% DE. Further pearling resulted in continued significant (P<0.05) reductions in the % of DON remaining to a level of 7.9±0.7% after 120 seconds but with significant losses in grain mass. These data provide evidence that pearling (de-hulling) can serve as an effective means of reducing the DON content of barley, with improvements in the nutrient content of the resulting samples. However, the need to reduce the DON content of contaminated barley to less than 1 ppm will necessitate the removal of a significant amount of the grain mass for highly contaminated samples. Funding: Manitoba Pork Council and A.R.D.I.

Key Words: Deoxynivalenol, Decontamination, Pearling

901 Effect of quality and enzyme supplementation of wheat based diets on feed consumption and growth performance of pigs from 19 to 89 kg live weight. T.A. Van Lunen[1], K.D. Foote*[2], and P.H. Simmins[3], [1]*Agriculture and Agri-Food Canada, Charlottetown, PEI,* [2]*Atlantic Veterinary College, Charlottetown, PEI,* [3]*Finnfeeds International, Marlborough, UK.*

A study was conducted to evaluate the effects of quality of wheat based diets and graded levels of a commercial enzyme mixture on growth performance and feed consumption of pigs. Eight replicates of 1 pig per pen were placed on test at 19 kg live weight to dietary treatments containing one of two wheat cultivars and 5 levels of an exogenous enzyme mixture in a 2 by 5 factorial design. The wheat cultivars represented high quality and low quality grains as measured in a previous growth trial. Enzyme levels consisted of 0, 0.25, 0.5, 0.75 and 1.0 kg/T of Porzyme 9300 which contained a minimum of 4000 U/g xylanase. The pigs were fed, ad libitum, a 75% wheat based diet formulated to meet the nutrient requirements of a fast growing genotype. Water was available ad libitum via nipple drinkers. At 57 kg, all pigs were evaluated by real-time ultrasound to measure back fat depth and longissimus dorsi (LD) muscle at the P2 site. The trial ended when the pigs reached 89 kg live weight. The animals were cared for in accordance with the guidelines of the Canadian Council on Animal Care. The results indicated that wheat quality had a significant ($P < 0.05$) effect on growth rate (ADG) and feed intake (FI) with the high quality wheat resulting in a higher ADG and FI than the low quality wheat. Wheat quality had no significant effect on feed conversion ratio (FCR). The 0.75 kg/T enzyme inclusion level tended to reduce FI ($P = 0.13$)in the grower stage and significantly ($P = 0.04$)improved FCR over the length of the trial as compared to the 0 kg/T treatment. Significant differences ($P < 0.05$)in FI and FCR, for the 0.75 vs 0 kg/T treatments, were achieved in the grower stage when the data from pigs wasting feed were removed. The interaction between wheat variety and enzyme level reduced FCR by 18% ($P < 0.05$) in the grower stage with the low and high quality wheat diets at 0.75 and 0.50 kg/T xylanase levels, respectively. P2 backfat and LD depth were unaffected by dietary treatment. The results of this study indicate that some negative performance aspects of growing pigs associated with poor quality wheat-based feeds can be overcome by the use of exogenous xylanase.

Key Words: Pigs, Wheat, Xylanase

Production, Management, and the Environment
Livestock Management

902 Comparison of silvopastures and open pastures for cow-calf production. S.M. DeRouen* and T.R. Clason, *Louisiana State University Agricultural Center, Homer.*

The objective of this study was to compare cow-calf production on pine silvopastures with open pastures. Cow-calf production data were collected for 4 yr. Land areas were composed of: two 4.85-ha silvopastures on a 34-yr old pine plantation (62 trees/ha) (SP); and two 4.85-ha open pastures (OP). Bahiagrass, common and Coastal bermudagrasses and sod-seeded ryegrass forages were established in both land areas and rotationally grazed. Within land areas, low rate of nitrogen (N) fertilization (LN; 112 kg/ha split over 2 applications) and high rate of N fertilization (HN; 224 kg/ha split over 4 applications) were evaluated. At the initiation of the study, 40 mature F_1 Brahman x Hereford cows were blocked by age, BW and previous calf 205-d weight (205W) and assigned to each land type x N fertilization regime (TRT). An equal stocking rate (2.06 cow-calf units/ha) of 10 cows per TRT was maintained. Cows were assigned shortly after calving in late February and remained on their respective TRT until weaning in early October. Fertile Angus bulls were used for a 60-d spring breeding season. After weaning, all cows were combined and managed equally during the fall and winter. Each of the 4 herds was rotated annually to a different TRT. Cows culled from the study were replaced with cows of the same breed type and similar age. Statistical analyses were conducted with a generalized linear mixed model procedure. A total of 160 cow and 156 calf records were collected. Cow BW and body condition score (BCS) changes were similar ($P > .22$) among TRT. Pregnancy rates were similar ($P = .76$) and were 98, 96, 92 and 94% for SP-LN, SP-HN, OP-LN and OP-HN, respectively. Calf birth date, birth weight, preweaning ADG, actual weaning weight and 205W did not differ ($P > .12$) among TRT. The 205W by SP-LN, SP-HN, OP-LN and OP-HN were 244, 251, 233 and 245 kg, respectively. In conclusion, similar cow-calf productivity was observed among silvopastures and open pastures and no differences in animal performance were found among the two levels of nitrogen fertilization applied to either land area.

Key Words: Cow-calf production, Silvopastures, Fertilization

903 Commercial Evaluation of Prototype Meishan Hybrid Pigs for Reproductive Performance and Carcass Composition Traits. C. Okere*, J. Cosgrove, and L. Nelson, *Genex Swine Group Inc., Regina, Saskatchewan, Canada.*

The Genex Meishan Hybrid (GMH) (50% Landrace: 25% Chinese Meishan: 25% Large White) was evaluated against the standard Genex F1 gilt - Genex Hybrid (GH) (50% LW: 50% LR) in a commercial setting. Principal areas of evaluation were female reproductive performance and carcass traits of progeny following specific terminal crosses (GH x GNX3000 vs GMH x GNX3000). Non-significant genotype differences were noted for all carcass composition traits with the exception of hot carcass weight (88.7 3.6 vs 90.2 3.6 kg, $P = 0.001$) for GMH and GH progeny respectively. Compared to GH, GMH had slightly lower grade fat depths (19.1 3.9 vs 19.5 4.2 mm, $P = 0.48$), loin depths (58.2 7.2 vs 59.1 8.5 mm, $P = 0.38$), and similar estimated lean yield (60.2 1.8 vs 60.1 1.8 %, $P = 0.72$). Carcass index varied from a low of 90.0 to a high of 116.0 and were similar for both genotypes (109.5 3.8 vs 109.2 4.1, $P = 0.50$). The sexes did not differ in carcass composition traits with the exception of grade fat depths (19.2 vs 15.6 mm, $P = 0.04$) for barrows and gilts. Age at first service (220.5 vs 222.9, 198.9 vs 197.7 d; P=0.89) and wean to first service (5.0 vs 4.9, 6.9 vs 8.8 d; $P = 0.67$) were similar for both genotypes. Mean number born alive, number weaned and weaning weights were10.4 vs 11.1 (Farm A), 11.1 vs 11.0 (Farm B), 9.8 vs 9.6, 8.9 vs 9.2, 7.1 vs 6.7, 7.0 vs 6.7 for GH and GMH respectively. Significant genotype effects were observed for number born ($P = 0.007$) and born alive ($P = 0.02$). The average parity of sows was 1.6, 1.9,