P<0.01). Plasma α-lactalbumin concentrations increased about fivefold from 10d to 15d (P<0.01), indicating onset of lactation. Megalin expression increased about 3-fold from 0d to 5d (P=0.01), then decreased 2.8-fold by 10d (P<0.01). Gene expression of LDL-R decreased 4.5-fold (P<0.00) from 5d to 10d while folic acid receptor mRNA decreased about twofold (P<0.05). We conclude that temporal changes in expression of megalin, LDL-R and folic receptor mRNA during colostrogenesis may be related to the transport of their ligands into colostrum. Hormonal induction of lactation provided a useful model for studying the regulation of colostrogenesis.

Key Words: Colostrum, Vitamins, Induced Lactation

**Meat Science and Muscle Biology**

**230 Conjugated linoleic acid (CLA) concentrations in beef tissues from cattle finished on pasture initially with limited grain.** R. N. Sonon Jr.1, R. A. Trenkle1, J. R. Russell1, and R. Rosmann2, 1Iowa State University, Ames, 2Rosmann’s Family Farms.

Thirty Red Angus cross yearling steers and heifers (initial BW = 394±54 kg) were fed to choice grade in an on-farm study to compare the concentrations of CLA in beef tissues and to evaluate beef quality of cattle finished on pasture initially or on drylot diet entirely. The cattle on the pasture group grazed by rotation forages consisting primarily of endophyte-free tall fescue grass for 207 d and then, were shifted to the drylot diet for 59±15 d, whereas the drylot cattle were fed ground alfalfa-orchardgrass hay for 183±16 d. In addition to the basal forage, a corn-soybean concentrate mixture was fed at 0.5 to 1.0% of BW to the pasture group of cattle while grazing, and at 2.0% of BW to the drylot group of cattle. After harvest of cattle, steaks were removed from the 12th-13th rib of the carcasses of sixteen animals for fatty acid analysis and sensory evaluation. Results showed that cis9, trans11 CLA concentration in ribeye steak of pastured cattle (0.44 g/100 g of fatty acids) was significantly higher (P<0.001) than in steak of cattle fed the drylot diet (0.17 g/100 g of fatty acids). Linolenic acid (C18:3n-3) concentration in ribeye steak of pastured cattle (0.79 g/100 g of fatty acids) was significantly higher (P<0.001) in the drylot steak of drylot cattle (0.61 g/100 g of fatty acids). The Warner-Bratzler shear test of tenderness of ribeye steak from pasture-fed cattle was 2.85±0.71 kg and did not differ with that of the drylot cattle (2.60±0.65 kg). Sensory evaluation of ribeye steaks (pasture vs drylot) included juiciness (5.83 vs 5.43), tenderness (6.61 vs 7.00), chewiness (3.14 vs 2.43), flavor (2.08 vs 2.43) and after-flavor (5.56 vs 5.55) and these attributes were not different (P>0.05) between the two groups of cattle. Data from this on-farm study indicate that pasture-feeding contributed to the production of a potentially healthier beef without diminishing eating qualities.

Key Words: CLA, Beef Quality, Pasture

**231 Effects of two supplementation levels of linseed combined with CLA or tallow on meat quality traits and fatty acid profile of adipose tissue and longissimus muscle in pigs.** G. Bee*, S. Jacot, G. Gues, and W. Herzog, Swiss Federal Research Station for Animal Production and Dairy Products 1725 Posieux, Switzerland.

Linseed is an efficient dietary supplement to increase 18:3n-3 concentrations in meat and adipose tissue in pigs. Increased concentration of highly unsaturated PUFA can lead to quality deterioration due to lipid oxidation. We hypothesize that inclusion of conjugated linoleic acids (CLA) or tallow could limit the potential for lipid oxidation. In the present study we evaluated the effect of CLA or tallow combined with linseed on carcass characteristics, longissimus muscle (LM) quality traits, and the fatty acid profile of the LM and adipose tissue. From 18 to 104 kg BW, 32 Swiss Large White barrows were fed a grower finisher diet supplemented either with: 1) 1% linseed (L1); 2) 2% linseed (L2); 4) 2% linseed + 1% CLA (L2C); or 3) 2% linseed + 1% tallow (L2T). The amount of omental fat was higher (P<0.05) in the L3 (2.09%) compared to the L2, L2C, and L2T group (1.96%). We conclude that CLA, but not tallow, combined with linseed could help reduce the potential for lipid oxidation by decreasing the unsaturation level without affecting the improved n-6/n-3 ratio.

Key Words: Linseed, CLA, Pig

**232 Consumer acceptance of beef from steers finished on ryegrass forage or a high-concentrate diet.** C. R. Kerth*, K. W. Braden, R. B. Cox, and J. Alexander, Department of Animal Sciences, Auburn University, Auburn, AL.

Charlais-Angus crossbred steers were fed one of three finishing diets to determine consumer acceptance of forage-fed or concentrate-fed beef. When steers (n = 30) reached 340 kg, they were randomly assigned to one of three finishing treatments consisting of ryegrass only for 178 d (RG), ryegrass for 125 d followed by 98 d of a high-concentrate, feedlot-type diet (RGC), or a high-concentrate, feedlot-type diet for 82 d (CON). Steers from RGC and CON groups were harvested when estimated backfat thickness reached 1.0 cm and steers from the RG group were harvested when the amount of forage was insufficient to maintain animal growth. To determine consumer acceptance, 153 consumers at an outdoor festival in Auburn, AL were asked to taste steaks from each of the three treatments. Boneless, strip loin steaks were cooked (71°C) on clam-shell-style electric grills, cut into 1.0 X 1.0 cm cubes and placed in double boilers kept warm over a small flame. Overall acceptability scores were determined by marking an “X” on a continuous line anchored with frowning (score of 0) and smiling (score of 100) faces and scored by interpolation. Pricing acceptability was determined in the same manner with $7.46/kg and $16.26/kg anchoring the line and $11.86/kg as the midpoint of the line, representing the typical market value of a strip loin steak at the time. Consumers were then asked which steak they preferred. The demographics of those participating in the survey were evenly distributed across income levels and gender, with almost half (46.6%) being younger than 30 y and the remainder evenly distributed from 31-60 y of age. Overall acceptability scores and price paid for steaks were higher (P<0.05) for steaks from cattle finished on CON compared to steaks from cattle finished on RG or RGC. Additionally, a higher (P<0.05) percentage of consumers preferred steaks from CON (63.9%) compared to RGC (13.9%) or RG (22.2%). Consumers that preferred RG beef were willing to pay $1.17/kg more for RG beef compared to CON beef. These results indicate that a significant market exists for forage-fed beef and consumers are willing to pay a premium for it.

Key Words: Grass-Fed Beef, Consumer Acceptance, Price


This study advanced a model that was developed to investigate the potential for relating changes in electrophoretic protein patterns derived from the L. dorsi of beef cattle 36 hr postmortem with tenderness at 7 d. Previous research done in this lab showed a significant association (R² = 0.82) between tenderness at 7 days, as determined by Warner Bratzler Shear analysis, and the relative intensities of 7 bands from L. dorsi myofibrillar fingerprints of proteins/peptides derived from the same tissue at 36 hr postmortem. Mass spectrometric analyses was used to identify one of the bands, significantly associated with tenderness, as bovine fast myosin light chain-1 (bMLC1) (P<0.001). The method was previously used to identify fragments of bovine myosin heavy chain as being associated with tenderness. These combined findings suggest the presence of at least two distinct mechanisms contributing to tenderness. One mechanism proposes a relationship between myosin heavy chain proteolysis and tenderness. The most recent finding indicates a positive correlation with the amount of intact bMLC1 and tenderness.
This information has the potential of increasing our understanding of the mechanisms regulating beef carcass tenderness.

**Key Words:** Proteomic Fingerprinting, Beef Tenderness, Myosin Light Chain

### 234 Effects of ractopamine and dietary fat source on performance and carcass characteristics of growing-finishing swine.
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To test the interactive effects of ractopamine (RAC) and dietary fat source on performance and carcass characteristics, crossbred pigs (n = 216) were blocked by BW (78.1 ± 6.5 kg), and allotted randomly to pens (6 pigs/pen). After a 1-wk adjustment period when a common diet devoid of RAC was fed, pens within blocks were assigned randomly to 1 of 4 dietary treatments arranged in a 2 × 2 factorial design with 5% fat (beef tallow or soy oil) and RAC (0 or 10 mg/kg). All diets were formulated to contain 3.1 g lysine/Mcal of ME and 3.48 Mcal/kg of ME. Individual pig weights and feed disappearance were recorded weekly to calculate ADG, ADFI, and G:F. At conclusion of the 35-d finishing period, pigs were slaughtered at a commercial pork packing plant, and carcass weight, 10th rib fat and LM depths, and fat-free lean yield (FFLY) were recorded prior to chilling. During fabrication, right-side loins were collected for pork quality determinations. Across the entire trial, pigs fed RAC had greater (P < 0.001) ADG and G:F, but RAC did not affect (P > 0.10) ADFI. Neither tallow nor soy oil affected (P > 0.10) pig performance. Carcass weight, LM depth and FFLY were increased (P < 0.002), whereas fat depth was decreased (P < 0.06), in carcasses from RAC-fed pigs; however, carcass composition measures were similar (P > 0.10) between fat sources. The LM from pigs fed RAC had higher pH values (P < 0.01) and received higher American (P < 0.01) and Japanese (P < 0.04) color scores. Although L* values were not affected (P > 0.10) by RAC, the LM from RAC-pigs had lower a* (P < 0.002) and b* (P < 0.005) values. The LM of pigs fed soy oil received higher (P < 0.05) American color scores than pigs fed tallow; otherwise pork quality did not (P > 0.05) affect the firmness and color of fresh pork bellies.

**Key Words:** Dietary Fat, Pork Bellies, Ractopamine

### 235 Effects of ractopamine and dietary fat source on quality characteristics of fresh pork bellies.
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To test the interactive effects of ractopamine (RAC) and dietary fat source on fresh pork belly quality, bellies (n = 167) from pigs fed 1 of 3 dietary fats were used to study the influence of slaughter weight (SW) on meat quality. Females were castrated at 30 kg BW and slaughtered at 105, 115 or 120 kg BW. Each of three treatments was replicated five times (ten pigs housed together). Foraging program was common for all the pigs and consisted of three diets offered ad libitum (2.3, 2.4, and 2.4 Mcal NE/kg and 0.97, 0.70, and 0.67 % lys from 30 to 65, 65 to 95, and 95 kg BW to slaughter, respectively). At 45 min postmortem, longissimus muscle samples were obtained from the last rib opposite the pigs per replicate. Intramuscular fat and Warner-Bratzler force of loins were determined by using a Near Infrared Transmittance meat analyzer and a texture meter, respectively. Loins from pigs slaughtered at 120 kg BW had more intramuscular fat and higher shear force values than loins from pigs slaughtered at 105 kg BW, with loins from pigs slaughtered at 115 kg BW in an intermediate position (1.99, 2.50, and 2.70 % of intramuscular fat and 6.34, 6.57, and 7.24 kg of Warner-Bratzler values for 105, 115, and 120 kg BW; P < 0.05 and P < 0.10, respectively). Defrosting and cooking losses decreased with SW (12.8, 9.2, and 11.7 %, P < 0.05; 26.0, 24.9, and 24.4 %, P < 0.10, for 105, 115, and 120 kg BW, respectively). Increasing SW increased meat color (a* value of 3.42, 4.78, and 5.07 for 105, 115, and 120 kg BW, respectively; P < 0.05). In addition, linoleic acid content of subcutaneous fat at the shoulder (a* was the higher) was lower for pigs slaughtered at 105 kg BW than for pigs slaughtered at 115 or 120 kg BW (11.56, 10.64, and 10.10 % for 105, 115, and 120 kg BW, respectively; P < 0.05). It is concluded that increasing slaughter weight from 105 to 120 kg improves intramuscular fat content and color of meat from heavy pigs destined to the dry-cured industry.

**Key Words:** Pork Quality, Castration, Slaughter Weight

### 236 Effect of slaughter weight on pork quality of castrated females.
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A total of 150 Pietrain*Large White x Landrace*Large White females of 23.3 ± 1.5 kg of initial BW were used to study the influence of slaughter weight (SW) on meat quality. Females were castrated at 30 kg BW and slaughtered at 105, 115 or 120 kg BW. Each of three treatments was replicated five times (ten pigs housed together). Foraging program was common for all the pigs and consisted of three diets offered ad libitum (2.3, 2.4, and 2.4 Mcal NE/kg and 0.97, 0.70, and 0.67 % lys from 30 to 65, 65 to 95, and 95 kg BW to slaughter, respectively).

### 237 Strategies based on gender and slaughter weight to modify carcass quality for cured product industry.
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A total of 336 Duroc x Landrace*Large White pigs of 28.4 ± 2.3 kg of initial BW were used to study the influence of sex (castrated females, CF; entire females, EF; castrated males, CM) and slaughter weight (SW) on pork quality. Each treatment was replicated four times (14 pigs housed together). Males were castrated at birth and females at 30 kg BW. All pigs received a common feeding program that consisted of three diets offered ad libitum (2.3, 2.4, and 2.4 Mcal NE/kg and 0.97, 0.70, and 0.67 % lys, from 30 to 60 kg BW, 60 to 90 kg BW, and 90 kg BW to slaughter). For the whole period, neither gender nor SW affected productive performance, although CM and CF pigs ate 4 % more and had 4 % worse feed conversion rate than EF. Backfat and fat thickness at Gluteus medius muscle (GM) were greater for CF than for EF or CM (31.4, 25.2, and 28.7 mm at P2, and 20.7, 18.1, and 18.7 mm at GM for CF, EF, and CM, respectively; P < 0.05). The percentage of pigs with a fat thickness at GM equal or greater than 20 mm was 76, 42, and 48 % for CF, EF, and CM, respectively. In intramuscular fat content and Warner-Bratzler force of loins was increased 19 % when SW increased from 119 to 131 kg (P < 0.05). Loin yield was greater for EF than for CM, with an intermediate value for CF (7.13, 7.22, and 6.91 % for EF, CM, and EF, respectively; P < 0.05). It is concluded that castration of females and increasing SW from 119 to 131 kg improves carcass fat content without impairing productive performance of pigs destined to produce cured hams.

**Key Words:** Carcass Quality, Pig Performance, Castration


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238 Evaluating the fatty acid distribution of bratwurst in retail products and of fat in Fertilium treated sows. L. Gordon, A. Cox, A. Schinkel, and M. Latour, Purdue University, West Lafayette, IN.

The objective in Experiment 1 was to investigate the fatty acid distribution of fourteen different brands of bratwurst available in retail stores. For Experiment 2, the investigators examined the fatty acid profile in the middle and outer fat layers of sows which were fed either a control diet (n=5) or a diet enriched with Fertilium (n=5), a supplement added to swine diets in low concentration and contains a protected n3 polyunsaturated fatty acid source. Results of Experiment 1, suggest that major fatty acids (C16:0, C18:0, C18:2, as well as the n6/n3 ratio and iodine value [IV]) varied significantly (P<0.01) between brands. The levels C16:0, C18:0, C18:2, n6/n3 ratio and IV ranged between 20-27%, 33-41%, 9-19%, 8.1-37.1 and 53-70, respectively. Collectively these results would suggest that retail brand of bratwurst exhibit tremendous variability in fatty acid composition. In Experiment 2, there were significant differences (P<0.03) in the fatty acid distribution between control and Fertilium enriched sows as well as between fat layers: more specifically and across both fat layers, enriched sows displayed a significantly lower (P<0.05) n6/n3 ratio when compared to controls. Furthermore, control sows displayed a significantly higher (P<0.05) level of n6/n3 ratio in the outer layer when compared to the middle layer. These data would suggest that enriched sows display a fatty acid profile unlike controls and may provide a better source of n3 fatty acids in ultimate products.

Key Words: Fat, Bratwurst, Sows


Connective tissues (endomysium and perimysium) are important contributors to growth and development of the muscle, being the site of capillary invasion, adipogenesis and age maturation. Perimysium is also an important contributor to meat toughness, though its contribution is difficult to quantify due to the inability of extraction techniques to account for three dimensional distribution. Here we describe a morphometric technique for quantification of the amount and frequency of perimysial seams. Longissimus dorsi muscle samples were collected by biopsy or necropsy and then either chemically fixed or frozen for histological sectioning. Muscle fascicular structure (FS) was visualised at low magnification, and morphological features were measured using image analysis tools. The features included perimysial seam width (SW) and average fascicular bundle width (BW). Our data suggest that FS measurements were robust and repeatable, and stable across divergent sarcomere lengths. Bos indicus (10 animals) and Bos taurus (10 muscles) could be differentiated by SW, even though the number of seams per cm of tissue did not differ (42 ± 2.3, Bos indicus; 46 ± 3.8, Bos taurus). Animals came from similar nutritional backgrounds. Although SW values were vastly skewed, the residuals of the fitted mixed-model were normally distributed. Bos indicus animals were found to have significantly fewer fine connective tissue seams than did the Bos taurus animals (P<0.05). Bos indicus also had significantly larger BW than did the Bos taurus animals (P<0.05). Apart from the gross phenotypic and enzymic differences between these cattle breed types, there are also finer structural differences that have resulted from the evolutionary divergence of these breeds. Measurements on FS from sheep longissimus dorsi muscle differentiated animals of divergent EBV for muscling (control muscling EBV, SW, 9.7 ± 0.4; high muscling EBV, SW, 8.3 ± 0.3; P< 0.01) when nutrition was comparable. We propose that muscle fascicular structure is a heritable and developmentally regulated phenotype of mammalian skeletal muscle.

Key Words: Meat, Connective Tissue, Tenderness

240 Growth characterization of callipyge myoblasts. J. N. Fleming, S. P. Jackson, and J. R. Blanton, Jr., Texas Tech University, Lubbock.

The objective of this study was to compare the growth rates of isolated myoblasts from both callipyge and normal (non-callipyge) lambs. Callipyge is a mutation found in sheep that causes muscle hypertrophy in the loin and hindquarters of lambs after they reach four to six weeks of age. Myoblasts, or satellite cells, are important factors in postnatal muscle growth, as they are located beneath the basement membrane and contribute to muscle fiber hypertrophy and repair. Lambs ranging from two to eight weeks of age were euthanized and the semimembranosus muscles were excised. Myoblasts were isolated by Pronase digestion and a series of differential centrifugations. Cells were plated on 0.1% gelatinized round culture plates and grown in MEM-α media supplemented with ten percent fetal bovine serum. Plates were incubated at 37°C, 5% CO2, and media was changed every two days. All plates were counted and replated using trypsin digestion. Primary plates were counted and replated at a level of one million cells per secondary plate. Secondary plates were counted every 24h, 48h, and 72h for all callipyge (n=13) and normal (n=19) lambs. Percent gain did not differ across genotypes at 24h (P=0.936), or 48h (P=0.9739). However, a significant difference was seen at 72h (P=0.0135), with the average gain in callipyge plates at 307% ± 46% gain, versus the normal rate of 152% ± 41% gain. This increase in growth rate could be attributable to either an upregulated mitotic cellular division rate in callipyge cells, or perhaps an increased secretion of growth factors from the callipyge cells, promoting cell proliferation. In conclusion, there is an increase in callipyge myoblast growth rates in vivo when compared to normal ovine myoblast growth rates.

Key Words: Sheep, Callipyge, Myoblasts

241 Integration of myostatin-null alleles in leptin db/db mice does not alter body composition. A. C. Dilger, A. L. Grant, M. E. Spurlock, and D. E. Gerrard, Purdue University, West Lafayette, IN.

Mutation in the myostatin gene and disruption of the leptin axis in animals leads to excessive accumulation of muscle and fat, respectively. Recent reports indicate that when myostatin and leptin genes are rendered nonfunctional in mice, fat accumulation in leptin obese (ob/ob) mice is suppressed; however, it is unknown whether fat accumulation is decreased when the myostatin and db/db mutations are combined. Therefore, pups from double heterozygous breeding pairs were weaned at 21 d of age and housed individually. Standard mouse chow and water were provided ad libitum. Animals were euthanized at 9 wk of age for body composition analysis. Mice were genotyped as myostatin null (MKO), leptin db/db (LKO), wild type (WT) or myostatin/leptin db/db double knock-out (DKO). At weaning (21d), LKO mice were heaviest (P < 0.05). At 6 wk of age, BW of MKO, DKO, and LKO was 22%, 41%, and 61% heavier (P < 0.05) than WT, respectively. A significant time and genotype interaction (P < 0.05) in percent body fat of DKO and LKO mice. Percent protein of MKO was 10% greater (P < 0.05) whereas LKO and DKO percent protein was 41% less than WT. No differences were observed in percent body fat of DKO and LKO mice. Percent protein of MKO was 10% greater (P < 0.05) whereas LKO and DKO percent protein was 41% less than WT. No differences were observed in percent body fat of DKO and LKO mice. Percent protein of MKO was 10% greater (P < 0.05) whereas LKO and DKO percent protein was 41% less than WT. No differences were observed in percent body fat of DKO and LKO mice. Percent protein of MKO was 10% greater (P < 0.05) whereas LKO and DKO percent protein was 41% less than WT. No differences were observed in percent body fat of DKO and LKO mice. Percent protein of MKO was 10% greater (P < 0.05) whereas LKO and DKO percent protein was 41% less than WT.