

inhibit the growth of *S. mutans* *in vitro*, with *L. fermentum* CS6039 exhibiting the highest inhibition. The turbidity and inhibition method was also performed to confirm the results from agar plate assay and competition test. All of the probiotic cultures, except *L. reuteri* CS332, significantly inhibited growth of *S. mutans* ($P < 0.05$). Based on these data, we suggest that lactic acid bacteria have a beneficial impact on inhibition of *S. mutans* and preventing dental caries.

Key Words: *Lactobacillus*, *Streptococcus Mutans*, Inhibition

W86 Lipid binding characterization of lactic acid bacteria in dairy products. D. Bachiero*, S. Uson III, and R. Jimenez-Flores, California Polytechnic State University, San Luis Obispo.

Probiotic bacteria are defined as a supplement that provides well being to the consumer when they are live and active. These microorganisms have gained more attention because of their known health benefits such as gastrointestinal health, enhancement of the immune system and their ability to inhibit pathogenic bacteria. However, there is still disagreement in defining their mechanisms of activity as well as methods of assessing them. An important limitation is the lack of knowledge regarding the nature in which these bacteria interact and bind in the gut as well as in the dairy system. Many studies have

focused on the protein binding properties while the binding to lipids has been poorly studied. We focused on developing an assay that gives a quantitative measurement of lactic acid bacteria's (LAB) affinity to bind to various lipids found in dairy foods. LAB strains used in this study were genetically characterized, isolated and typed using pulse field electrophoresis. Cells were used in their exponential phase of growth for the experiments. An immunoblotting technique was used as a quantitative measurement of bacteria's binding to various lipids from milk or buttermilk. Extracted lipids were separated on a TLC silica membrane, blotted on to PDF membranes and then exposed to biotinylated bacteria, to observe binding affinity. The bacteria/lipid interaction was measured using Avidin-HRP and Diaminobenzidine for a visual color reaction. We found two types of lipid binding: non-specific binding to triglycerides (non-polar lipids), in which the lipid concentration was the significant variable, and strain specific binding to phospholipids (polar lipids), where regardless of composition, each strain showed specific binding affinity. More importantly, these results show the specificity of binding as the direct result of the degree of processing of the dairy product. Those powders undergoing supercritical fluid extraction showed an increase in binding to phospholipids. These results will help in the design and formulation of dairy foods containing probiotic strains thus optimizing the bacteria's beneficial effects on health.

Key Words: Lactic Acid Bacteria, Binding, Lipids

Egg and Meat Science and Muscle Biology - Livestock and Poultry III

W87 Growth of muscular and adipose tissues of young heifers from different genetic groups. E. Rodrigues, M. D. B. Arrigoni, A. M. Jorge, P. S. A. Moreira, W. Bianchini, J. C. Hadlich, C. Andrighetto, C. L. Martins, D. D. Millen*, and R. D. L. Pacheco, FMVZ/UNESP–Botucatu, São Paulo, Brazil.

The objective of this study was to evaluate the growth of young heifers from different genetic groups (GG) in an intensive meat production system. It was used 42 animals of 4 different GG: 12 3/4 Canchim \times 1/4 Nellore (3/4 CN), 12 1/2 Canchim \times 1/2 Nellore (1/2 CN), 10 Crossbreed where the Simmental had predominance (SI) and 10 Three way cross – 1/4 Simmental \times 1/4 Nellore \times 1/2 Angus (TC). The Canchim breed is composed by 5/8 Charolais and 3/8 Nellore (Zebu breed). The experiment was conducted at the experimental feedlot of the Veterinary Medicine and Animal Science College, São Paulo State University, Botucatu campus (UNESP), Brazil. The animals received creep feeding supplementation and were weaned at 210 days of age with 247.4 \pm 16.48kg. It was analyzed the body weight characteristics, average daily gain (ADG), muscular and fat tissues growth. Real time ultrasound evaluation was used to measure rib eye area (REA, Longissimus dorsi muscle), back fat thickness (BFT) and P8 (Top rump, Biceps femoris) fat thickness. The animals were fed for 132 (\pm 14) days in feedlot system with a high concentrate diet. ADG was measured every 28 days. The heifers were slaughtered when the final weight of 350 kg and 5mm of back fat thickness predicts were reached. TC heifers had smaller ($P < 0.05$) final (TC=61.6, 3/4 CN=69.4, 1/2 CN=66.2, SI= 65.2) and adjusted at 100 kg/BW (TC=15.2, 3/4 CN=17.8, 1/2 CN=17.7, SI=18.9) rib eye area (cm²) compared to the others GG. This group also had a greater ($P < 0.05$) final body weight in kilos (TC=405, 3/4 CN=390, 1/2 CN=374, SI=350), better ADG ($P < 0.01$) in kilos/day (TC=1.07, 3/4 CN=1.04, 1/2 CN=0.95, SI=0.94)

and an intermediate days of feeding. There was not significant differences for initial REA, BFT and P8, but when the values were adjusted for fewer days of feeding (114 days), greater values ($P < 0.01$) were found for TC and SI for P8 114 (TC=8.8, 3/4 CN=6.5, 1/2 CN=5.7, SI=8.4) and for SI for REA 114 (TC=55.7, 3/4 CN=55.3, 1/2 CN=52.7, SI=65.2). Thus, heifers TC performed better than other GG tested showing a grain adaptation as zebu percentage in GG composition got lower.

Key Words: Rib Eye Area, Back Fat Thickness, Ultrasound

W88 Evaluation of performance, tissue growth and meat tenderness of Nellore, Brangus and Canchim young bulls. R. B. Rodrigues, M. D. B. Arrigoni, E. Rodrigues, D. D. Millen, R. D. L. Pacheco*, H. N. Oliveira, C. C. Laurino, M. V. Fossa, L. M. N. Sarti, M. Parrili, S. A. Matsuhara, C. L. Martins, J. P. S. T. Bastos, and T. M. Mariani, FMVZ/UNESP–Botucatu, São Paulo, Brazil.

This study had the objective to compare three different genetic groups with different zebu percentage in their compositions: Nellore (N), Brangus – 5/8 Red Angus, 3/8 Nellore (BC) and Canchim – 5/8 Charolais, 3/8 Nellore (CC). It was used 87 animals (27 CC, 30 N and 30 BC) separated by genetic groups and randomly disposed. The weaning weight in kilos was 244.6, 243.6 and 295.0 for N, BC and CC respectively with 8 months old, which were supposed to be slaughtered with 15 months of age around 450 to 500kg in a commercial packing plant. The experiment was conducted at the experimental feedlot of the Veterinary Medicine and Animal Science College, São Paulo State University, Botucatu campus (UNESP), Brazil. The feeding period

was 158 days including 28 days of adaptation using a high concentrate diet. The dry matter intake (DMI) was measured every day, subtracting the waste from the amount fed. Average daily gain (ADG) and feed efficiency (FE) were obtained every 28 days, weighting the animals after 16 hours withheld the feed. Simultaneously, real time carcass ultrasound was used to measure Longissimus dorsi area (LEA) and subcutaneous fat thickness (SFT). For carcass evaluation, samples of LEA between twelfth and thirteenth ribs were collected from the left carcass to evaluate tenderness by shear force method (SF). DMI and FE did not differ ($P > 0.05$) among the genetic groups tested. ADG in kilos/day differed ($P < 0.05$) from CC to the other two groups (CC=1.46, BC=1.22 and N=1.14). LEA differed in cm^2 ($P < 0.05$) for all treatments (CC=86.92, BC= 77.01 and N=71.14). SFT in millimeters showed difference ($P < 0.05$) in all treatments (CC=3.91, BC=6.67 and N=5.15). According to SF in kilograms force the CC group presented significant difference ($P < 0.05$) when compared to the other two groups (CC=3.98, BC=2.75 and N=2.74). The results indicated that CC had a better ADG, a faster and longer muscular growth than BC and N, but had the worst fat deposition and SF in this experiment; what may be explained for the major frame size of the animals used to compose this GG: the Charolais.

Key Words: Performance, Tissue Growth, Shear Force

W89 Efficacy of blood hemoglobin as an indicator of pork quality. A. N. Lepper*, H. N. Zerby, S. J. Moeller, K. M. Brueggemeier, and A. C. Naber, *The Ohio State University, Columbus.*

The objective of the study was to assess the efficacy of pre-harvest blood hemoglobin level as a predictor of pork quality in market weight swine. Market weight swine ($n = 110$) were harvested over three dates, following a 12 h rest in a commercial packing. Each harvest group consisted of proportional numbers of purebred Berkshire, Landrace and the reciprocal crossbred pigs. Blood hemoglobin (HB, Hemocue Hb 201) content was obtained from a sample collected 24 h prior to harvest via the anterior vena cava. Carcass backfat (BF), loin muscle area (LMA) and loin quality traits, including Minolta L* and a*, visual color (C), marbling (MARB), firmness (F), wetness (W), and pH were measured at 24 h post-harvest. Warner-Bratzler Shear (WBS) force assessment of the loin was completed on a chop aged for 7 d post-harvest. Data were analyzed using multi-trait analysis of variance for dependent carcass and pork quality measures. Fixed effects included breed combination and sex with a random harvest date effect. Residual correlations were estimated after accounting for model effects to determine associations among traits and simple correlations were estimated. After adjusting for breed, gender and harvest date effects BH was only associated ($P < 0.05$) with WBS ($r = 0.23$). Significant simple correlations were observed between HB and WBS ($r = 0.22$, $P < 0.05$) and pH ($r = -0.28$, $P < 0.01$) with the simple correlation between Minolta a* ($r = 0.17$, $P < 0.06$) approaching significance. The results indicate blood hemoglobin level, collected prior to harvest was not a good indicator of subsequent pork quality and would not be an effective tool for selection of live pigs as breeding animals to improve pork quality.

Key Words: Pork, Quality, Hemoglobin

W90 Evaluation of Haugh Units and yolk index as criteria to establish a low temperature storage limit for refrigerated shell eggs. D. Shin*¹, C. Narciso-Gaytan¹, M. Sartor¹, J. R. Regenstein², and M. X. Sánchez-Plata¹, ¹Texas A&M University, College Station, ²Cornell University, Ithaca, NY.

More than 89.9 billion eggs are distributed yearly in the U.S., most of them as table eggs transported and stored under refrigerated conditions. The USDA recommends the storage of shell eggs at temperatures below 7.2°C (45°F) for food safety reasons. However, no lower temperature storage limit has been recommended. Recent industry reports indicate that storage of shell eggs at low temperatures -close to 0°C (32°F) - may be associated with quality deterioration effects such as “running whites” and “flaccid yolks”. The goal of this study was to establish a low temperature storage limit for shell eggs based on the effect of low temperatures in conventional egg quality parameters including Haugh units, yolk index, albumen pH, yolk pH, vitelline membrane strength and cake density during prolonged storage. Fresh shell eggs, at least six per measurement for each of three replications, were stored under controlled refrigerated conditions at -1.1, 0.6, 2.2, 3.9, 5.6 and 7.2°C. Samples were taken at days 0, 2, 7, 14, 21 and 28. As expected, Haugh units decreased while albumen pH increased during storage at all temperatures. Significant Haugh unit differences ($P < 0.05$) were observed in eggs after 14 days of storage. High storage temperatures caused a faster decline in Haugh units and yolk indexes when compared to the lower temperatures evaluated. However, after 28 days of storage differences were more evident, indicating higher quality preservation at temperatures below 2.2°C. Results indicate that a low temperature storage limit for shell eggs could be established between 0.6 and 2.2°C, especially if eggs were to be stored beyond two weeks under these conditions.

Key Words: Shell Eggs, Storage Temperature, Haugh Units

W91 The acceptance of brown-shelled eggs in a white-shelled egg market. N. P. Johnston*¹, L. K. Jefferies¹, B. Rodriguez², and D. E. Johnston¹, ¹Brigham Young University, Provo, UT, ²University of San Andres, La Paz, Bolivia.

In recent years brown-shelled (BS) eggs have gradually entered the traditional white-shelled (WS) egg markets as a distinctive mode for packaging specialty eggs. A test was conducted at the Brigham Young University Sensory Laboratory to gain an understanding of how consumers view various attributes of the BS egg relative to the WS egg. The objectives were two fold, first to see how the consumer viewed properties of eggs by color and secondly the preference for brown color intensity. It was hypothesized that consumers would view BS eggs as more nutritious and more likely laid cage-free. It was further hypothesized that the darker colored BS eggs would be preferred to lighter ones. To test the hypothesis 52 panelists, all women who routinely purchased and consumed eggs, completed the evaluation. Of the panelists 46.2% consumed eggs daily and the remainder (53.8%) at least twice weekly. Frequency of egg purchases were weekly (9.6%), every two weeks (30.8%), and every three to four weeks (48%). 26.9% purchased specialty eggs (omega-3, organic or cage free). The panelists preferred WS eggs (90.4%), but as hypothesized BS eggs were viewed as likely more nutritious, flavorful,

fresher, higher in omega-3, and originating from a “farm flock” fed only organic ingredients. To test the preference for shade of BS eggs, a set six eggs with varying intensities of brown color was evaluated for appearance using a 9 point hedonic scale. The egg color intensities were measured using a Hunter Colorflex Spectrophotometer and the CIEL* system. The L* values ranged from 83.2 for WS eggs to 63.6 to 46.5 for the BS eggs. Contrary to our hypothesis there was a significant ($P<0.05$) preference for the lighter shades of brown (L^* 63.6 and 53.3). Using the same scale panelists then compared BS to WS eggs. Again the two most lightly tinted BS eggs were found most comparable WS eggs in acceptability and better ($P<0.05$) than the darker colored BS eggs. In conclusion WS eggs were preferred over brown eggs but BS eggs were viewed as likely more nutritious, flavorful and fresher, and laid in a non-caged setting. Panelists preferred the appearance of the lightly tinted to darker BS eggs.

Key Words: Eggs, Color, Preference

W92 Nutritional composition of raw and fried enhanced or non-enhanced boneless chicken breast fillets. J. Kiker^{*1}, J. Howe², J. Holden², J. Boyce¹, A. Luna¹, C. Alvarado¹, D. Wester¹, and L. Thompson¹, ¹Texas Tech University, Lubbock, ²Beltsville Human Nutrition Research Center, Beltsville, MD.

Research was conducted to determine the nutritional value of enhanced (E) and non-enhanced (NE), raw or battered and breaded (BB) fried boneless chicken breast fillets. Two trials were conducted in which 65 fillets per trial were E by injection with a 0.6% NaCl/0.4% Na triphosphate solution, and 65 fillets were not E. Injected fillets retained 9.2% solution based on the raw NE weights. After equilibration at 4°C for 48 h, half of the fillets from each treatment were BB using an automatic system, and then fried in a commercial fryer to an endpoint temperature of 74°C. ANOVA and means separation by LSM means were conducted using GLM procedures in SAS. Percentage moisture was similar in raw fillets (75.8%, $P > 0.05$), while raw fillets were higher in moisture than cooked (E-fried 55.31% and NE-fried 52.15%, $P < 0.0001$). Cooking concentrated ash (E-fried 2.33% vs E-raw 1.89%, $P < 0.0001$; NE-fried 1.36% vs NE-raw 1.03%, $P < 0.0001$). Means for percentage protein were greater in NE than in E fillets (NE 21.7% vs E 19.0%, $P < 0.03$). Fat content was higher in E-fried (6.6%) compared to NE-fried fillets (4.7%, $P < 0.0001$). Phosphorus and sodium contents were significantly higher in E than NE-fillets (252 mg P/100 g, 586 mg Na/100 g vs. 200 mg P/100 g, 296 mg Na/100 g, respectively, $P < 0.0001$). A 100-g serving of NE-fried breast fillet would provide 43.4% of the daily reference value (DRV) for protein, 7.2% of the DRV for fat, 12.3% of the DRV for Na, and 20.0% of the reference daily intake (RDI) for P. In contrast, a 100-g serving of E-fried fillet would provide 38%, 10.2 % and 24.4% of the RDV for protein, fat and sodium, and 25.2% of the RDI for P. Enhancement increased moisture content in the cooked product by 6.1%, Na by 98.0%, and P by 26.0%.

Key Words: Chicken Breast Fillets, Composition, Enhancement

W93 Physical and chemical meat traits of young heifers from different genetic groups. E. Rodrigues, M. D. B. Arrigoni, A. M. Jorge, P. S. A. Moreira, W. Bianchini, D. D. Millen, R. D. L. Pacheco*, J. C. Hadlich, C. Andrighetto, and C. L. Martins, FMVZ/UNESP–Botucatu, São Paulo, Brazil.

The objective of this study was evaluate physical (marbling, tenderness, evaporation losses (EL), leak losses (LL) and total losses in the cooking (TLC)) and chemical (Humidity, crude protein and lipids) meat traits from different genetics groups of young heifers finished in feedlot. Marbling was determined by a subjective score (1–5). The animals were divided in four groups: 12 3/4 Canchim × 1/4 Nellore (3/4 CN), 12 1/2 Canchim × 1/2 Nellore (1/2 CN), 10 Crossbreed where the Simmental had predominance (SI) and 10 Three way cross – 1/4 Simmental × 1/4 Nellore × 1/2 Angus (TC). The Canchim breed is composed by 5/8 Charolais and 3/8 Nellore. The experiment was conducted at the experimental feedlot of the Veterinary Medicine and Animal Science College, São Paulo State University, Botucatu campus (UNESP), Brazil. The SI animals had higher ($P<0.01$) marbling scores (TC=2.3, 3/4 CN=2.0, 1/2 CN=2.0, SI=2.5) when compared to 3/4 CN and 1/2 CN. For tenderness, measured by shear force in kilograms force, there was no significant difference ($P>0.05$) after seven days of ageing with the meat samples at zero Celsius degree (TC=2.1, 3/4 CN=2.0, 1/2 CN=2.1, SI=1.8). Regarding EL, LL and TLC, in percentage, the 1/2 CN was better ($P<0.05$) than others groups tested (EL: TC=11.8, 3/4 CN=12.9, 1/2 CN=7.5, SI=12.6; LL: TC=2.7, 3/4 CN=3.2, 1/2 CN=1.5, SI=3.3; TLC: TC=14.6, 3/4 CN=16.1, 1/2 CN=9.0, SI=15.9). There were no significant differences ($P>0.05$) among the genetic groups evaluated regarding chemical analysis, observing the mean values of 74.86%, 22.15% and 1.39% for humidity, crude protein and lipids, respectively. The 1/2 CN presented less losses when compared to the other groups tested. The meat of young heifers finished in feedlot is ideal for the packing plants and consumers requirements in Brazil.

Key Words: Meat, Heifers, Feedlot

W94 Evaluation of meat tenderness of forage-finished cattle produced in Hawaii and factors affecting the tenderness. Y. S. Kim*, A. Ong, N. Bobbili, M. DuPonte, G. K. Fukumoto, and C. N. Lee, University of Hawaii, Manoa, Honolulu.

The objective of this study was to evaluate the current status of meat tenderness of forage-finished cattle produced in Hawaii and to determine what production factors affect the meat tenderness of forage-finished cattle. Two ribeye steak samples from the 12th rib were obtained from 191 forage-finished cattle sacrificed at two local slaughter houses on Hawaii Island. The steak samples were vacuum-packaged in Kapak pouches individually and aged for 2 wk at 4°C, then were stored at -20°C for later proximate analysis and measurement of shear force values of cooked steaks. The vacuum-packaged steak samples were thawed and cooked in a water bath at 70°C for 1 h, cooled to room temperature, and shear force values were measured from 1.3 cm core samples (6 per steak). Information on animal age, breed, carcass weight and sex was obtained during sample collection from the slaughter houses. Carcass weight ranged from 353 lb to 939 lb with a mean value of 601.8 lb. Intramuscular fat content ranged from 0.19% to 14.11% with a mean value of 4.49%. Shear force value ranged from 2.41 kg to 9.41 kg with a mean value of 5.21 kg. The shear force value of heifers (5.52±0.133 kg) was higher ($p<0.05$) than that of steers (4.96±0.148 kg). The shear force value of the age group between 24-36 months (4.97±0.137 kg) was lower ($P<0.05$) than that of the age group over 36 months (5.51±0.149 kg) or the age group below 24 months (5.23±0.321 kg). The shear force value of Hereford breed (n=19, 6.24±0.288 kg) was higher ($P<0.05$) than that of Angus (n=53, 5.19±0.172 kg), or Bos taurus crosses (n=76, 5.06±0.144 kg),

or other breeds (n=25, 4.91±0.251 kg). Correlation coefficient of shear force value with intramuscular fat was 0.025, indicating that the intramuscular fat is not a good indicator for meat tenderness of forage-finished beef. In conclusion, the results of this study indicate that meat tenderness of forage-finished cattle can be improved by proper selection of breed types and slaughter age.

Key Words: Forage-Finished Beef, Meat Tenderness

W95 The effect of dietary mushroom supplementation on egg characteristics and production attributes of leghorn hens. W. L. Willis, O. Isikhuemhen, A. Ely, D. Coverington, and C. King*, *North Carolina Agricultural and Technical State University, Greensboro.*

An experiment was conducted to assess the effect of Shitake (*Lentinus edeods*) mushroom powder on laying hens' performance and their egg characteristics. Sixteen 45 wk old Single Comb White Leghorn hens were divided into control and experimental treatment groups, replicated four times with two hens per replicate cage group. The experimental hens were fed a 20% mushroom powder supplemented ration and the control received a standard laying ration for a period of one month. Body weights and egg components were weighed for each treatment group. Total fat (as triglycerides) saturated fat (as fatty acids), transfat (as fatty acid) and the percentage saturated, monounsaturated, polyunsaturated and unknown fat were determined in eggs from treatments. The hens fed the supplemented mushroom powder diet had a higher average body weight loss, whereas, the control fed hen exhibited a higher average weight gain. Egg production was not significantly affected by diet. The feeding of 20% mushroom powder for this short duration, however, resulted in higher numerical values for egg whites and yolks (63.4 vs 62.7 and 36.2 vs 34.9), respectively. There was no significant ($p < 0.05$) differences in saturated, monounsaturated, polyunsaturated and unknown fats between the two treatments. There was a trend for higher total fat, saturated (as fatty acids), and transfat in the mushroom supplemented hen eggs. Although the effects of dietary mushroom were not statistically significant with respect to fats and egg components, the results indicate that the use of an appropriate level of powder or extract in laying hen diets will change the parameters studied.

Key Words: Laying Hens, Mushroom, Saturated Fats

W96 On the tenderness of commercial boneless skinless broiler breast meat. Y. S. Lee*, C. M. Owens, and J. F. Meullenet, *University of Arkansas, Fayetteville.*

Although broiler processing practices have been fairly uniform across the industry, this is changing with the advent of specialty poultry processors. For example, immersion chilling has been the standard in industry but recent product introductions have included air chilling. Furthermore, although the enhancement of broiler breast meat is still common, non-enhanced and natural products have been introduced to satisfy market demand. The objective was to assess the level of tenderness of commercial products representing various industry practices. Six commercial boneless skinless breast meat products representing 4 brands were purchased at local supermarkets on four occasions over a period of 3 months. Two products followed an air

chill process with no enhancement and carcass aging durations of ~ 24 hrs. Two of the water chilled products were enhanced with up to 15% of a solution containing chicken broth while the other two contained up to 3% of water retained. Aging duration for the water chilled products was thought to follow standard practices (4-6 hrs). All products were cooked covered to an internal temperature of 71°C in a convection oven. Tenderness was instrumentally measured by the Meullenet-Owens-Razor-Shear (MORS) using a TA-XT2 plus Texture Analyzer (Texture Technologies Corp., Scarsdale, NY). Cooking loss was also calculated. Both air chilled and one enhanced products were found to be most tender with MORS energy values corresponding to moderately tender meat. The two water-chilled but non-enhanced products corresponded in average to tenderness levels considered by consumers as slightly tough. Cooking loss of the two air chilled products (13.5-15.5%, respectively) were significantly lower than that of water chilled products (18.7-22.6%). Results showed an array of tenderness in commercial products with several products showing unacceptable tenderness. Sensory analysis and consumer acceptance of such products should be further assessed to determine if tenderness is a key driver of acceptance and if other characteristics are also important to liking.

Key Words: Tenderness, Broiler Breast Fillet, Chilling

W97 Feeding wet distillers grains plus solubles reduces shelf life and increases lipid oxidation during retail display of beef steaks. A. S. de Mello Junior*, B. E. Jenschke, C. R. Calkins, L. M. Grimes, J. M. Hodgen, and G. E. Erickson, *University of Nebraska, Lincoln.*

Strip loins (*M. Longissimus lumborum*), tenderloins (*M. Psoas major*) and top blades (*M. Infraspinatus*) from 46 carcasses of calf-fed, crossbred steers, were evaluated to test the effect of wet distillers grains plus solubles (WDGS) in beef cattle finishing diets on beef shelf-life (color and oxidation). The animals were randomized into three groups (0%, 15% or 30% WDGS – DM basis) and fed for 133 d. After grading, the short loins (IMPS # 174) and shoulder clods (IMPS # 114) were vacuum-packaged and shipped to the University of Nebraska Meat Laboratory. At 7 d postmortem, two steaks were cut from each strip loin, tenderloin and top blade. One steak was vacuum packaged and frozen (-16°C) immediately until a measurement of rancidity could be made (thiobarbituric acid reactive substances - TBA). The other steak was divided in two and the halves were wrapped in oxygen-permeable film and displayed for 3 and 7 days under simulated retail conditions (200-250 ft-candles light, 2°C). For the top blade and strip steaks, inclusion of 30% WDGS in the diet resulted in higher levels of oxidation (higher TBA values) in the lean after 7 d display (Top blade: 3.84^a, 5.04^a, 8.42^b for 0, 15 and 30% WDGS, respectively; $P < 0.001$. Strip steaks: 2.02^a, 3.77^b, 4.81^b, respectively; $P = 0.001$). There were no effects of WDGS on TBA values of tenderloin steaks ($P = 0.191$). After 3 d of retail display, steaks from cattle fed WDGS were numerically higher in TBA values than those from controls ($P = 0.075$ for top blades and 0.285 for strips). Top blade steaks from cattle fed 15 or 30% WDGS were darker (lower L^* values) than controls ($P < 0.028$). Top blade and tenderloin steaks from cattle fed 30% WDGS were significantly less red (lower a^* values) after 3 d of retail display ($P < 0.040$). These data indicate that feeding WDGS can compromise the shelf-life of steaks.

Key Words: Distillers Grains, Oxidation, Shelf-Life

W98 Mapping tenderness of the *M. Serratus ventralis*. L. M. Grimes* and C. R. Calkins, *University of Nebraska, Lincoln*.

To map the tenderness of beef *M. Serratus ventralis* (SV) muscles and evaluate the effectiveness of an enhancement strategy, beef chucks (n = 32), with the brisket and shoulder clod removed, were obtained from both sides of 8 USDA Choice and 8 USDA Select-grade beef carcasses two days post mortem. At 7 d postmortem, SV from one side were enhanced (E) with a 12.5% solution containing beef broth, salt, phosphate, and rosemary extract; and alternate sides were the control (C). Both C and E muscles were blade tenderized once as a whole muscle and cut into halves by a medial cut from dorsal to ventral, splitting the muscles into anterior and posterior halves. The halves were cut into steaks beginning at the dorsal edge, creating 4 to 8 steaks per half. All steaks of the E muscles were then blade tenderized again. Steaks were vacuum packaged and frozen. Every other steak from each SV was thawed overnight, cooked to an internal temperature of 70°C, cored, and sheared to obtain Warner-Bratzler shear force values (WBS). Cores were taken approximately every 2.54 cm from anterior to posterior throughout the steak. Regardless of grade, E samples produced significantly lower WBS values ($P < .001$) than C samples, decreasing WBS from 3.85 kg to 2.99 kg, a reduction of 22%. For USDA Select muscles, the most ventral steak was least tender ($P < .001$) and the most anterior location within the steak was the toughest. For USDA Choice samples, differences occurred from anterior to posterior, not dorsal to ventral ($P > 0.050$). All WBS means from the posterior side of Choice-grade SV muscles were numerically lower than the anterior side. Tenderness varies throughout the SV, and enhancement techniques can decrease WBS values. Across both grades, the least tender areas were those toward the anterior portion of the carcass. It appears that steaks could be cut from the posterior portion of the SV, as WBS values were in the acceptable range.

Key Words: Enhancement, Serratus Ventralis, Tenderness Mapping

W99 Correlations among carcass, meat and eating quality traits of finishing pigs. C. C. Tsai*¹, L. L. Lo¹, Y. C. Yang¹, R. S. Lin², T. H. Huang³, J. Chen¹, L. C. Lee¹, P. Y. Lo¹, and H. J. Chien¹, ¹*Chinese Culture University, Taipei, Taiwan, ROC*, ²*National Ilan University, ILan, Taiwan ROC*, ³*Taiwan Farm Industry Co., Ltd., Pingtung, Taiwan, ROC*.

To establish the relationships among meat and eating quality, carcass and meat quality data were analyzed from 120 Duroc and Landrace (DL) crossbred pigs. 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. Carcass traits included the 10th rib backfat thickness, LM area (LMA), and the subjective scores of color, firmness, and marbling and the meat quality traits included were color, pH, shear force value, water holding capacity, chemical analysis and sensory evaluation. Backfat at the 10th

rib was significantly correlated with drip loss (-0.37), water holding capacity (0.20), ash (0.21) and intramuscular fat content (0.50). The saleable lean weight was also correlated with water holding capacity (0.38) water (-0.42), and protein (0.364). Higher ultimate LM pH was associated with lower L value (-0.69), lower b value (-0.61), more water, less ash, less protein, and more intramuscular fat content ($P < 0.05$). Marbling score was significantly associated with intramuscular fat content (0.53), and Hunter L value was correlated with color score (-0.28). Eating quality of juiciness, tenderness, and flavour scores were significantly correlated with ultimate pH, drip loss and water holding capacity. These results indicate that many factors might influence the eating quality of pork, and the correlation information may provide some knowledge to DL producers to improve their pork's competitiveness.

Key Words: Carcass Performance, Meat Quality, Pigs

W100 A novel laser air puff and shape profile method for predicting tenderness of broiler breast meat. Y. S. Lee*, A. Saha, C. M. Owens, and J. F. Meullenet, *University of Arkansas, Fayetteville*.

The laser air puff with shape profiles is a novel non-destructive method for predicting poultry meat tenderness from the raw state. It has the advantages of being non-contact and non-destructive and could be implemented in an on-line setting for classifying tough and tender meat at line speeds. The objective was to examine the potential application of this new system to assess poultry meat tenderness. Ninety broilers were deboned at either 1.75, 4 or 24 h postmortem (PM). The raw breast fillets were first scanned on a conveyor belt longitudinally by a laser distance sensor to obtain overall shape profiles and scanned again with a pressurized source of air (30 psi). The profile created with air was overlapped over the original profile to examine differences between the two profiles. Five parameters including height and length of each fillet were calculated and used to establish a model to predict tenderness. Instrumental and sensory analysis on cooked meats was conducted by the Meullenet-Owens-Razor-Shear (MORS) and seven trained panelists, respectively. Hardness and MORS Energy (MORSE) were modeled with the parameters extracted from the air puff system. Both models were highly significant ($P < 0.0001$). Predicted values obtained from the models and observed values of individual fillets were subjected to Logistic regression to classify tender and tough meat. Tender fillets, in the predicted tender group, represented 75% and 81% based on hardness and MORSE, respectively. This represents a 20% improvement in the number of tender fillets after classification. Of the parameters used for the prediction, those measuring the amount of deformation due to the pressurized air were negatively correlated to tenderness, indicating that tender cooked meat sustains more deformation by pressurized air in its raw form. The results suggested that this new system could potentially be implemented as an on-line tool for sorting poultry breast fillets by tenderness levels.

Key Words: Air Puff, Broiler Breast Fillet, Tenderness