

Thursday, July 23, 2009

## SYMPOSIA AND ORAL SESSIONS

### Behavior and Well-Being

**170 A comparative examination of rearing parameters for brown egg-type pullets grown for either range or cage production.** K. E. Anderson\*, *North Carolina State University, Raleigh.*

The U.S. Egg Industry has grown significantly in the past 50 yrs with alternative production systems such as cage-free or range egg production contributing heavily to the industry's expansion within the last 10 yrs. Despite the increasing popularity of alternative management methods among consumers, there is a paucity of current research on the influence of alternative production methods on egg performance and egg quality characteristics. Presently, knowledge regarding alternative management methods and performance/quality records is based upon research conducted in the late 1940's and early 1950's, or is limited to specific genetically selected lines of poultry. Because pullets reared for range egg production must be reared in a manner which facilitates their learning the function of the many aspects of the range environment, it is imperative that pullets learn to properly use the range, roost and nests for egg production, and foraging behaviors to ensure productivity of the flock. This study utilized Hy-Line Brown Layers that were reared using two different systems depending on the production for which they were intended i.e. range or cage. The range birds were started in floor pens on litter at 929 sq cm/bird and then moved to the range at 12 wks of age to complete their rearing. The cage birds were reared in an environmentally controlled brood/grow cage system at 310 sq cm/bird. The birds were maintained on the same rearing dietary regimen, vaccination, and supplemental lighting program. The pullets reared in cages were heavier ( $P < 0.05$ ) by 93 g than their range counterparts. Total feed consumption was reduced ( $P < 0.0001$ ) when the pullets were reared on the range by 0.79 kg, which represents a 13.3% reduction. This reduction in feed consumption is most likely due to the replacement of the feed with foraged materials. There was no difference in flock uniformity between the range and cage-reared pullets. This data indicates that pullets reared on the range consume less formulated feed and thus have lighter body weights than their caged counterparts.

**Key Words:** chicken, range, cage, growth

**171 Effects of degree of beak trimming on the behavior and feather condition of White Leghorn hens.** T. Gabrush\*, K. Schwean-Lardner, and H. L. Classen, *University of Saskatchewan, Saskatoon, SK, Canada.*

Three experiments were conducted to study the impact of degree of day-old beak trimming on behaviour and feather condition of White Leghorn hens. Pullets for the 3 experiments were derived from different hatcheries using different beak trimming techniques and with beak length modified as follows: Exp. 1 - infrared (IF) using varying hole sizes

(H, Shaver White); Exp. 2 - IF with beak length modification using variable IF intensity (I, Lohmann LSL); and Exp. 3 - hot-blade (HB) using varying hole sizes (H, Bovan CV20). Beak treatments included intact (C), mild (ML), moderate (MO), and severe (S) beak trimming. Pullets were housed in battery cages at 17 wks of age for a 40 wk production cycle (12 hens/rep; 6 reps/trt). Each experiment was analyzed as a CRD. Attempts to alter beak length were only successful for HB trimming which resulted in beaks being 14, 31 and 39% shorter than the C birds for the ML, MO and S treatments at 38 wks of age. IF trimming (I or H) resulted in beaks that were 30 to 36% shorter than the C trt regardless of severity of trim. Behaviour was monitored via scan sampling on 8 occasions between 0 and 55wks. Behaviour was unaffected by IF (H or I) treatment at 1 d of age while the S treatment foraged less than the C chicks for the HB technique. At 3 and 16 wks an increase in object pecking was noted in both IF treated hens. During the laying period, some behaviours were affected by severity of beak trimming with the effect trim technique specific. More consistent effects were a decrease in drinking and aggressive behaviour, and an increase in object pecking with increased severity of trim regardless of technique. Feather condition at 38 and 60 wks of age was superior for beak trimmed birds in comparison to the C hens for all trim techniques, with the exception that it was not affected by trt in the IF-I hens at 38 wks. In conclusion, beak trimming and its severity affect bird behaviour in laying hens, and beak trimming, regardless of trim technique and severity, improves feather condition.

**Key Words:** beak trimming, infrared

**172 Effects of degree of beak trimming on the performance of White Leghorn hens.** T. Gabrush\*, K. Schwean-Lardner, and H. L. Classen, *University of Saskatchewan, Saskatoon, SK, Canada.*

Three experiments were conducted to study the impact of degree of day-old beak trimming on the performance of White Leghorn hens. Pullets for the 3 experiments were derived from different hatcheries using different beak trimming techniques and with beak lengths modified as follows: Exp. 1 - infrared (IF) using varying hole sizes (H, Shaver White); Exp. 2 - IF with beak length modification using variable IF intensity (I, Lohmann LSL); and Exp. 3 - hot-blade (HB) using varying hole sizes (H, Bovan CV20). Beak treatments included intact (C), mild (ML), moderate (MO), and severe (S) beak trimming. Pullets were housed in battery cages at 17 wks of age for a 40 wk production cycle (12 hens/rep; 6 reps/trt). Each experiment was analyzed as a CRD. Attempts to alter beak length were only successful for HB trimming which resulted in beaks being 14, 31 and 39% shorter than the C birds for the ML, MO and S treatments, respectively, at 38 wks of age. IF trimming (I or H) resulted in beaks that were 30 to 36% shorter than the C trt regardless of severity

of trim. Body weight was reduced for the HB-S hens at 20 and 38 wks of age but there was no effect at 60 wks. IF trimming did not affect 20 or 38 wk weights regardless of technique. MO and S treatments of the IF-I modification were lighter than other treatments at 60 wks. Hen-day egg production was not affected by severity of beak trimming in any experiment but hen-housed egg production was lowest for the C birds in all experiments. Higher mortality was due to increased cannibalism by C hens. Feed intake decreased in a linear fashion with increasing severity of HB trimming, but was not affected by trim severity in the IF-I hens and was lower for all hens trimmed with the IF-H technique. Severity of beak trimming did not affect egg weight or specific gravity in any experiment. In conclusion, beak trimming within the limits used in these experiments caused relatively minor effects on laying hen performance and can be considered acceptable from a performance standpoint.

**Key Words:** beak trimming, hot-blade, production, infrared

**173 Potential for horizontal transmission of *Salmonella* and *Campylobacter* among caged and cage free laying hens.** J. F. Hannah\*<sup>1</sup>, J. L. Wilson<sup>1</sup>, R. J. Buhr<sup>2</sup>, N. A. Cox<sup>2</sup>, L. J. Richardson<sup>2</sup>, and J. A. Cason<sup>2</sup>, <sup>1</sup>University of Georgia, Department of Poultry Science, Athens, <sup>2</sup>USDA, Agricultural Research Service, Russell Research Center, Athens, GA.

Nine hens were inoculated orally and intravaginally with a marker strain of *Salmonella* and *Campylobacter* at 56 wk-of-age and housed in individual cages in isolation. Challenged hens were comingled with non-challenged hens 2 wk post-inoculation, at a ratio of 1 challenged hen per 4 non-challenged hens, in conventional colony cages (n=3), on all wire slats (n=1), or on all litter flooring systems (n=1). Comingled hens had access to the same feeding and watering systems and after 12 d challenged and non-challenged hens were euthanized. Ceca were aseptically removed from all hens, and the spleen, liver/gallbladder, and reproductive tract were aseptically removed from the challenged hens only. All samples were separately cultured by direct plating and enrichment for *Salmonella* and *Campylobacter*. Among hens housed in colony cages, *Salmonella* was recovered in one cage from 2/4 ceca of non-challenged cage mates. *Campylobacter* was not recovered from any of the challenged or non-challenged hens housed in cages. From hens housed on all wire slats, *Salmonella* was recovered from 2/3 ceca and 1/3 spleens from the challenged hens and from 2/12 ceca of non-challenged pen mates. *Campylobacter* spread minimally among hens housed on all wire slats with 1/3 ceca from challenged hens and 1/12 ceca from non-challenged pen mates being *Campylobacter* positive. Among hens housed on all litter floors, *Campylobacter* was recovered from 1/3 ceca of challenged hens and 7/12 ceca of non-challenged pen mates. *Salmonella* was not recovered from any of the challenged or non-challenged hens housed on all litter floors. All liver/gallbladder and reproductive tract samples were negative for both *Salmonella* and *Campylobacter*. With an increasing number of table egg producers transitioning to cage free systems, it is important to determine the impact housing systems have on the horizontal spread of *Salmonella* and *Campylobacter* among laying hens.

**Key Words:** horizontal transmission, cage free, *Salmonella*, *Campylobacter*, laying hens

**174 A comparison of humoral immune function in response to a killed Newcastle vaccine challenge in caged vs. free-range Hy-line**

**Brown layers.** J. B. Hoffman\*, D. V. Arbona, and K. E. Anderson, North Carolina State University, Raleigh.

The relationship between immune function and disease risk may be greatly influenced by an individual's response to chronic stressors including those that are environmentally induced. Extensive husbandry systems such as range production have been regarded as less stressful for hens due to the more natural setting as opposed to the cage environment. Ultimately, stress heightens the risk for adverse health outcomes by suppressing the immune response thus leaving the host vulnerable to opportunistic disease. Measurements of stress-induced immune alterations have been conducted in poultry by utilizing hematological and immunological indices. To ascertain the effects of alternative layer housing management methods on humoral immune function, Hy-line Brown hens housed on range (n=15) or in conventional/battery style cages (n=20) were inoculated with a killed Newcastle vaccine. Blood serum samples were taken prior to injection and for three consecutive weeks following injection to assess antibody production. Antibody production was significantly higher in caged hens in comparison to free-range hens at pre-injection ( $1.69 \pm 0.70$  vs.  $0.069 \pm 0.069$ ) ( $P < 0.0001$ ), and post-injection weeks 1 ( $2.26 \pm 0.77$  vs.  $0.145 \pm 0.25$ ) ( $P < 0.0001$ ), 2 ( $8.00 \pm 2.98$  vs.  $4.38 \pm 2.94$ ) ( $P < 0.001$ ), and 3 ( $9.24 \pm 2.56$  vs.  $6.69 \pm 3.86$ ) ( $P < 0.05$ ). Additionally, caged hens exhibited a significantly higher level ( $P < 0.0001$ ) of total antibody production ( $5.30 \pm 0.23$ ) throughout the immune challenge compared to free-range hens ( $2.82 \pm 0.26$ ). Blood smears used to analyze heterophil:lymphocyte ratios as an indicator of stress further emphasized increased heterophilia in free-range hens compared to caged hens. This data demonstrates that the husbandry systems used to produce eggs can have a great influence on layer hens' immune function in response to a killed Newcastle virus.

**Key Words:** humoral, immune, function, layers, husbandry

**175 Comparison of different methods of chicken depopulation.** R. M. Hulet\*<sup>1</sup>, P. H. Patterson<sup>1</sup>, E. A. Wallner-Pendleton<sup>1</sup>, E. Gingerich<sup>2</sup>, T. L. Cravener<sup>1</sup>, and G. L. Barbato<sup>1</sup>, <sup>1</sup>Pennsylvania State University, University Park, <sup>2</sup>University of Pennsylvania, New Bolton.

With the advent of Asian Flu, some depopulation practices of the past may not stand up to public scrutiny and should be reviewed and evaluated to determine if the practices are the best management procedures or there are better ways and means of conducting depopulation. The goal of this project was to evaluate new and approved methods of mass depopulation in order to develop recommendations for emergency situations involving whole flocks of layers and broilers. The methods currently approved by the AVMA (2001) are cervical dislocation, gassing with CO<sub>2</sub>, and recently, the use of foam for depopulation of highly pathogenic infectious disease outbreaks in poultry. In a series of trials, birds were exposed to various concentrations of CO<sub>2</sub> gas, electrical stunning, and use of foam for signs of stress (corticosterone levels), time to cessation of bird activity, and behavior prior to death. CO<sub>2</sub> gas for broilers and layers showed that groups of birds (24/group/three replications) had cessation of movement by 5.5 and 5.0 minutes, respectively. Broilers and layers (8 birds/group/3 replicates) were able to be euthanized by electrocution by using 70 volt (30 sec; 90 mA/bird) and 55 volts (25 sec; 60 mA/bird), respectively. Broilers and layers (24 birds/group/3 replicates), once completely covered with foam, had cessation of movement within 2.5 and 2.7 minutes, respectively. No difference in corticosterone levels were found between depopulation treatments or between pre and post treatment blood collections. In conclusion, the positives and negatives of the various depopulation systems were examined and compared to the needs of the type of housing from backyard flocks to million bird

complexes. Housing type (floor versus cage), type of chicken (layer versus broiler), and bird age/size could determine the selection of the approved technique.

**Key Words:** depopulation, chickens, stress, behavior

**176 Effect of age of lighting program initiation on broiler performance.** H. L. Classen\* and K. V. Schwan-Lardner, *University of Saskatchewan, Saskatoon, SK, Canada.*

Daylength is known to influence the growth and health of broiler chickens. Although it is generally accepted that adopting a shorter daylength lighting program at a younger age reduces mortality and leg weakness, research has not attempted to establish the optimum age to change from a continuous or near continuous brooding daylength to a shorter daylength. Two experiments were completed to study the impact of initiating a shorter daylength at one of four ages on the production of broiler chickens. In each experiment, 5,568 day-old Ross x Ross 308 chicks were housed in one of 8 environmentally independent rooms with two rooms assigned to each of four lighting treatments. Each room contained 12 pens with 6 housing males and 6 housing females. Room lighting consisted of 23L:1D until switching to 18L:6D at 1, 4, 7 or 10 d of age. Light intensity was 40 lux until all rooms were changed to 10 lux at 10 d of age, with lighting provided by incandescent bulbs. Changing the daylength caused a decrease in feed intake and growth rate over the subsequent 3 d regardless of age of change. During this 3 d period, there was a reduction in gain to feed ratio in comparison to those treatments without change. Broilers recovered from the initial slow down in growth associated with daylength change and final body weights at 39 d of age were unaffected by lighting treatment. Similarly, overall feed intake and gain to feed ratio were the same for all lighting programs. There were no overall differences in mortality but the effect of lighting program on losses from 10 to 39 d approached significance ( $P = 0.09$ ) with mortality lowest for the 1 d of age change and increasing in a linear fashion with age of change. Broiler gender affected many traits but interactions between lighting program and gender were inconsequential. In conclusion, broiler performance is not affected by age of lighting program initiation.

**Key Words:** broiler, light, day length, photoperiod, growth

**177 The effects of long-bright, increasing-dim, and shorter-bright split-dark lighting programs and strain on broiler mobility and stress.** R. J. Lien\*, J. B. Hess, and S. F. Bilgili, *Auburn University, Auburn, AL.*

To determine lighting program and strain effects on measures of mobility and stress, 40 male broilers of tray pack (TP) and high breast meat yield (BM) strains were placed by strain in each of two 1.5 by 3.7 m pens in twelve light controlled rooms. Four rooms were subjected to long-bright light (1-47 d, 23L:1D, 2 footcandles [FC]) (LB treatment). Four rooms were subjected to increasing-dim light (1-7 d, 23L:1D, 8-14 d, 12L:12D; 15-21 d, 14L:10D; 22-28 d, 17L:7D; 29-35 d, 20L:4D; 36-47 d, 23L:1D; 1 FC to 7 d & 0.25 FC thereafter) (ID treatment). Four rooms were subjected to a shorter-bright split-dark light treat-

ment (SBSD) (1-47 d, 16L:4D:2L:2D & 2 FC). Sitting or standing on 15 cm high raised platforms (decking), the ability to climb onto raised platforms to feed, tonic immobility (TI), and heterophil:lymphocyte ratios (H:L) were determined at approximately 3 and 6 wk. Gait scores and latency to lie durations were determined during wk 7. Decking was inversely proportional to the photoperiods to which broilers had recently been exposed and was greater in the TP than BM strain at 3 but not 6 wk. Feeding on raised platforms was greater in ID and SBSB than the LB treatment at 3 wk, and did not differ due to treatment at 6 wk or strain at 3 and 6 wk. Neither TI nor H:L were influenced by light treatment or strain. Gait scores and latency to lie durations were worst in the ID, best in the SBSB, and intermediate in the LB treatment. Gait scores were better in the BM than TP strain; however latency to lie was unaffected by strain. Although lighting treatments tested in this study affected broiler mobility, different measures of mobility often yielded different results, and measures of physiological and psychological stress were unaffected.

**Key Words:** broiler, lighting, photoperiod, mobility, stress

**178 Bone mineralization in four strains of male commercial broilers and its relationship to gait score.** P. Y. Hester\*<sup>1</sup>, P. N. Talaty<sup>1</sup>, and M. N. Katanbaf<sup>2</sup>, <sup>1</sup>*Purdue University, West Lafayette, IN*, <sup>2</sup>*Cobb-Vantress, Inc., Monticello, KY.*

The objectives of the following study were 1) to evaluate changes in bone mineralization among 4 strains (strains A, B, C, and D) of male meat-type commercial broilers at market age and 2) to determine the relationship between bone mineralization and gait score at 6 wk of age. At 38 and 39 d of age, 360 birds were evaluated individually for gait score. Three male chickens/pen with good walking ability (gait score of 0 or 1) and 3 male chickens/pen with poorer walking ability (gait score of 3) were euthanized and individual BW determined. The left humerus, the left middle toe, and both drumsticks were retrieved for bone measurements to determine bone mineral density (BMD), bone mineral content (BMC), and bone size traits using dual-energy X-ray absorptiometry. The BMD and bone size traits were similar among strains at 6 wk of age. However, gait scores differed among genotypes with strain C having better gait scores than strains A and B but did not differ from strain D. The BMC and bone size traits did not differ between birds with good walking ability (gait score of 0 or 1) as compared to those broilers of poorer walking ability (gait score of 3). However, birds with a gait score of 3 (poorer walking ability) had higher BMD ( $P < 0.05$ ) and BW ( $P < 0.001$ ) than males with a gait score of 0 or 1 (good walking ability). Within a strain, the correlation between gait score and BMD was NS except for strain D birds. Male broilers of strain D with better walking ability had decreased bone mineralization ( $r = 0.19$ ,  $P = 0.03$ ). Because there was a stronger correlation between gait score and BW for all strains ( $r = 0.38$ ,  $P < 0.0001$ ), it is believed that the low association between gait score and bone mineralization for strain D was mainly due to BW. In conclusion, bone mineralization was similar among strains of meat-type chickens, and it had little influence on the gait score of male broilers.

**Key Words:** bone mineralization, dual-energy X-ray absorptiometry, broiler, gait score, strains