

diets. Forty growing (initial BW: 25.4±1.41 kg) and 40 finishing (initial BW: 84.8±3.47 kg,) barrows were randomly allotted to 5 treatment groups within each stage of growth with 8 pigs per group. Two groups (16 pigs) at each stage of growth served as the initial slaughter groups (ISG) and were harvested at the initiation of the trial. The remaining 3 groups were randomly assigned to 3 diets that were provided on an ad libitum basis for 28 d in the grower phase and for 35 d in the finisher phase. All pigs were harvested at the end of the feeding period. Results showed that during the grower phase, ADG and G:F were greater ($P \leq 0.05$) for pigs fed the control corn-soybean meal diet (1.15 kg and 0.56 kg/kg) than for pigs fed the SBH (0.97 kg and 0.47 kg/kg) or the WM (0.89 kg and 0.48 kg/kg) diets. However, during the finishing phase, no differences in ADG or G:F were observed among treatments. In growing pigs, hot and chilled carcass weights and the dressing percentage were lower ($P \leq 0.05$) for pigs fed the SBH and WM diets compared with pigs fed the control diet, but weights of blood and viscera did not differ among treatments. The percentage and the total amount of fat in the carcass was lower ($P \leq 0.05$) for pigs fed the SBH and WM diets than for pigs fed the control diet, but the concentration and amount of protein in the carcass was not different among treatments. The percentage and total amount of fat in the carcass was lower ($P \leq 0.05$) in ISG pigs than in pigs fed the treatment diets. In finishing pigs, no differences in carcass concentrations of fat or protein were observed among treatments, but the total concentration of fat was greater ($P \leq 0.05$) in pigs fed the control diet (41.45 kg) than in pigs fed the SBH or the WM diets (35.0 and 36.7 kg). The ISG pigs had a lower ($P \leq 0.05$) concentration of fat, but a greater concentration of protein ($P \leq 0.05$) than pigs fed the treatment diets. In conclusion, the inclusion of SBH and WM affects performance and body composition more in growing pigs than in finishing pigs.

Key Words: Pig, Soybean hulls, Wheat middlings

133 Digestible and net energy contents of field peas in growing pigs. P. Leterme*, P. Kish, A. Samaraweera, A. D. Beaulieu, and J. F. Patience, *Prairie Swine Centre Inc., Saskatoon, SK, Canada.*

Field peas express a high variability in composition, due to genetic differences and variation in growth conditions. This project aimed to study the consequences of that variability on the digestible (DE) and net energy (NE) contents in growing pigs. Pea samples grown in different parts of Western Canada were collected in 2005 and analyzed. The crude protein, starch and total dietary fiber (TDF) contents ranged, respectively, from 19 to 28 %, 39 to 51 % and 19 to 24% of the dry matter. Based on their composition, 23 samples were selected and their DE value was measured in growing pigs at 2 BW (20 to 25 kg and 50 to 60 kg). A basal diet composed of barley, wheat, soybean meal, minerals and Celite (source of insoluble ash, used as a marker; 0.4%) was formulated and 23 diets containing 30% peas, at the expense of the basal diet, were prepared. A total of 144 pigs were fed with one of the 24 diets (6/diet) and a fecal sample was collected by grab sampling for 3 consecutive days, after a 10d-adaptation period. Once the pigs had reached a 50 kg-bodyweight, the procedure was repeated. The DE content of the pea samples alone was calculated and their NE content estimated by means of prediction equations. The average DE and NE in 20kg- and 50kg-pigs were, respectively: 3,715 and 3,923 kg DE/kg DM and 2,577 and 2,715 kcal NE/kg DM. The range of variation was extremely high: from 3,185 to 4,555 kcal DE/kg DM and from 2,222 to 3,084 kcal NE/kg DM. The DE and NE content was higher in 50kg-pigs (+ 208 kcal DE and + 138 kcal NE/kg DM; $P < 0.001$) and there was a high correlation ($P < 0.001$) between the results obtained in small and large pigs. Attempts to establish a relationship between the composi-

tion of the peas and their energy contents failed: the correlation with ADF was 0.09 ($P > 0.05$) and that between NDF and DE was -0.22 ($P > 0.05$). It is concluded that the DE and NE content of peas in pigs are extremely variable between pea samples grown in different conditions but the variability is not explained by their chemical composition.

Key Words: Pig, Peas, Digestible energy

134 The interaction of dietary flaxseed and length of feeding on the fatty acid profile of subcutaneous fat in grower-finisher pigs. J. F. Patience¹, A. D. Beaulieu^{*1}, M. E. R. Dugan², J. L. Aalhus², P. Leterme¹, I. U. Haq¹, and R. T. Zijlstra³, ¹*Prairie Swine Centre, Inc., Saskatoon, SK, Canada*, ²*Agriculture and Agri-Food Canada Lacombe Research Centre, Lacombe, AB, Canada*, ³*University of Alberta, Edmonton, AB, Canada.*

Successful production of pork enriched with omega-3 (n-3) fatty acids (FA) requires consistent attainment of the desired tissue concentration. Reports on the effect of length or level of flaxseed inclusion are limited, and the results contradictory. This study examined the impact of diet concentration and length of feeding of flaxseed on n-3 concentrations in the subcutaneous fat (SQF) of pigs. Eighty pigs (31.0 ± 2.9 kg) were fed a wheat, soybean meal control diet for 12 wk or diets containing 10, 20, or 30% LinPro® (50:50 flaxseed:peas co-extruded for optimal linolenic acid [18:3n-3] availability) for 12, 8 or 4 wk prior to sampling. SQF samples were obtained by biopsy at the 10th rib, 5 cm from the midline. Increasing dietary flaxseed level from 5 to 15% decreased ADFI (2.62 to 2.45 kg/d; linear, $P < 0.05$), improved G:F (0.39 to 0.41; linear, $P < 0.05$) while ADG did not change (mean 0.99 kg/d). Increasing the length of flaxseed feeding from 4 to 12 wk decreased ADG (1.01 vs. 0.97 kg/d) and ADFI (2.57 vs. 2.46 kg/d; $P < 0.05$) while G:F was not affected. Linolenic acid in SQF, as a % of total FA, was increased by flaxseed level (1.22% control, 4.72 to 13.6%; 5 to 15% flaxseed) and length of feeding (5.74 to 9.75%; 4 to 12 wk). Pigs fed 15% flaxseed for 12 wk had the highest concentration of 18:3n-3 (18.6%; diet by wk, $P < 0.001$). A similar pattern was observed for total n-3 and n-6 FA (diet by wk, $P < 0.02$). Increases for 18:3n-3 were linear over time for all levels of flaxseed inclusion ($R^2 > 0.99$). The SDs and CVs were lower when feeding for a longer period within flaxseed level. Increasing dietary flaxseed concentration or length of feeding decreased the n-6/n-3 ratio from 1.92 to 0.89 and 1.76 to 0.99, respectively (diet by wk, $P < 0.001$). Saturated FA concentration decreased from 36 to 30% as dietary flaxseed level increased and from 31.8 to 30.3% with increased feeding time (diet by wk; $P < 0.05$). Increasing either dietary flaxseed level or length of feeding increased n-3 FA in SQF. Maximal levels were obtained when feeding 15% flaxseed for 12 wk. Consistency of n-3 enrichment improved with length of feeding.

Key Words: Swine, Omega-3 FA, Flaxseed

135 Effects of increasing choice white grease in corn and sorghum-based diets on growth performance and fat quality characteristics of finishing pigs. J. M. Benz*, M. D. Tokach, S. S. Dritz, J. L. Nelssen, J. M. DeRouchey, and R. D. Goodband, *Kansas State University, Manhattan.*

One hundred twenty barrows and gilts (TR4 × 1050; 54 kg) were used in an 83-d experiment to evaluate the effects of increasing added

fat to corn or sorghum-based diets on growth performance and fat quality characteristics. Treatments were arranged in a $2 \times 2 \times 3$ factorial based on grain source (corn or sorghum), gender, and added fat (0, 2.5, or 5% choice white grease; CWG). At the end of the trial, jowl fat and backfat samples were collected. Pigs fed sorghum-based diets had increased ($P < 0.01$) ADG compared with pigs fed corn-based diets (0.98 vs 0.93 kg). There were no differences in G/F. Increasing CWG increased (linear, $P < 0.01$) ADG (0.92, 0.96, 0.99 kg) and increased (linear, $P < 0.02$) 10th rib backfat (17.3, 18.3, 19.8 mm). There was a fat level \times grain source interaction ($P < 0.03$) for iodine value (IV) and percent C 18:2 fatty acids in jowl fat. The interaction was due to the greatest increase in IV and percent C 18:2 fatty acids occurring when CWG was increased from 2.5 to 5% for corn-based diets (69.2, 69.3, 72.2 g; 14.57, 14.13, 15.35%), while the greatest increase was from 0 to 2.5% CWG for sorghum-based diets (66.2, 69.6, 68.9 g; 11.97, 13.85, 13.04%). Despite this interaction, adding CWG increased (linear, $P < 0.02$) iodine value and percent C 18:2 fatty acids in jowl fat (68.0, 69.5, 70.5 g; 13.39, 13.99, 14.19%) and backfat (62.5, 66.2, 65.9 g; 12.50, 14.02, 13.49%). Adding CWG decreased ($P < 0.01$) percent saturated fats in jowl fat (36.4, 35.3, 34.3%) and backfat (41.4, 38.7, 38.5%). Pigs fed corn-based diets had increased ($P < 0.01$) iodine values in jowl fat (70.3 vs 68.3 g) and backfat (65.8 vs 63.0 g), and increased ($P < 0.01$) percentage C 18:2 fatty acids in backfat (14.4 vs 12.3 compared with pigs fed sorghum-based diets. In summary, substituting sorghum for corn in diets for finishing pigs reduced iodine value while adding CWG increased iodine value.

Key Words: Sorghum, Corn, Iodine value

136 Nutrient digestibility of lupin and air-classified protein and starch fractions of field pea and faba bean in grower pigs. C. K. Gunawardena^{*1}, R. T. Zijlstra¹, and E. Beltrarena^{1,2}, ¹University of Alberta, Edmonton, Alberta, Canada, ²Alberta Agriculture and Food, Edmonton, Alberta, Canada.

Nine ileal cannulated barrows (25 kg) were used to establish the ileal AA and whole tract digestibility of energy, Ca, and P in lupin and the air-classified protein and starch fractions of field pea (Pea-P, Pea-S) and zero-tannin (<1%) faba bean (ZTFB-P, ZTFB-S), respectively, and compared to soy protein concentrate (SPC). A cornstarch-sucrose (CS) diet served as the N-free diet for the subtraction of basal endogenous losses. Test diets were formulated to provide 19% CP, 0.9% Ca, and 0.7% P; Cr₂O₃ was used as indigestible marker (0.375%). Pigs were randomized to diets as a 7×7 Latin square. Following a 5 d diet acclimation, feces and subsequently digesta were collected. Apparent ileal digestibility of Lys, Thr, and Met (Table 1) was higher ($P < 0.05$) for ZTFB and Pea fractions compared to lupin and SPC. Total tract digestibility of energy and DE content was higher ($P < 0.05$) in Pea-P, lupin and ZTFB-P than SPC. Total tract digestibility of P was higher ($P < 0.05$) in pea and faba fractions than SPC and of Ca was highest ($P < 0.05$) for Pea-P. In conclusion, air classification of pea and faba bean results in protein and starch fractions with a high nutritional value for swine.

Table 1. Apparent ileal and total tract nutrient digestibility values (%) for air-classified protein and starch fractions of field pea, zero-tannin faba bean and lupin compared to soy protein concentrate

	SPC	Lupin	ZTFB-P	Pea-P	ZTFB-S	Pea-S	SEM
Lys	85.5 ^a	82.3 ^a	91.3 ^b	89.1 ^b	91.1 ^b	85.4 ^a	1.3
Thr	73.9 ^c	78.0 ^{bc}	85.8 ^a	82.5 ^{ab}	82.3 ^{ab}	77.9 ^{bc}	2.1
Met	80.2 ^b	61.5 ^a	87.8 ^c	85.2 ^{bc}	82.8 ^{bc}	86.3 ^{bc}	2.8
GE, %	95 ^a	93 ^c	96 ^a	95 ^{ab}	92 ^c	94 ^b	0.4
DE, % Mcal/kg DM	4.1 ^c	4.2 ^d	4.2 ^d	4.2 ^e	4.0 ^b	4.0 ^b	0.2
P, % DM	16 ^c	59 ^{ab}	55 ^{ab}	69 ^a	56 ^{ab}	60 ^{ab}	7.7
Ca, % DM	12 ^a	30 ^{ab}	7 ^a	46 ^b	41 ^b	31 ^{ab}	12

superscripts differ ($P < 0.05$)

Key Words: Air classification, Digestibility, Pig

137 A comparative evaluation of a dried milk product (Nutri-Gold®) with other milk protein sources for weanling pigs. G. L. Cromwell*, B. G. Kim, Y. L. Ma, A. D. Quant, and M. D. Lindemann, University of Kentucky, Lexington.

Nutri-Gold® (International Ingredient Corp., St. Louis, MO) is a product resulting from the drum drying of fresh, chilled milk collected from grocery stores prior to, but approaching, the expiration date. This product consists of the full line of fresh dairy-case milk (skim milk and milk with 1%, 2%, and 4% fat). The milk is kept chilled throughout the handling process, de-packaged, and gently dried under tightly controlled temperatures. The dried product typically contains 25% CP, 17% fat, 35% lactose, and 41% total sugars. A 22-d experiment involving 90 pigs weaned at 21.1 d and averaging 7.5 kg BW was conducted to compare Nutri-Gold with 3 other sources of milk protein in phase I (8 d) and phase II (14 d) diets. There were 4 replications of 4 or 5 pigs/pen. Treatments were (1) basal diet with no milk protein, and 4 diets with 1.82% milk protein provided by (2) dried skim milk, (3) whey protein concentrate, (4) Nutri-Gold, or (5) casein. The 4 milk protein sources contained 34.9, 34.5, 26.0, and 80.9% CP, respectively. In addition, the Nutri-Gold analyzed 95.8% DM, 17.4% fat, 35.4% lactose, 2.1% glucose, 2.0% fructose, 2.1% sucrose, 0.71% Ca, 0.72% P, and 1.68% Lys. The milk products were substituted for starch (3.1% starch was in the basal diet), and lactose was equalized across diets at 20 and 15% during the 2 phases. Fat, Ca, and P also were equalized across diets. Lysine in the basal diet was 1.17 and 0.99% during the 2 phases and was equalized in diets 2-5 at 1.40 and 1.23%. The basal diet was purposely made slightly deficient in Lys so as to better assess the contribution of the milk protein sources. ADG, ADFI, and feed:gain for the 22-d study were, respectively (395, 421, 418, 444, 444 g/d; 574, 570, 558, 590, 589 g/d; 1.45, 1.35, 1.33, 1.33, 1.33). Pigs fed Nutri-Gold or casein gained faster than controls ($P < 0.006$) and all groups receiving milk protein gained more efficiently ($P < 0.001$) than controls. Feed intake was not affected by treatment. These results indicate that Nutri-Gold is as effective in improving performance in weanling pigs as other milk protein sources when fed in phase I and II nursery diets.

Key Words: Pigs, Milk protein