

## Swine Species

**441 Nutritive value of palm kernel cake-brewers dried grain (PKC-BDG) based diets supplemented with exogenous enzymes for growing-finishing pigs.** A. O. K. Adeshinwa<sup>\*1</sup>, O. O. Obi<sup>1</sup>, M. A. Adesina<sup>2</sup>, B. A. Makanjuola<sup>1</sup>, O. O. Oluwole<sup>1</sup>, T. O. Olorunbohunmi<sup>1</sup>, and O. Fagbiye<sup>3</sup>, <sup>1</sup>*Institute of Agricultural Research and Training, Obafemi Awolowo University, Ibadan, Oyo State, Nigeria*, <sup>2</sup>*National Agricultural Extension & Research Liaison Services, Ahmadu Bello University, Zaria, Kaduna State, Nigeria*, <sup>3</sup>*Federal College of Animal Health & Production Technology, Ibadan, Oyo State, Nigeria*.

Forty-eight (48) growing pigs (averaging  $41.20 \pm 1.41$  kg initial body weight) were randomly assigned to 4 dietary treatment groups in a completely randomized design to determine the nutritive value of PKC-BDG based diets supplemented with either of 2 exogenous enzymes (Allzyme Vegpro 5X or Allzyme SSF) or their combination for growing-finishing pigs. The basal control diet was formulated to contain 10, 45, 30, 10 and 5% of maize, palm kernel cake, brewers' dried grain, groundnut cake and micro-nutrients respectively. Pigs were provided ad-libitum access to the diets and water throughout the 56-d duration of the study. Record of weekly weight gain and feed intake was taken and used to compute all the data generated. All the data obtained were subjected to ANOVA and where statistical significance were observed, the means were compared using the Duncan's Multiple Range (DMR) test (Steel and Torrie, 1980). The SAS Computer software package (1988) was used for all statistical analyses. The result of the proximate analysis of the basal diet revealed that the diet contained 7.9, 17.3, 7.5, 6.8 and 9.2% moisture, crude protein, ether extract, crude fiber and ash contents respectively. The feed intake, weight gain, feed conversion ratio and dressing percentage (%) of the pigs were neither significantly ( $P > 0.05$ ) affected by the individual nor combination of the enzymes. The rate of growth of the pigs on the diet supplemented with Allzyme SSF was significantly ( $P < 0.05$ ) superior to that of pigs on the other 3 diets over the 8-week experimental period. However, final weights of the pigs were not significantly ( $P > 0.05$ ) different across the groups. Hence, since there was no superiority in the performance of pigs fed diets containing either or combination of Allzyme Vegpro 5X and SSF relative to the control diet (without enzyme inclusion), it could therefore be concluded that there was no advantage derived from using either or combination of the enzymes in this PKC-BDG based diet for growing-finishing pigs.

**Key words:** agro-industrial by-product, enzyme utilization, pig feed

**442 The influence of low and standard energy diets on efficiency, carcass value, and pork quality in Berkshire swine.** M. J. Bishop<sup>\*1</sup>, H. N. Zerby<sup>1</sup>, S. J. Moeller<sup>1</sup>, P. S. Kuber<sup>1</sup>, J. M. DeRouche<sup>2</sup>, and K. S. Betts<sup>1</sup>, <sup>1</sup>*The Ohio State University, Columbus*, <sup>2</sup>*Kansas State University, Manhattan*.

The present study addressed the influence of dietary-induced, reduced growth rate in purebred Berkshire pigs ( $n = 140$ ) on subsequent daily growth rate (ADG), pen gain:feed ratio (FC), ultrasonic backfat (BF) and loin area (LMA), and pork loin quality when fed to a target 113.6 kg live weight (LW). A randomized complete block design, conducted in 3 replications, assessed 3-phase dietary regimens fed at standard (SE; ME = 3234, 3243, 3247 kcal/kg, respectively) and low (LE; ME = 2857, 2864, and 2868 kcal/kg, respectively) energy content with TID lysine:ME ratios of 2.90, 2.37, and 2.06 g/Mcal in phases 1, 2, and 3, respectively. Dietary treatment resulted in harvest at 6 (6) and 7 (7) months of pig age. To avoid total confounding harvest date with pork

quality assessment, litter-mate pigs were randomly assigned to one of 4 treatments (6LE, 6SE, 7LE, and 7SE), with 6LE and 7LE representing harvest weight outside of a desired packer range. Pig weight and pen FC were measured weekly. Loin quality data were collected at 24h postmortem. Data were analyzed using mixed model procedures with treatment as a fixed effect, litter within replication as a random effect for all traits, and a random harvest date effect for meat quality traits. As expected, 6LE (0.62 kg/d) and 7LE pigs (0.61 kg/d) grew at a reduced rate when compared with 6SE (0.82 kg/d) and 7SE (0.81 kg/d) ( $P < 0.05$ ); however, 6LE and 7LE pigs consumed more feed and had poorer FC (0.19 kg/kg) when compared with 6SE (0.27 kg/kg) and 7SE (0.28 kg/kg) pens of pigs ( $P < 0.05$ ). While 7LE pigs had less BF than 6SE pigs (20.3 vs. 22.8 mm,  $P < 0.05$ ) at harvest, they also had less LMA (35.0 vs 37.5 cm<sup>2</sup>,  $P < 0.05$ ), resulting in no difference in estimated lean (49.1 vs 49.2%, respectively). Loin color (3.09 vs. 3.09), L\* (51.0 vs. 49.9), ultimate pH (5.91 vs. 5.91), marbling score (2.01 vs. 2.04) and slice shear force (12.9 kg vs. 12.1 kg) were not different between 7LE and 6SE, respectively. Feeding a lower energy diet reduced FC, and did not improve lean content or pork quality; therefore, SE diets offer the best economic return when feeding Berkshire pigs.

**Key words:** pork quality, swine, carcass composition

**443 Effects of ractopamine on performance, carcass and meat quality in purebred Berkshire swine.** K. S. Betts<sup>\*1</sup>, S. J. Moeller<sup>1</sup>, H. N. Zerby<sup>1</sup>, J. M. DeRouche<sup>2</sup>, M. D. Cressman<sup>1</sup>, M. J. Bishop<sup>1</sup>, A. S. Gress<sup>1</sup>, and F. L. Fluharty<sup>1</sup>, <sup>1</sup>*The Ohio State University, Columbus*, <sup>2</sup>*Kansas State University, Manhattan*.

The study evaluated the effects of a 28 d pre-harvest ractopamine (RAC) feeding program on average daily gain (ADG), feed conversion efficiency (FC), backfat (BF) and loin muscle area (LMA) and pork quality in purebred Berkshire pigs ( $n = 62$ ) utilizing a randomized complete block design with 3 treatments (Control (C) 0 ppm; RAC5, 5.0 ppm; RAC10; 10 ppm) in 2 replicates. Litter-mate pigs were randomly assigned to each RAC treatment. Ultrasonic BF and LMA and pig weight were measured at 0, 7, 14, 21, and 28 d of the feeding period. Carcass composition and pork quality (NPPC, 2000; visual color (VC), marbling (M), firmness (F), wetness (W), ultimate pH, and Minolta L\*, a\*, b\* were assessed at 24h post-harvest. Warner-Bratzler shear force (WBSF) was assessed on one chop after a 7 d aging period. Mixed model procedures were used in analyses with fixed effects of treatment and a random effect of litter within replicate. Live weight (93.5 kg) and BF (20 mm) were not different, while LMA was different (C = 32.3 cm<sup>2</sup>; RAC5 = 34.4 cm<sup>2</sup>, RAC10 = 33.1 cm<sup>2</sup>;  $P < 0.05$ ) at 0 d. Daily gain was numerically greater from 0 to 7 d and significantly greater from 0 to 14, 0 to 21, and 0 to 28 d for pigs fed RAC when compared with pigs fed a C diet ( $P < 0.05$ ). Pigs fed RAC10 had greater ADG than pigs fed RAC5 from 0 to 21 and 0 to 28 d. At 21 d, RAC5 and RAC10 pigs had greater LMA than C, at 28 d LMA of RAC5 was intermediate and not different from either C or RAC10 with C different from RAC10 ( $P < 0.05$ ), and carcass LMA of RAC10 was greater than RAC5 and C. No differences were observed across treatments for ultrasonic or carcass BF. Trends for greater lean percentage (LP) ( $P = 0.06$ ) and improved gain feed ratio (G:F) ( $P = 0.11$ ), whereby RAC10 (49.8%, 0.31 kg/kg) carcasses had numerically greater lean LP and G:F than RAC5 (47.8%, 0.28 kg/kg) and C (47.8%, 0.26 kg/kg) carcasses. Neither RAC5 or RAC10 diets influenced fresh loin quality with no differences in VC, M, F, W, L\* or WBSF, whereas ultimate

pH was greater (0.06 units,  $P < 0.05$ ) for the RAC10 treatment when compared with C. Ractopamine improved value and efficiency without negatively influencing quality.

**Key words:** swine, ractopamine, meat quality

**444 The effects of diet ingredients on gastric ulceration and salivary pH in gestating sows.** S. L. Wisdom<sup>\*1</sup>, B. T. Richert<sup>1</sup>, J. S. Radcliffe<sup>1</sup>, D. C. Lay Jr.<sup>2</sup>, and J. N. Marchant-Forde<sup>2</sup>, <sup>1</sup>*Purdue University, West Lafayette, IN*, <sup>2</sup>*USDA-ARS-LBRU, West Lafayette, IN*.

Diet and stress are thought to have significant influence on the development of ulceration of the pars esophagea (UPE) region of the stomach in swine. The objective of this experiment was to determine the effects of diet ingredients on UPE and salivary pH in breeding sows. Forty-eight sows were randomly assigned to 1 of 4 treatment groups with parities (avg.  $1.81 \pm 0.21$ ) balanced across treatments. Treatments were: 1) control, a commercial gestating sow diet; 2) proton pump inhibitor, a commercial gestating sow diet plus a single daily dose of 60 mg omeprazole; 3) sodium bicarbonate, a commercial gestating sow diet with sodium bicarbonate included at 2% of the diet; 4) roughage, a high fiber diet (25% SB hulls) fed at a higher feed intake to an equal total ME as control. Treatments began on d 30 of gestation and all diets were fed once per day. All sows underwent initial endoscopic evaluation at d 30 to assess UPE already present and initial salivary pH was measured. Salivary pH and UPE were also investigated at d 60 and d 90 of gestation. Ulcers were scored using a 7-point scale, ranging from 0, showing no visible lesions, to 6, showing deep ulcerations in > 20% of the pars esophagea. Salivary pH was measured 5 times throughout the day at 0700 h, 1000 h, 1300 h, 1600 h and 1900 h. Data were analyzed using mixed procedure of SAS. UPE differed between groups before treatment was applied ( $P < 0.01$ ), but using initial UPE as a covariate, there were no effects of treatment on d 60 or d 90 (both  $P > 0.05$ ). Treatment also had no effect on litter size, piglet weight, or lactation feed intake ( $P > 0.05$ ). The average UPE score was  $1.06 \pm 0.23$  ranging from 0 to 6, with the largest individual score difference changing from score 5 to 0. Salivary pH did not correlate with UPE and there was no treatment effect (both  $P > 0.05$ ), but there was a change in salivary pH throughout the day ( $P < 0.01$ ) with the highest pH ( $8.99 \pm 0.05$ ) at 0700 h and lowest pH ( $8.88 \pm 0.02$ ) at 1300 h. The results indicate that the selected treatments did not influence UPE. To evaluate the impact of natural changes in salivary pH, further investigations are needed.

**Key words:** swine, gastric ulcer, salivary pH

**445 Effect of dietary glutamine supplementation on the apparent total tract digestibility of energy and nutrients and jejunal gene expression in weaned piglets.** A. Chen<sup>\*</sup>, Y. Xiao, T. Wu, Q. Hong, and C. Yang, *Zhejiang University, Hangzhou, Zhejiang, China*.

Glutamine plays essential roles in the beneficial function to improve nutrition status in young mammals. This study was conducted to examine the effect of dietary L-glutamine supplementation on apparent total tract digestibility (ATTD) of dietary energy and nutrients in 21-d-old weaned piglets, and the expression of jejunal gene related to intestinal health. A total of 128 piglets were blocked by litter and assigned to one of 2 group, representing supplementation with 1% L-glutamine (wt:wt) or isonitrogenous L-alanine (control) to corn-and soybean meal-based diets. After 10-d treatment, the fresh fecal samples were collected to determine apparent total tract digestibility of dry matter (DM), digestible energy (DE) crude protein (CP) and amino

acid (AA), and jejunum were obtained to access the expression of peroxisome proliferator-activated receptor gamma (PPAR $\gamma$ ), mammalian target of rapamycin complex 1 (mTORC1) and pyruvate kinase (PK). The results show that the apparent total tract digestibility of energy or nutrients was higher ( $P < 0.05$ ) in dietary glutamine supplementation piglets. The total tract digestibility of DM, DE, and CP averaged 81.02, 82.18, and 86.73%, respectively, for glutamine treatment piglets and 74.29, 76.79, and 83.83%, respectively, for control piglets. A significant increase of AA digestibility was observed ( $P < 0.01$ ) except for alanine which was reduced by 8.19% ( $P < 0.01$ ). Besides, dietary glutamine supplementation resulted in increased expression of jejunal mTORC1 by 22.10% but decreased PK by 29.75% ( $P < 0.05$ ). Jejunal PPAR $\gamma$  mRNA abundance was not affected by glutamine treatment. In conclusion, 1% L-glutamine supplementation to post-weaned piglet diet enhanced the apparent total tract digestibility of energy or nutrients and modified jejunal gene expression.

**Key words:** glutamine, digestibility, gene expression

**446 Effect of feeding Bt (MON810) maize to pigs from 12 days post-weaning for 110 days on growth performance, body composition, carcass characteristics, organ weights and intestinal morphology.** S. G. Buzoianu<sup>\*1,2</sup>, M. C. Walsh<sup>1</sup>, G. E. Gardiner<sup>2</sup>, M. C. Rea<sup>3</sup>, R. P. Ross<sup>3</sup>, and P. G. Lawlor<sup>1</sup>, <sup>1</sup>*Pig Development Department, Moorepark Animal and Grassland Research and Innovation Centre, Teagasc, Fermoy, Co. Cork, Ireland*, <sup>2</sup>*Department of Chemical and Life Sciences, Waterford Institute of Technology, Waterford, Ireland*, <sup>3</sup>*Moorepark Food Research Centre, Teagasc, Fermoy, Co. Cork, Ireland*.

Increased use of genetically modified (GM) ingredients worldwide makes sourcing non-GM ingredients more difficult and expensive. The aim of this study was to assess the effects of feeding GM Bt (MON810) maize to pigs from 12 d post-weaning to slaughter for 110 d on growth performance, body composition, carcass characteristics, organ weights and intestinal health. Seventy 2 male pigs ( $10.7 \pm 1.9$  kg) were blocked by weight and litter and assigned to one of 4 treatments: T1: non-GM maize (nGMm) to slaughter; T2: GM maize (GMm) to slaughter; T3: nGMm for 30 d followed by GMm to slaughter; T4: GMm for 30 d followed by nGMm to slaughter. Individual BW and feed disappearance were recorded on d 0, 30, 60, 100 and at slaughter. Body composition (fat %, bone mineral content and area bone mineral density) was determined by dual energy X-ray absorptiometry on d 80 of the study ( $n = 10/\text{trt}$ ). On d 110 of the study, 10 pigs/trt were slaughtered and the heart, kidney, spleen, liver, stomach and small intestine (SI) were removed and weighed. Sections of SI were processed for histological examination of villus height, width, crypt depth and goblet cell number/villus. Carcass weight was also recorded at slaughter. All data were analyzed as a one-factor ANOVA using the GLM procedure of SAS. Organ weights were analyzed using body weight at slaughter as a covariate in the model. There was no treatment effect for body composition. Growth parameters (ADG, F:G and ADFI, BW at slaughter) were not influenced by treatment. Organ and carcass weight and kill-out percentage did not differ between treatments. Values for all parameters measured were within normal ranges for pigs of a similar age and weight. Intestinal morphology was not affected by treatment. In conclusion, feeding GM Bt maize from 12 d post weaning to slaughter had no adverse effect on pig growth performance, body composition, organ weights, carcass characteristics or intestinal morphology. This research will help assure both farmers and consumers as to the safety of GM Bt maize.

**Key words:** Bt maize, pig health, MON810

**447 Effect of feeding genetically modified Bt (MON810) maize to pigs from 12 days post-weaning for 110 days on serum and urine biochemistry.** S. G. Buzoianu<sup>\*1,2</sup>, M. C. Walsh<sup>1</sup>, G. E. Gardiner<sup>2</sup>, M. C. Rea<sup>3</sup>, R. P. Ross<sup>3</sup>, and P. G. Lawlor<sup>1</sup>, <sup>1</sup>*Pig Development Department, Moorepark Animal and Grassland Research and Innovation Centre, Teagasc, Fermoy, Co. Cork, Ireland*, <sup>2</sup>*Department of Chemical and Life Sciences, Waterford Institute of Technology, Waterford, Ireland*, <sup>3</sup>*Moorepark Food Research Centre, Teagasc, Fermoy, Co. Cork, Ireland*.

Perceived health risks are among the main reasons for low acceptability of genetically modified (GM) feed ingredients. The aim of this study was to evaluate the effect of feeding GM maize to pigs from 12 d post-weaning to slaughter for 110 d on health as assessed by serum and urine biochemistry. Seventy-two entire male pigs (10.7 ± 1.9 kg live weight) were blocked by weight and litter and randomly assigned to 1 of 4 treatments (d 0); T1: non-GM maize (nGMm) in diet to d 110; T2: GM maize (GMm) in diet to d 110; T3: nGMm in diet for 30 d followed by GMm to d 110; T4: GMm in diet for 30 d followed by nGMm to d 110. Serum collected on d 0, 30, 60, 100 and 110 (n = 10/trt) was analyzed for liver and kidney health indicators (alanine aminotransferase, aspartate aminotransferase (AST),  $\gamma$ -glutamyl transferase, alkaline phosphatase, total protein (TP), urea (SU) and creatinine (SC)). Creatinine and protein were measured in urine collected on d 110 to further assess kidney health. Statistical analysis was performed by a one-factor ANOVA using the GLM procedure of SAS. For serum biochemistry, d 0 values were used as a covariate in the model. On d 30, SU was lower for T3 compared with T1, T2 and T4 (2.9 vs 3.9, 4.7 and 4.2 mmol/L, respectively; SEM = 0.37;  $P = 0.03$ ). On d 110, there was a higher concentration of SC in pigs fed T3 and T4 compared with T1 and T2 (181.5 and 177.6 vs 163.9 and 155.9  $\mu$ mol/L; SEM = 5.63;  $P = 0.001$ ). Serum TP was lower on d 110 in pigs fed T4 compared with T1, T2 and T3 (57 vs 60.5, 59.3, 61.1 g/L; SEM = 1.62;  $P = 0.02$ ). On d 110, serum AST tended to be lower in pigs fed T2 compared with T1 (37.2 vs 53.5 units/L; SEM = 4.01;  $P = 0.06$ ). Although statistically significant differences were found, values remained within the normal ranges for pigs of similar age and weight. No parameter was consistently affected throughout the study, therefore changes detected are unlikely to be of clinical importance. This study shows no adverse effects of feeding Bt GMm to pigs between weaning and slaughter on serum or urine biochemistry and should help to assure consumers as to the safety of Bt maize.

**Key words:** Bt maize, pig health, MON810

**448 Supplementation of xylanase to improve DDGS and corn germ meal utilization by finishing pigs as measured by performance and carcass yield in a commercial environment.** D. D. Hall<sup>\*1</sup>, M. U. Steidinger<sup>2</sup>, J. C. Remus<sup>3</sup>, M. Hruby<sup>3</sup>, and A. J. Veldkamp<sup>3</sup>, <sup>1</sup>*Hall Farms Consulting, LLC, Noblesville, IN*, <sup>2</sup>*Swine Nutrition Services, Anchor, IL*, <sup>3</sup>*Danisco Animal Nutrition, Waukesha, WI*.

Two experiments were conducted to test a hypothesis that dietary supplementation of xylanase (Danisco Porzyme 9302 @ 4,000 units/kg) improves nutrient utilization of commercially available corn co-products in diets consisting of 30% dried distillers grains and solubles (DDGS) or a combination of 30%DDGS and 20% corn germ meal (CGM) by growing-finishing pigs. In both experiments, pigs were housed at 30–32 pigs/pen with pen space at 6.75–7.4 sq.ft./pig. Each

trial consisted of 8 reps (Exp. 1 initial wt. 26kg) or 7 reps (Exp. 2 initial wt. 33kg) Statistical analysis (SAS.JMP) was block design with block = (rep. initial wt.). All diets had equal phytase addition (Danisco Phyzyme XP@750 units/kg). Withdrawal of DDGS was tested in 2 × 2 factorial design with Xylanase in both experiments (Table 1). There were no differences in daily gain or feed intake in Exp. 1. In Exp. 2, addition of CGM reduced ADG compared with Control (DDGS) fed pigs (d43–97; 0.932 vs 0.841 kg/d;  $P < 0.05$ ). Feed/gain ratio was improved in both Exp. 1 (d41–81;  $P < 0.06$ ) and Exp. 2(d43–97;  $P < 0.001$ ) by addition of xylanase to the corn co-product diets of DDGS or DDGS + CGM (Table 1). Supplementation of xylanase and DDGS withdrawal resulted in carcass yield equal to the corn-soy control fed pigs in both experiments (Table 1).

**Table 1.** Feed/gain and yield

Exp.1	Corn	DDGS	DDGS	DDGS	DDGS	DDGS	Xylanase
Xylanase		+		+			
(D82-MKT)	Corn	DDGS	DDGS	Corn	Corn	SEM	$P <$
Feed/gain							
D0-41	2.40	2.32	2.34			0.026	0.10
D41-81	2.96 <sup>ab</sup>	2.98 <sup>a</sup>	2.88 <sup>b</sup>			0.045	0.06
D81-104	3.26	3.45	3.36	3.39	3.43	0.070	0.10
Yield,%	77.4 <sup>b</sup>	76.6 <sup>c</sup>	76.6 <sup>c</sup>	76.8 <sup>c</sup>	77.1 <sup>b,c</sup>	0.20	0.02
Exp.2	DDGS	CGM	CGM	CGM	CGM	SEM	$P <$
Xylanase		+		+			
(D76-mkt)	Corn	CGM	CGM	Corn	Corn		
Feed/gain							
D0-43	2.42 <sup>a</sup>	2.51 <sup>b</sup>	2.53 <sup>b</sup>			0.025	0.01
D43-97	3.26 <sup>a</sup>	3.54 <sup>d</sup>	3.38 <sup>b</sup>	3.46 <sup>c</sup>	3.38 <sup>b</sup>	0.023	0.001
Yield,%*	76.7	75.5	76.6	76.2	77.4		

\*At time of publication, yield (Exp. 2) = first cut 56 pigs/trt.

**Key words:** pigs, xylanase, corn germ meal

**449 Monitoring muscle proteolysis in pig plasma.** K. L. Price<sup>\*</sup> and J. Escobar, *Virginia Polytechnic Institute and State University, Blacksburg*.

N $\tau$ -methyl-L-histidine (N $\tau$ MH, CAS number 332-80-9, archaic 3-methylhistidine) is released from skeletal muscle during proteolysis, cannot be reused for protein synthesis, and it is excreted from the body in urine. In humans, free N $\tau$ MH is the main form found in plasma and urine. In healthy rodents N $\tau$ MH is predominately found in the acetylated form (Ac-N $\tau$ MH). Furthermore, changes in urinary Ac-N $\tau$ MH, and not free N $\tau$ MH, are associated with muscle breakdown during sickness. Our objective was to quantify free and Ac-N $\tau$ MH in pig plasma during health and disease. We chose plasma over urine because blood samples are usually easier, more reliable, and faster to collect than urine samples. Plasma samples were subjected or not to acid hydrolysis (6 M HCl for 24 h at 110°C) to quantify total and free N $\tau$ MH, respectively. Plasma samples were then subjected to pre-column derivatization with phenylisothiocyanate, and separation and quantification using HPLC. To determine how much N $\tau$ MH was acetylated, free N $\tau$ MH was subtracted from total N $\tau$ MH. Pigs (33.41 ± 1.05 kg, n = 9) were fitted with indwelling jugular catheters. Blood samples were collected before ( $t = 0$ ) and 12 h after a bolus of *E. coli*-derived lipopolysaccharide (LPS, 10  $\mu$ g/kg BW i.v.). In healthy pig plasma ( $t = 0$ ), the major representation of N $\tau$ MH was in the acetylated form (71% Ac-N $\tau$ MH). Plasma free N $\tau$ MH was not different ( $P = 0.490$ ) between  $t = 0$  and  $t = 12$  (30.60 ± 1.80  $\mu$ M vs 29.14 ± 0.93  $\mu$ M, respectively). Total plasma N $\tau$ MH increased 39% ( $P = 0.048$ ) from 86.4 ± 8.6  $\mu$ M

at  $t = 0$  to  $120.2 \pm 13.2 \mu\text{M}$  at  $t = 12$ . Ac-N $\tau$ MH increased 56% ( $P = 0.0546$ ) from  $57.3 \pm 9.2 \mu\text{M}$  at  $t = 0$  to  $89.6 \pm 12.6 \mu\text{M}$ . Finally, plasma concentrations of 3-methyl-L-histidine (3MH, CAS number 368-16-1, archaic 1-methylhistidine) were not detected at either time point. In summary, our findings indicate that a) 3MH is not detectable in plasma; b) free N $\tau$ MH remained unaffected after LPS treatment and hence may not be a reliable indicator of muscle proteolysis; and c) the majority of plasma N $\tau$ MH is present in the acetylated form in health and sickness. Additionally, our results demonstrate that to accurately monitor N $\tau$ MH fluctuations, pig plasma needs to be acid hydrolyzed.

**Key words:** methylhistidine, HPLC, acid hydrolysis

**450 Effect of independent laboratory assessment, freezing volume, and other factors influencing post-thaw quality of frozen boar sperm.** J. M. Ringwelski\* and R. V. Knox, *Department of Animal Sciences, University of Illinois, Champaign-Urbana.*

Frozen boar sperm shows lower fertility compared with liquid semen. This has been partly classified based on post-thaw lab assessments. Experiment 1 was performed to evaluate effects of independent lab assessment of post-thaw motility following freezing in 5 mL (Lab 1) or 0.5 mL (Lab 2) straws. Ejaculates ( $n = 117$ ) from 27 mature boars of Landrace ( $n = 5$ ), Large White ( $n = 15$ ), Duroc ( $n = 5$ ), and Other ( $n = 2$ ) breeds were collected and frozen across seasons (winter-summer) from Feb to Jun 2010. Ejaculates were collected, diluted 1:1 in Modena, and held at 17°C until processing (Lab 1) or upon arrival the next day (Lab 2). All samples were frozen within 24 h of collection. Once frozen, straws were stored at -196°C until analysis. Straws were thawed at 50°C for 45 s for 5 mL straws and 20 s for 0.5 mL straws and evaluated at 37°C upon thawing. Data were analyzed using SAS for the effects of lab and volume, breed and season. There was no effect ( $P > 0.05$ ) of lab and volume (47.4 vs. 49.8%), breed or season on motility. Experiment 2 was conducted to determine the effect of independent lab on pre-freeze concentration and motility, and also effects of breed, season, and collection number on post thaw quality measures in 0.5 mL straws. Straws ( $n = 47$ ) from 26 boars were thawed and evaluated for motility and membrane integrity using propidium iodide. Data were analyzed in SAS for effects of lab assessments on pre-freeze motility, concentration, and total sperm cells. Effect of breed, season, and collection number on motility and viability were also evaluated in 0.5 mL straws. Measures of concentration (0.82), motility (0.78), and total cells (0.67) were all positively related for independent lab assessments ( $P < 0.001$ ). Motility (47%) and membrane integrity (51%) were not affected by breed, season, or collection number ( $P > 0.05$ ). The results of these experiments suggest that independent lab assessments post-thaw can be highly related, and there is no significant difference related to freez-

ing in 5 or 0.5 mL straws. In boars in active collection rotations, breed and season had no impact on post-thaw quality of frozen boar sperm.

**Key words:** boar, spermatozoa, cryopreservation

**451 Characteristics of the work habits and demographics of caretakers on swine finishing facilities in Ohio.** S. M. Crawford\*<sup>1</sup>, S. J. Moeller<sup>1</sup>, P. H. Hemsworth<sup>2</sup>, C. C. Croney<sup>1</sup>, N. A. Botheras<sup>1</sup>, and H. N. Zerby<sup>1</sup>, <sup>1</sup>Ohio State University, Columbus, <sup>2</sup>University of Melbourne, Melbourne, Victoria, Australia.

Contract finishing farms representing 2 integrated swine entities ( $n = 32$ ) within Ohio were observed to study daily work habits and characterize the demographics of the caretaker(s) ( $n = 40$ ) working on the farms. The farms used in the research housed a minimum of 1000 pigs. A standard observer visited each farm for 2 consecutive days, at a time designated by the caretakers, and recorded human behaviors during the daily work. A questionnaire was administered to collect demographic data. Of the 40 persons observed, 33 completed the questionnaire. The data was summarized to characterize attributes that may influence animal care and caretakers attitudes and actions. On average, the caretakers were 41.2 yrs of age (range 21 to 60 yrs), had worked with pigs for 16.9 yrs (range 1 to 40 yrs; mode = 8 yrs), and worked in contract finishing for 7.4 yrs (range 1 to 20 yrs; mode = 1 yr). Males were the predominant gender (93.9% male; 6.1% female). Thirty caretakers indicated employment off-farm, including responses such as grain farming, dairy farming, beef feedlot manager, electrician, truck driver, postal worker, mechanic, seed sales, plumber, and financial services. When asked why they initiated a finishing production contract, responses included diversification, enjoyment, income, and risk reduction. Thirty-one of 33 caretakers had completed Pork Quality Assurance Plus® training. On observation days, caretakers spent 36.43 s per pen, with a wide range from 5.76 to 128.8 s. A significant association was observed between the time spent per pen and the number of words spoken ( $r = 0.71$ ) and verbal sounds (whistles, hoots, etc) ( $r = 0.72$ ). Salivary cortisol levels that were collected from 2 or 3 pigs in each pen, over a 2-d period, were different ( $P < 0.01$ ) indicating different stress levels across farms. The summary results are indicative of the large variation that is observed within contract finishing farms within the given integrated system and suggest that caretakers may need additional training to improve animal well-being. Also, the knowledge of these variations can aid in determining training/education needs for the caretakers in the future.

**Key words:** pigs, caretaker