also accelerated the rate of muscle growth but did so at the expense of heart tissue. The abilities to synthesize and accrue glycogen or to recyle lactate were affected by an interaction of eggshell conductance and length of the incubation period. Tissues that had high levels of lactate generally also had reduced growth rates. Metabolic energy may influence the growth of the demand tissues with little or no effect on the supply tissue. It was concluded that the length of the incubation period which is determined by eggshell conductance, influences the growth of embryos differently depending upon the ability of critical tissues to recycle lactate. Turkey eggs with different conductance constants may require different incubation periods to optimize embryonic growth and survival.

Key Words: Embryo, Growth, Metabolism, Survival, Conductance


This study was conducted to determine if veterinary drugs would transfer into egg albumen during the latter two phases of albumen formation (preplumping or plumping). Oxytetracycline (OTC) was picked as the model drug since it is known that it transfers into albumen. In two replicate experiments (24 hens per experiment), hens were injected (I.M.) with either 400 mg/kg OTC (n=20) or physiological saline (n=4). Equal groups of hens were dosed at ½ (preplumping phase) or ⅓ (plumping phase) after oviposition. Five hours following injections, hens were euthanatized by cervical dislocation and albumen collected from the reproductive tract.

Results indicate that OTC did transfer into albumen during both of the latter phases of albumen formation. The concentrations (ppm) were greater (P<0.05) in the preplumping vs. plumping phase (3.2±0.3 vs. 1.8±0.2 for preplumping vs. plumping, Exp. 1; or 2.8±0.3 vs. 1.6±0.2 for preplumping vs. plumping, Exp. 2, respectively). However, when the differences in albumen weights were accounted for, total µg transfer did not differ between the two phases of albumen formation.

The results indicate that veterinary drugs which are chemically and pharmacokinetically similar to OTC may transfer into egg whites during the latter phases of formation prior to oviposition. It is unknown if other classes of antibiotics behave in a similar manner. Therefore, it is incumbent upon the poultry producer or veterinary practitioner dosing laying hens to consider the possibility that egg whites contained in the first egg laid after dosing may contain drug residues.

Key Words: Food Safety, Drug Residues, Eggs, Albumen


Domestic avian species are exposed to relative high levels of the phytoestrogen genistein in soy based diets. Genistein and other phytoestrogens are known to impair reproductive development, function, and behavior in susceptible mammals, however, poultry species have not been examined for potential reproductive sensitivity to phytoestrogens. To begin to address this question, the objective of the present study was to determine whether the soy phytoestrogen genistein is estrogenic in chickens.

Day old female chicks were assigned to 5 treatments as follows: chicks fed a typical soy based chick diet with daily subcutaneous injection of sesame oil vehicle (SV); soy free diet and vehicle injection (V); daily injection of 0.5 mg diethylstilbestrol as a positive control (DES); 1.0 mg genistein injection (G1); and 10.0 mg genistein (G 10). At 12 days of age, the chicks were weighed and oviducts, ovaries, and livers were excised and weighed. DES treatment massively increased oviduct and liver weight, 76x and 2x respectively, as compared to vehicle injected control. Relative oviduct weights (mg/kg body weight) of the other treatments were: (SV) 112.10 ± 8.80, (V) 104.79 ± 10.57, (G1) 135.55 ± 21.84, and (G10) 178.87 ± 22.04. Oviduct weights of G10 chicks were significantly increased as compared to SV (P<0.05) and V (P<0.01). Liver and ovary weights were not significantly affected by the treatments other than DES. Significant growth of the chick oviduct in response to genistein demonstrates that genistein has estrogenic activity in chickens and may influence reproduction in poultry species. (Supported by the Alabama Agricultural experiment Station and USDA AD-421 project S-233).

Key Words: Phytoestrogen, Genistein, Oviduct


Genetically selected broiler line (42L) developed at Pennsylvania State University was used as primordial germ cell (PGC) donor in the present experiment. Embryonic blood was collected from 42L embryos at stage 14-15 (Hamburger and Hamilton, 1951). Collected blood was pooled into 100 microliter of Essential Medium (MEM) supplemented with 10 % fetal bovine serum (FBS). Pooled whole blood was placed into freezing container (Cryoware, Nagle) and 100 microliter of MEM supplemented with 10 % FBS and 20% DMSO was added following by placing freezing container into Bicell(Nihon Freezer Co. Ltd.). Bicell was then placed into deep freezer at -80 °C for approximately 3 hours followed by plunging freezing container into liquid nitrogen. Sample was stored in liquid nitrogen for about one month. After thawing sample in water bath circulating PGCs were isolated from blood cells. Thirty to seventy frozen/thawed cPGCs were injected into Brown Leghorn embryos at stage 14-15 using a fine glass needle, which 3-5 microliter of embryonic blood was removed prior to cPGC transfer. One male and 2 females were hatched and a progeny testing was performed upon reaching sexual maturity by mating with Brown Leghorn of opposite sex. Out of 2 females, one female died before reaching puberty. Both male and female recipients produced 48% - 100 % (as of Mar,1999) of offspring derived from transferred cPGCs. These results show that it is possible conserve parent stocks in domestic chicken by freezing circulating primordial germ cells.

Key Words: Chicken, PGCs, Genetic resources, Conservation

Monday, AM, Arkansas Ballroom E, PROCESSING AND PRODUCTS

90 Campylobacter Recovery From The Surface And Internal Organs of Commercial Broiler Carcasses. M. E. Berrang2, R. J. Buhr1, and J. A. Cason1, 1USDA-Agricultural Research Service.

Campylobacter is a human pathogen commonly found on live broilers and processed carcasses. In order to plan effective intervention strategies, it would be helpful to know what Campylobacter populations are associated with the surface and internal organs of broilers. Six broiler carcasses were collected after exiting the bleed tunnel at a commercial broiler plant on each of three visits (n=18). All carcasses were individually placed in sterile plastic bags, sealed and covered with ice to transport to the laboratory. Five samples were aseptically removed from each carcass: breast feathers (hand picked from the sternal tracts), breast skin underlying the sternal tracts, crop, ceca and colon. All samples, including the surface contamination or contents, were covered with phosphate buffered saline and blended. Serial dilutions were made for examination of Campylobacter, coliform, E. coli and total aerobic bacterial populations. Average sample weights (g) were: feathers:1.5, skin:6.5, crop:5.1, ceca:7.8, colon:3.1. Bacterial results are reported as mean log10 colony forming units per gram of sample. Campylobacter populations found were: feathers:5.4, skin:3.8, crop:4.7, ceca:7.3, colon:7.2. Coliform / E. coli populations observed were: feathers:6.4 / 6.0, skin:5.3 / 4.9, crop:4.3 / 3.7, ceca:6.6 / 6.2, colon:5.8 / 5.3. Total aerobic bacterial populations found were: feathers:7.9, skin:7.1, crop:5.8, ceca:6.8, colon:6.4. Prior to carcass scaling, aerobic bacteria were recovered in greatest numbers from feathers and skin, while Campylobacter was recovered at the lowest level from skin.

Key Words: Campylobacter, ceca, crop, colon, skin
91 Procedure for Obtaining Separate External and Internal Carcass Rinses from Eviscerated Broilers. R. J. Buhr*, 1 M. E. Berrang1, J. A. Cason1, and G. N. Rowland2, 1 USDA, ARS, Russell Research Center, Athens, GA, 2University of Georgia, Athens, GA.

A technique was developed to permit collection of separate external and internal rinses from defeathered carcasses. An abdominal incision was made along the linea mediana ventralis, from the kiel to the vent, through which the alimentary tract from the crop to the ceca was excised. The colon was tied to prevent leakage through the vent and the neck was tied to prevent leakage through the thoracic inlet. One hundred mL of phosphate buffered saline (PBS) was poured inside each carcass and the abdominal opening was sutured with a tight continuous interlocking stitch. The carcass was then placed into a plastic bag to which 100 mL of PBS was added. To test the procedure, either the external or internal rinse for each carcass was spiked with nalidixic acid-resistant Salmonella Typhimurium (10^6 cfu/mL). The carcass was then shaken for 1 min and the nonspiked rinse collected aseptically from either outside or inside the carcass. The marker Salmonella was not detected by direct plating for any carcass (level of detection 10 cfu/mL, n = 18) indicating very low level of migration of the marker between the external and internal rinse. After enrichment, however, 33% of nonspiked internal rinses and 92% of nonspiked external rinses contained the marker, indicating a greater rate of leakage of the spiked rinse from inside to outside had occurred. This exchange was circumvented by obtaining the outside carcass rinse prior to evisceration in subsequent experiments. This evisceration rinse technique will permit partitioning of carcass bacteria to external and internal surfaces when the alimentary tract is excised intact.

Key Words: Broiler, Evisceration, Bacteria recovery, Salmonella, Carcass rinse

92 Separate External and Internal Carcass Rinses from Eviscerated Broilers Orally Challenged with Salmonella. R. J. Buhr*, 1 M. E. Berrang1, A. Hinton, Jr.1, K. D. Ingram1, and G. N. Rowland2, 1 USDA, ARS, Russell Research Center, Athens, GA, 2University of Georgia, Athens, GA.

Experiments were conducted to determine if the recovery of Salmonella from eviscerated broiler carcasses differed between the external and internal surfaces. Using a new evisceration-rinse technique, separate external and internal carcass rinses were made and compared for a positive-incidence of the marker. At 5 wk of age, broilers in floor pens were orally challenged with Salmonella Typhimurium (10^6 cfu/mL, n = 30) and were processed 5 d later. Following evisceration, the neck of each broiler was tied to prevent leakage of crop contents, and the vent was sutured to prevent leakage of cloaca contents. The head and feet were removed and the carcass placed into a plastic bag to which 100 mL of sterile water was added. The carcass was then shaken for 1 min and the internal carcass rinse aseptically collected. By direct plating, 0-25% of the external and internal carcass rinses were positive for the marker Salmonella. Following enrichment, Salmonella was detected in 93% of external carcass rinses, 77% of internal carcass rinses, and 55% of the crops and ceca. These results indicate that the incidence of external and internal Salmonella-positive carcasses is not identical in orally challenged broilers.

Key Words: Broiler, Evisceration, Bacteria recovery, Salmonella, Carcass rinse


The objective of this study was to evaluate effects of polyphosphates and electrical stimulation on quality of IQF breast fillets. One hundred ninety two broilers were stunned and slaughtered. Half were electrically stimulated during bleeding and half were not. Breast fillets were harvested at 1 h postmortem, marinated in either NaCl or NaCl plus polyphosphate solutions, and quick frozen. Marination pH effects, marination uptake, drip, and shear values were observed. Post-marination pH values of stimulated fillets were greater than those of unstimulated fillets (6.48 versus 6.38). Treatments did not affect marination uptake, but drip of stimulated fillets was significantly lower than that of unstimulated fillets (0.95% versus 1.18%). Moreover, shear values of stimulated fillets was less than those of unstimulated fillets. These results support previous reports which concluded that negative quality effects of treating early-harvested chicken breast fillets with polyphosphates can be reduced by application of electrical stimulation during slaughter.

Key Words: Electrical Stimulation, Polyphosphate, Marinade, Chicken, Broiler

94 Tenderization of hot-boned broiler breast meat by clamping. J. A. Cason*, C. E. Lyon, and J. A. Dickens, Russell Research Center, Athens, GA.

Deboned breast meat that shortens during rigor is tougher than breast meat that passes through rigor while attached to the carcass. In three experiments, hot-boned breast meat was clamped between rigid plates during chilling to determine whether tenderness is increased if the breast meat is not allowed to shorten during rigor. In each experiment, nine six-week-old broilers were processed in a pilot plant. Approximately five minutes after evisceration, each breast half was subjected to one of three treatments in an incomplete block design. The three treatments were (1) left intact on the carcass, (2) hot boning, and (3) hot boning followed by clamping between rigid aluminum plates approximately 7.2 mm apart. All treatments were then chilled 60 minutes in an ice/water slush, after which intact breast halves were deboned and clamped breast halves were removed from the clamps. All breast halves were sealed in plastic bags, held overnight at 4 C, and cooked the following morning for 30 minutes in 75 C water. Warner-Braztler shear values for the treatments were 9.2, 13.0, and 5.1 kg for the cold boned, hot boned, and hot-boned clamped treatments, respectively, with significantly more tender meat in the clamped pieces. Cooked yield as a percentage of postchill weight was significantly higher for the clamped compared to the hot-boned pieces, 81.1 versus 77.3, with cold boned intermediate and not different from the other treatments. Off-the-carcass clamping of deboned breast meat prevents toughness due to shortening during rigor.

Key Words: Breast Meat, Tenderness, Hot Boning, Clamping, Broiler

95 Quality characteristics of breast meat from three commercial strains of turkey. D. M. Smith*, B. L. Booren, A. P. Rahn, A. M. Booren, W. N. Osburn, and K. D. Roberson, Michigan State University, East Lansing, MI.

Raw and cooked quality characteristics of breast meat from three commercial strains of turkeys, B.U.T.A. Big 6, Hybrid Large White and Nichols 790, were compared. Twenty-four birds were grown per treatment (3/pen) from the time of hatching until 24 wk of age. At six-week-old broilers were processed in a pilot plant. Approximately five minutes after evisceration, each breast half was subjected to one of three treatments in an incomplete block design. The three treatments were (1) left intact on the carcass, (2) hot boning, and (3) hot boning followed by clamping between rigid aluminum plates approximately 7.2 mm apart. All treatments were then chilled 60 minutes in an ice/water slush, after which intact breast halves were deboned and clamped breast halves were removed from the clamps. All breast halves were sealed in plastic bags, held overnight at 4 C, and cooked the following morning for 30 minutes in 75 C water. Warner-Braztler shear values for the treatments were 9.2, 13.0, and 5.1 kg for the cold boned, hot boned, and hot-boned clamped treatments, respectively, with significantly more tender meat in the clamped pieces. Cooked yield as a percentage of postchill weight was significantly higher for the clamped compared to the hot-boned pieces, 81.1 versus 77.3, with cold boned intermediate and not different from the other treatments. Off-the-carcass clamping of deboned breast meat prevents toughness due to shortening during rigor.
these meat quality parameters, turkey meat producers should base their strain selection decisions on other performance factors.

**Key Words**: Turkey breast meat, Strain trials, Quality

96 **Ability of an Electrical Method to Preferentially Enumerate *Escherichia coli* from Genetically Similar Species in Broiler Carcass Rinse Samples.** A. L. Edmiston and S. M. Russell*⁴, ¹, ², ³ *bioMérieux, Inc.* ⁴, ² *The University of Georgia.*

Experiments were conducted to evaluate the ability of an electrical method to distinguish and enumerate *Escherichia coli* (E. coli) from broiler carcass rinses, when other genetically similar competing species were present. In three separate trials, *E. coli*, *Citrobacter freundii*, *Salmonella enteritidis*, and *Shigella sonnei* were serially diluted and then inoculated into identical broiler chicken carcass rinses. Inoculated rinses were mixed with double strength CM Medium supplemented with 2% dextrose (CMD). The CMD mixture was placed into a Bactometer module in duplicate and conductance was measured at 44°C. Results indicated that *Citrobacter freundii* did not grow in the selective medium at 44°C. *Salmonella enteritidis* grew similarly to *E. coli*; however, an initial level of 10⁹ *Salmonella* in the food product would be required for *Salmonella* to interfere with the enumeration of *E. coli* using this method. *Shigella sonnei* grew at a different rate than *E. coli*; however, there was an interaction between the regression lines formed when comparing serial dilutions (log10 colony forming units/ml - CFU) to *E. coli* detection times (ECDT) for these two species of bacteria. Therefore, high levels of *Shigella sonnei* in a food sample may interfere with the enumeration of *E. coli*. In general, *Salmonella* and *Shigella* are not found at high enough levels on food products of animal origin to interfere with enumeration of *E. coli* using this method, and if found at high levels, would be detected and rejected using this procedure. Hence, organisms that are genetically and phylogenetically similar to *E. coli* do not interfere with the enumeration of *E. coli* using conductance under these conditions.

**Key Words**: conductance, *E. coli* *Citrobacter freundii*, *Salmonella enteritidis*, *Shigella sonnei*

97 **Evaluation of carcass dimensions as indicators of rigor mortis development.** L. C. Cavitt*¹ and A. R. Sams*², *Poultry Science Department, Texas A&M University, College Station, TX.*

Processors are interested in monitoring rigor mortis development to determine optimum deboning time and to predict the effectiveness of postmortem electrical stimulation (ES) for accelerating rigor. The two most common methods to follow rigor are the measurement of pH and ATP (R-value). Both of these measurements are destructive, time intensive, and cannot easily be used at commercial line speeds. Measurements based on the dimensions of the carcass may reflect the contractile state of the breast muscle and therefore, rigor mortis development. Furthermore, such physical measurements may be easily adapted to an optically-based monitoring system at commercial line speeds. Thirty-six broilers in each of two trials were slaughtered at 7 weeks of age. Half of the birds received electrical stimulation (400-450 mA, 2s on/2s off for 7 pulses) immediately after bleeding while the other half of the birds were non-stimulated controls. At 0.25 and 1 h postmortem, carcasses were evaluated for the angles of the shoulder, elbow, and wing tip, and the distance between the elbows. At 1 h postmortem (after chilling), both breast muscle were harvested from all birds and sampled for pH and R-value. The fillets were aged on ice and then cooked at 24 h postmortem for measurement of shear value. The pH and shear value means were lower and the R-value means higher for the ES fillets than for the controls, suggesting the acceleration of rigor mortis by ES. The carcass measurements changed significantly with the development of rigor mortis through about 8 h PM. In contrast, cooked meat shear values declined through the 2 h PM deboning time and remained constant thereafter. Although the electrical stunning treatment delayed pH decline and R-value increase through 15 min PM, stunning had no effect on any of the parameters tested at later sampling times. These results suggest that despite the development of rigor mortis through 8 h PM, deboning turkey breast at 2 h PM or later will not significantly impair meat tenderness.

**Key Words**: Turkey, Stunning, Rigor mortis, Tenderness, Meat quality

99 **Influence of selenium source on broiler carcass and fillet weep loss.** K. M. Downs*, J. B. Hess, and S. F. Bilgili, *Poultry Science Department, Texas A&M University, College Station, TX.*

A 49-d broiler growout (900 birds; 30 pens; 15 males (M) and 15 females (F)/pen) was conducted to evaluate the effect of dietary supplementation of an inorganic or organic selenium source (0.3 ppm Se in diet) on carcass and fillet weep loss. Dietary trts included: control (C), C + Na selenite (IsE), and C + Se-yeast (OSe). Each trt included a three-phase feeding program [starter (d 0 to 21; 21% CP, 3115 kcal ME/kg), grower (d 22 to 42; 20% CP, 3168 kcal ME/kg), finisher (d 43 to 49; 18% CP, 3212 kcal ME/kg)]. Average bird wt (ABW), and feed conversion adjusted for mortality (AFC) were determined on d 21, 42, and 49. All birds were subjectively feather scored on d 21 and 28. Live performance sex differences were evaluated on d 42 and 49. Eight M and 8 F from each pen were randomly selected for processing (49 d). Hot (HCW) and chilled (1.5 h, CCW) carcass weights were recorded. Ten carcasses (5 M and 5 F)/pen were stored (18 h, 3.5°C) and reweighed to determine whole carcass weep loss (CWL). Of the remaining birds (5 M and 5 F)/pen, one fillet was removed immediately after chilling (PRR) and the other after 18 h aging (POR) to calculate breast fillet weep losses. Data were analyzed as a completely randomized arrangement with 10 reps/dietary treatment.

Day 21, 42, and 49 ABW differed between sexes (P<0.0001) but not trts (P>0.05). AFC was similar between trts (P>0.05). Feather scores (% bareback) on d 21 tended (P<0.08) to be lower for OSe (7.7%) versus IsE (12.3%), while 28 d feathering was similar between trts. WOG yield did not differ (P>0.10) between trts, but males had the highest (P<0.02) WOG yield. Furthermore, CWL tended (P<0.08) to be lower for ISe versus C (P=0.67%, ISe=0.54%, OSe=0.61%) with OSe intermediate. Tissue weepage was not influenced by sex (P>0.10). Likewise, tissue weepage was not influenced by sex (P>0.10). Selenium source did not alter live performance, but influenced feathering and weepage.

**Key Words**: Broilers, Selenium, Weepage, Meat Quality

100 **The influence of transportation on meat quality of turkey toms.** C. M. Owens*¹ and A. R. Sams*², *Poultry Science Department, Texas A&M University.*

Previous research has indicated that antemortem stress factors can influence the development of pale, soft, and exudative (PSE) meat in swine as well as in turkeys. Such antemortem factors can include environmental temperatures, relative humidity, pre-slaughter handling practices, and transportation. However, the effect of transportation on meat quality of turkeys has not been extensively studied. Therefore, this study evaluated the effect of transportation prior to processing on the meat quality of market aged turkeys. Eighty Nicholas turkey toms (21 wk of age) were divided into two groups and were either transported in coops on a flatbed trailer for 3 h prior to processing (with no rest period) or processed without transportation. Breast muscle samples were collected for pH (0, 2, 24 h), L* value (2, 24 h), drip loss, and cook loss. Additionally, breast fillets were marinated and cooked to determine marination uptake, retention,
and cook loss. The breast muscles from transported turkeys had significantly higher muscle pH at 0, 2 and 24 h, significantly lower L* values at 2 and 24 h, significantly higher marination retention (i.e., lower drip loss after marination), and significantly lower cook loss in the marinated fillets compared to muscles in the non-transported turkeys. There were no significant differences in drip loss and cook loss of the non-marinated fillets or the marination uptake percentage between the transported and non-transported turkeys. These results suggest that transporting turkeys immediately before processing does not induce PSE meat.

**Key Words:** PSE, Transportation, Turkey, Marination, Rigor development

### 101 Marination performance of pale broiler breast meat

R. L. Wolff*,† and A. R. Sams, † Poultry Science Department, Texas A&M University, College Station, TX.

Pale, soft, exudative (PSE) meat is a growing problem in the poultry industry and is characterized by rapid postmortem pH decline. The low pH condition while the body temperature has not yet chilled leads to protein denaturation, which causes pale color and reduced water holding properties. The water loss and/or the protein damage from the PSE condition may impact the ability of the muscle to uptake or retain marinate solution. This study was conducted to determine if a marination with salt and alkaline phosphates could rectify the protein functionality losses imparted by the PSE condition. Pale (n=87) and normal (n=80) fillets were subjectively collected from the deboning lines at two commercial processing plants and characterized by L*value, pH, and expressible moisture. They were then tumbled with a 0.6% NaCl and 0.4% sodium tripolyphosphate solution at 4 °C for 30 min. Marinate uptake, drip loss, and cook loss were all measured. As expected, the pale fillets had higher L* values and lower pH values than the normal fillets. The pale fillets had similar marinate uptake and drip losses but greater cook losses than the normal fillets. These results indicate that the PSE condition cannot be reversed by the marination treatment used in this study.

**Key Words:** PSE meat, Meat color, Marination, Cook loss

### 102 Wastewater analysis system for small food processors

W. C. Merka* and B. H. Kiepper, .

A small Georgia company which hard cooks and peels eggs was receiving regulatory pressure from the municipality which received its wastewater. Although the company discharged a trivial organic load to the municipality, the concentration of organics as measured by BOD (Biochemical Oxygen Demand) was in violation of the municipal code. The wastewater treatment authority could not disregard the violation, however they were willing to allow a study to be conducted so that the plant could come into compliance over an extended period of time. To define the flow and organics patterns, a system was designed where the entire plant flow was diverted through a 900 gallon tank with an attached H-flume. Using this system, flow volume and organics concentration was monitored for a two week period. Based on the sampling protocol, water received by the plant as measured by water meters averaged 4,370 gallons per day. However, the volume discharged as measured by the H-flume averaged 3,245 gallons per day, only 75 percent of the received volume. Analysis of the wastewater showed that daily BOD mass varied from 14 to 75 pounds. The plant manager attributed this BOD variation to the variation in the quality of the eggs processed that day. The flow and organics variation discharged by this plant suggest that a pretreatment system is needed and should include a flow equalization basin.

**Key Words:** Wastewater, Egg Processing, Regulatory Compliance

### 103 Effect of marination and cooking on red discoloration of broiler breast meat.

D. P. Smith*, J. K. Northcutt, and D. L. Fletcher, The University of Georgia, Athens, Georgia, 30602.

An experiment was conducted to determine the effect of marination and cooking on red discoloration of broiler breast meat. Breast fillets were trimmed to remove fat and connective tissue, then chopped and divided into duplicate 10 g samples. Treatments consisted of adding one g of the following to each meat sample: no addition (control), blood, bone marrow, marinate (90 ml water, 6 g salt and 4 g sodium tripolyphosphate), blood and marrow, blood and marinate, marrow and marinate, and blood and marrow and marinate. Samples were mixed, placed into stoppered glass tubes, and cooked in 74 °C water for 45 min to an internal temperature of 74 °C. Samples were cooled, removed from tubes and cut into approximately 5 mm thick sections. Lightness (L*), redness (a*), and yellowness (b*) were measured on raw and cooked samples. Blood, and combinations significantly increased darkness and redness of raw samples. Marination had no significant effect on lightness or redness. Cooking significantly increased lightness and decreased redness, but blood, marrow, and combination samples were significantly darker and redder than control or marinate samples. Within blood and marrow samples, marrow produced darker and redder samples than blood. Marination had no significant effect on lightness or redness of discolored samples, and cooking did not significantly increase lightness or decrease redness to control values.

**Key Words:** Red discoloration, Marination, Breast meat, Cooking, Broilers

### 104 The Use of Honey Marinades to Improve Chicken Quality


Honey, a common ingredient in ham and other cured products, is often used as a flavor agent in meats. Recent research by the National Honey Board demonstrated that honey imparts flavor, color, moisture, oxidative stability and antimicrobial effects to processed turkey meats. It stands to reason, therefore, that honey has the potential to add flavor, moisture and many other benefits to marinated chicken.†† Appropriate conditions for marination and baking were developed in phase one. The primary objectives of this phase were: 1. To develop a series of chicken honey marinades with desirable texture, color and sensory characteristics. †† 2. To verify the safety of chicken containing honey marinades. †† 3. To test the acceptability of a honey marinate compared to a control (no honey) and commercial marinated chicken. †† Six experiments were conducted to develop an optimized, safe marinate and marination technique. Marinate retention, cooking loss and/or sensory evaluation were used to determine results. †† Injection of chicken breast quarters with lemon pepper poultry pump was very effective in increasing the amount of marinate retained and in producing a juicy, tender product. Chicken injected with marinate had a more attractive appearance than immersed chicken since the lemon pepper seasoning powder applied as a rub distributed the seasoning uniformly over the total surface area. The wing of the bone-in breast quarter developed a much darker brown color than the breast. Better results would have been obtained if bone-in breast (split breast) were used instead of breast quarters. †† Results from the analysis of honey use in chicken marinades revealed that consumers liked chicken injected with marinate containing 20 percent honey more than commercial marinated chicken. Consumers would be more willing to buy roasted chicken containing 20 and 30 percent honey than commercial marinated chicken. ††

**Key Words:** Honey, Marinade, Chicken

### POSTERS: Monday, John Q. Hammons Hall IV, ENVIRONMENT AND MANAGMENT

#### 105 Production and performance characteristics in the female Dandarawi chicken under sub-tropical conditions.

M. A. Abdelnabi1, M. A. Ottinger2, H. H. Sharara2, and A. E. Abdel-Rahman1, 1 University of Assiut, Assiut, Egypt, 2 University of Maryland, College Park, Maryland USA.

A longterm experiment was conducted to investigate effects of environmental temperature under conditions of Upper Egypt on female performance in two genetic strains of poultry: the Dandarawi (a highly selected heat tolerant strain) and the Hy-line (commercial) chicken. Data were collected in females of both genetic strains during growing and production periods. Day old chicks (n=15000/strain) were raised under controlled heat and photoperiod for 8 weeks, then transferred to rearing batteries. At sexual maturity, females of both strains were divided into two groups and housed in individual cages; group 1 was housed under ambient environmental temperatures (up to 43°C in summer) and group 2 was housed under controlled temperature (18-24°C); both groups were maintained on an 18L:6D photoperiod with feed and water available ad lib. Eggs were collected daily with periodic samples for egg quality analysis. Birds were weighed weekly. Results showed that Hy-line females were more affected by high temperature than Dandarawi hens. This was reflected in a significant (p≤0.05) decrease in egg production in Hy-line...