28  Effects of atmospheric pressure change on broiler breeder egg production. Joshua Deines*, Doug Yoho, and R. Bramwell, University of Arkansas, Fayetteville, AR.

Atmospheric pressure (barometric pressure) is the pressure exerted by the earth’s atmosphere at a given location due to the mass of the atmospheric column above. Atmospheric pressure is often used to predict patterns and changes in weather. Atmospheric pressure influences many behavioral and physiologic aspects of living organisms. As such this field study was conducted to determine the effects of atmospheric pressure changes on broiler breeder egg production. All data were collected from a single broiler breeder farm in Arkansas by the farm manager. The objective of the study focused on effects of the direction of pressure change rather than the numerical measurement of pressure. Data were collected from 2 back-to-back broiler breeder flocks raised in the same house. Date, egg count, and direction of atmospheric pressure change were recorded daily. The daily atmospheric pressure change was categorized as one of the following: steady, rising, falling, fluctuating. Because egg production naturally increases to a peak then decreases over the life of a breeder flock because of age, the data were normalized by taking the average egg count (calculated in 2 week intervals). This average was then compared with each day within the timeframe and its associated atmospheric pressure change category to find a percentage difference. All calculated differences from the same categorized atmospheric pressure change were then combined and compared with the other categories. Statistical analysis was carried out by ANOVA in SAS and means were compared using Tukey’s Studentized Range (HSD) Test. Overall there were 1.48% more eggs produced on days with steady pressure compared with the 2 week averages, 1.74% less on falling days, 1.35% less on rising days, 2.45% less on fluctuating days. This evidence suggests that atmospheric pressure changes do effect egg production of broiler breeders. It can also be concluded from this study that the breeder hens did lay more eggs on days with steady atmospheric pressure compared with days with any direction of change in pressure or fluctuation ($P < 0.0001$). There is no significant difference in egg production between days of fluctuating, increasing, or decreasing pressure changes.

Key Words: broiler breeder, laying, nutrition, feeding frequency, rearing

29 Can rearing feeding strategies improve the laying performance of broiler breeders? Aitor Arrazola*, Tina Widowski, Michele Guerin, and Stephanie Torrey, University of Guelph, Guelph, ON, Canada.

Broiler breeders are feed-restricted during rearing to control growth and to avoid obesity-related problems during production. To reduce the negative effects of chronic feed restriction, alternative feeding strategies have focused on increasing feed allowance through decreased diet quality and use of non-daily feeding programs. The objective of this research was to examine the effect of rearing feeding strategies for broiler breeders on the laying phase under simulated commercial conditions. At 3 weeks of age, 1,680 Ross 708 pullets were allocated into 24 pens of 70 birds each (7.7 pullets/m²). Six pens were fed from wk 3 to 22 with one of 4 treatments: (1) daily control diet (control); (2) daily alternative diet; (3) 4/3 control diet (3 non-consecutive off-feed days per week); and (4) graduated control diet. The alternative diet had an inclusion of 40% soybean hulls and an increasing concentration of calcium propionate from 1.44% to 5.05%. The feeding frequency of the graduated treatment was 5/2 from wk 3–4, 4/3 from wk 5–11, 5/2 from wk 12–18, and daily from wk 19–22. At wk 23, 40 mature hens per pen (4.4 hens/m²) were maintained based on their body weight (+15%). Five mature roosters were introduced per pen at wk 23. Pens were managed based on the breeding company’s guidelines and fed with a standard broiler breeder layer diet daily from wk 23 to 64. Egg production was recorded daily until wk 64. Once per week, 12 settable eggs per pen were set for incubation at wk 32, 40, 48, 56 and 64. Data were analyzed with a glimmix procedure with week as repeated measure and pen as subject. Egg production was greater for the pens fed with the 3 alternative feeding strategies (2, 3, and 4), 3.7 ± 0.1 eggs/hen weekly, compared with the control (1), 3.3 ± 0.1, from wk 56 to 64 ($P < 0.001$). Hatching egg weights for hens reared on non-daily treatments (3 and 4) were 1.1 ± 0.4 g lighter than for controls (1) from wk 32 to 64 ($P < 0.01$). However, live chick weight between treatments was similar for the same time window ($P = 0.41$). In conclusion, compared with the control, alternative feeding strategies in rearing improved laying rate after wk 56 with no detrimental effect on chick weight despite lower hatching egg weights for non-daily treatments.

Key Words: broiler breeder, laying, nutrition, feeding frequency, rearing

30  Broiler breeder laying signals: Body weight and rearing daylength. S. A. S. van der Klein*, K. L. Lovely1, C. A. Oueltte1, G. Y. Bédécarrats2, and M. J. Zuidhof3, 1University of Alberta, Edmonton, AB, Canada, 2University of Guelph, Guelph, ON, Canada.

Body weight and rearing day length are major signals influencing reproductive onset and performance in broiler breeders. The aim of this study was to investigate in group-housed hens the impact of longer rearing day lengths and higher BW on reproductive efficiency, when BW variation is minimized. Six groups of 26 Ross 708 broiler breeder pullets were reared in light tight chambers using precision feeding stations, which controlled feed intake toward the target BW of each individual hen. Half of the pullets in each chamber were assigned to the breeder-recommended target BW curve (Std), and half to an accelerated target BW curve reaching the 21 wk BW at 18 wk (High). Pairs of chambers were randomly assigned to either a 8L:16D, 10L:14D, or 12L:12D light schedule and photostimulated at 21 wk. Photostimulation was achieved in a single step to 16L:8D for all treatments. Hens were palpated from wk 20 onward daily to detect hardshelled eggs in the shell gland to measure individual egg production. Data were analyzed using a mixed model. Variance due to hen was accounted for all serial measurements. Eggs assigned to individual hens were weighed daily. The effect of day length on egg production depended on BW treatment ($P < 0.001$). Mortality corrected cumulative egg production per hen from wk 20 to wk 46 was 109, 110, and 72 for the High BW treatment and 89, 60, and 27 for the Std BW treatment for the 8L, 10L, and 12L schedule respectively. For the 8L, 10L, and 12L schedule, peak production in the High BW treatment was reached at wk 30 (86%), wk 34 (84%), wk 46 (68%), respectively; and in the Std BW treatment wk 29 (73%), wk 34 (55%), wk 46 (35%), respectively. The effect of day length on egg weight depended on BW treatment ($P = 0.001$). For the 8L, 10L, and 12L schedule, mean egg weight in the High BW treatment was 63.3 g, 62.6 g, 63.9 g, respectively; and in the Std BW treatment 63.7 g, 61.1 g, and 63.3 g, respectively. Egg production ($P = 0.999$) and egg weight ($P = 0.508$) of High BW hens reared on the 8L or 10L schedule did not differ, whereas pairwise comparisons of egg production for other
growth and reproduction, the objectives of this study were to determine if specific wavelengths could be provided for 24hs as supplemental (S) feeder lighting without interfering with production. Furthermore, the effects of 2 spectrum daytime lights (DTL) and possible interactions with S lights were also examined. Four identical rooms (12 pens each) were used in a 2x3x2 factorial arrangement of treatments (pen as replicate unit) with 2 DTL sources (60% red or 60% green LEDs; n = 2 rooms each), 3 S lights (dark SD, pure red SR, or pure green SG; n = 16 pens each), and a transfer of half of the pens in each room between the 2 DTL sources 1 week before photostimulation, while remaining under the original S treatment. At 1 d of age (doo), 480 ROSS 708 chicks were distributed across 3 pens in each room, and at 14doo, chicks were randomly placed across pens (n = 10 per pen) with illuminated S lights. All birds were given the same daily feed allocation according to the breeder’s guidelines. Pullets were reared under an 8h PP and stimulated with an abrupt transfer to a 14h PP at 154doo. Data were analyzed using PROC MIXED, and Tukey was used to separate the means. Despite DTL, birds under SR light were heavier from 195 to 287doo compared with birds under SD and SG lights (P < 0.0001). At 34, 40 and 41 weeks of age (woa), production was ~5% higher under 60% red (68.4 ± 1.76%, 79.7 ± 1.05%, 77.8 ± 1.53%, respectively) vs. 60% green (63.7 ± 1.78%, 74.0 ± 1.51%, 72.5 ± 1.50%, respectively) DTL (P < 0.05), regardless of DTL pre-transfer. Furthermore, exposure to SR delayed sexual maturity by 2 weeks, regardless of DTL, and a decreased egg production from 25 to 35woa compared with SG and from 25 to 38woa compared SD (P < 0.05). At 36 and 40woa, eggs from SR light were heavier than under SG and SD lights (P < 0.05). In conclusion, 24h SR light desensitized the reproductive axis, delaying sexual maturity and diverting energy toward growth. Furthermore, exposure to 60% red DTL in adults promoted post-peak egg production despite DTL used in pullets.

Key Words: broiler breeder, spectrum lighting, precision feeding, growth, reproduction

33 Yolk free body weight of layer chicks provided different wavelengths of LED light during incubation. Nilakshi Abeysinghe1, Janice MacIsaac1, Karen Schwean-Lardner2, and Bruce Rathgeber1, Dalhousie University, Truro, NS, Canada, University of Saskatchewan, Saskatoon, SK, Canada.

Chicken eggs are commonly incubated in the dark environment and the hatch performance can be affected by the incubation conditions. In the present study, it was hypothesized that provision of different wavelengths of LED light during incubation can affect the hatch performance of chick, including yolk absorption and hatch weight. 640 eggs from each of 2 laying hen lines (Lohmann Lite and Lohmann Brown) were incubated in 8 incubators. 80 eggs from each strain were randomly selected to be placed in each incubator. Six incubators were installed with 3 different LED light types and 2 were left in the dark, which served as the control. Blue LED, red LED (ONCE Innovation) and full spectrum white LED lights (4100K) were installed in 2 incubators each. In each lighting treatment the photoperiod used was 12h of light followed by 12h of dark (12L:12D). The lights were dimmed to a similar intensity for the incubators with lights. Four chicks were randomly selected from each sex of each genetic line per incubator to determine the hatch weight (HW) and yolk-free body weight as a percentage of HW (YFBW).

Data collected was analyzed using the Proc Mixed procedure of SAS and Tukeys multipule range test was used to separate means when P < 0.05. The results revealed that there were no interactions among the main factors of interest (incubation light treatment, genetic line and sex). The HW for chicks was not different between incubation lighting treatments for the chicks sampled for YFBW (n = 128) or for all chicks.
hatched including those not sampled for YFBW (P > 0.05). The YFBW was marginally different for the hatchery lighting treatments (P = 0.068). YFBW was highest for chicks incubated in red light (88.12% ± 0.44) and lowest for the blue light incubation treatment (86.44% ± 0.45). The 2 other treatments were intermediate for this measure (87.5% ± 0.44). The 2 genetic lines utilized yolk differently. LB showed a higher yolk utilization resulting in a higher (P < 0.05) yolk-free body weight (88.24% ± 0.31 g) compared with LL (86.58% ± 0.32). Based on the results it can be concluded that, of the lights evaluated, provision of red LED light during the incubation tended to improve yolk utilization. Early utilization of yolk material can improve post-hatch performance.

Key Words: LED light, incubation, yolk-free body weight, hatch weight

Providing a photoperiod with different wavelengths LED lights on growth performance of broiler chickens during the first week of life. Xuje Li1, Kayla Graham1, Bruce Rathgeber1, and Janice MacIsaac2, 1Dalhousie University, Truro, NS, Canada, 2Atlantic Poultry Research Institute, Truro, NS, Canada.

Previous findings have been shown that broiler growth performance and behavior can be affected by illuminating with different colors of light during the production period. This study was conducted to evaluate the effects of providing different colors of LED lights during incubation on growth performance of broiler chickens at the early stage. A total of 1200 Ross 308 broiler hatching eggs were randomly distributed into 6 incubators. Two incubators were operated with the traditional complete dark method as the control. The remaining 4 incubators were illuminated for 12 h per day with white or blue LED lights. After hatch, chicks were randomly placed into 36 floor pens. This completely randomized design experiment included 6 pens for each treatment, with 26 birds of same incubation lighting treatment and gender in each pen, as the experimental unit. At 6 h post-placement, the body weight and feed consumption were measured. The body weight of chicks at placement was affected by the incubation lighting treatment (P < 0.05). The chicks hatched from dark had higher body weight (45.8 g/bird) than that hatched under the white light treatment (44.8 g/bird). At 6 h post-placement, the chicks hatched from the white light treatment had higher (P < 0.05) body weight gain (7.6 g/bird) compared with those hatched in the dark (6.2 g/bird) and the blue light treatment (6.5 g/bird). No significant differences were found in feed intake (P = 0.070) among light color treatments (Dark: 4.1 g/bird; White: 4.6 g/bird; Blue: 4.3 g/bird). In addition, the performance was assessed in terms of body weight, daily body weight gain, feed consumption and feed conversion every 24 h during the first week. Performance data were analyzed as repeated measures using the Proc Mixed procedure of SAS. Daily feed consumption, body weight gain and feed conversion ratio were not affected by incubation lighting treatments (P > 0.05). However, a 2-way interaction effect of light treatment and gender resulted in the male birds hatched from white light being heavier than that in the blue light treatment during the first week post-hatch. These results indicated that the illumination of white LED light with photoperiod can help chicks have a better start during the early stage of production phase.

Key Words: broiler, incubation, light wavelength, photoperiod, growth performance

The effects of stocking density on turkey tom performance to 16 weeks of age. Kailyn Beaulac*, Henry Classen, Susantha Gomis, and Karen Schwean-Lardner, University of Saskatchewan, Saskatoon, SK, Canada.

Stocking density (SD) is one of the primary drivers of economic return for poultry producers. However it can have a large impact on bird health and wellbeing. While broiler SD has been evaluated in depth, much less is known in regards to the effects of SD on turkeys. This study (one experiment composed of 2 trials) evaluated the effects of increasing SD on turkey tom productivity (1,434 Nicholas Select poults/trial). For each trial, birds were weighed and randomly allocated to 4 density treatments (final estimated density at 16 wk of 30, 40, 50, or 60 kg/m2). All treatments were equalized on a per bird basis. Air quality (carbon dioxide and ammonia) was monitored and adjustments to ventilation were made when necessary to equalize treatment differences. Mortality was recorded daily and both dead birds and culls were necropsied for cause of death. Group body weight and feed consumption were recorded at 4, 8, 12, and 16 wk of age and body weight gain and feed efficiency were calculated for each time period. Individual body weight (20 birds/replicate) was recorded at 12 and 16 wk of age to assess uniformity. Regression analyses were performed using Proc Reg and
37  **Effect of stocking density on live performance and leg health on broilers up to 49 d.** Viviana San Martin*, Edgar Oviedo-Rondón, Albaraa Sarsour, Hernan Cordova-Noboa, Pedro Ferzola, Kenneth Anderson, Jesse Grimes, and Kimberly Livingston, North Carolina State University, Raleigh, NC.

Stocking density is important in the poultry industry. However, there is no agreement on which density is most appropriate for animal welfare. One study was conducted to evaluate the effects of changing floor space availability with same feeder and drinker space and equal flock size on live performance and leg health. Pens were built to provide 8.12, 7.55, 6.96, and 6.37 m². Four replicate pens per stocking density were used. In each pen 9 nipple drinkers and 1 feeder tube was used. Consequently, stocking density treatments were 10.59, 11.39, 12.36, and 13.50 chicks/m² at placement. A total of 1,376 Ross 708 male chicks were randomly placed in 16 pens with new wood shavings with 86 chicks/pen. BW, feed intake, footpad dermatitis incidence (presence or absence) and severity (scores from 0 to 9), and leg problem incidence were recorded and evaluated in all chickens at 14, 35 and 48 d. At 48 d, individual BW of 40 chickens randomly selected in each pen were obtained to determine flock uniformity as CV%. BW gain and FCR were calculated for each period. All data were analyzed using the one-way ANOVA, regression analyses using JMP 12. Tukey’s test was used for mean separation. Results of live performance indicated that the average final density at 48 d in kg/m² was 34.37, 36.37, 40.77, and 41.74 ± 0.80. The final density in broilers/m² was 10.10, 10.89, 11.82, and 12.59. However, no significant differences (P > 0.05) among treatments were observed in BW gain and FCR. Increasing stocking density aggravated (P < 0.01) the footpad dermatitis severity as demonstrated by higher average scores in all periods evaluated. The same effects of increasing stocking density were observed on hock burns (HB) at 35 and 48 d. On the contrary, the lowest (P < 0.05) valgus (VL) incidence was observed on the treatment with the highest stocking density (13.50 chicks/m²) and the highest incidence of VL at 11.39 m²/bird at 14 and 35 d. At 14 d, VL incidence decreased linearly (P < 0.0001) as stocking density increased. No effect (P > 0.05) on VL incidence was detected at 48 d. Crooked toe (CT) incidence decreased linearly (P < 0.05) as stocking density increased. In conclusion, stocking density at placement did not affect live performance. However, higher stocking density affected animal welfare by increasing footpad dermatitis and HB and decreasing VL.

**Key Words:** stocking density, broiler, leg health, animal welfare

38  **Effect of stocking density on carcass and cut up yields, and meat quality of broilers up to 49 d.** Santiago Álvarez*, Edgar Oviedo-Rondón, Albaraa Sarsour, Hernan Cordova-Noboa, Pedro Ferzola, Kenneth Anderson, Jesse Grimes, and Kimberly Livingston, North Carolina State University, Raleigh, NC, Universidad Nacional de Colombia, Bogota, Cundinamarca, Colombia.

Higher stocking density is a welfare concern within the poultry industry which does not seem to affect broiler performance. One study was conducted to evaluate the effects of changing floor space availability with similar drinker and feeder space and number of chicks at placement on carcass and cut up yields, and meat quality of broilers up to 49d of age. Pens were built to provide 8.12, 7.55, 6.96, and 6.37 m². Four replicate pens per stocking density were used. In each pen 9 nipple drinkers and 1 feeder tube with 20-inch diameter was used. Consequently, stocking density treatments were 10.59, 11.39, 12.36, and 13.50 chicks/m² at placement. At hatch, 1,376 Ross 708 male chicks were placed in 16 pens with new wood shavings with 86 chicks/pen. At 48 d, 40 birds/pen were individually weighed and 13 birds/pen were selected for processing representing 2 standard deviations above and below the average. Broilers were processed at 49 d after 12 h of feed withdrawal. Total carcass, wings, leg quarters, and breast meat weights and yields were recorded and calculated relative to live and carcass weight. Additionally, breast meat quality parameters were measured which included pH, color, shear force, drip, and cook loss. All data were analyzed using the one-way ANOVA, regression analyses using JMP 12. Tukey’s test was used for mean separation. Based on the results of live performance, the average final density at 48 d in kg/m² was 34.37, 36.37, 40.77, and 41.74. The final density in broilers/m² was 10.10, 10.89, 11.82, and 12.59. No differences among treatments (P > 0.05) were observed on carcass, or cut up parts yields. However, carcass yield increased linearly (P < 0.05) as stocking density increased. Stocking density had a quadratic effect (P < 0.05) on breast meat pH after 6 h of slaughter. Moreover, breast meat pH after 24 h of processing increased linearly (P < 0.01) with higher stocking density. At 24 h post-processing, breast meat samples from the highest stocking density had higher (P < 0.05) pH than samples from chickens raised at 10.59 and 11.39 m²/chick. Nonetheless, color, shear force, drip and cook loss were not affected (P > 0.05) by stocking density. In conclusion, stocking densities did not affect carcass or cut up yields. However, higher stocking densities affected some meat quality parameters.

**Key Words:** stock density, broiler, carcass, cut up yield, meat quality

39  **Thermal manipulation of commercial lines selected for different market ages and the impact on breast meat yield and meat quality characteristics.** Sara Orlowski*, James Mason, Alex Gilley, and Nicholas Anthony, University of Arkansas, Fayetteville, AR, Aviagen, Crossville, TN.

Muscle development during embryonic and early post hatch growth is primarily through hyperplastic growth (increase in muscle fiber number) and accumulation of nuclei through satellite cell contribution. Post hatch, muscle development transitions from hyperplastic to hypertrophic growth (increase in muscle fiber size). Currently, muscle growth selection in the industry promotes increased body weight and growth through muscle fiber hypertrophy. Thermal manipulation (TM) during embryogenesis has been shown to promote growth, possibly due to an increase in hyperplasia. The purpose of this study was to evaluate the growth and meat quality parameters of 2 lines varying in growth rate and processing age under TM conditions. Line A is typically grown for
use in a whole bird/parts market while Line B is a higher yielding bird
grown for use in the debone market. Both lines were separated into a
control (C) (constant temperature of 37.8°C) and TM treatments (tem-
perature increased to 39.5°C for 6 h between embryonic d 16 and 18) (n
= 360 line/trt). A hatch window was recorded and birds were sampled at
d 4 and 7 and necropsied for analysis of parts weights. Birds sampled
at d 46 and 60 were also evaluated for meat quality characteristics
including breast muscle color, pH, drip loss and tenderness. Data was
analyzed using a 3-way full factorial ANOVA (line/trt/sex) and means
were separated using Duncan’s HSD \( (P < 0.05) \). For lines A and B at d
4 and 7, the TM groups exhibited a higher body wt than the C groups.
The TM groups exhibited improved body weights up to d 35 for both
lines. For Line A, the TM group showed an improved FCR compared
with the control (C = 1.16 ± 0.02, TM = 1.06 ± 0.01). The TM group
had an improved breast percentage at d 60 (C = 21.29 ± 0.22, TM =
22.02 ± 0.29) for Line A and at d 60 (C = 23.16 ± 0.29, TM = 23.97 ±
0.27) for Line B. Evaluations of meat quality parameters showed no
difference between the C and TM groups for either line. TM may be a
beneficial way to promote growth by targeting hyperplastic growth with
no negative impact on meat quality traits.

**Key Words:** broiler, thermal manipulation, meat quality, hyperplasia,
muscle growth

### 40 Effects of infrared heat treatment on early pullet feed intake, water intake, and body weight

**Sarah Struthers*, Henry Classen, Susantha Gomis, and Karen Schwean-Lardner, University of Saskatchewan, Saskatoon, SK, Canada.**

The effects of infrared heat treatment (IRBT) on early pullet feed intake
(FI), water intake, and body weight (BW) gain were examined using Lohmann LSL-Lite (LW) and Lohmann Brown (LB) pullets. IRBT set-
inggs were adjusted to create specific beak shapes: shovel (SHV) (top
much shorter than bottom), step (ST) (intermediate differentiation), stan-
dard (STAN) (small differentiation), and a sham (C) untreated control.

Birds were treated on day of hatch. Birds were given access to water
either through nipple drinkers or chick founts. Treatments (trt) were
arranged in a 4x2x2 factorial arrangement, in a completely randomized
design. Birds (\( n = 160 \)) were housed in cages (8 reps per IRBT, 16 reps
per strain or 16 reps per drinker type). Feed was weighed at 0, 2, and
4 wk for intake and efficiency calculation. Water intake was measured
every second day from 0 to 4 wk. All birds were weighed at 0, 2, and
4 wk to calculate BW gain. Production data were analyzed using Proc
Mixed (SAS 9.4) with Tukey’s range test to separate means. Differences
were considered significant when \( P \leq 0.05 \) and a trend was noted when
\( P \leq 0.10 \). IRBT did not affect FI or BW. Strain affected FI over the 2–4
wk period (28.6 vs. 30.6 g/bird/d for LB and LB; \( P = 0.03 \)), and BW
at 2 wk (128.4 vs. 138.1 g for LB and LB; \( P = 0.002 \)). A trend was
noted at 1–2 wk (\( P = 0.06 \)) with LW consuming more water than LB
and differences were significant at 3–4 wk (51.4 vs. 48.4 g/bird/d; \( P =
0.02 \)). A trend was noted for the effect of strain on BW at 4 wk as LB
were heavier than LW (320.4 vs. 309.4 g; \( P = 0.10 \)). No effect of trt or
strain was observed for feed efficiency. At 0–1 and 1–2 wk, drinker type
affected water intake. Birds with founts consumed more water than birds

with nipple drinkers. An interaction was seen between trt and drinker
type on water intake at 2–3 wk and 3–4 wk, with intake being similar
between trt for fount drinkers. When water was supplied with nipple
drinkers, C birds consumed more water than treated birds. Overall,
the results indicate that IRBT did not negatively affect early FI or BW gain
and that strain may play a role in BW and FI. The results also suggest that
when 360-degree nipple drinkers were used, untreated birds consumed
more water. However, the differences were not significant enough to
affect feed intake or body weight.

**Key Words:** Lohmann, nipple drinker, fount drinker, production

### 41 Carbon dioxide and nitrogen infused compressed air foam for depopulation of caged laying hens.

**Shailesh Gurung*, Dima White, Gregory Archer, Dan Zhao, Yuhua Farnell, and Morgan Farnell, Texas A&M AgriLife Research, College Station, TX.**

Poultry infected with a reportable disease are quickly removed to prevent
the spread of virulent pathogens. Firefighting foam and whole house
gassing may be used, in emergencies, for depopulation of floor-reared
poultry. However, methods available for the rapid and humane depopula-
tion of commercial caged layers, during reportable disease outbreaks, are
limited. We hypothesized that adding carbon dioxide (CO\(_2\)) or nitrogen
(N\(_2\)) to compressed air foam (CAF) would reduce physiological stress
and shorten time to cessation of movement. The objective of this study
was to evaluate and compare the efficacy of compressed air foam infused
with carbon dioxide and nitrogen for depopulation of caged laying hens
with CAF and gas inhalation methods. The experiment consisted of 6 treatments: negative control (normal handling, NEG), 50% CO\(_2\), 100% N\(_2\), CAF, CAF infused with 50% CO\(_2\) (CAF CO\(_2\)),
and CAF with 100% N\(_2\) (CAF N\(_2\)). The study had 5 replications, and in
each replicate 4 spent layer hens were randomly assigned to a treatment.

Accelerometers were attached to the Shank of each hen to determine
time to cessation of movement. Blood was collected by venipuncture
in the NEG treatment and via the femoral artery from birds killed by
the remaining treatments. Corticosterone was measured using a com-
mercially available competitive ELISA. Means were compared by one-
way ANOVA using the GLM procedure. Significant means were further
analyzed using a Tukey post hoc test. Corticosterone concentrations of
hens subjected to all 6 treatments were not significantly different (\( P =
0.4132 \)). The mean serum corticosterone concentrations were: 12.97 ng/
ml NEG, 10.31 ng/ml CO\(_2\), 9.42 ng/ml N\(_2\), 13.11 ng/ml CAF, 12.93
ng/ml CAF CO\(_2\), and 7.56 ng/ml CAF N\(_2\). Hens subjected to the CO
and N\(_2\) treatments had significantly reduced (\( P < 0.0001 \)) times to
cessation of movement as compared with the foam treatments. Mean time
to cessation of movement was 70.6 and 75.1 s for hens in the CO\(_2\) and
N\(_2\) alone treatments, respectively. Cessation of movement time for hens
in the CAF, CAF CO\(_2\), and CAF N\(_2\) treatments were 142.9, 149.5, and
135.2 s, respectively. These data suggest that infusion of CO\(_2\) and N\(_2\)
into compressed air foam is similar in terms of stress levels and time to
cessation of movement with respect to the CAF control group.

**Key Words:** depopulation, avian influenza, compressed air foam, layers