

**W117 Effect of sampling day and number of lambs raised on somatic cell counts (SCC) and cell populations in ewe milk.** E. R. Kretschmer<sup>1</sup>, D. W. Holcombe<sup>1</sup>, D. Redelman<sup>2</sup>, and D. L. Garner<sup>1</sup>, <sup>1</sup>University of Nevada, Reno, <sup>2</sup>Sierra Cytometry/UNR Cytometry Center, Reno, NV.

The objective of this research was to examine the effects of number of lambs raised per ewe and day of milk sampling on live, dead and total somatic cell counts (SCC) including the percentages of specific cell types (monocytes, granulocytes, apoptotic cells and large cells) in ewe milk. Each udder half of thirty-two Rambouillet ewes (2 - 5 yr old) was sampled at 24 h after birth (d 0) and at d 10, 20, 30, 40, 50, and 70 ± 1 d (mean ± SD) and at d 93 ± 10 d postpartum. Four ewes raised triplets, 16 ewes raised twins and 12 ewes raised single offspring. Somatic cell numbers in the ewe milk were quantified by flow cytometry and expressed as log<sub>10</sub> values. The number of lambs raised increased the number of live cells ( $P = 0.03$ ) and total cells ( $P = 0.07$ ); ewes raising triplets had more cells than ewes raising twins or singles. Day of sampling had no effect ( $P = 0.32$ ) on the number

of dead cells, but did affect ( $P < 0.05$ ) the number of live and total cells in milk; values decreased at subsequent sampling days after d 0 but increased again at d 93. Difference in large cell percentages were noted ( $P < 0.04$ ) at d 20, 50 and 70 relative to the number of lambs raised. Total number of granulocytes were greater ( $P = 0.036$ ) for triplets than for twins or single offspring. Monocyte numbers were lower ( $P < 0.0001$ ) at d 0 and increased throughout lactation, whereas the total large cell population was greatest ( $P < 0.0001$ ) early in lactation and continued to decrease throughout lactation. Total granulocytes for all groups were greater at d 0 ( $P = 0.015$ ) than that of the subsequent sampling days, and increased again at d 93, whereas, the percentage of live granulocytes and apoptotic cells increased ( $P < 0.04$ ) from d 0 to d 93 for all lambing groups. In conclusion, ewes raising triplets had more live and total SCC, likely reflective of an increase in the total granulocytes. Cell populations were either increased or decreased from d 0 to d 90 depending on cell type.

**Key Words:** Somatic cell count, Mastitis, Sampling day

## Nonruminant Nutrition: Dietary Influences on Boars, Sows and Gilt Development

**W118 True calcium and phosphorus digestibility and the endogenous calcium and phosphorus outputs associated with soybean meal for multi-parity sows measured by the simple linear regression technique.** K. Kuang<sup>1</sup>, R. He<sup>1</sup>, J. Wang<sup>2</sup>, Y. L. Yin<sup>3,4</sup>, and M. Z. Fan<sup>4</sup>, <sup>1</sup>Huazhong Agricultural University, Wuhan, Hubei Province, China, <sup>2</sup>The Chinese National Institute of Animal Sciences, Beijing, China, <sup>3</sup>The Chinese Academy of Sciences, Changsha, Hunan Province, China, <sup>4</sup>University of Guelph, Ontario, Canada.

Six Yorkshire x Landrace dry sows, with an average initial BW 200 kg and 5-7 parity, were housed individually and fed six diets (2 kg/d) according to a 6x6 Latin square design. The diets were soybean meal (SBM)-cornstarch-glucose based and contained six graded levels of Ca (1.58, 1.69, 1.94, 2.30, 2.88 and 3.65 g/kg DMI) and P (0.79, 1.91, 2.91, 4.04, 4.86 and 5.82 g/kg DMI). Chromic oxide (0.35%) was included in the diets as a digestibility marker. Each experimental period lasted 8 d with a 5-d adaptation and 3-d collection of fecal samples. True digestibility of Ca ( $27 \pm 5.0\%$ ) and P ( $44.0 \pm 4.5\%$ ) and the endogenous outputs of Ca ( $1.19 \pm 0.12$  g/kg DMI) and P ( $0.78 \pm 0.17$  g/kg DMI) associated with the solvent-extracted SBM for the sows were obtained by the simple linear regression analysis technique. In conclusion, Ca associated SBM was poorly digestible in sows. The endogenous fecal Ca output associated with SBM was relatively high in sows.

**Key Words:** Phosphorus, True digestibility, Sows

**W119 Development of procedures to assess the potential for parturient hypocalcemia in sows.** C. Darriet and T. D. Crenshaw\*, *University of Wisconsin, Madison.*

Parturient hypocalcemia, also known as milk fever, is a common disorder in dairy cows, but occurrence in sows is not known. An increased incidence of unexplained sow mortality near farrowing has triggered questions about potential involvement of hypocalcemic related disorders as contributors to the incidence of mortality. A long-term objective was to develop procedures that could eventually be used to assess the incidence of hypocalcemia in a large population of sows. The current experiment was designed to assess diurnal variation

in serum Ca and blood gas responses of sows at farrowing. On gestation day 111, indwelling venous catheters were placed in 15 multiparous or single parity sows fed diets with either minimal (0.75%) or excess (1.50%) Ca for 4 wk prior to farrowing. Five blood samples were collected at 15-min intervals (0, 15, 30, 45, and 60 min) within each of 4 designated times (0700, 1000, 1300, and 1900) within a day on gestation day 113 (G113) and lactation day 1 (L1). On the day of farrowing (L0), 5 blood samples (at 15-min intervals) were collected within each of 2 times (6 and 9 h after birth of the first pig). Blood gas assays (pH, pO<sub>2</sub>, pCO<sub>2</sub>, base excess and blood Na, K and Ca (ionized)) were performed on 1 sample at each designated hour within days G113, L0, and L1. Serum Ca values (mg/dL) of sows fed diets with minimal or excess Ca were not different for any of the daily collections ( $9.28$  vs.  $9.48 \pm 0.09$ , G113;  $9.31$  vs.  $9.83 \pm 0.11$ , L0; and  $9.88$  vs.  $9.43 \pm 0.06$ , L1) pooled across hourly times and 15 min interval samples. Within days (G113, L0 and L1) no diurnal pattern was detected ( $P > 0.10$ ). Blood pH and blood gas values were not affected by diet or day of sampling. These results provide evidence that single daily blood samples can be collected from a large population of sows to assess incidence of hypocalcemia relative to other production traits. Diurnal patterns are not a significant source of error in assessment of serum Ca in sows at farrowing.

**Key Words:** Sows, Hypocalcemia, Mortality

**W120 The effect of omega-3 fatty acid addition to sow diets on milk composition.** S. A. Meers\*, C. R. Dove, and M. J. Azain, *University of Georgia, Athens.*

The objective of this study was to determine the effects of feeding a diet containing n-3 fatty acids during late gestation and/or lactation on sow milk composition. The study was designed as a 2 x 2 factorial arrangement with main effects of feeding n-3 fatty acids in the gestation diet and/or lactation diet. Diets were corn-SBM based diets such that the gestation diet (G) was calculated to contain approximately 3290 kcal ME, 13% CP and, 0.78% lysine, while the lactation diet (L) was calculated to contain 3242 kcal ME, 17.5% CP and, 1.15% lysine. Omega-3 fatty acids, supplemented in the form of an encapsulated product (Fertilium®, United Feeds, Sheridan, IN), added to the G or

L diet resulted in a shift of the n-6/n-3 ratio from approximately 20 in the control to 13 in the n-3 G diets and 13 to 10, respectively, in the L diets. Fertiliu<sup>®</sup> is 17.5% fat, with about 15% of that as EPA and DHA, and was added at only 1.5% of the diet. Sows (n=44) were allocated by parity to either the control or n-3 diet at approximately d 60 of gestation. Sows were moved to the farrowing barn on d 110 and switched to the L diet, with half of the sows in each dietary treatment maintained on the same diet and half switched to the other diet (Control or Omega-3). Litters were weaned at an average of 21 d and sows were maintained on their respective diets through re-breeding. Milk samples were obtained from each sow within 24 h of farrowing, at d 7, and at weaning. The addition of n-3 fatty acids increased the total n-3 percent of milk from O/O sows (1.35%) as compared to C/C sows (1.12%,  $p < 0.0001$ ). While the percent of total n-6 in the milk did not change, the change in n-3 significantly altered the n-6/n-3 ratio (17.49 for C/C to 14.56 for O/O,  $p < 0.0001$ ). There was a diet effect on both EPA and DHA concentrations. Addition of n-3 to the L diet increased the concentrations of EPA (0.09% in O/O vs. 0.03% in C/C,  $p < 0.0001$ ) and DHA (0.14% vs. 0.03% in O/O and C/C respectively,  $p < 0.0001$ ) regardless of which G diet the sow consumed. These results demonstrate that small additions of n-3 fatty acids to the maternal diet can significantly alter the milk consumed by progeny.

**Key Words:** Omega-3 fatty acid, Sow, Pig

**W121 Protein and dry matter digestibility of colostrums by newborn piglets.** C. Lin<sup>\*1</sup>, D. C. Mahan<sup>2</sup>, and S. W. Kim<sup>1</sup>, <sup>1</sup>Texas Tech University, Lubbock, <sup>2</sup>The Ohio State University, Columbus.

This study was conducted to determine the nutrient digestibility of colostrums by newborn piglets. Colostrums were collected from 120 sows within 12 h postpartum after injection of oxytocin. Total of 6 L colostrums were used in this study. Twelve, 1 d old, male piglets were selected from three litters and housed individually in the crates with heating lamps to maintain the temperature at 35°C. All the piglets were fed colostrums containing 0.25% (w/w) Cr oxide as an external marker. Pigs were provided seven meals of colostrums per day for 3 d allowing 40.0 mL/meal for d 1, 55.0 mL/meal for d 2, and 70.0 mL/meal for d 3. Colostrums were hand fed using baby milk bottles. Entire fecal samples with unique chromium color were collected. Total collection of the fecal samples was done 7 times daily to ensure collecting fresh samples. Fresh fecal samples were immediately weighed, stored in the freezer (-20°C), freeze-dried, and ground for chemical analysis. Colostrums were also freeze-dried and ground for chemical analysis. Contents of dry matter and crude protein were determined to calculate nutrient digestibility. Total tract digestibility of protein and dry matter in colostrums from piglets averaged 96.9±0.40 % and 98.3±0.21 % and these values were not affected by litter origin.

**Key Words:** Colostrums, Protein, Pigs

**W122 Determination of bioequivalence ratio of D-α- to DL-α-tocopheryl acetate based on tissue α-tocopherol content of swine.** H. Yang<sup>\*1</sup>, D. Mahan<sup>2</sup>, D. Hill<sup>3</sup>, T. Shipp<sup>3</sup>, T. Radke<sup>1</sup>, and M. Cecava<sup>1</sup>, <sup>1</sup>ADM Animal Nutrition, Quincy, IL, <sup>2</sup>The Ohio State University, Columbus, <sup>3</sup>ADM Animal Health and Nutrition, Quincy, IL.

Gilts (n=24; BW=67 kg) were individually housed to determine bioequivalence ratio (BR) of d-α-tocopheryl acetate (DαT) to dl-α-tocopheryl acetate (DLαT). The study had five treatments (TRT) in a RCB design in four or five replicates. TRTs were 1) DLαT addition

at 22 mg/kg, 2) DαT addition at 16.18 mg/kg (BR1.36), 3) 11 mg/kg (BR2.00) and 4) 8.33 mg/kg (BR2.64), and 5) 6.71 mg/kg (BR3.28). Prior to initiation of Exp, pigs were fed a non-vitamin E fortified diet for 30 d. Corn-SBM diets were formulated to contain TID lysine 0.9% (depletion diet) and 0.8% (Exp diet). Day 0 serum α-tocopherol (αT) was a covariate for analysis of all tissue αT. Polynomial analysis was conducted for DαT TRTs. As dietary DαT decreased, αT decreased linearly for lung ( $P < 0.05$ ), heart, kidney, spleen, liver and d15 and 32 serum ( $P < 0.01$ ), whereas there was a cubic effect for brain ( $P = 0.05$ ), loin ( $P = 0.15$ ) and fat ( $P = 0.09$ ). Tissue & serum αT data from DαT TRTs were used to generate seven linear regression equations to calculate BR. BR was 2.76, 2.45, 2.88, 2.76, 2.66, 2.83 and 2.89 for heart, kidney, spleen, lung, liver, d15 and 32 serum, respectively. αT content for each tissue was highly correlated with that for serum on d0 ( $P < 0.12$ ), 15 and 32 ( $P < 0.05$ ), with coefficients higher for d15 than d0, but similar to d32. These results suggest an average biological equivalence ratio of 2.75 for growing swine, substantially above the accepted USP value of 1.36.

**Table 1.**

Trt	DLαT	BR1.36	BR2.00	BR2.64	BR3.28	P Value for DαT			
						SE	Lin	Quad	Cubic
PPM	22.00	16.18	11.00	8.33	6.71				
Serum αT (μg/ml)									
d 0	0.71	1.16	1.11	1.01	1.11	0.12	0.55	0.73	0.49
Tissue αT on d 32 (μg/g)									
Heart	3.89	4.75	4.38	3.96	3.67	0.27	0.01	0.43	0.94
Kidney	2.07	2.53	2.17	1.91	1.62	0.14	0.01	0.29	0.69
Spleen	2.98	4.44	3.59	3.22	2.71	0.17	0.01	0.45	0.39
Liver	2.96	4.39	3.33	2.75	2.75	0.23	0.01	0.38	0.45
Lung	2.11	3.48	2.43	2.42	2.34	0.44	0.04	0.37	0.78
Brain	4.94	5.19	4.93	5.46	4.20	0.40	0.26	0.28	0.05
Loin	1.22	1.71	1.53	1.83	1.34	0.26	0.54	0.69	0.15
Fat	3.55	5.16	4.65	5.04	4.05	0.39	0.11	0.53	0.09

**Key Words:** Pigs, Vitamin E, Tocopherol

**W123 Amino acid requirements of lactating sows: Selection of source data for factorial estimates.** K. T. Soltwedel<sup>\*1</sup>, N. R. Augspurger<sup>2</sup>, S. K. Webel<sup>2</sup>, D. D. Hall<sup>3</sup>, and J. E. Pettigrew<sup>1</sup>, <sup>1</sup>University of Illinois, Urbana, <sup>2</sup>JBS United, Sheridan, IN, <sup>3</sup>AusGene International, Gridley, IL.

Factorial estimates of AA requirements of lactating sows vary widely depending on which source data on AA ratios of mammary and maintenance requirements and mobilized body protein are used. This experiment was designed to provide evidence about which source datasets may be appropriate. Data were collected on 410 sows and their litters, of which 378 were used in the analysis because sows that weaned 7 or fewer pigs were removed from the dataset. Three experimental diets, each formulated to 0.65% standardized ileal digestible (SID) Lys, were used in the study. Supplemental L-Lys•HCl was included at 0.0 (Diet 1), 0.1 (Diet 2), and 0.3 (Diet 3) percent of the diet respectively. L-Lys•HCl replaced intact Lys, primarily from soybean meal, resulting in diets with similar levels of SID Lys but varying levels of other AA. Sows were allotted to treatment on the basis of parity. The SID Thr:Lys ratios calculated to be in Diets 1, 2, and 3 from analyzed amino acid values were 0.68, 0.63, and 0.50, respectively; corresponding ratios for Val:Lys were 0.93, 0.85, and 0.70. Pre-planned orthogonal contrasts for Diet 1 vs. 2, and Diets 1 and 2 vs. 3 were tested. The contrast of Diet 1 vs. Diet 2 was not significant for any response variable. However, when Diets 1 and 2 were compared to Diet 3, overall litter ADG tended to be higher (2.22

$\pm 0.03$  and  $2.25 \pm 0.03$  vs.  $2.18 \pm 0.03$  kg/d;  $P = 0.10$ ), litter ADG from d 9 to weaning was higher ( $2.46 \pm 0.03$  and  $2.45 \pm 0.03$  vs.  $2.37 \pm 0.03$  kg/d;  $P < 0.01$ ), and piglet BW at weaning was higher ( $5.86 \pm 0.05$  and  $5.85 \pm 0.05$  vs.  $5.74 \pm 0.05$ ;  $P = 0.05$ ). These results suggest SID Thr:Lys and SID Val:Lys ratios required in the diet did not exceed 0.63 and 0.85, respectively. These ratios are consistent with requirement estimates of NRC (1998) and Kim et al., (2001) but suggest Thr:Lys and Val:Lys requirement ratios supported by previous measures of mammary amino acid uptake are too high.

**Key Words:** Sows, Threonine, Valine

**W124 Effects of feed allowance levels on nitrogen retention and blood hormone levels in gestating and dry gilts.** D. Wu<sup>\*1,2</sup>, F. Yang<sup>1</sup>, A. Zhou<sup>1</sup>, Z. Wang<sup>1</sup>, and K. Wang<sup>1</sup>, <sup>1</sup>*Sichuan Agricultural University, Ya'an, Sichuan, China*, <sup>2</sup>*University of Guelph, Ontario, Canada*.

Eighteen high-producing crossbred gilts (Landrace×Meishan) were used to investigate the effect of feed allowance levels on N retention and blood hormone levels in gestating and dry gilts. The gilts were randomly allotted to three feed allowance levels (High:2×maintenance; Medium:1.2×maintenance; Low:0.65×maintenance). Three of the gilts for each of the treatments were bred on the fourth estrus. Bred and dry gilts' BW ( $95.8 \pm 1.78$  kg) and backfat thickness ( $23 \pm 1.2$  mm) at the breeding were similar among treatments. After breeding, the gilts were housed individually in automatic weighing metabolic cages. The N balance was measured after breeding, and during early-, mid-, and late-gestation. The 6-d nutrient-balance collection commenced on d 0, 30, 60, and 90. Serum progesterone, leptin, GH and insulin levels were measured at d 5, 35, 60 and 95 during the gestation. At similar feed allowance levels, gestating gilts gained more BW ( $p < 0.01$ ) than dry gilts during the gestation. There were no differences ( $p > 0.05$ ) in fecal N excretion and apparent N digestibility between the gestating and dry gilts. However, urine N excretion in the gestating gilts were lower ( $p < 0.05$ ) than that of the dry gilts for all the treatment groups during the mid- and late-gestation. Efficiency of N retention of the gestating gilts at the low feeding level was significantly higher ( $p < 0.01$ ) compared with that of dry gilts during gestation. The progesterone or leptin level of the gestating gilts on all treatments was higher ( $p < 0.05$ ) than that of the dry gilts during gestation. However, GH or insulin level was only significantly higher during the late gestation. It is concluded that gestation influenced hormone secretion and had more N retention and body gain compared with dry gilts, especially at the low feed allowance level.

**Key Words:** Feeding levels, Nitrogen efficiency, Gilts

**W125 Effect of feeding rye silage and feed restriction on performance and reproductive development in developing gilts.** J. H. Cho<sup>\*1</sup>, Y. K. Han<sup>2</sup>, B. J. Min<sup>1</sup>, Y. J. Chen<sup>1</sup>, H. J. Kim<sup>1</sup>, J. S. Yoo<sup>1</sup>, J. W. Kim<sup>1</sup>, and I. H. Kim<sup>1</sup>, <sup>1</sup>*Dankook University, Cheonan, Chungnam, Korea*, <sup>2</sup>*Sungkyunkwan University, Suwon, Gyeonggi, Korea*.

This study was conducted to evaluate the effects of feeding rye silage and feed restriction on growth performance and reproduction in developing gilts. Twenty four replacing gilts (Landrace×Yorkshire,  $67.63 \pm 1.17$ kg) were used in 49 d growth assay. Dietary treatments were included 1) CON(basal diet), 2) S15(15% feed restriction + ad libitum rye silage) and 3) S30(30% feed restriction + ad libitum rye silage). In growth performance, ADG( $1.088$  vs  $0.921$  vs  $0.782$ kg) and ADFI( $3.024$  vs  $2.590$  vs  $2.257$ kg) were significantly the highest in CON ( $P < 0.05$ ) among treatments. Average daily silage intake was

not significant difference between S15 and S30 treatments ( $P > 0.05$ ). F:G was the lowest in CON( $2.779$ ) vs silage treatments( $2.812$ ,  $2.886$ )( $P < 0.05$ ). Average silage intake of S1 and S2 treatments was increased as time increased ( $P < 0.05$ ). While all gilts of S15 and S30 treatments became pregnant, one gilt of CON became pregnant. Also, first estrus and mating occurred earlier in S15 and S30 than those of CON. In conclusion, 15% feed restriction and feeding rye silage reduced growth performance, but gilts reached first estrus earlier with an increased pregnancy.

**Key Words:** Rye silage, Feed restriction, Replacing gilts

**W126 Tissue concentrations of selenium in boars fed a diet supplemented with selenium from organic or inorganic sources.** M. J. Estienne<sup>\*</sup>, A. F. Harper, and R. J. Crawford, *Virginia Polytechnic Institute and State University, Blacksburg*.

Dietary supplementation with 0.5 ppm sodium selenite enhances fertility in boars. Because of environmental concerns, however, the U.S. FDA limits the amount of supplemental Se to 0.3 ppm for all swine. The objective of this experiment was to determine tissue concentrations of Se in boars fed diets supplemented with 0.3 ppm Se from either sodium selenite or an organic source that is purportedly more bio-available than traditional inorganic sources. Mature boars ( $444.1 \pm 0.5$  d of age) were fed at a rate of 2.0 kg/d, a control diet (no supplemental Se), or a diet supplemented with 0.3 ppm Se from either an organic (Sel-Plex; Alltech, Inc., Nicholasville, KY) or inorganic (Premium Selenium 270; North American Nutrition Co., Inc., Lewisburg, OH) source for 70 d ( $n = 3$  boars/group). At the end of the trial, samples of whole blood, liver, and testicular parenchyma were collected, and tissue Se concentrations determined using atomic absorption analysis. Concentrations of Se in testicular tissue were higher ( $P < 0.05$ ) in boars fed the organic source ( $397.7 \pm 23.5$  ppb) compared with controls ( $317.3 \pm 23.5$  ppb), with boars fed the inorganic source having an intermediate value ( $380.7 \pm 23.5$  ppb), that was not different ( $P > 0.05$ ) from the other groups. Levels of Se in liver were similar ( $P > 0.05$ ) for boars fed the organic ( $534.3 \pm 33.2$  ppb) or inorganic source ( $516.0 \pm 33.2$  ppb) and concentrations in both groups were greater ( $P < 0.01$ ) than controls ( $293.0 \pm 33.2$  ppb). Whole blood concentrations of Se were higher ( $P < 0.01$ ) in boars fed the organic source ( $180.7 \pm 11.7$  ppb) compared with controls ( $115.0 \pm 11.7$  ppb), with boars fed the inorganic source having an intermediate value ( $152.7 \pm 11.7$  ppb), that was not different ( $P > 0.05$ ) from the other groups. Tissue Se concentrations were greatest for boars fed the diet containing an organic source of Se, suggesting that even in a relatively brief trial bio-availability was influenced by the source of supplemental Se.

**Key Words:** Boar, Selenium, Testicle

**W127 Comparative study of two analytic methodologies for the determination of acid-insoluble ash for evaluation of nutrients digestibility in broiler diets.** E. Jiménez-Moreno, J. M. González-Alvarado, A. Coca, R. Lázaro, and G. G. Mateos<sup>\*</sup>, *Universidad Politécnica de Madrid, Spain*.

Two methodologies widely used in digestibility trials for determination of acid-insoluble ash (AIA) in feeds and faeces are the procedure described by Vogtmann et al., 1975, (VO; Br. Poult. Sci. 16, 531) based on the boiling of the complete sample (4N HCl for 30 min), followed by ashing at 600°C for 6 h, and the procedure described by Van Keulen and Young, 1977, (VK; J. Anim. Sci. 44, 282) based on the sequential analysis of DM, ash, and boiling (2N HCl for 5 min) to determine



AIA. In our test we used 12 experimental diets of similar nutritive value to determine apparent retention of nutrients and the AMEn by both techniques in 18 d-old broilers. The main difference among diets was the cereal used (corn vs. rice), the type of processing of the cereal (raw vs. heat processed), and the inclusion of a fiber source (none vs. 3% oat hulls vs. 3% soybean hulls) and all of them included 1% celite an additional indigestible marker. Each treatment was replicated three times (9 birds caged together). The AIA values of feeds and excreta were lower when determined by VK than when determined by VO (1.693 vs. 1.748% DM for diets and 6.655 vs. 6.961% DM for excreta;  $P < 0.001$ ) but no interactions of technique x dietary treatment were

found. The correlation coefficient of the AIA content of feeds and excreta between VO and VK techniques was good ( $r > 0.99$ ). Nutrient digestibility and AMEn of the diets were lower when calculated with the VK technique than when calculated with the VO technique (74.6 vs. 75.0% for DM, 79.1 vs. 79.5% for OM, and 3,022 vs. 3,033 kcal/kg for AMEn;  $P < 0.05$ ) but no interactions between techniques used for AIA determination and dietary treatments were observed. We concluded that either technique is acceptable to determine the apparent retention of nutrients and the AMEn of diets in poultry experiments.

**Key Words:** Acid-insoluble ash, Nutrient digestibility, Broilers

## Nonruminant Nutrition: Enzyme Supplementation

**W128 Investigating possible interactions between phytase and xylanase in wheat-based diets for growing pigs.** T. A. Woyengo<sup>\*1</sup>, C. M. Nyachoti<sup>1</sup>, J. S. Sands<sup>2</sup>, and W. Guenter<sup>1</sup>, <sup>1</sup>University of Manitoba, Winnipeg, Manitoba, Canada, <sup>2</sup>Dansico Animal Nutrition, Marlborough, United Kingdom.

An experiment was conducted to determine the effect of combining phytase and xylanase on total tract nutrient digestibility and performance of growing pigs. Ten wheat-based diets were fed to 60 (30 barrows and 30 gilts) Cotswold growing pigs from 19.9±1.2 to 60.2±2.4 kg BW. The ten diets included a control and a nutrient reduced (energy, Ca and P) diet supplemented with phytase at 3 levels, i.e, 0, 250 and 500 FTU/kg and xylanase at 3 levels, i.e, 0, 2000 and 4000 XU/kg in a 3x3 factorial arrangement to give 9 treatment combinations. Each diet was randomly assigned to 6 pigs balanced for sex. Chromic oxide was added to the diets (at rate of 0.5 %) during the first and last 10 d of the experiment to determine nutrient digestibility at about 20 and 60 kg BW, respectively. Enzyme supplementation had no effect ( $P > 0.05$ ) ADFI, ADG, G:F and crude protein digestibility. Phytase supplementation did not influence ( $P > 0.05$ ) energy digestibility while xylanase supplementation only increased ( $P < 0.05$ ) energy digestibility at 60 kg BW when it was given at 4000 XU/kg. Phytase supplementation increased Ca and P digestibilities ( $P < 0.05$ ) at both 20 and 60 kg BW. But there was no effect ( $P > 0.05$ ) of increasing the level of phytase on digestibility of Ca and P. Xylanase supplementation at 4000 XU/kg increased digestibility of Ca, but not of P, at both 20 and 60 kg BW. There were no significant interactions ( $P > 0.05$ ) between phytase and xylanase with regard to nutrient digestibility. In summary, phytase supplementation improved Ca and P digestibilities while xylanase improved Ca and energy digestibilities, but neither affected pig performance. Furthermore, there were no synergistic effects of phytase and xylanase on nutrient digestibility and pig performance.

**Key Words:** Wheat, Phytase, Xylanase

**W129 Effects of supplemental dietary phytase and strontium on bone strength of weanling pigs fed a high phosphorus diet.** P. K. Roy<sup>\*</sup>, K. Yasuda, R. Maiorano, K. R. Roneker, and X. G. Lei, Cornell University, Ithaca, NY.

Our laboratory has previously shown positive impacts of supplemental microbial phytase (AppA2) and strontium (Sr) on bone traits of weanling pigs fed phosphorus-adequate diets. The aim of the present study was to determine if supplemental phytase (OptiPhos, JBS United, Inc., Sheridan, IN) and Sr (SrCO<sub>3</sub>, Alfa Aesar, Ward Hill, MA) still

exerted that positive effect in pigs fed a high phosphorus diet. Forty pigs (BW = 7.60 ± 0.14 kg) were allocated into four groups (n = 10). Group 1 were fed a corn-soy basal diet (BD) + 0.25% inorganic phosphorus (iP, dicalcium phosphate) + 50 mg Sr/kg (Diet 1). Group 2 were fed Diet 1 + 0.10% iP (Diet 2). Group 3 were fed BD + 0.35% iP + 3,400 units of phytase/kg (Diet 3). Group 4 were fed Diet 3 + 50 mg Sr/kg (Diet 4). After 8-wk feeding, five female pigs close to the mean value from each group were killed to collect bone samples for mechanical analysis. Plasma iP concentrations and body weight of individual pigs were measured biweekly, and showed no differences between treatments. Elevating dietary iP from 0.25 to 0.35% in the diet containing 50 mg Sr/kg significantly ( $P < 0.05$ ) improved breaking strength of femur and metacarpals by 9 and 20%, respectively (Diets 1 vs. 2). Supplementing phytase in the diet containing 0.35% iP and 50 mg Sr/kg improved ( $P < 0.05$ ) breaking strength of the two bones by 10 to 11% (Diets 2 vs. 4). Supplementing Sr in the diet containing 0.35% iP and phytase produced non-significant effect on bone strength (Diets 3 vs. 4). In conclusion, 3400 iu/Kg phytase supplementation improved bone strength of pigs fed diet containing 0.35% phosphorus, but the moderate level of Sr supplementation did not produce benefit as an alternative of phytase in those pigs.

**Key Words:** Pigs, Phytase, Strontium

**W130 Supplemental dietary phytase and strontium improves bone traits of weanling pigs fed a phosphorus-adequate diet.** A. R. Pagano<sup>1</sup>, K. R. Roneker<sup>1</sup>, K. Yasuda<sup>\*1</sup>, T. D. Crenshaw<sup>2</sup>, and X. G. Lei<sup>1</sup>, <sup>1</sup>Cornell University, Ithaca, NY, <sup>2</sup>University of Wisconsin, Madison.

Previous research in our laboratory has shown that dietary phytase supplementation at 2,000 units (U)/kg enhanced bone strength of weanling pigs fed phosphorus-adequate diets, possibly by improving dietary strontium (Sr) absorption. The objective of this study was to determine if supplementing Sr and phytase additively improved bone traits of those pigs. A total of 32 weanling pigs (BW: 11.4 ± 0.3 kg) were allotted to four groups (n = 8) fed a corn-soy, phosphorus-adequate (0.65%) basal diet (BD), the BD + Sr (50 mg/kg, SrCO<sub>3</sub>, Alfa Aesar, Ward Hill, MA), the BD + phytase (2,000 U/kg, OptiPhos, JBS United, Inc., Sheridan, IN), or the BD + Sr (50 mg/kg) + phytase (2,000 U/kg) for 6 wk. Weight gain, plasma alkaline phosphatase activity, and plasma inorganic P concentration of individual pigs were measured weekly, but no differences among treatments were detected. Femurs and metacarpals were collected from both front legs at the end of experiment to test mechanical properties, mineral density (BMD,