White striping and woody breast are major quality issues in the poultry industry. These conditions have been associated with rapid growing, high breast yielding broilers. This study was conducted to evaluate effects of WS and WB hardness on meat quality traits in broiler breast fillets. High breast yielding broilers were processed at 6 and 9 wk of age. All fillets were deboned at 2 h postmortem and scored for severity of white striping (visual evaluation) and woody breast (tactile evaluation). For meat quality analyses, fillets were collected at 6 wk (n = 160) and at 9 wk (n = 87) of age and were categorized as normal (NORM), severe for white striping/mild for woody (WS), or severe for both white striping and woody (WB). Sarcomere length, marination uptake, cook loss, and Meullenet-Owens razor shear energy values (MORSE) on non-marinated and marinated (vacuum tumbled, 15% marinade addition; targeted 0.75% NaCl and 0.45% phosphate for final concentration) fillets were assessed. Results showed that sarcomere length was longer in fillets with WS+WD compared with NORM (P < 0.05) at both 6 and 9 wk of age, despite the increasing degree of fillet hardness. As severity of either WS or WB increased, marination uptake decreased (P < 0.05) at both 6 and 9 wk; WS+WB had lower uptake than WS which had lower uptake than NORM (P < 0.05). Cook loss of marinated fillets in 6 and 9 wk was higher (P < 0.05) in WS+WB compared with WS and NORM, which were similar (P > 0.05). In the non-marinated fillets, WS+WB had higher (P < 0.05) cook loss than WS, which was also higher (P < 0.05) than NORM. At 6 wk, MORSE of the NORM non-marinated fillets were significantly higher (P < 0.05) than WS and WS+WB which were similar (P > 0.05) and there was no significant difference observed in MORSE of marinated fillets. At 9 wk, there was no difference (P > 0.05) in MORSE values of both marinated and non-marinated fillets between WS+WB or WS and NORM. Results of this study suggest that severe degrees of white striping and woody breast affect meat quality with negative effects on water holding capacity.

Key Words: broiler, breast fillet, woody breast, white striping, meat quality

Recently, broiler breast fillets have been affected by a condition known as white breast, which results in a distinct hardness of raw fillets. Woody breast can vary in severity from normal (NORM) to severe (SEV). In 2 experiments, NORM and SEV woody breast were subjected to descriptive and consumer sensory analysis. The descriptive panel (n = 9 trained panelists) was conducted to obtain a flavor and texture profile of 60-d-old broiler breast fillets. The consumer panel (n = 74 consumer panelists) was designed to assess consumer acceptance of 63-d-old broiler breast fillets. In both panels, non-marinated breast fillets were cooked to an internal temperature of 165°F in aluminum covered pans. Samples were held at either 140°F or 38°F before serving and 2 samples (2.54 × 2.54 cm cube) of each treatment were presented in a HOT (140°F) and COLD (40°F) state to simulate different serving scenarios. Treatments were hot normal (HOTNORM), cold normal (COLDNORM), hot severe (HOTSEV), and cold severe (COLDSEV). The descriptive panel used standard flavor and meat texture lexicons. Consumers expressed their overall liking for impression, flavor, and texture on a 9-point hedonic scale (9 = like extremely; 1 = dislike extremely). For the consumer panel, the ballot included an open-ended comment section assess likes and dislikes. Results of the descriptive panel indicated that HOTSEV fillets had greater (P < 0.05) cohesiveness of mass and fewer loose particles (P < 0.05) than HOTNORM. COLDSEV samples showed more oxidized and barnyard flavors than the HOTSEV samples. This may be related to increased white striping (i.e., fat) associated with the SEV samples. Results of the consumer panel analysis showed no significant differences (P > 0.05) in hedonic sensory attributes between NORM and SEV (HOT OR COLD) breast fillet samples. Open-ended comments showed more dislike comments related to texture in the SEV compared with NORM breast meat. Results suggest that some descriptive attributes related to texture and flavor are affected by woody breast though consumers may not detect these changes. Future studies should include sensory analysis of marinated woody breast.

Key Words: woody breast, consumer sensory, descriptive sensory, quality

Colorimetric assessment and crude fat content of pectoralis major muscles (breast fillets) affected by the white striping quality defect. Barbara A. Mallmann*, Sarge F. Bilgili, Sergio L. Vieira, Cristiane Sanfelice, and Kathryn J. Meloche, 1Universidade Federal do Rio de Janeiro, Brazil, 2University of Arkansas, Fayetteville, AR, 3Texas A&M University, College Station, TX.

In recent years, older market broilers have been shown to have tougher meat when compared with younger broilers. In addition, there has been an increase in incidence of woody breasts in broilers, often associated with larger broilers. Woody breast is characterized by a distinct hardness of the raw fillet. A blunt version of the Meullenet-Owens razor shear (BMORS) has been shown to be a more sensitive method at higher degrees of toughness. An experiment was conducted using high breast yielding commercial male broilers to evaluate the effectiveness of BMORS in at different ages and different levels of woody conditions (i.e., hardness). Six hundred broilers were processed using to commercial methods at 6 and 9 wk of age in 2 replications. Breast fillets were deboned at 2 h postmortem (PM) and aged on ice in a 4°C walk-in cooler overnight. Fillets were scored for severity of woody and 440 were placed into 2 categories, normal (NORM) and severe (SEV). Breast fillets (n = 440) were cooked to 76°C and cook loss, MORSE, and BMORS measuring energy (MORSE, BMORS) were determined. Broilers grown to 9 wk had a higher live weight than 6 wk (4.5 vs 2.7 kg, P < 0.05). There was a age by woody category interaction (P < 0.05). For NORM fillets, there were no significant differences (P > 0.05) for MORSE, BMORS and cook loss due to age. The lack of differences in the NORM samples is likely due to the early deboning time masking effect of age. However, for WB fillets, MORSE, BMORS, and cook loss were significantly higher (P < 0.05) at 9 wk of age than at 6 wk of age. The higher energy values are likely related to the mechanisms related to increased hardness of the fillets. Results indicate a similar trend between the MORSE and BMORS though the magnitude of difference for the WB samples using BMORSE was greater than using MORSE.

Key Words: MORS, BMORS, shear, age, woody

Colorimetric assessment and crude fat content of pectoralis major muscles (breast fillets) affected by the white striping quality defect. Barbara A. Mallmann*, Sarge F. Bilgili, Sergio L. Vieira, Cristiane Sanfelice, and Kathryn J. Meloche, 1Universidade Federal do Rio de Janeiro, Brazil, 2University of Arkansas, Fayetteville, AR.
White striping (WS) is a recently described breast fillet myopathy characterized by abnormal deposition of adipose and connective tissues in parallel striations between the myofibers of the pectoralis major in broiler chickens. Previous research has utilized subjective visual evaluation for this defect. Therefore, the aim of this study was to evaluate the use of a colorimeter as an objective assessment tool. Seventy-five breast fillets were collected from a research study and divided into 3 groups based on the severity of WS (0 = normal, 1 = moderate, and 2 = severe) by subjective visual assessment. Live weights of birds as well as weights of the carcass, fillets, and tenders were recorded. Fillet color was measured, on the surface as well as over a cross-sectional area, with a Minolta colorimeter on both the cranial and the caudal portions of the fillets. Color measurements (L*, a* and b*) were also recorded on the cranial and caudal portions of the same fillets after gridding. Finally, each sample was analyzed for crude fat content. All measurements were made in duplicate. The data were subjected to ANOVA with significance set at P < 0.05. Live weights and chilled carcass weights among the 3 WS groups did not differ (P > 0.05), however, total breast yield of severe group (26.4%) was significantly higher than that of the moderate (24.2%) and normal (22.8%) groups. As expected, fillet lightness values (L*) were higher for the cranial portion of the moderate and severe WS groups for surface, cross-sectional, and ground meat, samples. Crude fat level only differed significantly (P < 0.01) between the cranial (1.67%) and caudal (1.15%) portions of normal WS groups. Crude fat content of moderate and severe WS groups were 1.82% and 2.46% for the cranial and 1.68% and 2.30% for the caudal portions, respectively. These results indicate that the severity of WS can be objectively measured by a colorimeter and that crude fat content does not accurately reflect the severity of the white striping defect.

Key Words: broiler, breast fillet, white striping, color

121 Utilization of functional fibers in soy protein chicken nuggets. Jiyang Fang1, Gerardo Casco2, Ron Wheeler3, Rosemary Walzem2, and Christine Alvarado1,2. 1Department of Nutrition and Food Science, Texas A&M University, College Station, TX. 2Department of Poultry Science, Texas A&M University, College Station, TX. 3FormtechSoluions, College Station, TX.

Soluble fiber in the diet provides many health benefits; however, most people in the United States have less than half of the reference daily dietary fiber intake. Therefore, the objective of this study was to develop a soy protein chicken nugget with added functional fiber to the meat block to help increase dietary intake of fiber. Chicken nuggets were made with an industry soy formulation (30% of meat block weight replaced by pre-hydrated 3:1, wt/wt water: textured soy protein concentrate (TSPC) with added 10% brine resulting in 0.60% salt and 0.50% STPP of the final product. Treatment nuggets were formulated to include a final concentration of 3.0 g of functional fiber (composed of 70% VitaFiber and 30% Methocel K100M) per serving (3 nuggets, 65 g) based on the control formulation. Control and treatment nuggets were evaluated for pick-up (%), par-fry yield (%), cook loss (%), frozen loss (%), yield (%), color (L*, a* and b* value) and shear force (N). All data were analyzed by ANOVA and a significance was determined using a P value of <0.05. The results indicated that treatment nuggets had higher pick-up (%) and yield (%) (P < 0.05) compared with control, but no difference (P > 0.05) was found in par-fry yield (%), cook loss (%) and frozen loss (%). For color, addition of fiber to the treatment resulted in lower L* (darker color) and higher b* value (P < 0.05). Shear force was lower (more tender) in the treatment group when compared with the control (P < 0.05). In conclusion, addition of functional fibers in the meat block of soy-protein chicken nuggets resulted in higher pick-up (%), yield (%), darker and more yellow color, and more tender texture.

Key Words: chicken nugget, functional fiber, soy protein, Methocel K100M

122 An evaluation of novel food interventions on poultry parts. Amie M. Ibarra* and Christine Z. Alvarado, Texas A&M University, College Station, TX.

Recently, the USDA proposed federal standards to reduce the bacterial contamination in poultry parts. The objective of this study was to determine the bacterial reduction and efficacy of a buffered pH6 (A6) and pH3 (A3) antimicrobial, and an antibiotic base antimicrobial (AA) on poultry drumsticks. Drumsticks used in testing were sourced from a local meat distributor. Drumsticks, inoculated with a 3-strain cocktail of rifampicin resistant *Salmonella* spp. (n = 5). After 30-min bacterial attachment period, the parts were separately dipped into each of the 3 novel products and a set of control negative (CN) and control positive (CP) drumsticks were dipped in ddH2O for comparison; for aerobic plate counts (APC) and *Enterobacteriaceae* (EB) counts, non-inoculated drumsticks were used. Each treatment was rinsed with a proportionate amount BPW, as described by the USDA poultry parts rinse method and the rinse sample collected for sampling. 3M Petrifilms were used to enumerate APC and EB and Brilliant Green agar (BGA) was used for the enumeration of *Salmonella* spp. Data log cfu/ml were analyzed by ANOVA and means separated by Duncan’s multiple ranges test. Results showed that drumsticks treated with A3 had a 2.57 log10 cfu/ml reduction (P < 0.001) in APC microbiota when compared with the controls and the remaining products. There was also a reduction (P < 0.01) with both A6 and AA, compared with that of the naturally occurring APC on the drumsticks (CN). For EB counts, a reduction (P < 0.001) of ≥ 1.5 log10 was observed for A3 and A6. Reductions (P < 0.001) were observed for A3 (>3.5 log10) and A6 (1.0 log10) when compared with CP, AA had no statistical reduction (P > 0.05). A3 formulation showed to be significant (P < 0.05) at reducing all the areas tested: CP, APC, and EB. AA had a statistical reduction of the target organisms for APC and EB but no reduction for the CP. Therefore, these products should be considered further for their utility in the poultry industry to improve food safety as well as to improve shelf life of parts.

Key Words: parts, *Salmonella*, APC, EB, food safety

123 Surface water accumulation and subsequent drip loss for processed broiler carcasses subjected to a postchill water dip or spray. Kimberly M. Wilson1,2, Dianna V. Bourassa2, L. Nicole Bartenfeld2, Caitlin E. Harris1, Amanda K. Howard1, Kimberley D. Ingram3, Arthur Hinton Jr.2, Eric S. Adams2, Mark E. Berrang2, Peggy W. Feldner2, Gary R. Gamble2, Jonathan G. Frye2, Charlene R. Jackson2, and R. Jeffrey Buhr2. 1The University of Georgia, Athens, GA, 2USDA-ARS US National Poultry Research Center, Athens, GA.

To estimate the potential residual carriage of antimicrobials, surface water accumulation and loss was measured for postchill carcasses either dipped or sprayed with water and allowed to drip for up to 5 min. In trials 1 and 2, 10 male broilers were slaughtered, and either soft or hard scalded, and then defeathered and eviscerated. Carcasses were air-agitated ice/water immersion chilled for 30 min and postchill carcass weight (CW) recorded. Carcasses were dipped for 30 s in water and hung by a wing or a leg and CW recorded at 0 and 30 s, 1, 2 and 5 min post dip.
In trials 3 and 4, broilers were slaughtered, soft or hard-scaled, chilled for 40 min and postchill CW recorded. Individual carcasses were hung in a shackel by either the wings or legs that was suspended from a scale, water sprayed (40 psi at 70 carcasses/min) and postspray CW recorded at 0 and 30 s, 1, 2, and 5 min. In trials 1 and 2, water accumulation postdip for soft-scaled wing or leg hung carcasses was 126 and 86 g, and for hard-scaled wing or leg hung carcasses was 104 and 56 g. At 5 min postdip, soft-scaled carcasses retained 15 g when hung by a leg but lost −1 g when hung by a wing. In contrast, hard-scaled carcasses retained 2 g when hung by a leg, but lost −1 g when hung by a wing. In trials 3 and 4, all groups had similar accumulation at 0 s postspray, 60 g. At 5 min postspray, soft-scaled carcasses retained 1 and 5 g of water when hung by the legs and retained 1 g or lost −2 g when hung by the wings in trials 3 and 4. At 5 min postspray hard-scaled carcasses hung by legs lost water in both trials −6 and −2 g compared with carcasses hung by the wings that lost −2 g in trial 3 and retained 1 g in trial 4. Overall, water-dipped carcasses accumulated 37 g more water at 0 s than sprayed carcasses and retained 4 g more water after 5 min drip than those that were sprayed. Carcasses that were dipped and hung by a leg accumulated 50 g more and retained more 8 g more water than all other groups. Water application method and carcass orientation affect retained water and may affect residual antimicrobials on treated carcasses.

Key Words: broiler carcass, water accumulation, spray dip, scald

124 Growth performance and liver histopathology of laying chickens fed diet containing chlorpyrifos-treated maize. Isaac O. Adejumo*1, Anthony D. Ologhobo2, and Olayinka O. Alabi1, 1Landmark University, Omu-Aran, Kwara State, Nigeria, 2University of Ibadan, Ibadan, Oyo State, Nigeria.

Agricultural practices in Nigeria depend on extensive use of synthetic insecticides. Chlorpyrifos, although banned in some developed countries, is a common seed dresser in developing countries. This insecticide may leave residues that may negatively affect environment, livestock and humans. Maize, the main ingredient in poultry feed has tendency to retain residue arising from treatment. Information on toxic effects of chlorpyrifos-treated maize on poultry in Nigeria is scanty; hence this study was conducted to investigate toxic effect of chlorpyrifos on growth performance of chickens. Fifty 25-wk-old hens were randomly allotted to 2 diets: control (T1) and diet 2 (T2) which had maize grain treated with 20% chlorpyrifos at 2 ml/kg of maize grains (manufacturers’ recommended dose). The study lasted for 14 d. The design of the study was completely randomized design. Each treatment had 5 replicates with 5 birds per replicate. Feed intake (FI, g/bird), body weight change (BW, g/bird) and liver histopathology were assessed using standard procedures. Data were analyzed using descriptive statistics and ANOVA at α=0.05. Chlorpyrifos significantly (P < 0.05) reduced feed intake (0.81 ± 0.03) and weight gain (−0.08 ± 0.01) of chickens in T2 compared with those fed control diet. Severe widespread of vacuolar change of the hepatocytes was observed in the liver of birds fed with diet containing 20% chlorpyrifos diet (T2). 20% chlorpyrifos-treated maize depressed growth rate and resulted in liver damage of laying chickens.

Key Words: chlorpyrifos, chicken, growth, histopathology, toxicity

125 β-Resorcylic acid reduces Campylobacter jejuni in postharvest poultry. Basanta R. Wagle1, Annie M. Donoghue2, Komala Arsi1, Ann Woo-Ming1, Sandip Shrestha1, Pam J. Blore1, Kumar Venkitarianaryanan2, and Dan J. Donoghue1, 1University of Arkansas, Fayetteville, AR, 2University of Connecticut, Storrs, CT, Poultry Production and Product Safety Research Unit, ARS, USDA, Fayetteville, AR.

Human Campylobacter infections, a leading food-borne illnesses globally, has been linked with high prevalence of this bacterium in retail chicken meat. Reduction of Campylobacter in poultry will greatly reduce the risk of this disease. Unfortunately, strategies employed to reduce Campylobacter in live poultry have had limited success. This, along with growing consumer demand for the natural alternatives, compels researchers to look for potential antimicrobials to reduce Campylobacter during processing. This study explored the potential use of β-resorcylic acid (BR), a phytophenolic compound, for reducing Campylobacter in post-harvest poultry. Previous studies have demonstrated that BR kills Campylobacter jejuni and Salmonella, in broth systems. Therefore, the objective of this study was to evaluate antibacterial ability of BR to reduce Campylobacter on chicken skin or meat samples. To accomplish this, a total of 4 trials, 2 each on thigh skin or breast meat, were conducted. Chicken skin or meat samples (2 ± 0.1g) were inoculated with 50 μL (−107 cfu/mL) of a cocktail of 4 wild strains of C. jejuni. Following 30 min of attachment, samples were dipped into their respective treatment solutions (0, 0.5, 1, 2% BR in Butterfield’s phosphate diluent) for 30 s and dried dripped for 2 min (n = 10 samples/dose). The samples were then processed and plated on Campylobacter line agar for enumeration. The Campylobacter mean CFUs were logarithmically transformed (Log cfu/g) to maintain the homogeneity of variance and treatment means were partitioned by LSMEANS analysis. Data were analyzed by PROC GLM procedure of SAS (P < 0.05). Two percent BR was most effective (1–3 Log cfu/g) followed by 1% BR (1–2 Log cfu/g) and 0.5% BR (1 Log cfu/g) in reducing Campylobacter counts in either skin or meat samples. Our post-harvest studies demonstrate a consistent reduction in Campylobacter counts in multiple trials and support the potential application of BR during poultry processing. Funded in part by the USDA-NIFA-OREI 2011–01955.

Key Words: Campylobacter jejuni, β-resorcylic acid, antimicrobial, post-harvest poultry

126 The ability of select probiotics to reduce enteric Campylobacter colonization in broiler chickens. Sandip Shrestha*1, Annie M. Donoghue2, Komala Arsi1, Ann Woo-Ming1, Basanta R. Wagle1, Pam J. Blore1, and Dan J. Donoghue1, 1Department of Poultry Science, University of Arkansas Fayetteville, AR, 2Poultry Production and Product Safety Research Unit, ARS, USDA, Fayetteville, AR.

Campylobacter is the leading cause of foodborne illness worldwide and is often associated with consumption and/or mishandling of contaminated poultry products. Probiotic use in poultry has been an effective strategy in reducing other enteric foodborne pathogens but not consistently for Campylobacter. As Campylobacter resides and utilizes intestinal mucin for growth, isolates selected on the basis of mucin utilization might be a strategy to screen for efficacious probiotic bacteria. In this study, bacterial isolates demonstrating increased growth rates in the presence of mucin in broth were tested in a total of 4 bird trials. In both trials 1 and 2, 90 d-of-hatch chicks were randomly divided into 9 treatment groups (n = 10/treatment) and treated individually with 1 of 4 bacterial isolates (Bacillus sp.) grown in media with or without mucin (mucin-containing treatment solutions: 0, 0.5, 1, 2% BR in Butterfield’s phosphate diluent) for 30 s and dripped dried for 2 min (n = 10 samples/dose). The samples were then processed and plated on Campylobacter line agar for enumeration. The Campylobacter mean CFUs were logarithmically transformed (Log cfu/g) to maintain the homogeneity of variance and treatment means were partitioned by LSMEANS analysis. Data were analyzed by PROC GLM procedure of SAS (P < 0.05). Two percent BR was most effective (1–3 Log cfu/g) followed by 1% BR (1–2 Log cfu/g) and 0.5% BR (1 Log cfu/g) in reducing Campylobacter counts in either skin or meat samples. Our post-harvest studies demonstrate a consistent reduction in Campylobacter counts in multiple trials and support the potential application of BR during poultry processing. Funded in part by the USDA-NIFA-OREI 2011–01955.
isolates grown in mucin before inoculation consistently reduced cecal *Campylobacter* counts (1–2 log reduction). These results support the potential use of preselection and growth of isolates in mucin in evaluating bacterial isolates with the ability to reduce enteric *Campylobacter* colonization. Funded in part by the USDA-NIFA-OREI 2011–01955.

**Key Words:** *Campylobacter*, probiotic, in vivo, chicken

127 Poultry products in grocery sales circular advertisements appeal to consumers. Lindy Froebel*, Billy McKim, Holli R. Legnette, and Christine Z. Alvarado, 1Department of Agricultural Leadership, Education and Communications, Texas A&M University, College Station, TX, 2Department of Poultry Science, Texas A&M University, College Station, TX.

Grocery sales circulars are influential on consumers’ poultry purchasing decisions, but little research has been conducted on the appeal of poultry product advertisement elements. Therefore, the purpose of this study was to evaluate raw, cooked, and prepared poultry products displayed in grocery store sales circular advertisements appeal to consumers. A survey with mock advertisements, derived from the results of a nationwide content analysis of 1,575 grocery sales circular advertisements, was used to assess the degree of appeal to consumers. Data from 232 questionnaires (response rate 15.1%), distributed in several Western states in the US, were used, and inferential statistics, a series of paired-sample *t*-tests, were calculated and reported. Analyses were approached conservatively due to multiple comparisons, using a Bonferroni Correction to adjust the *α* level from *P* < 0.05 to *P* < 0.001. In total, advertisements containing cooked meat products (M = 12.005, SD = 3.052) had greater appeal than those containing raw meat products (M = 9.267, SD = 3.101, *t* (209) = −12.863, *P* < 0.001). Advertisements containing a cooked chicken product (M = 4.550, SD = 1.153) were more appealing than ones containing a raw chicken product (M = 3.412, SD = 1.398, *t* (215) = −11.197, *P* < 0.001). An advertisement containing a prepared chicken product (M = 4.005, SD = 1.339) had greater appeal than ones containing a cooked chicken product (M = 3.737, SD = 1.402, *t* (216) = −7.140, *P* < 0.001). The results of this study can be used to guide the creation of grocery sales circular advertisements for chicken products. Further, there is a need for studies relating the appeal raw, cooked, and prepared products to consumer purchases.

**Key Words:** grocery circulars, consumer survey, chicken advertisements