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Behavior and Well-Being

183 Impact of monthly cage sanitation on two- to four-year-old *Gallus domesticus* laying hens. K. E. Anderson*, P. E. Mozdziak, and J. N. Petite, *North Carolina State University, Raleigh.*

The chicken model related to ovarian adenocarcinoma (OVAC) holds tremendous potential for ovarian cancer research, but there has been some welfare related controversy regarding flock husbandry for these 2 – 4 yr old hens. Furthermore, there has been limited research using a long term an-ovulatory egg type chicken often needed for chemopreventive studies, and there have been no studies involving the management, productivity and feeding of these hens past the normal 2 cycle productive life. Problems arise when dealing with agricultural animals in a biomedical research setting. The recommended husbandry practice currently described for animals in biomedical research by the ILAR Guide, indicate that animals should be moved for cage sanitation on a biweekly basis. We examined the mortality records from 2 comparable flocks containing 2- to 4-year-old hens. Flock 1 contained 2,880 hens housed at 619 sq cm using the FASS Ag Guide standard agricultural husbandry practices and Flock 2 with 3,672, 2 year old laying hens that were initially housed at 550 or 619 sq cm for the first year of the study. After 9 months, to meet regulatory requirements, the Flock 2 hen population was reduced to 2,592 to initiate a housing density of 826 sq cm along with a monthly cage sanitation program. Both flocks were fed a body maintenance diet and provided levonorgestrel as a chemopreventive agent to reduce the percentage of spontaneous OVAC formation. In Flock 1 the mortality decreased after the initial housing and remained at a relatively constant level from 2 to 4 years; however, in Flock 2 mortality was significantly higher ($P \leq 0.05$) after the third month on ILAR Guide monthly sanitation (6.4%) compared to birds that were maintained under standard FASS Ag Guide management practices (1.3%). These results suggest that monthly cage sanitation does not benefit flock health since there was no change in disease presence, but there was a higher level of mortality associated with the sanitation. It appears that the implementation of monthly sanitation for 2 to 4 yr old hens increases flock mortality suggesting an adverse effect handling for monthly sanitation.

Key Words: chicken, husbandry, sanitation

184 Effects of feeder space allowance on behavior and productivity of caged hens. C. M. Thogerson*, P. Y. Hester¹, J. A. Mench², R. C. Newberry³, E. A. Pajor¹, and J. P. Garner¹, ¹*Purdue University, West Lafayette, IN*, ²*University of California, Davis*, ³*Washington State University, Pullman.*

Limited feeder space for laying hens could increase competition at the feed trough causing aggression, disrupted feeding, and reduced productivity. Our goal was to test this hypothesis by evaluating how

feeder space allocation affects feeding behavior and productivity in a modern layer strain. We predicted that decreasing feeder space would increase monopolization of the feeder by some hens and decrease feeding by cagemates. We housed 480 Hy-Line W-36 hens at 5/cage (stocking density, 434 sq cm/hen with feeder space of 12.2 cm/hen). After 1 wk acclimation, baseline measures were taken for 2 wk and then hens were given 5.8, 7.1, 8.4, 9.7, 10.9, or 12.2 cm of feeder space/hen (16 cages/treatment). Hen/day egg production and feed consumption/cage were calculated monthly for 12 mo. We used one-zero recording to score feeding behavior in each cage for 5 s every 10 min over a 24 h period each mo and, for each hen, calculated % time spent feeding and synchrony (mean number of additional hens feeding at the same time), and averaged these scores/cage. For each cage we calculated: feeding switches (no. of observations hens changed between feeding and not feeding), and feeder monopolization (the probability that feeder access was equally distributed among all hens). Data were analyzed using a repeated measures GLM incorporating tier, treatment, and age. Hens with reduced feeder space spent less time feeding ($F_{5,683} = 10.93$ $P < 0.001$); used more food ($F_{5,1000} = 6.83$ $P < 0.001$) with more kg/feed/dozen eggs produced ($F_{5,913} = 22.74$ $P < 0.001$); synchronized their feeding bouts to a lesser extent ($F_{5,683} = 14.04$; $P < 0.001$); made fewer switches at the feeder ($F_{5,692} = 7.18$; $P < 0.001$); and exhibited more feeder monopolization ($F_{5,692} = 2.75$ $P = 0.018$). Total egg production was not affected by feeder space. Our results suggest that the Hy-Line W-36 hens adapted behaviorally to reduced feeder space, but used more food with no production benefit.

Key Words: laying hens, feeder space, welfare

185 Classification of stressful vocalizations of captive laying chickens using the Hidden Markov Model (HMM). E. Otu-Nyarko*, M. J. Darre¹, P. M. Scheifele², D. B. Miller¹, and M. T. Johnson³, ¹*University of Connecticut, Storrs*, ²*University of Cincinnati, Cincinnati, OH*, ³*Marquette University, Milwaukee, WI.*

A 3-month study was conducted at the University of Connecticut to classify stress vocalizations made when the normal living environmental and management conditions of white leghorn laying chickens were altered. For this study 100 birds at 36 weeks of age were randomly selected. The birds were divided into 4 groups of 25 birds per group. Physical, psychological and mixed stressors were applied as treatments against a control. The objective of the study was to determine the extent to which vocalizations made by laying chickens under different stressful conditions could be classified using the Hidden Markov Model (HMM) with voice recognition algorithms. HMM, is a statistical model that represents both the temporal and spectral characteristics of audio signals. An additional objective was to establish the use of vocalizations as a means of determining if chickens are straining in response to a stressor. Heat at

37.78°C, human presence, crowding (595 cm² per bird) and combinations of these stressors were applied as treatments. Vocalizations and behavioral data were collected for analysis. A total of 4,640 minutes of sound bytes were recorded and edited for analysis. HMM was used to classify the vocalizations. The model achieved an overall condition classification accuracy of 74% showing a clear pattern of vocalizations relative to the different stressors applied to the chickens. A confusion matrix reinforced the ability of the HMM to correctly identify different vocalizations resulting from different stressors, suggesting that the chickens have different repertoires under different stressful conditions.

Key Words: vocalizations, stress, hidden Markov

186 Effect of amount of human contact on behavioral, physiological, and production responses of turkeys. N. A. Botheras*¹, P. H. Hemsworth², J. M. Engel¹, and M. S. Lilburn¹, ¹The Ohio State University, Columbus, ²University of Melbourne, Victoria, Australia.

Research in the egg and meat chicken industries has shown that human-animal interactions can affect animal fear, stress physiology and productivity. However, no such research has been conducted in the turkey industry. We investigated the effects of different levels of human contact on fear behavior, physiology and growth of turkeys. Male poults (N = 180) were housed from hatching to 10 weeks of age in groups of 10 to 11, in 2 similar, adjacent rooms in the same building. In one room, poults received minimal human contact (MC), consisting of routine husbandry each day. In the other room, poults in each pen received 2 min of additional human contact (AC), twice daily, in which an experimenter stood stationary in the center of each pen for 1 min, and then walked slowly and deliberately around the perimeter of each pen for 1 min. At 5 and 10 weeks of age, fear of humans and body weight were measured. Fear of humans was evaluated in a behavioral test in which the poults' withdrawal and approach behavior to a human was measured. Plasma corticosterone concentration in response to handling was assessed at 10 weeks of age. More AC poults remained near an approaching and stationary experimenter in the behavioral test, at both 5 and 10 weeks of age ($P < 0.01$). These results suggest AC poults were less fearful of humans than MC poults. There was no difference in the body weights of AC and MC poults at 5 and 10 weeks of age. There was also no significant difference between AC and MC poults in plasma corticosterone concentrations in response to handling. While the handling treatments may have been confounded by location (room), the findings suggest that human contact may be an important determinant of turkey behavior. However, the handling treatment did not affect productivity. Fear differences between treatments may not have been sufficient to elicit a physiological stress response nor affect animal performance.

Key Words: fear of humans, human-animal interactions, turkeys

187 Vocalizations as an indicator of distress in laying hens. J. L. Canterbury*¹, F. J. Struwe¹, E. Blankenship¹, H. Taira^{1,2}, and M. M. Beck^{1,2}, ¹University of Nebraska, Lincoln, ²Clemson University, Clemson, SC.

A study was conducted to determine whether changes in call characteristics could be elicited by mildly stressful conditions in Leghorn laying hens (*G. gallus*) to determine whether vocalizations could be reliable

indicators of distress. Four birds each were placed in 4, 55 × 63 cm cages (852 cm²/bird). Recordings were made on a Uher 4200 Report Monitor with a Sennheiser microphone 3m from the edge of each cage. A total of 28 recordings were analyzed (5min recordings; 7 recordings per treatment). Treatments were control (C); mild hunger/frustration (FC; feed covered); mild thirst (WW; water removed 12 h); heat stress (HS; 36°C). All treatments except mild thirst were recorded 3×/d for 3 d from May to Aug. Birds in mild thirst were sampled after 12 h without water. Tapes were digitized and analyzed using Raven[©] (Cornell University). Acoustic properties (max frequency, max power, notes/s, percent time calling, call rate) were measured. Data were analyzed using ANOVA, PROC MIXED. Two observers were present during each taping session, taking notes and classifying calls to 4 call types: moan, squaak kluck, kluck kluck, and kuk (Wood-Gush, 1971; Collias, 1987). In order for a call to be classified, both observers had to be in agreement. Sonograms were used to visually inspect and confirm each call type. Of 1,177 calls, 1,034 could be typed reliably (C 177; FC 247; WW 191; HS 277). Across type, 3 properties were higher in HS (notes/s, $P = 0.0007$; max power, $P = 0.08$; max frequency, $P = 0.04$). Percent time calling was higher in HS, FC than in C or WW ($P < 0.09$). Call rate was higher in HS and FC than in WW ($P < 0.045$); C was intermediate. Within call type, only the kuk call was consistent across acoustic properties; max power, max frequency, and notes/s were higher in HS ($P < 0.02$; $P = 0.0001$; $P < 0.0006$, respectively). Squaak kluck was higher in max power in HS, FC, and WW than in C ($P = 0.0001$, 0.001, and 0.055, respectively). Kuk may be a more consistent stress call for signaling HS and max power (call intensity) may be a more general distress signal.

Key Words: vocalizations, well-being, *Gallus gallus*

188 Effects of photoperiod on measures of stress and mobility in growing chickens of three breeds. R. J. Lien* and J. B. Hess, Auburn University, Auburn, AL.

Growing chickens of the 2 primary commercial breeds and a heritage breed were subjected to long and short photoperiods to determine effects on heterophil-lymphocyte ratio (H:L), tonic immobility (TI), perching, and mobility. Either 30 straight-run commercial broiler, commercial layer, or White Plymouth Rock (WPR) chicks were placed at 1 day of age in each of 2 pens (3.7 × 1.5 m) in 6 light controlled rooms. Three rooms were subjected to long photoperiods (23L:1D) and 3 to short photoperiods (16L:8D), all at an intensity of 2 footcandles. Water and feed were provided ad libitum and a typical brooding temperature regimen was provided. A 15 cm high × 1 m square deck and two 15 cm high × 20 cm wide × 1 m long decks were provided in each pen. Perching on decks (decking), the ability to climb on the deck to feed after a period of feed removal (mobility), H:L, and TI were determined during wk 4 and 7. Breeds and photoperiods made up a randomized incomplete block design. Data were analyzed as a 2 by 3 by 2 factorial arrangement of photoperiods, breeds, and ages. A 3 way interaction affected H:L. In broilers, H:L was elevated by 23L:1D during wk 7. In layers, H:L was greatest under 16L:8D during wk 4 and least under 23L:1D during wk 7. In WPR, H:L was reduced by 16L:8D and increased by 23L:1D during wk 4, but intermediate during wk 7. Age ($P = 0.0567$) and breed ($P = 0.0880$) effects approached significance for TI. Decking was affected by age × breed and photoperiod × breed interactions. In broilers, decking was moderately reduced under 16L:8D and markedly reduced under 23L:1D. Decking was increased in WPR during wk 7. Mobility was affected by age × breed and photoperiod × breed interactions. Mobility was reduced by 23L:1D in broilers and increased by

23L:1D in layers and WPR. Effects of photoperiod on H:L and TI were not consistent at different ages in different breeds, although the only markedly elevated H:L levels observed did occur under 23L:1D in 2 breeds. While decking and mobility were generally reduced in broilers this effect was attenuated by 16L:8D.

Key Words: chicken, photoperiod, welfare

189 Physiological response of broilers during water based foam depopulation. M. D. Dawson¹, E. R. Benson*¹, R. L. Alphin¹, G. W. Malone², K. J. Johnson¹, S. E. Seta¹, and D. Hougentogler¹, ¹*University of Delaware, Newark*, ²*University of Delaware, Georgetown*.

Avian influenza virus (AIV) and other zoonotic poultry diseases are serious risks to the United States poultry industry. The US Department of Agriculture Animal and Plant Health Inspection Service (APHIS) provide the guidance for responding to AI outbreaks. "When AI outbreaks occur in poultry, quarantine and depopulation (culling) of all infected, exposed or potentially infected birds, followed by proper disposal of carcasses and the quarantining and rigorous disinfection of farms and surveillance around affected flocks are the preferred eradication and control options." Depopulation is one of the major steps involved in a response. Unfortunately, current depopulation methods leave room for improvement. A new procedure using water based fire fighting foam was developed by the University of Delaware. Initial studies showed that water based foam is faster to implement, caused more rapid cessation of activity, and caused corticosterone stress levels that are not statistically different from other depopulation methods. In this study, EEG, ECG and other sensors were used to record time to unconsciousness, time to cessation and other parameters during Ar-CO₂ gassing, CO₂ gassing, and water based foam depopulation.

Key Words: depopulation, EEG, broiler

190 Simulation of cold temperature transportation of broiler chickens. T. L. V. Leer*, N. A. Burlingette, S. Dadgar, E. S. Lee, T. D. Knezacek, T. G. Crowe, P. J. Shand, and H. L. Classen, *University of Saskatchewan, Saskatoon, SK, Canada*.

Previous research on broiler transportation has focused on defining the acceptable upper temperature ranges, but little is known about the lower limit. An environmental chamber was used to study this lower limit by investigating the effect of cold conditions on the core body temperature of broiler chickens. The chamber held 2 commercial transport drawers, each subdivided into 15 equally sized cells. Temperature and relative humidity levels within each cell were logged at 1-minute intervals. Four hundred eighty broilers (39–43 d) were used in 16 experiments. Birds were randomly selected, weighed and orally gavaged with temperature loggers at least 1.5 h prior to testing to capture deep core body temperatures. Birds were assigned to cells and held at controlled temperatures within the chamber for 3 h. Air temperatures entering the

chamber were -18, -15, -12, -8, 11, or 20°C. Birds were weighed, stunned and exsanguinated at 0 and 2 h after removal from the chamber with 2 h lairage temperature ranging from 15–22°C. The mean core body temperatures (±SE) following 0 h lairage were 38.1 ± 0.30, 37.7 ± 0.27, 38.8 ± 0.13, 39.4 ± 0.14, 40.1 ± 0.05, and 40.6 ± 0.03°C after exposure to -18, -15, -12, -8, 11 and 20°C conditions, respectively. After 2 h of lairage, mean core body temperatures in the same order as above were 38.1 ± 0.66, 40.1 ± 0.15, 40.1 ± 0.12, 40.4 ± 0.11, 41.0 ± 0.06, and 41.2 ± 0.03°C, respectively. Linear relationships between ambient and bird core body temperatures for both lairage times were significant ($P < 0.0001$). Individual bird weight loss decreased in a linear fashion ($P < 0.0001$) with increasing chamber ambient temperature. Reducing ambient temperature decreases core body temperature and increases weight loss in broiler chickens. These data can be used with other welfare assessment parameters to determine lower temperature limits for broiler transportation.

Key Words: welfare, cold stress, shrink

191 Photoperiod effects on broiler behavior. A. J. Brown*¹, A. B. Webster¹, B. D. Fairchild¹, and R. J. Buhr², ¹*Department of Poultry Science, University of Georgia, Athens*, ²*Russell Research Center, USDA-ARS, Athens, GA*.

This study evaluated the effects of 3 photoperiod regimes on behavior of broilers. The photoperiods were 23 h for all treatments from 1–6 d. Treatments 1 and 2, 20L:4D and 18L:6D, were applied from 7–36 d, after which the photoperiod was 23L:1D. In treatment 3 the photoperiod was changed to 18 h at 7 d, decreased by 3 h at 10 and 13 d to achieve 12L:12D, then increased to 18 h by 1 h daily increments between 22 and 27 d, and to 23 h by 1 h daily increments between 37 and 41 d. Light intensity was 20 lux. In 2 trials, each light treatment was applied to 2 rooms, with 6 pens per room. Videos were taken of 2 pens in each room at 9, 15, 22, 29, and 43 d. Standing, walking, feeding, drinking, wing flapping, preening, nonnutritive pecking and inactivity were recorded. In addition, blood for heterophil to lymphocyte (H/L) ratios was collected at 38 d in both trials and gait scores were observed during week 6 of trial 2. Management protocols followed the breeder company guidelines, with water and a standard series of broiler diets provided ad libitum. Stocking density was 0.7 ft²/bird.

At 22 d, birds in treatments 2 and 3 were significantly more inactive over the 24-h period than birds in treatment 1. During the dark period, however, broilers in treatment 3 performed significantly more standing and walking at 22 d, indicating that while darkness may inhibit activity, extended darkness may cause broilers to resume activity before light is restored. The proportion of birds feeding during the light period was significantly higher at 29 d in treatments 2 and 3, indicating that broilers learned to eat during the available photoperiod. There were no significant differences in H/L ratios or gait scores, suggesting that the birds were not differentially stressed nor was leg condition affected by the different treatments.

Key Words: photoperiod, broiler, behavior