

dependent on position effects within the incubator. However, the top taped group again showed a significant increase in relative heart and liver weights when compared to the bottom taped and control groups. These data suggest altered air flow to modify the adverse effects of high egg temperatures in these experiments.

Key Words: Ventilation, Egg temperature, Organs, Embryonic development, Incubation

S-M44 Intraflock dynamics of *Salmonella* contamination in broilers throughout the production and processing continuum. V. Volkova*¹, K.B.R.C. Dazo¹, R.H. Bailey¹, J.A. Byrd², and R.W. Wills¹, ¹Mississippi State University, Mississippi State, ²USDA, ARS, Food and Feed Safety Research Unit, College Station, Texas.

The preliminary analysis reported here is part of an on-going project undertaken to identify risk factors associated with *Salmonella* status of broiler flocks at sequential segments of the production and processing continuum. One of the risk factors considered is a flock's *Salmonella* contamination status as it changes from upon arrival from the hatchery at a grow-out farm to the end of the carcasses processing. Flock's *Salmonella* status was measured by different sample types at sequential production segments: upon arrival from the hatchery at a grow-out farm (30 transport tray pads (TP) and gastrointestinal track (GI) samples from 30 chicks from the corresponding trays); one-week before processing (whole carcass rinse (WC), ceca (CA) and crop (CP) samples from each of 30 birds); upon arrival at the processing plant (WC, CA and CP samples from each of 30 birds); prior to the chill tank (rinses from 30 carcasses); and immediately after the chill tank (rinses from 30 carcasses). Presence of *Salmonella* was evaluated in 54 broiler flocks from 27 farms. Logistic regression was used to model the relationships between a flock's *Salmonella* status at sequential production segments as measured by different sample types. Preliminary analysis revealed significant associations among several sample types at different segments providing insight into the dynamics of *Salmonella* contamination of broilers throughout the production and processing continuum.

Key Words: *Salmonella*, Food safety, Epidemiology, Broilers, Poultry

S-M45 Broiler performance as affected by phytase and chloride supplementation to reduced phosphorus broiler grower and finisher diets. P. Plumstead*¹, R. Maguire², H. Romero-Sanchez¹, N. Lekrisompong¹, and J. Brake¹, ¹North Carolina State University, Raleigh, ²North Carolina State University, Raleigh.

A study was conducted to evaluate effects of supplementing a thermo stable bacterial derived phytase (Quantum™) at two levels of dietary chloride (Cl) in broiler grower and finisher diets with reduced available phosphorus (AvP). Fourteen male and 14 female Ross 344 x 508 broiler chicks were assigned to each of 72 floor pens. All birds received 906g of a broiler starter feed (0.45% AvP) after which 12 dietary treatments were applied in a randomized complete block design to each of six replicate pens during the grower and finisher phases to 28, and 42 d of age, respectively. A 3 x 2 x 2 factorial treatment structure was used with 3 AvP levels in the grower and finisher diets of High (0.35%, 0.35%), Med (0.35%, 0.25%) or Low (0.25% and 0.25%) to which combinations of two levels of Cl (0.34% and 0.56%) and two levels of added phytase (0 and 600 FTU) were applied. The AvP level of phytase amended diets was held constant by replacing 0.10% of the inorganic phosphorus from dicalcium phosphate with 600 FTU of phytase, while the Cl level of treatments was increased by adding 3.8g/kg of ammonium chloride. All diets were pelleted with conditioning temperatures in excess of 80 °C. Independent of AvP level, phytase supplementation significantly increased 42 d male and female BW by 25 and 30g, respectively, and reduced 42 d mortality corrected feed conversion from 1.84 to 1.82 (P<0.05). AvP level had no effect on 42 d BW. Effects of AvP or phytase on 42 d BW may have been further reduced by high heat stress related mortality of faster growing birds from 35-42 d. This was supported by the mean BW of all mortality being 327g higher for the High vs. Low AvP regimen and 387g higher for treatments receiving the phytase amended diets. Elevated Cl level increased BW at 28 d but beneficial effects were no longer evident at 42 d which was in part due to high late mortality of this treatment.

Key Words: Poultry, Broiler, Phosphorus, Phytase, Ammonium Chloride

Monday, January 23 Processing & Products I Room: B315

S-M46 Thyme as an antioxidant in broiler chicken meat. A.M. Raji* and F.O. Ajasin, *Adewura Farms, Lagos and Federal College of Animal Health and Production Technology, IAR&T, Ibadan, Nigeria.*

Lipids in various foods undergo oxidative deterioration at all stages from handling through processing, storage, distribution and utilization. Antioxidants are capable of delaying or preventing the development of deterioration reaction due to oxidation. Thymus vulgaris (thyme) oil and a number of its constituent compounds have been shown to possess strong antioxidative properties. Because of the concern being raised as to the safety of synthetic compounds as conventional antioxidants; world-

wide interest from natural sources is growing. This study was carried out to investigate the potential of dried leaves of *Thymus vulgaris* as an antioxidant in refrigerated fresh broiler-chicken meat. 24 male broiler-chickens averaging 2.9kg live weight were used. The muscle tissues of each were separated, minced and mixed thoroughly, divided into 5 parts and weighed. Thyme at 0, 0.5, 1.0, 1.5 or 2.0% w/w was added to each portion in grinder and thoroughly mixed. One pack each of fresh meat portions were frozen immediately. Extent of oxidation of the meat was determined by quantification of malonaldehydes content using the thiobarbituric acid (TBA) test. Encouraging results obtained indicate that thyme is a natural antioxidant in muscle tissue. With increasing inclusion level of thyme up to 2.0% evaluated, oxidation of fats and

lipids decreased both in the refrigerated fresh broiler-chicken meat. More investigations are suggested in validation of safe level of inclusion of thyme.

Key Words: broiler-chicken meat, thyme, antioxidants

S-M47 Egg quality measurements from White Leghorn hens fed yeast beta-glucans. N. McKillop* and B. Rathgeber, *Nova Scotia Agricultural College, Truro, NS, Canada.*

The poultry industry suffers enormous economic loss from breakages due to poor shell quality. As a hen ages it will have more difficulty mobilizing calcium from the bone and is less able to produce calcium carbonate. A deficiency in calcium will adversely affect the egg structure. In vitro studies conducted recently found that a partially purified soluble beta-glucan was a potent inhibitor of bone resorption by the inhibition of osteoclast activity. Therefore, these yeast beta-glucans have the potential to slow bone loss which can allow for better utilization of calcium. In this experiment 240, 18-week old White Leghorn hens of the Babcock variety were randomly assigned to four different diets supplemented with 0, 25, 50, 250 g/ton of refined yeast beta-glucan. Beginning at 22 weeks of age, 8 eggs per unit were collected every four weeks with the last collection at 50 weeks of age. Albumen height, egg weight and specific gravity of the eggs were measured at each collection. No treatments effects were observed on the albumen height and egg weight measurements. However, the treatment supplemented with 25g/ton was noted to have a higher specific gravity than the other treatments from 22 to 50 weeks of age. Future studies will attempt to identify potential structural changes that may influence shell quality due to dietary inclusion of yeast beta-glucans.

Key Words: laying hen, beta-glucan, egg quality, specific gravity

S-M48 Growth performance and postmortem pH decline of broiler chickens fed blueberry by-products. D. Spurgeon*¹, J. MacIsaac², and B. Rathgeber¹, ¹*Nova Scotia Agricultural College, Truro, NS, Canada,* ²*Atlantic Poultry Research Institute, Truro, NS, Canada.*

Blueberries are the richest natural source of anthocyanins and other bioactive molecules which are known to have a wide array of health benefits in humans. Broiler chickens often suffer from heart disease in the form of ascites or sudden death syndrome, and may benefit from the addition of dietary antioxidants. Additionally, poor meat quality associated with rapid post-mortem metabolism may be reduced with dietary antioxidants. The objective of this study is to evaluate the usefulness of blueberry reel-stock in broiler diets to improve broiler growth performance and post-mortem metabolism. Day-old chicks (n=912) were randomly assigned to 24 pens (38 birds /pen) and one of three dietary treatments, which were supplemented with 0% (control), 1.5% and 3.0% freeze-dried blueberry reel stock. The birds were fed on the above diets from 0 to 14 days (d), from then on all birds were given commercial grower and finisher diets. The birds were reared under a continuous light in effort to increase the incidence of ascites and sudden death syndrome. All birds that died during the experiment were necropsied to identify ascites-related mortalities. All birds were manually weighed on days 0, 14, 24, and 38. At 38 days of age, 48 broilers (2/pen) were custom processed to obtain 15 minute post-mortem breast muscle samples. Post-mortem metabolism was assessed using the iodoacetate pH method. Results clearly demonstrated that there was no difference ($p > 0.05$)

among the three groups for rate of pH decline at 15 minutes post-mortem. Analysis of the treatment effect on body weight indicated that there was a difference ($p < 0.05$) among the three treatment groups in terms of size. The control group were the largest birds (1925g) compared to the 1.5% and 3.0% group, which were 1877g and 1856g, respectively. Further research may be directed towards minimizing this negative effect on growth in effort to evaluate the influence of the blueberry bioactive molecules on broiler health and product quality.

Key Words: broiler chicken, blueberry by-products, pH decline, growth performance, heart disease

S-M49 Monitoring skin color of broilers fed blueberry by-products. K. Isenor* and B. Rathgeber, *Nova Scotia Agricultural College, Truro, NS, Canada.*

Dietary antioxidants may play a role in reducing the incidence of heart related diseases such as ascites and sudden death syndrome in broiler chickens. In human health blueberry consumption has been linked to a reduction in certain diseases like cancer and heart disease. These benefits are thought to be associated with the high anthocyanin content of these berries which are known to have antioxidant properties. When evaluating the effects of blueberries on broiler health, it must be remembered that pigments present in the berries may also influence the color of the processed carcass. The object of this study was to determine if feeding broiler chickens a freeze dried blueberry by-product changes skin color. For the duration of a 38 day trial, 912 day-old male broilers were randomly assigned to 24 floor pens with 38 birds per pen. Each pen received one of three diets containing various amounts of freeze dried blueberry by-product for the first 14 days (0%, 1.5% and 3%). The birds were subjected to 23 hours light per day to increase the likelihood of cardiac disease. Light intensity began at 35 lux and then was reduced to 5 lux, at the level of the bird, when they reached 4 days of age. Skin color on the dorsal side of the both feet were measured in duplicate on days 14 and 20 using a miniscan™ XE plus, portable spectrophotometer. As the birds aged the L* and b* values increased indicating the birds skin became lighter and more yellow. The a* value also changed with age, but was reduced for older birds. The blueberry treatments did not influence L* or b* values, however, the highest level of blueberry inclusion reduced the a* value indicating that the skin of these birds was less red in color. Additional studies will need to be performed to determine if changes in skin color of this magnitude can be detected by consumers.

Key Words: broiler, skin color, blueberry

S-M50 Collagenase activity in the skin of broiler chickens subjected to two lighting regimens and microwave toe-treatment. E. Fraser* and B. Rathgeber, *Nova Scotia Agricultural College, Truro, NS, Canada.*

The integrity of broiler chicken skin can affect the number of bruises and tears on the processed carcass. Management practices are available to the poultry industry to reduce the incidence of carcass blemishes. Microwave toe-treatment reduces the incidence of scratches without the negative impact on bird welfare that other methods of claw reduction have caused. Selection of lighting regimen influences broiler skin damage

and overall health of the bird. It has been found that birds raised on an increasing photoperiod regimen have increased levels of Type I collagen in their skin which provides strength and improves integrity. The objective of this study was to determine the effects of photoperiod, microwave toe-treatment and sex on collagenase enzyme activity in broiler skin. A 2x2x2 factorial was used to examine the effects of these variables on activity of MMP-2 in broiler skin samples. The treatments in this study were increasing photoperiod and microwave toe-treatment compared to continuous lighting and untreated toes. Water-soluble proteins were extracted from the skin of 38 day-old broiler chickens. Gelatin zymography was used to measure the activity of plasma matrix metalloproteinases (MMP-2) in these samples. Neither the toe-treatment nor sex of the bird was found to have any influence on skin collagenase activity. The quantity of MMP-2 in skin samples was found to be different ($p < 0.05$) between the two lighting treatments. The skin samples from birds grown under increasing daylength had lower collagenase activity than samples from birds grown under continuous light. Since this enzyme is involved in collagen breakdown during the process of collagen turnover, these results support previous findings of an increased level of Type I collagen in birds grown under an increasing photoperiod. Therefore, management of photoperiod can be an important factor for improving the integrity of broiler chicken skin.

Key Words: broiler chicken skin, lighting program, photoperiod, microwave toe-treatment, collagenase activity

S-M51 Phase-feeding in broilers: impact on breast fillet dimension, cook loss and tenderness. V. Brewer*, P. Pillai, A. Saha, C. Owens, J. Meullenet, and J. Emmet, *University of Arkansas, Fayetteville.*

Phase-feeding (PF) is a concept of feeding broiler chickens wherein the dietary nutrient density is brought as close as possible to the requirement of the bird as age progresses, and has been effective in maintaining growth while reducing production cost. An experiment was conducted to study how PF (switching diets every other day and reducing dietary levels of amino acids (AA), Ca and P in grower and finisher diets) would impact breast fillet dimensions, cook loss and meat tenderness. Treatments consisted of 1) diets formulated to meet NRC recommendations, 2) diets with phased levels of AA, Ca, and P, 3) diets with phased levels of AA, and Ca and P reduced by 0.2%, 4) as diet 2 with AA reduced by 10%, 5) as diet 3 with AA reduced by 10%. Birds fed the NRC diet were switched from a grower to finisher diet on d 43. Each PF treatment was based on two diets formulated to either meet the requirement at 27 d (high nutrient density) or 60 d (low nutrient density). Actual PF diets resulted from blending the high and low nutrient diets in variable quantities. Treatments were replicated in 8 pens with 20 birds per pen. Birds were processed on d 60 or 61 (four replicate pens per d) and breast fillets were harvested following 4-hour chilling. After measuring the dimensions using a laser-guided machine, fillets were stored overnight, cooked and sheared using a razor blade texture analyzer to determine cook loss and tenderness. Reducing AA by 10% (diet 4) or Ca and P by 0.2% (diet 3) did not reduce ($P > 0.05$) breast fillet length, width, or height, but reduction of AA, Ca and P in diet 5 reduced ($P < 0.05$) fillet dimensions. Cook loss was lower ($P < 0.05$) in birds that received diet 5 compared to diets 1, 2 and 3. Shear force was higher ($P < 0.05$) for birds fed diet 5 than birds fed the diet 1 (NRC). It appears that PF, along with a reduction in both Ca and P, or a reduction in dietary AA density does not adversely affect fillet dimensions, cook loss or tenderness in broil-

ers. Uniformity of fillets (as indicated by SD and CV) was similar among treatments for each parameter.

Key Words: broilers, phase feeding, fillet dimension, cook loss, tenderness

S-M52 The influence of crab meal on laying hen performance and egg quality. T. MacKinnon*¹, J. MacIsaac², and D. Anderson¹, ¹*Nova Scotia Agricultural College, Truro, NS, Canada,* ²*Atlantic Poultry Research Institute, Truro, NS, Canada.*

When investigating new alternative nutrient sources for laying diets consideration must be given to the potential influence the feed ingredient may have on bird performance and product quality and consumer acceptability. The present study was carried out to evaluate the effects of feeding crab meal to laying hens on yolk color. Ninety-six single comb white leghorn Babcock layers were randomly distributed into two experimental treatments with four replications at sixty-five weeks of age. For 15 days all birds were given a wheat-based control diet to minimize dietary pigment. Half the birds continued on this diet while the other half were given the wheat-based diet with 8% crab meal. The two diets were formulated to be isocaloric and isonitrogenous. Yolk color score was monitored every fifteen days using a Hunter Lab Miniscan XE™ on eight eggs per experimental unit. After feeding the crab-meal diet for thirty days the L* and b* color values decreased for yolks from crab meal fed birds, whereas a* values increased compared to controls ($P < 0.05$). After 45 days on the crab meal diet the L* value was still lower and a* higher. The addition of crab meal to the diet darkened the yolk and increased redness. Crab meal may be used as an alternative feed ingredient in layer diets however, the inclusion rate may need to be modified to adjust pigmentation levels to the preference for the region the eggs are marketed in.

Key Words: laying hen, crab meal, yolk pigmentation, color, bird performance

S-M53 Survey of *Enterobacteriaceae* contamination of nest run egg carts in shell egg processing facilities. J. Shaw*¹, M. Musgrove², M. Sheppard³, and D. Jones², ¹*University of Georgia, Athens,* ²*USDA, ARS, Egg Safety and Quality Research Unit,* ³*Clafin University.*

Enterobacteriaceae are frequent contaminants of food and several members of this bacterial family are human pathogens. High levels of *Enterobacteriaceae* in the processing plant environment can be an indication of inadequate sanitation. This experiment was designed to determine if nest run egg carts serve as reservoirs for *Enterobacteriaceae*. Eggs that are produced by hens not housed in buildings connected to the processing plant are referred to as nest run. Prior to processing, nest run eggs are transported to the plant on carts. Two plants in the Southeastern United States were sampled. On each visit, five shelves on each of five carts were sampled ($n=50/\text{visit}$). A 12 x 12 cm area on each shelf was swabbed with a sterile gauze pad moistened with phosphate buffered saline and transported on ice back to the laboratory. *Enterobacteriaceae* were enumerated using violet red bile glucose agar incubated at 37°C for 24 h. Two randomly selected isolates from each positive sample were re-cultured three times to assure clonality and were then identified bio-

chemically. There was 100% prevalence for *Enterobacteriaceae* at plant A with an average 4.0 log₁₀ cfu/mL swab diluent. Plant B had 80% prevalence for *Enterobacteriaceae* with an average 3.1 log₁₀ cfu/mL swab diluent. Of the 140 isolates analyzed, the most common genera identified were *Escherichia* spp., *Enterobacter* spp., *Klebsiella* spp., *Citrobacter* spp., *Hafnia* spp., *Kluyvera* spp., *Leclercia* spp., and *Salmonella* spp. *Pseudomonas* spp. was the only non-*Enterobacteriaceae* identified by our methods. This work demonstrates that nest run egg carts serve as reservoirs for *Enterobacteriaceae* in the shell egg processing environment.

S-M54 Comparison of shell egg sanitizers and application methods. M. Musgrove*¹, N. Cox², J. Richardson², D. Jones¹, and J. Northcutt³, ¹USDA, ARS, Egg Safety and Quality Research Unit, ²USDA, ARS, Poultry Microbiological Safety Research Unit, ³USDA, ARS, Poultry Processing Research Unit.

In compliance with Agricultural Marketing Service guidelines, shell eggs marketed with the USDA shield must be washed and treated with a sanitizer prior to entering the retail market. Experiments were conducted to compare the antimicrobial effects of a periacetic acid solution and a chlorine solution (200 ppm) applied to unwashed shell eggs. Other treatments evaluated included distilled water and untreated controls. Additionally, two application methods were evaluated for each solution: hand spray and a mechanical atomizer which delivered the solutions in a fog of micron-sized particles. After treatment application, egg shells and membranes from individual eggs were crushed in 10 mL phosphate buffered saline for one min. Aliquots from each crushed sample were plated onto aerobic Plate Count Agar to enumerate aerobic mesophilic microorganisms and onto Violet Red Bile Glucose agar to enumerate *Enterobacteriaceae*. Ten eggs were sampled per treatment for each of three repetitions (n = 210). From untreated controls (C), distilled water-hand sprayed (WH), distilled water-machine applied (WM), chlorine-hand sprayed (CH), chlorine-machine applied (CM), periacetic acid-hand sprayed (PH), and periacetic acid-machine applied (PM), aerobic microorganisms were recovered at 1.7, 1.7, 2.2, 1.7, 1.5, 0.6, and 1.7 log₁₀ cfu / mL sample, respectively. Aerobic prevalence for these treatments was 100%, 93%, 100%, 93%, 97%, 50%, and 50%, respectively. *Enterobacteriaceae* prevalence was 20% (C), 10% (WH), 53% (WM), 13% (CH), 10% (CM), 17% (PH), and 3% (PM). Periacetic acid was more effective than distilled water or chlorine at reducing aerobic prevalence when applied by either method. A greater reduction in numbers was noted for this population when applied by hand spray. Greatest reduction in *Enterobacteriaceae* prevalence was achieved when the periacetic solution was dispensed as a fog using the mechanical atomizer. Chlorine (200 ppm solution), the most commonly used sanitizer, was not effective in reducing either population.

S-M55 Comparison of modern broilers with randombred broiler strains. 1. What has happened to production efficiency over 50 years? V. Carney*¹, M. Zuidhof¹, B. Schneider¹, R. Renema², and F. Robinson², ¹Alberta Agriculture, Food and Rural Development, Edmonton, AB, Canada, ²University of Alberta, Edmonton, AB, Canada.

Through intense selection for growth rate, white meat yield and feed conversion, astonishing progress has been made. The effects of selection on production efficiency was investigated with 264 mixed sex broil-

ers. Commercial broilers (Ross 308) and two randombred lines were grown on modern commercial diets to 8 wk (1957: Athens-Canadian randombred since 1957, and 1977: a male-line broiler from Agriculture Canada, randombred since 1977). Four males and four females of each strain were processed semi-weekly from 3 to 8 wk to study development and production efficiency. Data were analyzed using the mixed model procedure of SAS[®]. At all ages BW was significantly different between strains. Eight-wk BW in modern strains were more than 2 and 4 times larger than the 1977 and 1957 strains, respectively (4200, 1809 and 905 g).

Roughly every 20 to 25 year period of selection resulted in a doubling of the average daily gain. This increasing rate of gain can largely be attributed to increased feed intake and improved feed conversion efficiency. At all ages, the Ross 308 had significantly higher average daily feed intake than the other strains. Average daily feed intake of the 1957 and 1977 strains were not different up to 13 d of age, after which the 1977 strain was intermediate. Significant improvements in feed conversion occurred during the 20 yr period from 1957 to 1977, with a reduction in cumulative feed conversion ratio of 72 points. During the subsequent 30 yr cumulative feed conversion ratio improved by 22 points. The slower rate of improvement from 1977 to 2005 may be due in part to changes in selection programs. Selection programs became more complex by including traits other than growth rate and feed conversion, thereby reducing selection intensity on any one trait. Over the last 50 yr the intended consequence of selection has been improved growth rate, feed conversion and white meat yield. Heavy selection pressure for production traits may have inadvertently resulted in unintended consequences for allometric relationships and meat quality.

Key Words: body weight, feed conversion, broiler, selection, growth

S-M56 Comparison of modern broilers with randombred strains. 2. What has happened to yield dynamics over 50 years? M. Zuidhof*¹, B. Schneider¹, V. Carney¹, R. Renema², and F. Robinson², ¹Alberta Agriculture, Food and Rural Development, Edmonton, AB, Canada, ²University of Alberta, Edmonton, AB, Canada.

Through intense selection for growth rate, white meat yield, and feed conversion, astonishing progress has been made. Effects of selection on yield dynamics were investigated with 264 mixed sex broilers. Commercial broilers (Ross 308) and two randombred lines were grown to 8 wk (1957: Athens-Canadian randombred since 1957, and 1977: a male-line broiler obtained from Agriculture Canada, randombred since 1977). Four males and four females of each strain were processed semi-weekly from 3 to 8 wk to study development using allometric yield curves. Following 10 h of feed withdrawal, weights of viscera (whole gut, heart, liver, and abdominal fatpad) and weights of commercially relevant parts (P. major and P. minor, drums, thighs, and wings) were recorded. Coefficients were determined for Huxley's allometric function $y=ax^b$, where y is carcass part weight (g), x is live BW (g) at feed withdrawal, a is a scale variable, and b is the allometric coefficient. In the special case where $b=1$, growth of the part is directly proportional to the rest of the body. If $b>1$, the carcass part grows at a rate greater than body as a whole; conversely, if $b<1$ the carcass part grows more slowly. Because of high nutritional demands, organs that supply nutrients are of interest. Heart growth patterns have not changed dramatically. Similarly, gut growth has not changed relative to BW though nutrient demands are much higher due to increased relative early growth rate in modern broilers. A

dramatic increase has occurred in the rate of liver growth, particularly in males, though liver allometric coefficients have not progressed in a consistent manner. Demand organs are of interest because of their economic importance. Simplistically, increases in P. Major growth rates have traded off with drum and wing yields. The allometric coefficient of the P. Major has progressed from 1.14 to 1.17, to 1.74 in females, and 1.11 to 1.15 to 1.23 in males of the 1957, 1977, and Ross 308 strains, respectively. Relatively, changes in allometry of the P. Minor have been trivial.

Key Words: yield, allometry, development, growth, white meat

S-M57 Comparison of modern broilers with randombred broiler strains. 3. What has happened to meat quality over 50 years? B. Schneider^{*1}, M. Zuidhof¹, V. Carney¹, R. Renema², and F. Robinson², ¹Alberta Agriculture, Food and Rural Development, Edmonton, AB, Canada, ²University of Alberta, Edmonton, AB, Canada.

Through intense selection for growth rate, white meat yield and feed conversion, astonishing progress has been made. Effects of selection on meat quality was investigated with 264 mixed sex broilers. Commercial broilers (Ross 308) and two randombred lines were grown to 8 wk (1957: Athens-Canadian randombred since 1957, and 1977: a male-line broiler from Agriculture Canada, randombred since 1977). Eight birds from each strain were processed semi-weekly from 3 to 8 wk to study development and meat quality. Birds were electrically stunned and slaughtered following 10 h of feed withdrawal. Meat quality parameters: pH and temperature at 0.25 h postmortem; color using the CIELAB (L*, a*, b*) scale, drip and cooking losses (%) at 24 h postmortem, and tenderness were measured on the Pectoralis major. Data were analyzed in the mixed model procedure of SAS[®]. Significant age effects were observed on all parameters except a*. Significant strain effects were observed on all parameters except a* and b*. Significant interaction between age and strain was observed for cooking loss and b*.

Ross 308 birds had higher 0.25 and 24 h pH than 1977 and 1957 strains, which were not different (6.63, 6.41 and 6.40; 5.79, 5.74 and 5.76, respectively). Temperature at 0.25 h was significantly different between strains and is likely affected by breast muscle size. Drip losses (%) for each strain were significantly different (1957 = 1.83%, 1977 = 1.19% and Ross 308 = 0.79%). Cooking losses were lowest in the 1977 strain (21.08%) with no difference between the 1957 and Ross 308 strains (22.92% and 23.25%, respectively). Ross 308 breasts were lighter than the 1957 and 1977 groups, which were not different (L* = 42.6, 41.2 and 41.8, respectively). Modern strains demonstrate a stronger relationship between L* and 24 h pH than unselected strains. The consequence of selection programs over the past 50 years has been increased yield; however, literature suggests that the unintended consequence has been decreased meat quality. In contrast, this study shows that some meat quality factors like drip loss may improve with genetic selection.

Key Words: meat quality, selection, pH, color, broiler

S-M58 Effect of flock age and incubator capacity on hatchability after cessation of turning of broiler hatching eggs. J. Brake^{*1} and O. Elibol², ¹North Carolina State University, Raleigh, ²University of Ankara, Ankara, Turkey.

Effect of flock age and incubator capacity on hatchability after cessation of turning of broiler hatching eggs was studied in two experiments. Experiment 1 investigated effect of cessation of turning at either 14 or 18 d of incubation. Hatching eggs from commercial Ross 344 male x Ross 308 female broiler breeder flocks were collected at six different ages ranging from 28 to 53 wk. Eggs were then stored for 2 d at 18C and 75% RH prior to setting and hatching under standard conditions. The machines used were Petersime model 576 setters and model 192 hatcher. Turning of eggs was stopped (trays parallel to floor) at either 14 or 18 d incubation. An incubation tray of 150 eggs constituted a replicate and each flock age X turning treatment combination had 4 replicate trays for a total of 48 trays.

There was a significant flock age X turning treatment interaction for fertile hatchability that indicated stopping of turning at 14 d had a beneficial effect on eggs hatchability from older flock in comparison to younger flock eggs. Turning beyond 14 d increased the percentage late dead in eggs from older flock.

In Experiment 2, Hatching eggs were produced from a 47-wk-old flock. Two hatcheries located in the same geographical area with different types of machines (small versus large) were utilized. The machines in Hatchery A were Petersime model 576 setters and model 192 hatcher. The machines in Hatchery B were Petersime model 168 setters and model 168 hatcher. The capacity of model 576 and 168 setters were 57,600 and 16,800 eggs. Eggs collected on a single day were divided randomly into two groups and sent to the two hatcheries. Eggs were stored for 2 d before setting. Eggs were then divided into two incubation treatments with turning stopped at either 14 or 18 d of incubation. An incubation tray of 150 eggs constituted a replicate and the treatment groups had a total of 32 or 16 replicate trays in Hatchery A or B. There was a significant machine capacity X turning treatment interaction for fertile hatchability that indicated that stopping of turning at 14 d had a beneficial effect on hatchability of the larger capacity setter.

Key Words: flock age, hatchability

S-M59 Deboning times, extended aging and marination: Impact on poultry breast meat quality. A. Saha^{*}, A. Perumalla, J. Meullenet, and C. Owens, University of Arkansas, Fayetteville.

Studies have shown that marinating broiler breast meat resulted in improved tenderization and increased yield. It is often a practice in the industry to marinate breast fillet even on the fifth day of deboning. If processors could use this period of extended aging to their advantage, 2h postmortem (PM) deboned breast fillets that are marinated could potentially achieve a shear value comparable to 4h PM deboned fillets. The interaction between deboning times and extended aging followed by marination might play an important role in determining tenderness and cooked yield of the product. An experiment was conducted to determine the impact of deboning times, extended aging and marination on poultry breast meat quality parameters. The treatments consisted of 2h or 4h deboned breast fillet aged on ice for time periods of 0d, 1d, 3d and 6d which were tumble-marinated at respective time periods. The fillets were analyzed for pickup, drip loss, thaw loss, cook loss and tenderness. Marination pickup was not different (P < 0.05) among any of the treatment groups, whereas drip loss and cook loss increased (P < 0.05) through day 6. On the other hand, thaw loss decreased with aging, compensating partially for the high drip loss. Shear values for marinated breast fillets belonging to 2h deboning - 0 day marination and 2h deboning

- 1 day marination groups were significantly ($P < 0.05$) higher than rest of the treatments. But after three days of storage, the 2h deboned fillets did not significantly differ ($P > 0.05$) from any of the treatment groups that were deboned 4h PM. It may be assumed that extended aging and marination led to a decrease in the shear values of early-deboned meat making it equally tender as post rigor-deboned meat. Thus extended aging and marination could significantly reduce the deboning time of the broiler carcasses without adversely affecting the meat quality parameters.

Key Words: extended aging, tenderness, deboning time, marination, poultry breast meat

S-M60 Effectiveness of DBDMH (1,3-Dibromo-5,5-Dimethylhydantoin) bromine chemistry in final immersion chiller and post-chill wash system. J.L. McNaughton* and M.S. Roberts, *Solution BioSciences, Inc., Salisbury, Maryland.*

The poultry industry continues to need an improved & sustained reduction in post-chill Salmonella incidence (SAL), with multiple interventions required. Management of *Escherichia coli* (EC), Aerobic Plate Count (APC) & SAL incidence is essential in meeting future USDA post-chill carcass bacteria criteria. Two trials were conducted to measure the effectiveness of bromine (Br_2) broad-spectrum antimicrobial

applied in either final chiller or combined with post-chill, in controlling poultry post-chill carcass EC, APC, & SAL bacteria, with the ultimate goal of achieving $<10\%$ SAL, and improving shelf-life. In both trials, poultry carcasses were spotted along the thigh, breast, & internal cavity with approximately 10^3 each EC & SAL bacteria. After a 1-hr drying period in which the bacteria were allowed to adhere to the poultry skin, carcasses were treated internally & externally with a Br_2 solution applied either final chiller for 15 min or combined with post-chill for various contact times. All carcasses were rinsed using the recommended whole bird rinse procedure. Rinses were plated & counted using standard microbiological techniques. Final chiller procedures were applied on each carcass at either 0, 4, 8, or 12 ppm free or active Br_2 addition during immersion chilling (15 min chill), in Trial 1, were washed for either 0, 5, 25, or 50 sec and, in Trial 2, for either 0, 15, 25, or 50 sec (both trials used 80-82 ppm total Br_2), and then dripped 10 sec before rinsing. Results required to achieve $<10\%$ SAL standard and acceptable bacteria counts (significance $P < 0.05$): (1) At least 12 ppm final chiller free Br_2 levels with at least 15 sec contact time and (2) A combination of both final chiller Br_2 , with <12 ppm free Br_2 , and post-chill wash in a multiple intervention approach. Conclusion is that either final chiller Br_2 addition or a combination with post-chill wash will achieve the desired SAL goal. EC, APC, and shelf-life (at least 4-day improvement over control) followed a similar pattern.

Key Words: bromine, DBDMH, processing, *Escherichia coli*, *Salmonella*

Monday, January 23 SCAD (Avian Diseases) I Room: B312

S-M61 Development of a predictable model for gangrenous dermatitis in broilers. S. Collett*, Y. Cho, J. Glisson, C. Hofacre, and M. Lee, *University of Georgia, Athens.*

Although first reported in the sixties GD has, until recently been of limited importance to the USA broiler industry. In a 2004 survey of US poultry veterinarians, 70% of respondents ranked gangrenous dermatitis (GD) as one of the top three most serious current disease entities' confirming that this is a re-emerging disease.

GD research is limited by the difficulty in predictably reproducing this multifactorial disease under research conditions. In an initial screening (18 treatments with 10 birds per treatment), field isolates and ATCC reference strains of the two most frequently recovered etiological agents (*Clostridium perfringens* type A and *Clostridium septicum*), in the vegetative form were administered by subcutaneous injection or full-thickness skin scratch contamination. It was concluded that 0.5 ml of an overnight brain heart infusion broth culture of *Clostridium perfringens* type A ($\sim 1 \times 10^8$ cfu/ml), in the vegetative form, administered by subcutaneous injection was the challenge method of choice.

To establish the repeatability and predictability of the GD induction model dose response (0.5 ml 1×10^8 - 1×10^6 cfu/ml) studies and comparisons of broth (cells and toxin), washed cells alone and toxin alone were tested repeatedly (6 consecutive experiments with 3 treatments and 50 birds per treatment).

This challenge model consistently induces gangrenous dermatitis lesions in 100% of the challenged birds.

Key Words: dermatitis, clostridium, model, chickens

S-M62 Serological response and *in vivo* persistence of *Mycoplasma gallisepticum* vaccine strain 6/85 in layers and broilers. J.D. Evans*, S.L. Leigh, S.D. Collier, and S.L. Branton, *USDA/ARS Poultry Research Unit, Mississippi State, Mississippi.*

Commercially available attenuated strains of *Mycoplasma gallisepticum* (MG) are commonly used within the layer industry to control MG-induced mycoplasmosis. Strain 6/85 is a commonly utilized vaccine strain which has been demonstrated to be safe due to reduced pathogenicity and transmissibility. To further examine the protection afforded by 6/85, the serological response to 6/85 vaccination and subsequent persistence of the strain was monitored in 80 pullets and 64 broilers in separate studies. The experimental subjects were housed in biological isolation units (10 pullets/unit or 8 broilers/unit) and were divided among 4 treatment groups: (1) sham-inoculated control subjects; (2) subjects vaccinated with 6/85 at the recommended dosage (1X); (3) subjects vaccinated with 6/85 at 8.3X the recommended dosage; and (4) subjects vaccinated with 6/85 at 15X the recommended dosage. Pullets were vaccinated at 8 wks of age and broilers at 1 wk of age. The *in vivo* persistence of 6/85 was determined via culturing swabs of the choanal