Management and Production

363P  Withdrawn


Necropsy results from randomly sampled birds (n = 558,580) and flocks (n = 100,222), normal in appearance, were entered into a computer-based health monitoring system (HTSi, Elanco Animal Health) between January 2011 and December 2015 across 5 geographic regions. The observational unit was percentage of flocks affected (prevalence). Mean flock age at necropsy was 25 d in Asia Pacific (APAC) and Turkey Middle East Africa (TMEA), 26 d in Europe (EU) and South America (SA), and 29 d in North America (NA). A composite score for overall intestinal integrity score (I2) was computed by subtracting individually weighted enteric condition scores from 100. Region, year, and region x year effects were analyzed using ANOVA (JMP 12), and LSMeans Tukey was used for pairwise mean separation. Of the 24 enteric conditions scored, the most commonly reported globally were gizzards erosion (17%), excessive intestinal fluid (17%), gross E. acervulina (16%), feed passage (11%), litter eater (10%), intestinal tone (9%), hyperemia (9%), and microscopic E. maxima (8%). A region x year interaction (P < 0.01) was observed for I2 score, showing that while enteric health was highest and stable over time for EU, NA, SA, and TMEA regions, the APAC region saw lower I2 scores but significant improvement over time. Low was observed for I2 score, showing that while enteric health was highest and microscopic E. maxima (15%) and gross E. maxima (15%) and gross E. tenella (12%). APAC reported higher E. maxima and E. tenella prevalence compared with all other regions where E. acervulina was the most commonly reported species. Flock health monitoring and benchmarking can help producers better understand and respond to enteric health trends. However, there can be large differences in disease prevalence between locations within geographic region so monitoring and interventions should be focused at the company or farm level.

Key Words: broiler, enteric health, necropsy, benchmark, health tracking

365P  Evaluation of direct-fed microbial Bacillus licheniformis and 25-hydroxycholecalciferol in coccidiosis vaccinated broilers. Katie A. Burchfield*SC,1, Omar Gutierrez2, Thomas Gaydos2, Audrey P. McElroy1, and Jason T. Lee1, 1Texas A&M Agrilife Research, College Station, TX, 2Huvepharma Inc., Peachtree City, GA.

This experiment was conducted to evaluate the inclusion of a direct-fed microbial (DFM) bacterium Bacillus licheniformis in combination with 25-hydroxycholecalciferol (HC) in diets with varying calcium levels (0.95 or 0.75% dietary calcium in the starter diet with similar separation in the grower and finisher diets) in coccidiosis vaccinated broilers on performance as compared with non-medicated feed and bacitracin methylene disalicylate (BMD). The experiment was designed in a 2 (calcium) x 3 (control, BMD, and DFM + HC) factorial with 15 replicates of 28 male broilers for a 45-d growout period. Calcium and total phosphorus was ratioed at 1.75 and all diets included phytase. Each basal diet was divided into 3 groups consisting of no additive, Bacillus licheniformis (1.5 x 10⁶ cfu/g of feed) and 25-hydroxycholecalciferol, or BMD. The dietary program consisted of a starter (d 0–14), grower (d 15–35), and finisher (d 36–45). Birds were weighed by pen at the end of each grow out phase to determine average body weight, body weight gain, feed intake, feed conversion ratio (FCR), and phase mortality. Early body weight (d 14) showed a significant interaction (P < 0.001) between calcium level and additive as inclusion of the DFM + HC and BMD increased body weight in low calcium diets compared with the non-medicated control. At the conclusion of the trial, the lower level of calcium reduced (P < 0.001) body weight. One-way ANOVA determined that inclusion of DFM + HC and BMD treatments increased final body weight in the low calcium diet compared with the non-medicated diet. Further, mortality was reduced (P < 0.05) with the inclusion of BMD compared with the non-medicated control. Inclusion of the DFM + HC additive reduced mortality to levels similar to the inclusion of BMD. This data supports that the inclusion of a feed additive composed of Bacillus licheniformis and 25-hydroxycholecalciferol can result in performance levels similar to that of BMD.

Key Words: broiler, calcium, DFM, performance, Bacillus licheniformis

366P  Using white with red LED lighting to improve hatchability and chick quality in broilers and layers. Gregory S. Archer*1 and Juliette Delabbio2, 1Texas A&M University, College Station, TX, 2Once Inc., Plymouth, MN.

Commercial chicken eggs are often incubated in complete darkness, although in nature they would receive some light exposure. Previous work has shown that layer and broiler eggs filter light differently and that white light could improve hatchability in broiler eggs but not layer. It was hypothesized that due to the difference in pigment of the eggshells that utilizing the inclusion of red light would improve hatch in white eggs similarly to that observed in brown eggs using white light. To determine if there is an effect of exposing embryos to an LED light that contained both white and red light exposure when in nature they would receive some light exposure. Previous work has shown that layer and broiler eggs filter light differently and that white light could improve hatchability in broiler eggs but not layer. Utilizing this type of light can improve the hatchability and embryo mortality, and chick quality were all evaluated. Light was observed to increase hatch of fertile over dark (broilers: 86.9 ± 0.5%; layers: 58.6 ± 9.2%) in both broilers (86.9 ± 1.6%, P = 0.04) and layers (79.2 ± 2.8%, P = 0.05). Chick quality was improved in both broiler and layer eggs with any light exposure when compared with dark incubation. Broiler eggs exposed to light (0.78 ± 0.04) improved (P = 0.03) the proportion of non-defect chicks over dark (0.59 ± 0.03) incubated eggs. Similarly, layer eggs show the same trend (0.72 ± 0.03) with improved (P = 0.001) the proportion of non-defect chicks over dark (0.47 ± 0.05) incubated eggs. The main improvement in both types of chicks was an increased proportion of healed navels at hatch. There was no difference in any other chick quality or embryo mortality measures (P > 0.05). These results indicate that red light is possibly the key spectrum to improving hatchability. Utilizing this type of LED light that has both white and red light combined makes it useful in both broilers and layers. Utilizing this type of light can improve the efficiency and quality of hatching chicks.

Key Words: incubation, light, LED, layer, broiler
367P Increasing hatchability in duck eggs by exposing them to LED light during incubation. Zachary S. Tucker1, Debbie Jeffrey1, and Gregory S. Archer2,1, Maple Leaf Farms Inc., Leesburg, IN, 2Texas A&M University, College Station, TX.

Commercially eggs are often incubated in complete darkness, although in nature they would receive some light exposure. Previous work has shown that layer and broiler chicken hatchability can be increased by exposing them to light during incubation. It was hypothesized that this would also be true in duck eggs. To determine if there is an effect of exposing duck embryos LED light we incubated Pekin duck eggs (n = 3,564) under either no light (dark) or LED light (light); the light level was 550 lx. Hatchability and embryo mortality was calculated along with counting the number of ducklings hatched. Ducklings were also evaluated for quality. White light was observed to increase (P = 0.046) hatch of fertile (79.5 ± 3.0%) over dark incubated duck eggs (71.2 ± 2.5%). Duckling quality was not improved with light exposure (89.3 ± 3.8% no defect ducklings) when compared with dark incubation (81.2 ± 3.1% no defect ducklings, P > 0.05). Embryo mortality was not affected by light exposure during incubation (P > 0.05). Eggs exposed to light had 8.4 ± 1.9% early dead embryos, 8.6 ± 2.0% late dead embryos, and 2.8 ± 0.4% pipped eggs. Eggs not exposed to light had 12.7 ± 9.7% early dead embryos, 10.6 ± 1.4% late dead embryos, and 5.5 ± 1.2% pipped eggs. Light exposure during incubation did not affect duckling weight at hatch (dark, 59.0 ± 2.1 g; light, 52.9 ± 1.6 g, P > 0.05). These results indicate that exposing duck eggs to LED light during incubation can increase the hatchability of fertile eggs. These results are similar to those observed previously in both white laying hen eggs and broiler eggs.

Key Words: incubation, light, duck, hatchability

368P Effect of in ovo feeding on jejunum mucosa development in neonatal Athens-Canadian Random-Bred (ACRB) and Ross 708 broilers. Dimitri M. Malheiro1,2,1, Ramon D. Malheiro, Vera M. B. Moraes, and Peter R. Ferket, Prestige Department of Poultry Science, NC State University, Raleigh, NC.

Growth rate of broilers has increased dramatically over the past 60 years; consequently, the neonatal period is becoming a greater proportion of their productive life. Perinatal enteric development may be a constraining factor of early growth and welfare, but IOF (nutrient supplementation during incubation) may alleviate these nutritional constraints in modern broilers when the embryo imbibes the amniotic fluid around 17 d of incubation. Arguably, genetic selection for rapid growth may cause hatchlings to be less precocial than their ancestors. We hypothesize gut mucosa development of modern broilers (Ross 708) neonatal broilers is different than their genetic ancestors (ACRB) and they respond better to in ovo feeding (IOF). To test our hypothesis, 100 eggs of each strain were incubated until 17.5 d and then divided into 2 groups: one injected with 0.4 mL of IOF nutrient solution, and the other non-injected control. At hatch, 6 birds from each of the 4 treatment groups were euthanized and a segment of the jejunum was flushed and fixed in 10% formalin solution. The remaining birds were placed in battery cages with ad libitum access to feed and water until 8 d when another 6 chicks per treatment group were sampled as previously. Histological sections were prepared and stained by Alcian Blue for microscopic image analysis. There were no significant interaction effects observed at hatch, but muscularis thickness was less for Ross than ACRB (37 vs 46 μm, P = 0.01), and IOF increased villi height:crypt depth ratio (Vh/Cd) (6.75 vs 5.77, P = 0.07). At 8 d, Ross and ACRB strain differed in Vh/Cd (4.4 vs 3.4, P = 0.04) and number of goblet cells/mm2 villus surface area (Ge/SA) (1.5 vs 0.9, P = 0.005), respectively. IOF increased SA (54,620 vs 39,020, P = 0.01), with a greater response among Ross. Cd and Ge/villus were also significantly increased by IOF for Ross but not ACRB. The constraints in enteric development in modern broilers due to genetic selection for growth can be alleviated by IOF.

Key Words: jejunum mucosa histomorphology, genetic selection for growth, in ovo feeding, neonatal development

369P Growth performance of broiler chickens and heritage breeds raised on pasture. Jacqueline P. Jacob1, Anthony J. Pescatore4, Michael J. Ford1, Tatijana M. Fisher1, Sunday A. Adedokon1, and Tuoying Ao2,1, University of Kentucky, Lexington, KY, 2Alltech, Nicholasville, KY.

There has been increased interest in alternative chicken meat production systems. This study compared the effect of finishing meat chickens on pasture with those raised in floor pens. The study used a 4 × 2 factorial with 4 breeds [commercial-type broiler (BR), Rhode Island Red (RIR), Barred Plymouth Rock (BPR), and Black Australorp (BA)] raised in floor pens or finished on pasture. All chickens received the same diet (2866 kcal ME/kg; 19.2% CP). All the heritage breeds were started on the floor at the same time with half moved to pasture at 4 wk of age. BR were started on the floor 7 wk after the heritage breeds and half of these moved to pasture at 3 wk of age. There were 3 reps of 24 chicks per treatment. All chicks were placed straight run and weights adjusted for differences in sex ratios at the end of the 14-wk trial. The data were analyzed as a completely randomized design. There were breed × location interactions affecting performance. For BR with those finished on pasture (2,491 g) being lighter than those raised on the floor (2,840 g). Of the heritage breeds, BPR were the heaviest (1,571 g) and BA the lightest (1,511 g) with RIR intermediate (1,526 g) but the differences were not significant (P = 0.0577). There was a significant breed × location interaction on overall FCR. There was no significant effect of location on FCR for BR (2.18 on the floor and 2.06 finished on pasture). For all 3 heritage breeds, FCR was lowest for those finished on pasture, but the degree varied among the 3 breeds. FCR for those finished on pasture averaged 3.76, whereas those finished on the floor averaged 4.16. Mortality was low throughout the trial with the majority occurring during the week after placement. Mortality was low in the pasture pens, with the exception of the BA lost 4 chickens during the 10 wk on pasture. One BPR was lost to a raccoon with no other predation. The results suggest that finishing BR on pasture reduces final BW but has no effect on overall FCR. For heritage breeds, there were no differences in the growth performance, but finishing on pasture improved FCR.

Key Words: heritage breed, pasture, growth performance

370P Carcass yield of broiler chickens and heritage breeds raised on pasture. Jacqueline P. Jacob1, Anthony J. Pescatore1, Michael J. Ford1, Tatijana M. Fisher1, Sunday A. Adedokon1, and Tuoying Ao2,1 University of Kentucky, Lexington, KY, 2Alltech, Nicholasville, KY.

This study was conducted to evaluate the effect of raising 4 different chicken breeds [commercial-type broiler (BR), Rhode Island Red (RIR), Barred Plymouth Rock (BPR), and Black Australorp (BA)] on pasture or in floor pens. All chickens received the same diet (2,866 kcal ME/kg; 19.2% CP). The heritage breeds were started on the floor at the same time with half moved to pasture at 4 wk of age. BR were started on the floor 7 wk after the heritage breeds and half moved to pasture at 3 wk of age. Each treatment had 3 reps of 24 chicks. At the end of the 14 wk trial, 2 males and 2 females per rep were processed. Live BW,
although males had lower tibia ash than females (51.4 vs 55.7%, respectively). The results indicate that both breed and the use of pastures affect carcass yields.

Key Words: heritage breed, pasture, carcass yield

371P Effect of raising different breeds of chicken on pasture on skeletal development. Jacqueline P. Jacob*1, Anthony J. Pescatore1, Michael J. Ford1, Tatijana M. Fisher1, Harold D. Gillespie1, Sunday A. Adedokun1, and Tuoying Ao2, 1University of Kentucky, Lexington, KY, 2Alltech, Nicholasville, KY.

The objective of this study was to look at the effect of raising meat-type chickens on pasture or floor pens on the body quality. A 4 × 2 factorial treatment structure was used with 4 breeds [commercial-type broiler (BR), Rhode Island Red (RIR), Barred Plymouth Rock (BPR), and Black Australorp (BA)] raised in floor pens or on pasture. All chickens received the same diet (2866 kcal ME/kg; 19.2% CP). The heritage breeds were started on the floor at the same time and half moved to pasture at 4 wk of age. BR were started on the floor 7 wk after the heritage breeds and half moved to pasture at 4 wk. Wing yield was higher (P < 0.05) for RIR (14.1%) and lowest for BR (10.1%) with the BPR and BA being intermediary. Wing yield was higher for those raised on the floor than for those finished on pasture (13.2 vs 12.7%, P < 0.05). The results indicate that both breed and the type of pastures affect carcass yields.

Key Words: heritage breed, pasture, carcass yield

372P Does spectrum lighting affect layer pullets’ growth and subsequent production? Kayo Takeshima*1, Andrew Heuthorst, Brandi Sparling, Charlene Hanlon, Adriana Rodriguez, and Gregory Y. Bedecarrats, University of Guelph, Guelph, ON, Canada.

Light spectrum has been shown to influence physiological and behavioral processes with green and red lights promoting growth and reproduction, respectively. The purpose of this study was to determine whether raising layer pullets under a 60% red (R) or 60% green (G) spectrum LED light would influence growth and early maturation with any potential carry-over during the adult stage. Two replicates of 3,625 day-old Lohmann Brown pullets were raised in a 2-story free-run barn. Pullets were exposed to white LED light until 2 wk of age (woa), time at which red and green bulbs were installed. At 19 woa, pullets were transferred from their respective treatments (G or R) to either side of a free-run layer facility separated by a wire mesh. In the adult barn, all hens were exposed to 14 h of 60% red light. Body weights were taken weekly on a random sample (n = 50 per pen) during the pullet and adult stages. In the adult barn, egg production was recorded daily and expressed as percent egg-hen-day. At 7, 11, 18, 25 and 41 woa, various organs were harvested from carcasses (n = 5 per treatment), weighed, and kept for further analyses. Feather scoring (n = 45) was also completed at 44 and 50 woa. Results were analyzed by 2-way ANOVA (light and age as variables) followed by Sidak’s multiple comparisons post-hoc test. Pullets from the R treatment were significantly heavier than from the G treatment at 15 woa (P < 0.05), whereas the opposite was observed at 18 woa (P < 0.01). No other significant difference were observed on body and organ growth between treatments. At 18 woa, the relative ovary to body weight of pullets from the R treatment was significantly higher than from the G treatment (P < 0.01). Peak production was achieved at 32 woa (94.8%) and 27 woa (94.5%) for hens from the R and G treatments, respectively. Throughout the laying phase, egg production from the R treatment hens was on average 1 to 2% higher than the G hens. No significant difference in feather scoring was observed. Results suggest raising pullets under the R treatment did not affect growth and development and may promote reproduction in adults.

Key Words: layer, pullet, spectrum lighting, growth, reproduction

373P Turkey gait analysis: Calibrating a pressure-sensing walkway. Cara I. Robison*, Prafulla Regmi, and Darrin M. Karcher, Michigan State University, East Lansing, MI.

Increased awareness and a desire to identify acute lameness are growing more important as meat bird welfare is continually scrutinized. Technology can be used to assess gait or lameness issues accurately and more objectively potentially allowing for a higher level of bird welfare to be achieved. Utilization of a pressure-sensing walkway such as the Tekscan allows for acquisition of gait, stride, and force data as birds walk over the walkway. To obtain accurate force data, calibration of the walkway is critical and the calibrating object should represent the animal being studied. Furthermore, using a consistent method of calibration will allow comparison of results obtained from different sources. Therefore, the objective was to determine the appropriate calibration method for turkeys. Five calibration methods were used to calibrate the walkway: step calibration using a 54-kg human, step calibration using a 80-kg warm and cold carcass wt, as well as boneless breast, tenderloin, wing and whole leg wt were measured. BR had the highest (P < 0.05) cold WOG with the yield higher (P < 0.05) for those on the floor (76.1%) vs those finished on pasture (74.4%). The heritage breeds had similar WOG yields (63.7%) with no differences between finishing location. BR had higher breast yields than the heritage breeds (25.6 vs. 12.5%, P < 0.05). Females had higher breast yields than males (16.3 vs. 15.2%, P < 0.05). Finishing chickens on pasture increased breast yield compared with those on the floor (16.1 vs 15.4%, P < 0.05). BR had higher tenderloin yield (56.6%) than the heritage breeds. Tenderloin yield was higher for BPR than BA (4.2 vs 3.9%, P < 0.05), with RIR (4.1%) being intermediary. Females had higher tenderloin yields than males (4.6 vs 4.3%, P < 0.05). Males had higher leg yield than females (45.3 vs 43.6%, P < 0.05). For BPR, birds finished in floor pens had higher leg yield than those finished on pasture (46.1 vs 43.7%, P < 0.05). For the other breeds, there was no difference for leg yield between those raised on the floor and those finished on pasture. For BR, both males and females had lower leg yield compared with the heritage breeds (40.8 vs 45.6%, P < 0.05). Wing yield was highest (P < 0.05) for RIR (14.1%) and lowest for BR (10.1%) with the BPR and BA being intermediary. Wing yield was higher for those raised on the floor than for those finished on pasture (13.2 vs 12.7%, P < 0.05). The results indicate that both breed and the type of pastures affect carcass yields.

Key Words: alternative breed, pasture, bone quality
human, step calibration using an 11-kg turkey, step calibration with a 3-legged phantom weighing 11 kg, and step calibration with a 3-legged phantom weighing 24 kg. Eight turkey hens were selected from a pen of 35 birds based on their desire to walk repeated times over the walkway. Each hen walked over the walkway until 6 useable movies were recorded. Data were analyzed using Proc Mixed and Proc Reg in SAS 9.4. Calibration method did not affect temporospatial parameters such as gait, stride, or speed ($P > 0.20$); however, kinetic parameters such as force, impulse, and pressure were altered by calibration method ($P < 0.01$). Average maximum force recorded during the walk varied from 12 to 13.5 ± 0.2 kg depending on calibration method ($P < 0.01$). Calibration method can alter the kinetic parameters; however, the kinetic parameters are consistent within a calibration method. To make comparisons between studies or between multiple on-farm data collections detailed information about the calibration protocol must be provided. Based on this information, a turkey representative of the average weight should be used to step calibrate the walkway.

Key Words: turkey, walkway, calibration, gait

Managing ammonia emission in poultry houses using gas-permeable membrane. Felix Buabeng$^{8,9}$,1, Fawzy Hashem$^2$, Mattias Vanotti$^2$, William Brigman$^2$, Jennifer Timmons$^1$, Robert Dadson$^1$, and Patricia Millner$^3$. 1University of Maryland Eastern Shore, Princess Anne, MD, 2USDA-ARS, Florence, SC, 3USDA-ARS, Beltsville, MD.

Ammonia volatilization from poultry manure is one of the major air quality and human health concerns associated with confined poultry production. High accumulation of ammonia ($NH_3$) can negatively affect the health of both workers and birds; therefore, this study was conducted to examine modules of $NH_3$ capturing and recovery approaches using a gas-permeable flat and tubular membrane systems placed inside a 6.0 m × 6.0 m room in an UMES poultry house. The objectives of the study were to (1) evaluate the performance of 2 gas-permeable membrane $NH_3$-capturing system models in capturing $NH_3$, and (2) assess $NH_3$ emission rate in the rooms. In this system, $NH_3$ selectively pass through microporous, hydrophobic, gas-permeable membranes and was captured in a circulated acidic solution. Once $NH_3$ gas passed through the membrane and was in contact with the acidic solution ammonium ($NH_4^+$) salt was formed, which was retained and concentrated in the acidic solution. The experiment consisted of 3 treatments, namely: (1) control with no birds and membrane systems, (2) birds alone, and (3) birds with both membrane systems. Each room had 400 birds. The results of this study indicated a 24% decrease in $NH_3$ emissions in the room with the installed system when compared with the room without the system. Ammonium nitrogen ($NH_4^+$) recovered averaged 14.5 ppm (with a range of 0.95 to 29.85 ppm) for the flat membrane system and 213 ppm (with a range of 109.9 to 274 ppm) for the tubular membrane system. Chicken mortality rate was higher in the control room (6.5%) as compared with the room with the installed system (2.5%). The average feed conversion ratio (FCR) for broilers was lower in the experimental room (1.14) when compared with the control room (1.21). This study supports the concept of using gas-permeable membrane systems to capture $NH_3$ from poultry manure.

Key Words: gas permeable, ammonium, poultry, ammonia, membrane

A novel blend of natural botanical oils supplied in the drinking water reduces on-farm mortality. Ashley L. Wagner$^*$, Lorraine Fuller$^2$, Ivan D. Girard$^3$, and David W. Sammons$^1$. 1Probiotech International, Saint-Hyacinthe, QC, Canada, 2University of Georgia, Athens, GA, 3University of Tennessee at Martin, Martin, TN.

On-farm mortality is influenced by a variety of factors and increases profit losses especially when it occurs late in the grow cycle. Botanical oils (BO) have shown mixed results when it comes to reducing mortality. The objective of the present trial was to evaluate the efficacy of a novel blend of natural botanical oils for drinking water at reducing mortality on a commercial broiler farm in Tennessee. Six barns with an average of 21,000 birds/barn were used. All birds were vaccinated with live oocysts before arrival at the farm, and were administered salinomycin in the feed from d 16 to 25. Barns were randomly assigned to a control (CON; n = 3) or BO treatment (n = 3); where the CON water lines were not treated and the BO treatment was administered at 500 ppm in the water line from d 21 to 30. Daily mortality was evaluated from d 21 to 53, and droppings were collected at d 21, 25, and 30 for oocysts counts. Statistics were analyzed using PROC MIXED of SAS for all independent variables. Daily mortality differed ($P < 0.0001$) between the 2 groups with an overall higher mortality in the CON than the BO treatment. Peaks in mortality occurred at d 39 ($P = 0.13$), 45 ($P = 0.11$), and 51 ($P = 0.001$), where the mortality peaks were higher in the CON barns than BO barns. Cumulative mortality was higher ($P < 0.0001$) in the CON barns compared the BO treated barns beginning at d 43 ($P = 0.10$) and 46 ($P < 0.05$), and continuing to the end of the flock cycle (CON: 1477 ± 57; BO: 931 ± 57). Oocyst counts for E. acervulina tended to be lower ($P < 0.09$) in the BO treated birds on d 21 and 25. Oocyst counts for E. tenella was not significant ($P = 0.30$), but numerically higher in CON birds compared with BO birds. The results demonstrate the efficacy of BO to reduce mortality on a commercial broiler farm. Additionally, this trial indicates the benefits of BO after administration ceased by keeping the mortality lower throughout the entire life cycle of the flock.

Key Words: botanical oil, mortality, water

Effects of genetic line and incubation temperature profiles on broiler live performance until 56 days of age. Edgar O. Oviedo-Rondón$^1$, Albaraa Sarsour$^1$, Hernan A. Cordova$^1$, Beatriz Saldaña$^1,2$, Luis C. Bernal-Arangó$^3,4$, Ricardo Fasano$^4,5$, Mariana Mesquita$^1,5$, Luke Borst$^6$, and John Barnes$^7$. 1Prestage Department of Poultry Science, North Carolina State University, Raleigh, NC, 2Universidad Politécnica de Madrid, Madrid, Spain, 3Politécnico Colombiano Jaime Isaza Cadavid, Medellín, Antioquia, Colombia, 4Universidad Estadual Paulista, Botucatu, SP, Brazil, 5Universidade Federal de Goiás, GO, Brazil, 6College of Veterinary Medicine, North Carolina State University, Raleigh, NC.

Genetic lines differ on live performance and incubation conditions could be an additional factor increasing grow-out variability. This experiment was conducted to evaluate the effects of temperature incubation profiles on live performance of 3 genetic lines. A total of 1,000 eggs from 3 genetic lines: Cobb 500 × Cobb MX, Ross 708 × Ross and Cobb 500 × Hubbard M99, were randomly distributed into 4 machines with 2 incubation temperature profiles. In 2 machines, eggshell temperatures were maintained close to 37.8°C (100.0°F) during the whole incubation period by adjusting machine set points to simulate single stage incubation (Standard). In the other 2 machines, eggshell temperatures were low (36.9°C) for the first 3d and close to 37.8°C until the last 3d...
when eggs had elevated (38.9°C) eggshell temperatures (Low-High), as it is observed in multistage machines with fixed set point (37.5°C). Eggshell temperatures were measured with pipe-probes and thermistors. At hatch, 720 chicks sex-separated (12/pen) were randomly distributed into 60 pens with 5 replicate pens/treatment combination. All chickens were fed common diets ad libitum. BW and feed intake were analyzed every 2 wk. BW gain and FCR were calculated at the end of each phase. Data were analyzed as randomized complete block design with a 3 × 2 factorial arrangement of genetic lines, incubation profiles and sex as main effects. No 3-way interactions (P > 0.05) were detected. There was a 2-way interaction effect (P < 0.05) between genetic lines and incubation profile at hatch. Cobb × Hubbard incubated under Low-High conditions were heavier at hatch than those coming from Standard incubation. Ross × Ross were lighter (P < 0.05) than the other lines during the whole grow-out, with lower (P < 0.001) feed intake up to 42 d. However, no significant differences (P > 0.05) among genetic lines or incubation temperature profiles were detected on FCR. In conclusion, genetic lines differed on live performance and incubation temperature profiles did not significantly influence grow-out parameters.

Key Words: live performance, incubation, genetic line, broiler

377P Effect of chlorine treatment on day 7 biofilm removal and its effect on inhibition of Escherichia coli serogroup O2 incorporation into established biofilm. Pramir Maharjan*SC1, Geraldine Huft2, Wen Zhang3, and Susan Watkins1. 1Department of Poultry Science, University of Arkansas, Fayetteville, AR, 2USDA-ARS Poultry Production and Product Safety Research, University of Arkansas, Fayetteville, AR, 3Department of Civil Engineering, University of Arkansas, Fayetteville, AR.

Poultry waterlines are constructed using polyvinyl chloride (PVC) material which can easily form biofilms. Biofilms can harbor pathogens including E. coli serogroup O2, a strain of APEC. An in vitro test (n = 2) was conducted to understand biofilm growth rate on PVC surface using water type >4.5 log10 cfu/ml as test water and its removal upon application of sanitizer. Next objective was to test if E. coli O2 strain could incorporate into the established biofilm. PVC test coupons (15.16 cm²) were used in the study and were immersed in test water in beakers (3 coupons/beaker; 6 beakers) to grow biofilm for 7 d period. Temperature of test water was set dynamic over time, 90°F on d 1 and then a 1°F drop each day over 7-d period. Also, the water inside beakers that bathed the coupons was gently agitated; the purpose was to mimic the flowing water in waterlines in first week of brooding. On d 7, coupons (n = 6) were analyzed for APC levels and then remaining 2 coupons per beaker were transferred into pathogen free water utilizing 6 beakers (300 mL/beaker). 0.1 mL of tryptophosphate buffer that has E. coli O2 (7 × 10⁶ cfu/mL) was seeded in each of the beakers and then treated with chlorine (3 beakers) producing ~3 ppm free chlorine. Three beakers served as control. Beakers were set at 83°F for 24 h post treatment and 82°F post 24 h treatments and were similarly agitated. Coupons were sampled (by swabbing) for APC and E. coli O2 presence post 24 and 48 h treatment. Day 7 APC recovered had 4.35 log10 cfu/cm² in trial 1 and 3.66 log10 cfu/cm² in trial 2. Upon chlorine application, APC in biofilm were not recovered (P < 0.05) during the sampling occasions, whereas control had similar (P > 0.05) level of APC in trial 1 or increased APC level (P < 0.05) in trial 2. E. coli O2 was not detected in treated test coupon samples, whereas it was detected in control (>3 log10 cfu/cm²) in both the trials. The results show that biofilm can quickly (≤7 d) develop on PVC surface in contaminated water and E. coli O2 can incorporate into established biofilm if water is not treated.

Key Words: waterline, biofilm, Escherichia coli O2, chlorine


The use of litter acidifying agents is a common practice used to control ammonia levels, which is an important aspect in poultry management. In a previous study performed on clean bedding material, sulfur at a feed inclusion rate of 2.27 kg/ton with or without the addition of sodium bisulfate at 22.67 kg/92.9 m² as a litter amendment reduced ammonia levels without affecting bird live performance. A follow-up study was performed using built-up litter in place of fresh bedding to determine if this change affected either ammonia levels or live bird performance. Eight hundred straight run broilers were randomly assigned to 32 pens (25 birds/pen). Inclusion levels for treatments containing sulfur and/or sodium bisulfate were 2.27 kg/ton of feed and 45.36 kg/92.9 m² onto the litter respectively. The treatments were as follows: (Con) control, (S) sulfur, (S+SB) sulfur+sodium bisulfate, and (SB) sodium bisulfate. SB was spread onto the surface of built-up litter in the assigned pens 24 h before placement of the chicks. Live performance data was recorded at d 0, 9, 30, and 38. Ammonia readings were taken at d 9, 24, and 38. At trial termination (d 38), birds were scored for footpad dermatitis, pen litter quality scored and litter was collected for moisture and pH analysis. Data was analyzed using the GLM procedure; if significant (P ≤ 0.05), means were separated using Tukey HSD. There was no significance between treatments for BW on d 9 or 38. Day 30 BW were significantly higher (P < 0.05) for SB compared with S. Day 0 to 38 AFCR values for S were significantly higher (P < 0.001) compared with other treatments. There was no significance between treatments for ammonia on d 23 or 38. Day 9 ammonia values were significantly higher (P ≤ 0.05) for S and Con compared with S+SB and SB. There was also no significance between treatments on d 38 for footpad dermatitis, litter scores, pH, or moisture levels. Based upon the results, the addition of sulfur at this rate did not negatively affect ammonia level, BW, pH, footpad score or litter moisture as compared with the other treatments at D38. In this initial trial there was a significant increase in AFCR when comparing the S treatment to the others.

Key Words: ammonia, sulfur, broiler, AFCR

379P Effect of incubation temperature on residual yolk sac and liver lipids by meat-type chicken embryos. Francine Vercese* and Gita Cherian, Oregon State University, Corvallis, OR.

There is a growing interest in manipulating temperature during incubation for initiating adaptation to post-hatch environment. The objective of the study was to investigate effects of incubation temperature on residual yolk sac and liver lipids in broiler chick embryos. One hundred twenty eggs were incubated at a temperature of 100°F. On d 11 of incubation, the eggs were distributed into 2 groups of 60 eggs each. The eggs were maintained at a constant temperature of 100°F (Control) or at 101.3°F (High). At embryonic age (EA) 13, 16 and 19, 20 eggs were taken from each treatment. Liver and residual yolk sac was dissected, weighed and subjected to total lipid and fatty acid analysis. The average weights of eggs incubated were 63.5 g. Overall, embryo, liver, and residual yolk sac weight at all ages were higher in High than Control (P < 0.01). Total lipid content of liver was higher in High than Control (P < 0.01). No difference was observed in the yolk sac total lipid (P > 0.05). No effect of incubator temperature was observed on saturated fatty acids, monounsaturated fatty acids (MUFA), and total n-3 and n-6 polyunsaturated fatty acids (PUFA) in the residual yolk sac. However, EA had significant effect on yolk sac content of MUFA, long chain (>20-C) n-3 and n-6 PUFA. At EA 13, 16, and 19 a significant decrease
in MUFA ($P < 0.004$), total LC n-3 ($P < 0.001$) and LC n-6 ($P < 0.01$) was observed. In conclusion, the results demonstrate that incubation temperature influences embryo weight, liver weight and lipid content. Considering the diverse roles of lipids in growth and maturation of the embryo, these results suggest that early thermal manipulation could be used as tool to enhance growth, health and adaptation to post-hatch environmental temperature.

**Key Words:** chick embryo, incubation, liver, lipid, yolk sac


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This trial was conducted to evaluate egg production and quality from laying hens having a magnetized water source. For the water magnetization treatment group, 2 magnets (3000 gauss each), were affixed to the exterior surface of the incoming PVC water lines. One hundred 92 Hy-Line W36 hens, 48 wk of age, were housed in a tunnel ventilated house. On d 0 of the trial, hens were randomly allotted to one of 2 treatment groups: control (un-magnetized water line) or magnetized water line. There were 3 replicates per treatment with 6 cages per replicate. There were 6 (replicate 1) or 5 (replicates 2 and 3) hens per cage. Feed and water were provided ad libitum. Hens were fed a standard laying diet formulated to contain 0.82% lysine, 4.80% Ca, and 0.43% P. The trial was conducted for 28 d. Water samples were analyzed for pH. The response criteria were egg production, egg weight, egg quality, and egg mineral content. Egg weight and egg quality were determined on one d of each wk of the trial. The pH of the water from magnetized lines (7.97) was lower ($P < 0.01$) than the pH of the water from the un-magnetized lines (8.22). Egg production, egg weight, and specific gravity were not affected by magnetization of the water lines of laying hens. Albumen and yolk height, Haugh units, yolk index (%), and shell mass were higher ($P < 0.05$) for eggs laid by hens that received magnetized water than for eggs laid by hens that received un-magnetized water. Yolk Mg content was higher ($P < 0.05$), and Ca ($P = 0.07$), K ($P = 0.08$), and S ($P = 0.10$) tended to be higher in yolks from hens receiving magnetized water compared with yolks from hens receiving un-magnetized water. Magnetized water improved egg quality but did not affect layer egg production or egg weight.

**Key Words:** layer hen, water, magnetic, egg quality, egg production