74 Myofibrils isolated from red and white porcine muscles respond differently to pH. B. C. Bowker*, D. R. Swartz2, A. L. Grant1, and D. E. Gerrard1. 1 Purdue University, West Lafayette, IN, 2 Indiana University Medical School, Indianapolis, IN.

The pH-dependent ATPase activity of myofibrils from muscles varying in fiber type is thought to modulate postmortem muscle metabolism. The objective of this study was to determine the effects various conditions, simulating postmortem conditions, have on myofibrillar ATPase activity of red semitendinosis (RST) and white semitendinosus (WT) porcine muscle. The ATPase activity of myofibrils was measured at 39°C, 10-4 M Ca2+, and pH ranging from 5.0 to 7.5 at 0.25 unit intervals. To test if decreased pH irreversibly alters myofibrillar ATPase activity, activity was measured using myofibrils incubated 90 min at 39°C at pH 7.0, then pH 5.0 or 6.0, and back to pH 7.0. Maximum activity was at approximately pH 7.0 with WT myofibrils exhibiting greater (P < 0.001) ATPase activity than RST myofibrils (0.621 vs. 0.445 mmol Pi/mg protein/min). Activity of both RST and WT myofibrils declined from maximum rates to approximately zero between pH 6.25 and 5.5. Activity declined to half-maximal levels at pH 5.95 in both RST and WT myofibrils. Following incubation at pH 6.0, ATPase activity recovered to a higher (P < 0.05) percent of maximum activity in RST than WT myofibrils. These data suggest that postmortem muscle pH and muscle fiber type affect overall myofibrillar ATPase activity and that low pH may irreversibly alter myofibrillar proteins causing a loss in ATPase activity, with this pH sensitivity being more pronounced in WT than RST.

Key Words: Myofibrils, ATPase activity, pH

75 Relationship between muscle fiber type and pork quality traits of pigs selected for leanness and growth efficiency. C. R. Kerth*, A. A. Helm, D. L. Kuhlers, L. B. Cagle, L. K. Blair-Kerth, and W. R. Jones, Auburn University, Auburn AL.

Progeny from the sixth generation of Duroc pigs selected for leanness and growth efficiency or a control line of pigs maintained from the base population were tested to determine the relationship between muscle fiber types and muscle quality traits. Random samples of pigs from each genetic line with mixed sexes (n = 31) were slaughtered at 114 kg. Longissimus muscles were measured for postmortem pH at 0.5, 1, 2, 3, 4, and 22 to 24 h postmortem. Chops were removed to determine Hunter L*, a*, and b* values, drip loss, water holding capacity, and fiber typing. Muscle fiber type samples were stained for acid-stable ATPase activity to determine muscle fiber type. Correlation and regression analyses were conducted to determine the relationship between muscle fiber type and muscle quality traits. No significant correlation existed (P > 0.05) between muscle fiber type and percent drip loss, Hunter a* and b* values, percent moisture, or postmortem pH at 0.5, 1, 2, 3, 4, and 22 to 24 hours. Genotype did not affect (P > 0.05) mean fiber type percentage. Hunter L* values were negatively correlated with slow-twitch oxidative (SO) fiber types (r = -0.39) and positively correlated with fast-twitch glycolytic (FG) fiber types (r = 0.49, P < 0.05). No correlation existed (P > 0.05) between percent free water and SO or FG fiber types. However fast-twitch oxidative, glycolytic (FOG) fiber types were negatively correlated (r = -0.40) with percent free water and positively correlated with percent bound and immobilized water (r = 0.40 and 0.40 respectively, P < 0.05). Regression analysis showed that percent FG muscle fiber types accounted for 23.8% and SO muscle fiber types accounted for 14.9% of the variation in Hunter L* (P < 0.05). The percentage of FOG fiber types accounted for 16.1% (P < 0.05) of the variation in percent free water. These data indicate that a relationship exists between muscle fiber type and objective muscle quality traits of pigs selected for increased leanness and growth efficiency.

Key Words: Muscle Fiber Type, Water-holding, Muscle Color

76 Variation in color and pH measurements throughout boneless pork loins. C. L. Lorenzen1, J. L. Norman2, G. K. Rentfrow2, C. A. Stahl2, E. P. Berg2, and M. L. Ellersieck3. 1 Food Science and Engineering Unit, 2 Animal Sciences Unit, 3 Department of Statistics, University of Missouri - Columbia.

Color is an extremely important consideration for merchandising pork both domestically and internationally. The objective of this study was to characterize the changes in color and pH throughout the length of the boneless pork loin. Center cut boneless pork loins (n = 93) were obtained commercially and segmented according to NPPC color standards assessed at the sirloin face of bone-in loins. Treatment 1 included NPPC color standards 1 and 2; treatment 2, standards 3 and 4; and treatment 3, standards 5 and 6. Loins were cut into 2.54 cm chops and allowed to bloom for at least 10 min. Hunter color L*, a*, and b* values and pH measurements were taken on all chops in the loin starting at the sirloin end. Treatment affected (P < 0.05) all measures of color. Hunter color L*, a*, and b* values for chops differed (P < 0.05) by position of chop in the loin. All regression equations used to predict color values were polynomial with R² values of 0.71, 0.87, and 0.95 for L*, a*, and b*, respectively. A treatment by position interaction (P < 0.05) existed for pH values with treatment 3, sirloin end being the highest and treatment 1, blade end the lowest. The center of the loin is typically merchandized as the high value, high yield portion of the loin most popular with consumers. This study indicates that there is variation in color and pH throughout the loin; therefore, a single measurement at the end of the loin may not accurately predict the color of pork in the portion of the loin that creates retail demand.

Key Words: Pork, Color, pH

77 In-home consumer acceptance of boneless pork loins varying in color. J. L. Norman1, C. L. Lorenzen1, C. A. Stahl2, G. K. Rentfrow2, E. P. Berg2, and H. Heymann1. 1 Food Science and Engineering Unit, 2 Animal Sciences Unit, University of Missouri - Columbia.

The objectives of this study were to determine the effects of color and light reflectance on Warner-Bratzler shear force values and/or consumer preferences for pork. Center-cut boneless pork loins (n = 60) were divided into three groups based on NPPC color standards. Treatment 1 included NPPC color standards 1 and 2; treatment 2, 3 and 4; and treatment 3, 5 and 6. Loins were cut into 2.54 cm chops. Two chops obtained from the center section of each loin were used to determine Warner-Bratzler shear force, Hunter color L*, a*, and b* values, and pH values. The “in-home” portion of this study consisted of two three-week repetitions where consumers prepared, consumed, and evaluated specific pork chops. Chops were allotted randomly for both treatment and week of repetition. Consumers used a nine-point sensory hedonic scale for the attributes overall likeness, tenderness liking, juiciness liking, and flavor liking; where 1 = dislike extremely and 9 = like extremely. A treatment by position interaction (P < 0.05) mean fiber type percentage. Hunter L* values were negatively correlated with slow-twitch oxidative (SO) fiber types (r = -0.39) and positively correlated with fast-twitch glycolytic (FG) fiber types (r = 0.49, P < 0.05). No correlation existed (P > 0.05) between percent free water and SO or FG fiber types. However fast-twitch oxidative, glycolytic (FOG) fiber types were negatively correlated (r = -0.40) with percent free water and positively correlated with percent bound and immobilized water (r = 0.40 and 0.40 respectively, P < 0.05). Regression analysis showed that percent FG muscle fiber types accounted for 23.8% and SO muscle fiber types accounted for 14.9% of the variation in Hunter L* (P < 0.05). The percentage of FOG fiber types accounted for 16.1% (P < 0.05) of the variation in percent free water. These data indicate that a relationship exists between muscle fiber type and objective muscle quality traits of pigs selected for increased leanness and growth efficiency.

Key Words: Muscle Fiber Type, Water-holding, Muscle Color

Key Words: Pork Quality, Tenderness, Light Reflectance
78 Muscle glycogen and lactate content and pork quality traits as affected by available dietary carbohydrate in pigs. G. Bee*, 1 Swiss Federal Research Station for Animal Production.

The aim of the study was to determine whether muscle glycogen content and pork quality traits could be modified by availability of carbohydrates in the diet. Bioproc samples of longissimus (LM) from 48 Swiss Large White pigs (25 gilts; 23 barrows) weighing 70 kg were collected, and the glycogen (GLC) content (GLC = 2[glycogen + glucose + lactate]) was determined to vary from 111 to 187 µmol/g wet weight. At 90 kg pigs were moved into individual pens and assigned (blocked by GP and sex) to be fed 2.8 kg of a diet either high (H) or low (L) in available carbohydrate up to 104 kg. Pigs were fasted over night (15 h) before slaughter. Glycogen and lactate content were determined in samples of LM (predominately glycolytic) collected 30 min and 24 h after stunning, and in samples of the dark part of the semitendinous (ST, oxidative muscle) collected 24 h after stunning. Measurements of pH were carried out in the LM 30 min and 24 h after slaughter. Hunter L*, a*, b* values and drip losses were assessed the day after dissection. Overall glycogen and lactate levels 24 h postmortem were higher in the LM compared to the ST (19.5 vs. 11.5 µmol/g; 95.4 vs. 74.8 µmol/g; P < 0.05). Diets did not affect pH, color, drip losses, or glycogen and lactate concentrations of the LM. The diets altered the glycogen content of the ST in gilts (14.7 vs. L: 9.2 µmol/g) but not in barrows. Lactate concentrations in the ST were also higher in pigs fed the H diet (H: 76.3 vs. L: 73.4 µmol/g; P = 0.03). Compared to diet L, Hunter L* values tended to be lower in the ST (42.6 vs. L: 43.5; P = 0.07) in the ST of animals fed diet H, and H* (6.8 vs. L: 5.6; P < 0.05) and drip losses (H: 4.8 vs. L: 3.1%; P ≤ 0.05) were higher in gilts but were unaffected in barrows. Hunter L*, a*, b* and drip losses were positively correlated with glycogen (0.36; 0.34; 0.57; 0.59; P < 0.05) and lactate content (0.36; 0.28; 0.34; 0.27) in the ST, whereas the correlations were not significant in the LM. In conclusion, dietary treatment affected quality traits of the ST, but not of the LM muscle, and the effects were more pronounced in gilts than barrows.

Key Words: pigs, glycolytic potential, pork quality

79 Influences of nutritional levels on porcine muscle development and meat quality. Daiwen Chen*, Keying Zhang, Zhu Yu Li, Feiyun Yang, and Zuohua Liu, 1 Institute of Animal Nutrition, Sichuan Agricultural University, Yaan, Sichuan, PR.China, 2 Academy of Swine Research of Chongqing, PR.China.

This study was conducted to investigate the growth models of piglet traits at high (HL) and low (LL) nutritional levels. Landrace x Rongchang barrows (n = 90) with 18 kg bodyweight (BW) were randomly allotted into two treatments with 3 replicates each. Pigs were fed with diets containing DE 14.2 MJ/kg and CP 15.5%, 13.2% and 11.2% for each stage (LL). For each replicate, 3 pigs were killed at 20, 35, 50, 80 or 100 kg BW to examine meat measurements. Quality traits were measured at 45 min postmortem. The amount (kg) of lean deposition increased linearly with BW (= 0.4156 + 0.3299 BW (kg), R² = 0.9997, P < 0.001, but didn’t vary with nutritional levels (P > 0.05). There were no differences for color score of longissimus muscle (LM) among treatments. LM area, lean percentage (LP) in carcass, intramuscular fat (IMF) content and water loss (WL) of meat after 5-min pressure under 35-kg force responded quadratically to BW (x, kg) (LP = 4.512 + 0.0009 x + 0.0001 x²) as fully shown. Analysis of these equations indicated that the effects of HL and LL on LM area and LP differentiated from each other. The extent of effects was greater when VE was included at 20 kg LW than at 60 kg or 80 kg. There were no interactions between Cu and VE. It was concluded that Cu supplementation in growing-finishing diets has no adverse effects on pork quality and VE supplementation was able to improve pork quality and extend pork shelf life.

Key Words: Meat Quality, Copper/Vitamin E, Pigs

81 Effects of dietary levels of ideal protein on pig meat quality. Keying Zhang*, Daiwen Chen, Xianmei Luo, Xuewei Li, Fangquan Li, and Zhuyu Hu, Institute of Animal Nutrition, Sichuan Agricultural University, Yaan, Sichuan, PR. China.

There are no investigations on the relationship between dietary ideal protein (IP) levels and pork quality up to now. In this study, sixty Large White x Rongchang barrows with initial live weight (LW) of 20 kg were used to examine the effects of dietary IP levels on meat quality. Five dietary IP levels were designed as 8, 11, 14, 17 and 20% on as-fed basis (DM 89%). Corn-soybean-meal diets were formulated to contain DE 14.2MJ/kg, digestible lysine 4.75 g per 100 g of N x 6.25, and a ratio of lysine: sulfur-containing amino acids: threonine and tryptophan on digestible basis of 100:61:64:20. Pigs were randomly assigned into each treatment with 4 replicates each and given ad libitum access until 100 kg LW. When 1 pig of each replicate was slaughtered to check carcass quality. The results were showed in the table. There were no significant differences among treatments in terms of meat pH, color scoring. However, as IP increased, area and drip loss of longissimus muscle significantly improved, while marble and intramuscular fat decreased. Because marbling, intramuscular fat and drip loss are related to meat tenderness, juiciness and overall acceptability, this study indicates that appropriately low level of dietary ideal protein may be favorable to eating quality of pig meat.

Key Words: Meat Quality, Ideal Protein, Pigs

82 Validation of three cookery methods to eliminate Listeria monocytogenes on short versus long term aged country ham slices. J.S. Kotrola*, W.B. Mikel, and M. Newman, University of Kentucky, Lexington, KY.

Newly implemented USDA regulations dictate that all ready-to-eat products, of which Country-cured hams are classified, have validated cooking instruction on the label to be considered not ready to eat. Recent research indicates that if the USDA process for curing country hams is not strictly adhered to, then Listeria may possibly be present in sufficient numbers to cause illness in immuno-compromised individuals. Therefore, three cookery methods were evaluated on short versus long term aged country ham slices to determine mean temperature at which Listeria monocytogenes was no longer viable. Country-cured hams slices were inoculated with a cocktail of 5 strains of Listeria monocytogenes at 3.70 x 105 CFU/ml, 1.33 x 105 CFU/ml and 7.10 x 105 CFU/ml in preparation for cookery by microwave, oven and griddle respectively. Heating times were as follows: microwave (1000 watts) for 1, 2, 4, 6, 8 min.; oven (350°F) for 2, 4, 8, 12, 16, 20 min.; and Griddle (350°F) for 30, 45, 60, 90, 120, 150 sec. There were nine observations per cook
method and time combination. After the heat treatment, 25 gm of meat was rapidly mixed with 225 ml chilled UVM broth to terminate heating effect. Microwave heating effectively eliminated the Listeria monocytogenes cultures after 2 minutes for the long term ham and 1 minute for short term ham slices. Oven heating resulted in no viable cultures remaining after 8 minutes for the long term and short term cured products. Griddle heating eliminated populations after 45 sec for short term aged slices and after 60 sec for long term aged slices. The efficacy of eliminating Listeria monocytogenes from country cured ham slices is dependent upon time, temperature, and cookery method used.

**Key Words:** Listeria monocytogenes, Country-cured ham, cookery

## Analysis of postmortem tenderization in porcine *longissimus dorsi* muscle. C.P. Allison*, R.J. Tempelman, and M.E. Doumit, Michigan State University, East Lansing, MI

Our objective was to quantify the rate and extent of postmortem tenderization in porcine *longissimus dorsi* (LD) muscle and determine if proteolysis of desmin corresponds to mechanical measures of tenderness. Berkshire (n=32) and Yorkshire (n=16) sired pigs were harvested on two days at a commercial abattoir. Four 5.72-cm sections of the LD were removed at d 1 from the 11th rib to the 3rd lumbar vertebrae. Loin sections were randomly assigned to aging treatments of 1, 3, 7, and 14 d, vacuum packaged and stored at 4°C. After storage, two 2.5-cm thin chops were cooked to an internal temperature of 73°C on Farberware Open Hearth™ broilers. Chops were cooled overnight at 4°C and three 1.27-cm diameter cores per chop were sheared with a Warner-Bratzler Shear (WBS) machine. No differences in WBS values were observed between brood or loin location (P>0.05). Shear values decreased (P<0.0001) from 4.1 kg at d 1 to 3.6 kg and 3.2 kg at d 3 and d 7, respectively.

Chops aged for 7 and 14 d had similar WBS values (P>0.05). Western blot analysis of desmin from 4 tender (<4 kg) and 4 less tender (>4.7 kg) samples at d 1 revealed that desmin degradation paralleled decreases in WBS. Intact desmin was typically undetectable in tender samples by d 7 and in less tender samples by d 14. Tenderness of most pork loin chops is complete by d 7, however some chops exhibit additional tenderization and desmin degradation between 7 and 14 d postmortem.

**Key Words:** Pork, Tenderness, Desmin

## Desmin degradation influences water-holding capacity and tenderness of fresh pork. L.J. Rowe*, E. Huff-Lonergan¹, and S.M. Lonergan¹, Iowa State University Ames, Iowa.

Proteolysis of desmin and troponin-T has been related to increased tenderness of meat. Degradation of desmin may also influence water-holding capacity (WHC) by disrupting linkages among adjacent myofibrils as well as myofibrils and the sarcolemma which would allow more space for fluid to reside in the tissue. We hypothesized decreased proteolysis of the myofibril-associated protein desmin would result in reduced WHC and tenderness. The objective was to determine if degradation of desmin was related to WHC and/or tenderness of pork. Halothane negative Duroc pigs (n=82) were harvested and pH measurements of the longissimus muscle (LM) at 1, 30, and 60 min, and 24 h postmortem (PM). Drip loss was measured on LD chops taken at 24 h and held at 4°C for an additional 24 h. Warner-Bratzler shear (WBS) force measurements were made on chops held 5 d at 4°C. LD samples taken at d 1 and 5 d PM were analyzed by immunoblotting using antibodies for desmin and troponin-T. Immunoreactive bands were quantified using densitometry. Desmin degradation was indicated by a decrease in intensity of an approximately 55 kDa immunoreactive band while troponin-T degradation was indicated by an increase in a 30 kDa band. 24 h drip loss was significantly correlated with 45-min pH (r=-0.372) and 24 h pH (r=-0.329). Drip loss at 24 h was not correlated with 5 d troponin-T degradation (r=0.19, P=.28) but was correlated with desmin degradation (r=0.437, P<.001) indicating that products with less desmin degradation may have greater drip loss. 45 min pH and 24 h pH measurements were also significantly correlated with 5 d desmin degradation (r=-0.254, P=.0377 respectively) indicating higher pH products tended to have greater desmin degradation. WBS at 5 d was significantly correlated with 5 d desmin degradation (r=0.295) and 5 d troponin-T degradation (r=0.295). These results indicated increased drip loss and decreased tenderness of pork may be related to reduced proteolysis of proteins like desmin. (This work was supported by the National Pork Producers Council.)

**Key Words:** Water-holding capacity, Tenderness, Desmin

## Dietary Conjugated Linoleic Acid and IGF-I Transgene Effects on Pork Quality. J. S. Eastridge¹, M. B. Solomon¹, V. G. Purse², A. D. Mitchell², and A. Arguello², USDA-ARS, BARC, ²Univ. de las Palmas de Gran Canaria, Spain.

Transgenic (T) pigs produced with a fusion gene composed of avian skeletal α-actin regulatory sequences and cDNA encoding human IGF-1 have exhibited increased lean tissue and less fat than normal (N) controls. While the use of T-pigs for meat production has not yet been approved, it is worthwhile to explore the quality of the meat from these pigs. Thirty pigs (14 T and 16 N siblings) were finished on a control (CO) growing-finishing diet or with added conjugated linoleic acid (CLA) to 120 kg. Carcass weight for N pigs was heavier (P<0.01) than for T (92.5 vs 87.4 kg, respectively); however T loin eye area (38.1 cm²) was 10% larger than in N (32.5 cm²). Backfat thickness was lower (P<0.05) for T pigs than for N pigs (24.1 vs 24.8 mm, respectively). CO-CLA pigs had greater (P<0.01) marbling than N-CLA and T-CLA pigs (29.8, 27.5, and 27.0 mm, respectively). Although pH at 45 min was higher (P<0.01) than that of N (6.10) compared to T (6.01), there were no differences detected in ultimate pH (P=N=5.65 vs T=5.59). CLA affected pH at 45 min (5.99 vs 6.13 for CO and CLA, respectively) but not ultimate pH (P=0.58; CLA=5.66). Gene and diet effects on pork quality traits of ultimate pH, amount of purge after 21 d, cook yield and shear force values were not different. Shear force for N vs T (6.3 vs 5.8 kg) and for CO vs CLA (6.1 vs 5.9 kg) was not different. Malonaldehyde (TBAIR) formation after 5 d fresh, 21 d fresh and 60 mo frozen storage was not influenced by gene or diet. CLA added to growing-finishing diet may help reduce carcass fatness. Based on the present study, the muscle hypertrophy induced by the IGF-1 transgene has no detrimental effects on quality of meat as compared to control.

**Key Words:** Pork quality, IGF-1 transgenic pig, Conjugated linoleic acid

## Enhanced rates of postmortem muscle glycolysis differ across porcine genotypes. M. D. Spires*, B. C. Bowker, J. E. Hammelman, A. P. Schinckel, A. L. Grant, and D. E. Gerrard, Purdue University, West Lafayette, IN.

Pork quality development varies with genotype. Mechanisms responsible for this variation likely involve postmortem muscle metabolism. Curiously, many genotypes do not develop adverse pork quality unless they are subjected to pre-slaughter stress or postmortem mishandling. The objective of this study was to challenge pork carcasses of different genotypes using electrical stimulation (ES) to determine if some genotypes are more susceptible than others to exaggerated postmortem muscle metabolism. Three different genotypes, fifty pigs each, were slaughtered, then subjected to ES (100V or 200V, 13 pulses, 2 sec on / 2 sec off) at 15 or 25 min post-exsanguination, or no stimulation (NS). Longissimus muscle (LM) pH and temperature were recorded at 1, 10, 20, 30, 40, 50, and 60 min, and 24 h postmortem. Samples were collected from LM at 1, 30, and 60 min, and 24 h and analyzed for glycogen, glucose, glutamate-phosphate (G6P), and lactate concentration. Muscle pH, but not temperature, differed (P<.05) across genotype. Genotype altered (P<.05) muscle glycogen, glucose, G6P, and lactate concentrations postmortem. In particular, G6P decreased (P<.05) from 1 to 60 min postmortem for all genotypes; however, G6P at 24 h accumulated to concentrations equivalent to 1 min levels for one genotype, but only accumulated to concentrations equivalent to 30 min levels for the other genotypes. Genotype effects were not observed for color, firmness, drip loss, 24 h pH, or CIE L*, a*, b* values. These data show that genotypes respond differently to postmortem perturbation by altering muscle glycolysis.

**Key Words:** Genotype, Pigs, Muscle Metabolism

## Effect of processing plant on pork quality. E. Hambrecht*¹ and M.W.A. Verstegen², ¹Nutreco, ²Wageningen University.

The objective of the present study was to compare meat quality of pigs processed at three different plants. Plant A and B worked with head-to-heart electrical stunning (Miudas®, Stork) while plant C had a CO₂-dip-lift system (87% CO₂, Butina). Line speed varied from 420 (plant B) to 500 pigs/hour (plant A and C). In plant A carcasses passed through a 3-phase rapid chilling tunnel (-15/-10/-1°C, air velocity (AV) 2-3m/s, 90 min), in plant B through a pre-cooling tunnel (4-5°C, AV 3-5m/s, 30
min), and in plant C carcasses were directly transported to the cold storage (1.3°C, AV 2m/s). All carcasses were chilled until 20 h postmortem when meat quality was measured in the loin (3°/4 th lumbar vertebra). From October to March, 9 batches of ~150 pigs each (halothane-negative, average carcass weight 87kg) were purchased at commercial farms, divided in three and sent to the plants on three consecutive days.

Feed withdrawal, transport and lairage time were identical for the three plants within batch. At 30 min postmortem pH was measured: plant A and C showed a lower pH90 than plant B (A: 6.50 and C: 6.53 vs. B: 6.70, P<0.001). After 4 h, pH was highest at plant B and lowest at plant C (A: 6.06 vs. B: 6.12 vs. C: 5.99, P<0.001). Ultimate pH (pHul) was lowest at plant B (5.68), intermediate for plant A (5.62) and highest for plant C (5.71, P<0.001). In agreement with other measurements, drip losses (DL) differed between plants (P=0.057) with highest DL found at plant C (5.2% vs. A: 4.8%, P<0.05, B: 5.0%, P>0.10). The plants ranked the same with regards to conductivity as with DL (A: 5.5 vs. B: 6.5 vs. C: 7.4 mS, P<0.001). Although instrumental color measurement (Minolta) did not show significant differences, visual scoring (Japanese color scale, 1-6, 6 being darkest) revealed a paler color for plant B (A and B: 2.7 vs. C: 2.9, P<0.001). Correlations (corrected for plant, batch and day of slaughter) were low to moderate: DL showed highest correlation with conductivity (r=0.63) but lower correlations with pH90, pH4h and pHul (pH90: r=-0.38, pH4h: r=-0.38, pHul: r=-0.45). It is concluded that processing plant can affect meat quality with differences being most likely related to pre-slaughter stress, stunning and/or cooling systems.

Key Words: Pork quality, Stunning, Cooling

ASAS Nonruminant Nutrition: Health, Nutrition Interactions

88 Use of menhaden oil to alter n-6:n-3 fatty acid ratios in nursery pig diets. T. A. Meyer*, M. D. Lindemann, G. L. Cromwell, and H. J. Monegue, University of Kentucky, Lexington, KY.

Weanling pigs (n=125, 21.4 d of age, and 6.8 kg BW) were used in two 28-d experiments to evaluate five dietary n-6:n-3 fatty acid (FA) ratios in two trials on performance, cell-mediated immunity, and intestinal morphology. Pigs were blocked by weight and randomly allotted to five pigs/pen. Complex diets with 5% oil (menhaden, corn, or a mixture) and calculated n-6:n-3 FA ratios of 0.7, 1.9, 6.9, 35, 5, and 70.0 were then randomly allotted to pens within a replicate. Diets were formulated to contain 1.28% lysine; all other nutrients met or exceeded requirement estimates (NRC, 1998). Pig weights and feed consumption were recorded weekly.

Cell-mediated immunity was assessed on d 14 and 28 by measuring the inflammation response to an intradermal injection of phytohemagglutinin solution in the ear. One pig/pen was euthanized on d 28 and taken for polymerase chain reaction (PCR) test to detect E. coli K88.

Feed efficiency ranged from 1.3 to 1.4 and was not affected (P>0.05) by dietary treatment. Mean daily feed intake was lower (P<0.05) in piglets fed diet PPI (64.3 g/d) compared to PPI + EYA (54.8 g/d) during WK 1. Piglets fed PPI without EYA had lower (P<0.05) ADG (49.9 g/d) compared to those fed PPI + EYA (123.0 g/d) or SDPP-based diets. Scour appeared in all groups of pigs 4-6h after ETEC K88 oral challenge. However, piglets fed PPI + EYA or SDPP-based diets recovered after 10h post-challenge, whereas those fed PPI continued to have severe diarrhea resulting in 46.5% mortality. PCR results showed that all PPI fed piglets continued to shed ETEC K88 at the end of the 14-d experimental period. It was concluded that specific EYA and SDPP can provide passive control of ETEC (K88) infection and potentially improve feed intake and weight gain in early-weaned pigs fed PPI

Key Words: Porcine plasma, E. coli, Scours

90 High levels of dietary ascorbic acid on liver gulonolactone oxidase activity, serum and liver ascorbic acid concentration, and growth performance of postweaning pigs. S. Ching*, and D.C. Mahan, Ohio State University.

Pig liver ascorbic acid synthesis activity was found to be suppressed while nursing the sow, but increased during the initial 2 wk postweaning. Blood and tissue ascorbic acid concentration declined postweaning and continued at a low concentration for several weeks. This experiment therefore evaluated the effects of feeding high dietary vitamin C levels on liver gulonolactone oxidase (GLO) activity, tissue ascorbic acid contents, and growth performance during a 38 d postweaning period. A randomized complete block design was conducted with four levels of dietary ascorbic acid (0, 500, 1000, 3000 ppm) in 12 replicates. Diets were comprised using typical Phase 1, 2, and 3 starter pig diets, except that a little (2%) form of vitamin C (Stay C 35%) was used. A total of 260 crossbred pigs was weaned at 17 d of age and averaged 6.2 kg BW. At the end of each phase (10, 24, and 38-d postweaning) pigs were weighed and feed consumption measured. Pigs were bled at each period with the serum analyzed for ascorbic acid. Two pigs per treatment group were killed at the end of each period and liver GLO activity and ascorbic acid concentration determined. Daily gains (P<0.05) and G:F ratio (P < 0.10) increased linearly as dietary ascorbic acid increased during the 0 to 10-d period, but not thereafter. Liver GLO enzyme activity decreased linearly (P < 0.01) at 10, 24, and 38 d as dietary vitamin C increased. As dietary vitamin C levels increased, serum ascorbic acid (P < 0.01), liver ascorbic acid (P < 0.01), and urinary ascorbic acid (P < 0.01) increased at 10, 24, and 38-d postweaning. These results indicate that high levels of dietary vitamin C suppressed vitamin C synthesis in the pig, but stimulated pig growth and feed efficiency during the initial 10-d postweaning with higher serum, tissue, and urinary ascorbic acid concentrations.

Key Words: Ascorbic acid, Gulonolactone oxidase, Weaning pigs

91 High levels of dietary ascorbic acid on liver gulonolactone oxidase activity, serum and liver ascorbic acid concentration, and growth performance of postweaning pigs. S. Ching* and D.C. Mahan, Ohio State University.

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