T117 Wet distillers grains plus solubles do not alter the relationship between fat content and marbling score in calf-fed steers. A. S. de Mello Junior*, C. R. Calkins, J. M. Hodgen, B. E. Jenschke, and G. E. Erickson, *University of Nebraska*, *Lincoln*.

Some research has suggested feeding dried distillers grain plus solubles can have a negative effect on marbling score in beef. One hypothesis is that feeding this byproduct of ethanol production alters the relationship between lipid content and marbling score by reducing the ability to visualize fat present in the ribeye. The objective of this study was to determine the effects of finishing diets with different levels of wet distillers grains plus solubles (DG) on the relationship between fat and marbling in beef cattle. Ninety-four, calf-fed, crossbred steers were randomly distributed to three treatments (0%, 15% and 30% DG – DM basis) for 133 d. Forty-eight h postmortem, marbling score, marbling texture and marbling distribution were assessed by a USDA grader. For the treatments (0%, 15% and 30%) 37.5%, 62.5% and 46.9% of the carcasses of each respective treatment were considered USDA Choice, with mean marbling scores ($P = 0.456$) of $Slight^{93}$, $Small^{03}$ and $Small^{04}$, respectively. For all treatments, there were linear relationships ($P < 0.008$) between marbling score and fat percentage in the ribeye. Slopes were statistically similar at $P = 0.721$. Treatment did not significantly influence marbling texture, marbling distribution or fat content of the ribeye. These results indicate that finishing diets containing up to 30% wet distillers grains plus solubles can be used without affecting the relationship between fat and marbling in beef.

Key Words: Distillers Grains, Fat, Marbling

T118 Effects of distillers grains finishing diets on fatty acid profiles in beef cattle. A. S. de Mello Junior*, B. E. Jenschke, J. M. Hodgen, G. E. Erickson, T. P. Carr, and C. R. Calkins, *University of Nebraska*, *Lincoln*.

Ninety-four, calf-fed crossbred steers were randomly allocated to three different treatments (0%, 15% or 30% wet distillers grains plus solubles - WDGS – DM basis) and fed for 133 d to test the influence of different levels of WDGS on fatty acid profile in the ribeye. After grading, one ribeye slice (*M. Longissimus thoracis*) about 7 mm thick was excised from each carcass, trimmed and analyzed for fatty acid profile and lipid content. Treatment did not influence the content of total lipid (5.44, 5.91, and 5.94%; $P > 0.187$), unsaturated ($P = 0.762$) and saturated fatty acids ($P = 0.788$). As amount of WDGS in the diet increased (0, 15 and 30%), there were higher concentrations (g per 100 g) of C 18:2 fatty acids (3.27^{b}, 4.22^{a}, and 4.50^{a}, respectively; $P < 0.001$), C 18:2 trans fatty acids (0.003^{b}, 0.011^{b}, 0.034^{a}, respectively; $P < 0.011$), total amount of trans fatty acids in the lean (2.87^{c}, 3.61^{b}, 4.86^{a}, respectively; $P < .001$), conjugated linoleic acid 9*c*, 11*t* (CLA: 0.21^{b}, 0.22^{ab} and 0.27^{a}; $P < 0.041$) and an elevated omega 6:omega 3 ratio (26.72^{c}, 33.64^{b}, and 41.75^{a}; $P < 0.001$) in the lean. Conversely, increasing WDGS in the diet reduced concentrations (g/100 g) of *cis*-vaccenic acid [C 18:1, n7] (3.20^{a}, 2.77^{b} and 2.41^{c}; $P < 0.014$), which has been related to development of off-flavors in beef. The elevated content of polyunsaturated fatty acids could lead to greater oxidation, which could negatively affect color and rancidity. Results from this study demonstrate that inclusion of WDGS in finishing diets can alter the fatty acids profile, which may have negative implications to product quality.

Key Words: Beef, Fatty Acids, Distillers Grains

T119 Influence of complexed trace mineral supplementation on carcass grade and meat quality of broilers processed at 42 and 56 d of age. B. Saenmahayak*, S. F. Bilgili, and J. B. Hess, *Auburn University*, *Auburn, AL*.

A total of 1920 male Ross × Ross 708 broilers were utilized to evaluate the influence of complexed zinc (C-Zn) and manganese (C-Mn) on skin quality and meat quality of broiler chickens at 42 and 56 d of age. Four dietary treatments (60 birds per pen; 8 pens per treatment), consisting of (1) Inorganic Control (80 ppm Zn and 80 ppm Mn), (2) 40 ppm C-Zn [complexed Zn replaced 40 ppm Zn from $ZnSO_4$], (3) 40 ppm C-Zn [complexed Zn provided additional 40 ppm Zn on top of control] and (4) 40 ppm C-Zn + 40 ppm C-Mn [40 ppm complexed Zn and 40 ppm complexed Mn added on top of control] were provided on a four stage feeding program. At 41 d of age, 2 birds per pen were randomly selected to measure skin puncture strength (displacement, load at break point and energy at break point). At 42 and 56 d of age, 10 birds were randomly selected from each pen, processed and chilled in static slush ice. Whole carcass, abdominal fat yields (42 and 56 d), carcass defects (42 d), parts yield (56 d) and deboned breast (fillet and tender) yields (56 d) were also determined. At each age, drip loss (24 and 48 h), cook loss, water holding capacity (WHC) and meat color (L*, a* and b*) were determined on breast fillets. Few differences in live performance were detected throughout the study. Skin puncture strength did not vary ($P>0.05$) between the dietary treatments. Birds on Treatment 3 (40 ppm C-Zn) exhibited significantly lower ($P<0.05$) incidence of sores, scabs and scratches as compared to other treatments. Overall carcass grade, whole carcass and parts yields were not significantly different among the treatments. Breast fillet drip losses and WHC did not show any differences due to treatments at either age. However, at 42 d of age, cook loss was significantly reduced with Treatment 4 as compared to Treatment 1 (22.3% vs. 29.7%). Color measurements at 42 d of age showed highest L* value and lowest a* values with Treatment 1. Response of broiler chickens to complexed trace mineral supplementation was variable and age dependent.

Key Words: Complexed Zinc, Manganese, Skin Quality

T120 Analysis of veal shoulder muscles for chemical attributes. G. A. Sullivan*[1], C. R. Calkins[1], D. D. Johnson[2], and B. G. Sapp[2], [1]*University of Nebraska*, *Lincoln*, [2]*University of Florida*, *Gainesville*.

Veal muscles from the loin, rack and round are being fully utilized using conventional culinary application and therefore sell for a premium; conversely, few applications are commonly applied to shoulder muscles thus causing a lower-value primal. The objective of this study was to characterize the shoulder muscles, using their chemical properties, for the potential to upgrade their value. Twenty

paired veal shoulders from two processors were dissected to isolate nine muscles for the determination of expressible moisture on day 3 and objective color (L*, a*, b*), composition (fat, moisture, ash) and pH on day 13. All traits showed a significant muscle effect ($P < 0.008$). The *M. Supraspinatus* was the lightest colored muscle with an L* of 51.37 ($P = 0.023$). The *M. Serratus ventralis* had the highest fat content at 5.04% ($P = 0.043$) followed by the *M. Complexus* at 4.41% ($P = 0.003$) with the remaining muscles ranging from 2.28-3.26%. The *M. Teres major* was numerically highest in expressible moisture at 39.53% and was significantly different than all but two muscles ($P < .044$). The *M. Infraspinatus* had the highest pH at 5.99 ($P = 0.002$) and the *M. Triceps brachii* and *M. Pectoralis profundus* had a significantly lower pH than the remaining muscles at 5.69 and 5.67, respectively ($P < 0.039$). The *M. Infraspinatus* and *M. Rhomboideus* were statistically superior ($P < 0.050$) in chemical traits compared to muscles with the least desirable values. Conversely, the *M. Pectoralis profundus* was statistically similar to the least desirable value ($P > 0.050$) for expressible moisture, pH and b*. From a chemical profile perspective, all of the muscles possessed some favorable characteristics and in the proper application could be utilized for a value-added muscle.

Key Words: Properties, Quality, Veal

T121 Influence of gender and slaughter weight on growth, carcass characteristics, and meat quality of Duroc and Landrace crossbred pigs. L. L. Lo*[1], C. C. Tsai[1], Y. C. Yang[1], R. S. Lin[2], T. H. Huang[3], and J. Chen[1], [1]*Chinese Culture University*, *Taipei, Taiwan, ROC*, [2]*National ILan University*, *ILan, Taiwan, ROC*, [3]*Taiwan Farm Industry Co., Ltd.*, *Pingtung, Taiwan, ROC*.

One hundred and twenty Duroc and Landrace crossbred pigs were divided into two genders (barrows and gilts) and 5 slaughter weight (85, 95, 105, 115, and 125 kg) to detect the effects of gender and slaughter weight (SW) on growth, carcass and meat quality traits. Pigs were raised under commercial farm condition, and were transported to a commercial slaughter plant when reached the slaughter weight to collect the carcass performance data. Sections of Longissimus muscle (LM) from 9th to last rib were removed and transported to Chinese Culture University for meat quality evaluations. Barrows were grow faster and had shorter days to reach 110 kg of body weight than those of gilts (P<0.05). Gender had no significant effect concerning backfat thickness and saleable lean percentage. LM areas (LMA) of gilts, however, were larger (P<0.05) than that found in barrows (54.33 vs. 51.22 cm^2 , respectively). While no significant differences were detect for subject scores of firmness score, LM from barrows showed higher color (P<0.10) and marbling scores (P<0.05) than in gilts. Significant differences were found for most of the carcass traits between 85 and the other groups of pigs. For most of the carcass traits, slaughter weight larger than 95 and lower than 125 kg were acceptable and showed no differences across groups. Gender showed no difference on most meat quality traits. However, intramuscular fat content was higher in the barrows than in gilts (P<0.01). LM from lighter pigs tended to had more water and less intramuscular fat content (P<0.05). Meat pH, Hunter L value, and water holding capacity were found to not be different across groups. For eating quality, LM from barrows had higher scores on flavour and overall acceptability (P<0.05). No differences were found for sensory evaluation across groups except for lighter pigs had less off-flavor score. Results from this study indicated that LM from barrow had better meat quality and increased SW to 125 kg might have some benefits on marbling and intramuscular fat content.

Key Words: Slaughter Weight, Gender, Meat Quality

T122 Effect of seaweeds on the physical quality and the sensorial characteristics of eggs enriched with omega-3 fatty acids and stored for long time under different conditions. V. H. Ríos[1], S. Carrillo*[1], M. M. Casas[2], M. E. Carranco[1], E. Avila[3], and F. Pérez-Gil[1], [1]*Instituto Nacional de Ciencias Mérdicas y Nutrición Salvador Zubirán*, *México D.F.*, [2]*Centro Interdisciplinario de Ciencias Marinas*, *La Paz, Baja California Sur, Mexico*, [3]*Facultad de Medicina Veterinaria y Zootecnia, UNAM*, *México D.F.*

The aim of this study was to determine if the inclusion of seaweeds in laying hen diets contribute for maintaining the physical quality and the sensorial characteristics of egg enriched with omega-3 fatty acids stored for long time under different conditions. During 8 weeks 144 Leghorn laying hens were distributed in four treatments: T1 (control diet), T2 (2% fish oil+10% M.pyrifera), T3 (2% fish oil+10% Sargassum spp.) and T4 (2% fish oil+10% Enteromorpha spp.). At the end of the trial 122 eggs were taken, which 61 eggs were storage at 20°C and other 61 at 4°C. The egg physical quality was evaluated at 0, 15, 30 and 45 days of storagement; while that the sensorial characteristics of egg (flavor and yolk color) were evaluated by an acceptation test at 0, 15 and 30 days. The results showed a low egg weight loss when the eggs were stored at 4°C (P<0.05), mainly with M.pyrifera and Enteromorpha spp. Time and temperature of storagement did not have any effect on the weight of egg shell. Egg shell thickness did not seem to be affected by time, temperature and seaweeds (P>0.05). Haugh Units were drastically reduced through days (from 0 days until 45 days) when the eggs were stored at 20°C (87 vs 40 UH, respectively). However, when the eggs were stored at 4°C a less reduction was observed (87 vs 63 UH, respectively), mainly with Sargassum spp. and Enteromorpha spp. seaweeds. Egg yolk colour was not affected by time and temperature. The egg flavor was affected on 30 day in all eggs stored at 20°C and 4°C. Treatment with Enteromorpha spp showed a less acceptation for yolk colour at 0 and 15 days because the egg yolk colour was low (8 Roche color Fan). It is concluded that there is a low egg weight loss when Sargassum spp and Enteromorpha spp are included in laying hens diets, similarly, they preserver the Haugh Unit for a long time when eggs are enriched with omega 3 fatty acids.

Key Words: Seaweeds, Egg Physical Quality, Storage

T123 A direct method for fatty acid methyl ester (FAME) synthesis. J. V. O'Fallon, J. R. Busboom, M. L. Nelson*, and C. T. Gaskins, *Washington State University*, *Pullman*.

The objective of this paper was to develop a method to directly synthesize fatty acid methyl esters (FAME) from muscle tissue, oils, and feedstuffs in aqueous solution without prior organic solvent extraction. Wet tissues, or other samples, were permeabilized and hydrolyzed for 1.5 hr at 55°C in 1N KOH in methanol containing C13:0 as internal standard. The KOH was neutralized and the free fatty acids methylated by H_2SO_4 catalysis for 1.5 hr at 55°C.

Hexane was added to the reaction tube, which was vortex-mixed and centrifuged. The hexane is pipetted into a GC vial for subsequent gas chromatography. All reactions were conducted in a single screw cap Pyrex tube. Freeze-dried beef longissimus muscle fatty acids were methylated using sodium methoxide, boron trifluoride and direct FAME synthesis. ANOVA of beef longissimus muscle FAME was calculated using a model with methylation method as the treatments and animal as a blocking factor in a randomized complete block design. When the F-ratio for the methylation methods was significant, Student ′s t-test was used to make pairwise comparisons among the means. Direct FAME synthesis recovered more ($P \leq 0.01$) fatty acids (FA) than did sodium methoxide and much more than did boron trifluoride. Apparently there were fatty acid structures in beef longissimus muscle that were easily methylated by direct FAME synthesis but not by boron trifluoride. When expressed as % FA, sodium methoxide and direct FAME synthesis were quite similar in their results, but boron trifluoride was different ($P \leq 0.01$), and in this latter case (BF_3) the % FA values were higher when the concentration of fatty acid was lower. Direct FAME synthesis consistently methylated more fatty acid, averaging 1.3 times that of sodium methoxide and 2.2 times that of boron trifluoride. The method met a number of criteria for fatty acid analysis including not isomerizing CLA or introducing fatty acid artifacts. Its unique performance, including easy sample preparation, was achieved because water is included in the FAME reaction mixtures rather than eliminated.

Key Words: Fatty Acid Analysis, FAME Synthesis, Longissimus Muscle

T124 Intramuscular tenderness, sensory, and color attributes of two muscles from the *M. Quadriceps femoris* when fabricated using a modified hot boning technique. B. E. Jenschke*, B. J. Swedberg, and C. R. Calkins, *University of Nebraska*, *Lincoln*.

The *M. Quadriceps femoris* from USDA Choice and Select carcasses were fabricated traditionally (**COLD**) or innovatively (**HOT**) in which the seams it shares with the top round and bottom round were separated pre-rigor to test this effect on intramuscular variation in tenderness and color. At harvest, alternating carcass sides were assigned either the HOT or COLD treatment. At 48 h post-harvest, subprimals were removed, vacuum-packaged and aged for an additional 5 d. Following aging, the *M. Rectus femoris* (**REC**) and *M. Vastus lateralis* (**VAL**) were cut into 2.54 cm thick steaks, and allowed to bloom 1 h. For both muscles, L^* values significantly ($P < 0.050$) decreased when moving from the proximal to distal position within the muscle. Similarly, a^* and b^* values decreased in the VAL when moving from the proximal to the distal aspect. Following color measurement, steaks were vacuum-packaged and frozen (-26°C) until shear and sensory data were collected. Significant position (proximal to distal) and location effects (anterior to posterior) were noted for both muscles. For the REC, Warner-Bratzler shear force (**WBSF**) values were not greater than 4.35 kg and all regions were rated slightly tender or better. For USDA Choice REC steaks, the HOT treatment was significantly more tender when compared to COLD treatment. However, treatment did not affect the VAL. For both muscles, a trained sensory panel found a decrease in tenderness moving from the proximal to distal aspect which agrees with WBSF values for both muscles. Additionally, juiciness decreased when moving from the proximal to distal aspect of the VAL that received the HOT treatment. Results from this study indicate that the modified hot boning technique had minimal effects on the tenderness, sensory, and color attributes of the REC and VAL thus making it a feasible fabrication strategy for the industry. Since minimal differences in WBSF and taste panels values between the ball tip portion and the rest of the knuckle were detected, there is little need for value differences between these two portions.

Key Words: Hot Boning, Knuckle, Tenderness

T125 Effect of juvenile clenbuterol exposure on growth in mice. A. C. Dilger*, R. N. Dilger, L. W. Kutzler, and J. Killefer, *University of Illinois*, *Urbana*.

Clenbuterol (clen), a β-2 adrenergic agonist, increases muscle and decreases adipose tissue growth, though it is unclear if clen administration to dams confers similar benefits to offspring. Therefore, our objective was to determine the effect of clen administration to gestating and lactating mice on subsequent growth of their offspring. Clen was administered free choice as 20 ppm of clen HCl mixed in tap water. This study was designed as a 3×2×2 factorial arrangement with main effects of juvenile clenbuterol treatment, adult clen treatment and gender. Juvenile clen treatments consisted of clen administered to dams during the 3 weeks of gestation (GC), clen administered to dams during the 3 weeks of lactation (LC) and no clenbuterol administered to dams (NC). All pups were weaned at 3 weeks of age. At 5 weeks of age, offspring were assigned to adult clen treatment groups - clen or control (no clen) for 2 weeks - and were sacrificed at 7 weeks of age. GC increased 3- and 5-week-old pup weight while LC reduced 3- and 5-week-old pup weight when compared to NC. At 7 weeks of age, pup weight between GC and NC were not different, though both were greater than LC. For all juvenile clen treatments, adult clen treatment increased weight gain from 5 to 7 weeks. However, weight gain was not different between GC and NC pups treated with clen, though both were greater than LC pups treated with clen. Weights of the tibialis anterior (TA) muscle and the combined weight of the soleus and gastrocnemius (SG) muscles were determined. Weight of the TA was increased by adult clen treatment for all juvenile clen treatments. GC TA muscles weighed more than NC which weighed more than LC. Weight of the SG muscles were also increased by adult clen treatment, however, juvenile clen treatment had no effect. These data suggest that LC treatment may reduce growth performance while GC treatment may have beneficial effects. Furthermore, exposure of dams to clen during gestation and lactation does not seem to alter the adult response to clen in their offspring.

Key Words: Clenbuterol, Mouse, Growth

T126 Hematocrit and carcass parameters in broiler chickens submitted to acute heat stress in climatic chamber. E. F. Delgado*[1], C. C. Santos[1], A. C. M. S. Pedreira[2], I. J. Silva[1], and J. F. M. Menten[1], [1]*Escola Superior de Agricultura*, *Piracicaba, São Paulo, Brasil*, [2]*Agência Paulista de Tecnologia do Agronegócio*, *Piracicaba, São Paulo, Brasil*.

Acute heat stress (AHS) occurs in several physiological conditions and may depreciate broiler meat production and quality. The present experiment aimed to simulate in climatic chamber conditions of AHS (35°C; 85% RH) to evaluate the following parameters: hematocrit

(Ht); weight loss (WL, g); carcass weight and yield (CW and CY,%); breast weight and yield (BW, g and BY, %); wing weight (WW), leg weight (LW); visceral weight (VW); and breast free water (BFW, %) of broiler chickens. Animals were slaughtered with 40, 42 or 44 days of age, in three different slaughter times (ST) with average weight of 2.85 Kg (1st ST), 3.00 Kg (2nd ST) and, 3.28 Kg (3rd ST), respectively. In each ST, ten animals were weighed, placed into transport crates (10 by crate) and submitted to AHS conditions for 120 min. Simultaneously, other 10 animals (NS) were evaluated in crates kept in room temperature (22°C). Blood was collected in different times of crate confinement (t0, t30, t60 e t120 min) followed by slaughter. The Ht values showed a decline ($P<0.01$) during crate confinement from 30.0 ±0.4 (t0) to 27.8±0.4 (t120), but there was no effect of AHS. Higher WL ($P<0.01$) and CY ($P=0.078$) were observed for heat stressed broilers (112.0 vs 56.2 and 71 vs 70, respectively). In the 1st ST, there were also higher BW and BY ($P<0.01$) for AHS broilers compared to NS (705 vs 617 and 34 vs 31, respectively). The AHS animals had similar BFW among ST. Within ST, BFW was higher ($P<0.01$) in AHS compared to NS only in the 2nd ST (3.4 vs 2.5, respectively). The BFW in the 1st ST for NS broilers was higher compared to the others ST, and not different from AHS. The Ht reduction would be a preventive measure to avoid hipovolemia that may occur due to WL represented mainly by transpiration. The drainage of water from body tissues during AHS may be concentrated in determined non-carcass tissues and/or groups of skeletal muscle, with a preservation of water in the breast. The AHS can have a detrimental effect in the muscle water distribution.

Key Words: Weight Loss, Carcass Yield, Muscle Water Distribution

T127 Effect of DEX Treatment on Ca^{2+} Content in the satellite cell from broiler muscle. S. G. Wu, Y. Miao, H. J. Zhang, and G. H. Qi*, *Feed Research Institute, Chinese Academy of Agricultural Sciences*, *Beijing, China*.

The effect of glucocorticoid (GC) on Ca^{2+} content of satellite cells (SCs) from broiler muscle was determined to confirm if GC can activise Ca^{2+} signal transmit system in the muscle cells. The SCs were picked up from leg and breast muscle of day-old Abor Acres broilers respectively, and cultured in DMEM culture medium which contained 20% FBS. After 2 day culture, the SCs was marked with Fluo-3/AM. Using laser scanning confocal microscope (LEICA TCS SP2 SE) and highly sensitive Ca^{2+} fluorescent dye, Fluo-3/AM, kinetic changes of Ca^{2+} in single intact living SCs were measured before and after Dexamethasone (DEX) directly treatment. The results showed that intracellular Ca^{2+} content decreased as DEX concentration reduced. The maximum relative values of intracellular Ca^{2+} content of SCs from breast muscle and leg muscle were 144, 80, 63 and 66, 60, 48 for treatment 10^{-4},10^{-5} and 10^{-6} mol/L DEX, respectively. Time for intracellular Ca^{2+}content to reach the maximum relative value increased as DEX concentration reduced; The values for treatment 10^{-4}, 10^{-5}, and 10^{-6} mol/L DEX, SCs from breast muscle and leg muscle were 59s, 130s, 158s and 80s, 98s, and 216s, respectively. More time was needed for intracellular Ca^{2+} content to decrease to the initial level from maximum one; The figures for treatment 10^{-4}, 10^{-5}, and 10^{-6} mol/L DEX, SCs from breast muscle and leg muscle were 542s, 389s, 606s, and 260s, 675s, and 533s, respectively. Compared to the SCs from leg muscle, the SCs from breast muscle were more sensitive to DEX treatment. Treating SCs with DEX at 10^{-4}-10^{-6}mol/L can enhance intracellular Ca^{2+} content. These results indicate that extra cellular DEX can enhance intracellular Ca^{2+} content through active Ca^{2+} signal transmit system in the muscle cells from broilers.

Key Words: Intracellular Ca^{2+}, Dexamethasone, Satellite Cell

T128 Effect of low refrigeration temperature storage on physicochemical properties of packaged shell eggs during retail display. D. K. Shin*[1], C. Narciso-Gaytan[1], M. A. Sartor[1], J. Regenstein[2], and M. X. Sánchez-Plata[1], [1]*Texas A&M University*, *College Station*, [2]*Cornell University*, *Ithaca, NY*.

Approximately 89.9 billion eggs were distributed in the United States, and 86% of the total is table egg. However, most egg quality deterioration reported by egg processing industry is closely related to ″running whites″ and n″flaccid yolks″ during transport and/or retail display. Such deteriorated physicochemical properties of shell eggs may be associated with inadequate handling and/or storage condition. To establish a threshold temperature limit during transport and/or retail display, standard quality parameters and other physicochemical functionalities of shell eggs were evaluated under six different refrigeration temperatures (-1.1, 0.6, 2.2, 3.9, 5.6 and 7.2°C). Three eggs from each temperature were used at days 0, 2, 7, 14, 21 and 28 of storage. As standard quality parameters, Haugh units (HU), yolk index (YI), pHs of albumin (pHA) and yolk (pHY) and vitelline membrane strength were performed. Foaming (CD) and coagulation properties of eggs were also estimated. As expected, HUs was decreased but pHA was increased as storage day increased ($P<0.05$). Additionally, HUs of eggs stored at -1.1, 0.6 and 2.2°C were significantly differed when compared to the eggs under 3.9, 5.6 and 7.2°C of storage temperature and 28 days of storage ($P<0.05$). In conclusion, although storage temperatures below 1°C positively affected some of the quality and functional characteristics of shell eggs, storage temperature around 2°C would match economically.

Key Words: Refrigeration Temperature, Storage, Quality

T129 Isolation and characterization of μ-calpain, m-calpain, and calpastatin from postmortem bovine muscle. I Initial steps. J. P. Camou*, S. W. Mares, J. A. Marchello, R. Vazquez, M. D. Taylor, V. F. Thompson, and D. E Goll, *University of Arizona*, *Tucson*.

The calpains have been suggested to be an important contributor to proteolytic postmortem tenderization. Studies have shown that μ-calpain activity decreases rapidly during postmortem storage, and is nearly zero after 3 d postmortem. Activity of calpastatin, the specific inhibitor of the calpains, also decreases rapidly during postmortem storage, but not as rapidly as activity of μ-calpain does. Activity of m-calpain decreases only slightly during postmortem storage, but it is unclear whether Ca2+ concentrations in postmortem muscle get high enough to activate m-calpain. Hence, μ-calpain has been proposed as the principal contributor to postmortem proteolysis. However, because μ-calpain loses its activity rapidly postmortem, it is not clear how it could be a major contributor to postmortem proteolysis. Therefore, we have initiated attempts to purify μ-calpain, m-calpain, and calpastatin from 10-13-d postmortem bovine muscle. Several properties of postmortem calpains and calpastatin make their purification difficult. 1. Calpastatin is degraded into small fragments, some but not all of

which may have inhibitory activity, so purification of calpastatin from postmortem muscle will require purification of a number of fragments. 2. μ-Calpain is proteolytically inactive, so its purification from postmortem muscle will require detection by antibodies. 3. Because postmortem μ-calpain is autolyzed, it is too hydrophobic to be eluted from phenyl Sepharose columns, and these columns, which are powerful tools in purification of the calpains, cannot be used. We have developed a procedure using a hexyl-TSK hydrophobic interaction column as a first step in purification of the calpains and calpastatin from postmortem muscle. All calpastatin fragments pass straight through this column, and both autolyzed and unautolyzed calpains bind and are eluted quantitatively with 0.1 mM EDTA, 0.1% Brij35. After anion-exchange chromatography, it is possible to isolate two active calpastatin fractions, two μ-calpain fractions, one active and the other inactive, and one m-calpain fraction. Supported by the NIH,NRI,MDA.

Key Words: Calpain, Calpastatin, Postmortem

T130 Sarcomere length dynamics of postmortem ovine *Psoas major* and *Longissimus dorsi* muscles. I. Zapata*[1], T. D. Leeds[2], M. R. Mousel[2], and M. Wick[1], [1]*The Ohio State University*, *Columbus*, [2]*USDA-ARS U.S. Sheep Experiment Station*, *Dubois, ID*.

Understanding the biological mechanisms of postmortem events in muscle is of enormous importance for the meat industry because of their relationship with quality. Because sarcomere length has been previously related to tenderness issues in lambs we decided to study two contrasting types of muscle with known differences in tenderness characteristics. The objective of this study was to compare the sarcomere length (SL) dynamics of postmortem ovine *Psoas major* (PM) and *Longissimus dorsi* (LD) muscles at two time points and to relate LD tenderness to SL. Samples from the PM and LD muscles were removed from 57 animals at 50 min and at 36 h postmortem at the abattoir in the Ohio State University meat science laboratory. Muscle tissue free of evident fat or connective tissue was dissected from each sample and fixed in a glutaraldehyde/cacodylic acid buffer (pH 7.1). Samples were homogenized in cacodylic acid buffer (pH 7.1), mounted on glass slides, observed by phase contrast microscopy and images were captured with a CCD camera. SL were measured using image analysis software. LD chops were assayed at 7 d postmortem for tenderness using Warner-Bratzler sheer (WBS) force. Statistical analysis of the SL was performed using the MIXED procedure and a correlation test with SAS. SL was significantly different from each other within each muscle group and over time ($P < 0.001$). SL least square means estimate for the PM were 2.275 ± 0.023 μm at 50 min and 2.888 ± 0.032 μm at 36 h. SL least square means estimate for LD were 1.835 ± 0.023 μm at 50 min and 1.736 ± 0.016 μm at 36 h. Estimate differences were 0.613 ± 0.040 μm ($P < 0.001$) for PM and -0.098 ± 0.028 μm ($P < 0.001$) for LD. A Pearson′s correlation test showed no relation between LD SL and WBS force at either time point. These results demonstrate inherent differences in the postmortem SL dynamics between the two muscles. That is, the PM exhibited a positive slope in SL during postmortem aging while the LD SL exhibited a negative slope over the same time frame. Currently, the biological mechanism underlying this phenomenon has yet to be elucidated and is actively being pursued in our laboratory.

Key Words: Microscopy, Tenderness, Sarcomere Length

T131 Effect of pig age at slaughter on postmortem muscle protein degradation and fresh pork quality. C. E. Wagner*[1], E. Huff-Lonergan[1], A. A. Sosnicki[2,1], S. B. Jungst[2], and S. M. Lonergan[1], [1]*Iowa State University*, *Ames*, [2]*PIC North America*, *Hendersonville, TN*.

The objective of this study was to investigate if genetic selection of sires for improved growth rate is associated with changes in fresh pork quality. A pig population derived from the cross between a commercial line of Duroc sires and white line dams was subdivided according to the sires' estimated breeding value (EBV) for age at 125 kg. Differences in age at 125 kg were achieved by slaughtering pigs sired by High EBV growth boars (n=48), Low EBV growth boars (n=48) or a control group (n=32). Loin pH and temperature decline were monitored on each carcass. Fresh pork quality characteristics and water holding capacity were monitored at 2 d postmortem. Sensory traits (juiciness, tenderness, chewiness, flavor, and off-flavor) and star probe texture were measured 10 d postmortem. Proteolysis was estimated by desmin degradation and μ-calpain autolysis at 2 d postmortem. Pork quality data were analyzed in a one-way analysis of variance by age at 125 kg. Progeny were divided into groups based on standard deviation from the mean age at 125 kg (165 d) into groups A (142-157 d, mean=149.88 d), B (158-174 d, mean=166.61 d), and C (175-202 d, mean=182.61 d). Loins from pigs in group A had a significantly higher pH at 24 hr and 10 d than groups B and C. Loins from pigs in group A had higher subjective marbling scores and higher lipid content than loins from pigs in groups B and C. Loins from pigs in group C had a higher moisture content than loins from pigs in groups A and B. All groups differed in cook loss, with group A having the most and group C the least amount of cook loss. All groups differed when evaluated for sensory juiciness with loins from group A scoring the lowest and loins from group C the highest. Loins from pigs in group A had lower scores for sensory tenderness than loins from pigs in group C. Loins from pigs in group A had more intact desmin than pigs in groups B and C, as well as a greater amount of autolyzed μ-calpain than pigs in group C. Variation in pork quality could not be attributed to lower pH but could be due to proteolysis differences associated with growth.

Key Words: Growth, Pork Quality, Proteolysis