

## Monday, January 24 Environment/Management Room: B314

**S69 Evaluation of stocking density on live performance and processing yield of broilers.** W. Dozier, III<sup>\*1</sup>, J. Thaxton<sup>2</sup>, S. Branton<sup>1</sup>, G. Morgan<sup>2</sup>, D. Miles<sup>3</sup>, W. Roush<sup>1</sup>, B. Lott<sup>2</sup>, Y. Vizzier-Thaxton<sup>2</sup>, <sup>1</sup>USDA, ARS, South Central Poultry Research Laboratory, <sup>2</sup>Department of Poultry Science, Mississippi State University, <sup>3</sup>USDA, ARS, Forage and Waste Management Unit.

Animal welfare has generated concerns from both domestic and global market sectors. In growout, stocking density has been regarded as an area of interest for food retailers and wholesalers with welfare audits. This study examined four stocking densities on responses of male broilers during a 49d production cycle. Two trials were conducted and results were pooled. In each trial, 1,488 male chicks were randomized across 32 floor pens to simulate a final density of 30, 35, 40, and 45 kg/m<sup>2</sup> based on a projected final BW of 3.29 kg. Growth rate and nutrient utilization were similar from 1 to 35 d of age. From 33 to 49d, BW gain (P=0.005), feed consumption (P=0.009), feed conversion (P=0.014), and the incidence of mortality (P=0.029) were adversely affected by increasing density from 30 to 45 kg/m<sup>2</sup>. Collectively, these differences were also apparent for BW (P=0.011), BW gain (P=0.011), and feed consumption (P=0.029) from 1 to 49d. The reduction in cumulative BW gain due to density can be largely explained by feed consumption. Litter moisture content (P=0.025) and foot pad lesion score (P=0.001) increased linearly with increasing density. Upon processing, weights of the whole carcass (P=0.070) and *pectoralis major* breast muscle (P=0.079) were decreased as density increased from 30 to 45 kg/m<sup>2</sup>, but their yields, relative to BW, were not affected. The proportion of birds with scratches on the back and thighs (P=0.021) of the whole carcass increased as density increased. These results indicate that increasing density beyond 40 kg/m<sup>2</sup> adversely affects BW gain, feed conversion, and meat recovery of broilers approximating 3.2 kg.

**Key Words:** Animal welfare, Broiler, Stocking density

**S70 Evaluation of stocking density on physiological adaptive responses of broilers.** J. Thaxton<sup>\*1</sup>, W. Dozier, III<sup>2</sup>, S. Branton<sup>2</sup>, G. Morgan<sup>1</sup>, D. Miles<sup>3</sup>, W. Roush<sup>2</sup>, B. Lott<sup>1</sup>, Y. Vizzier-Thaxton<sup>1</sup>, <sup>1</sup>Department of Poultry Science, Mississippi State University, <sup>2</sup>USDA, ARS, South Central Poultry Research Laboratory, <sup>3</sup>USDA, ARS, Forage and Waste Management Unit.

Physiological adaptive responses are integral to well being when animals are subjected to environmental alterations. The purpose of this study was to assess major adaptive responses of broilers reared at different stocking densities. Three trials were conducted. In Trial 1, 2057 males broilers were reared for 35d at a density of 0.065M<sup>2</sup>/bird. These birds were reassigned to the pens at densities of 19.5, 24.4, 29.3, 34.2, 39.0, 43.9, 48.8, and 53.7 kg/m<sup>2</sup> based upon a projected final BW of 3.27kg at 49d. At 35 and 49 d, 8 birds from each pen were selected at random and a plasma sample was collected. The following parameters were determined corticosterone (CS), glucose (GLU), cholesterol (CHOL), nitric oxide (NO), and heterophil/lymphocyte (H/L) ratio. In Trials 2 and 3, 1,488 male broilers were randomized across 32 floor pens to simulate a density of 30, 35, 40, and 45 kg/m<sup>2</sup> based on a projected final BW of 3.29 kg. Birds were bled at 49 d of age and the same parameters as in Trial 1 were determined. Stocking density did not affect adaptive responses of broilers in these three trials.

**Key Words:** animal welfare, broiler, corticosterone, stocking density

**S71 Evaluation of stocking density on intestinal microflora of broilers.** M. Putskam<sup>1</sup>, Y. Vizzier-Thaxton<sup>\*1</sup>, W. Dozier, III<sup>2</sup>, J. Thaxton<sup>1</sup>, W. Roush<sup>2</sup>, S. Branton<sup>2</sup>, G. Morgan<sup>1</sup>, D. Miles<sup>3</sup>, B. Lott<sup>1</sup>, <sup>1</sup>Department of Poultry Science, Mississippi State University, <sup>2</sup>USDA, ARS, South Central Poultry Research Laboratory, <sup>3</sup>USDA, ARS, Forage and Waste Management.

Product quality in broilers, as indicated by microbial numbers on meat, is indirectly related to the microbial flora of the total intestine. The question of whether stocking density impinges on microbial related product quality has not been investigated previously. The purpose of this study was to evaluate the

microbial flora of the entire intestine in broilers as influenced by stocking density. Two trials were conducted and in each trial 1,488 male chicks were randomized across 32 floor pens to simulate a final density of 30, 35, 40, and 45 kg/m<sup>2</sup> based on a projected final BW of 3.29 kg. At 49d, 2 birds were selected at random from each of the 32 pens. Each bird was killed by cervical dislocation and within 10min both the small and large intestines were removed aseptically. Small and large intestines were each deposited into a sterile zip-lock bag and placed in an ice bath. Immediately after collection of intestines, the sealed intestinal samples were frozen at -20C for later microbial analysis. Samples were removed from the freezer, thawed in a cool water bath and aseptically cut into pieces for analysis. Serial dilutions were made for enumeration using standard plate counting techniques for anerobic, anaerobic, coliform and mold counts. Results show that density had no effect on microbial counts in either segment of the intestine. Apparently, stocking density does not affect microbial numbers in the intestines of broilers.

**Key Words:** Broiler, Food safety, Microflora, Stocking density

**S72 Performance and intestinal characteristics of broilers fed salinomycin, fructooligosaccharides, probiotics and synbiotics.** K. M. Burkholder, T. J. Applegate, J. A. Patterson<sup>\*</sup>, Purdue University.

The objectives of this study were to determine the influence of dietary treatments on broiler performance, intestinal morphology, intestinal microbial community structure and attachment of *Salmonella* Enteritidis to ileal tissues. A total of 750 day old male Ross 308 broilers were assigned to the following 5 diets (6 pens/diet): control (CON), salinomycin (SAL), probiotic (PRO, a mixture of lactobacilli and bifidobacterial strains), fructooligosaccharides (FOS) and synbiotic (SYN). Birds had ad libitum access to food and water and room temperature was reduced from 37.2°C initially to 30°C by day 14 and remained at 30°C for the remainder of the 4 week study. At 4 wk, broiler fed the CON, FOS and SYN diets (1.01<sup>a</sup>, 1.00<sup>a</sup>, 1.00<sup>a</sup> kg, respectively) were heavier (P< 0.03) than those fed SAL (0.91<sup>b</sup> kg), with broilers fed the PRO diet being intermediate (0.97<sup>ab</sup> kg). There were no significant differences in overall feed/gain. Villus height at 4 wk was greatest for the SYN diet, followed by CON, PRO, FOS and SAL (600<sup>a</sup>, 528<sup>b</sup>, 517<sup>b</sup>, 512<sup>b</sup> and 482<sup>c</sup> μm, respectively). Crypt depth was greatest for the SYN diet, followed by SAL, CON, FOS and PRO (210<sup>a</sup>, 161<sup>b</sup>, 149<sup>c</sup>, 135<sup>d</sup>, and 126<sup>d</sup> μm, respectively). Microbial community structure was analyzed by DGGE and dietary treatment altered the microbiota as measured by differences in number of bands and similarity coefficients. Although in vitro attachment of salmonella to ileal tissues was numerically greater for the control treatment, there were no significant effects of diet on attachment. Diet had no effect on in vitro attachment of salmonella to ileal tissue. Supplementation with PRO, FOS or SYN improved apparent ileal phosphorous digestibility by at least 11% versus birds fed the CON or SAL diets. Nitrogen digestibility, however, was not affected. The SAL treatment had a negative effect on broiler performance. Diet had significant effects on intestinal morphology and microbial community structure.

**Key Words:** Broiler, Microbiota, Performance, FOS, Probiotic

**S73 Evaluation of *Salmonella enteritidis* in molting hens following administration of an experimental chlorate product (9 days) in the drinking water.** J. McReynolds<sup>\*1</sup>, L. Kubena<sup>1</sup>, J. Bryd<sup>1</sup>, R. Anderson<sup>1</sup>, S. Ricke<sup>2</sup>, D. Nisbet<sup>1</sup>, <sup>1</sup>Southern Plains Agricultural Research Center, USDA, <sup>2</sup>Texas A&M University, Department of Poultry Science.

Currently in the U.S. feed deprivation is used to induce molting and stimulate multiple egg-laying cycles in laying hens for commercial egg production. The current methodology has been shown to increase the risk of some enteric pathogens such as *Salmonella*. New strategies are needed to stimulate multiple egg-laying cycles without increasing the risk of SE. In the present investigation hens over 50 wk of age were divided into 12 groups of 11 hens each and placed in individual laying cages. Two wk prior to dietary changes, hens were placed

on an 8-h light and 16 h-dark photoperiod that continued for the 9-day experiment. All hens were challenged orally with 106 cfu of SE on the fourth day. Treatments were non-fed hens with distilled water (NFD), non-fed hens with the experimental chlorate product (ECP which provided 15mM chlorate ion concentration) water (NFECP), alfalfa diets with distilled water (ALD), and alfalfa diets with ECP water (ALECP). In the NFD hens, 67% (Log<sub>10</sub> 2.74) of the crops and 94% (Log<sub>10</sub> 5.62) of the ceca were colonized; whereas, for the NFECP hens a significant reduction to 22% (Log<sub>10</sub> 1.05) of the crops and 61% (Log<sub>10</sub> 2.44) of the ceca was observed. In the ALD hens, 61% (Log<sub>10</sub> 2.52) of the crops and 94% (Log<sub>10</sub> 4.06) of the ceca were colonized. In the ALECP hens, a highly significant reduction to 11% (Log<sub>10</sub> 1.26) of the crops and 39% (Log<sub>10</sub> 1.12) of the ceca was observed. When compared with the NFD hens, a significant reduction in SE invasion of the ovary, liver, and spleen occurred in all other treatments, except the ovary in the ALD hens. In previous reports our laboratory has shown reductions in enteric pathogens in birds consuming 15-20 g/day of alfalfa. In the present investigation alfalfa intake was lower than previous experiments, and this may have resulted in the decreased protection against SE. This data shows the ECP added to the drinking water during an induced molt either alone or in combination with an alfalfa diet significantly reduced SE. This developmental product should be considered as a potential management tool to control SE.

**Key Words:** Laying Hens, Molting, Alfalfa, Chlorate, Salmonella

**S74 Broiler response to post-placement exposure with Salmonella and Campylobacter while receiving dietary 2-Hydroxy-4-(Methylthio) Butanoic acid (HMB).** E. T. Moran, Jr.\*, O. Oyarzabal, N. S. Joseph, *Dept. of Poultry Science, Auburn University.*

Organic acids are known to diffuse through cell walls in their nondissociated form to impair viability of many micro-organisms. HMB would be non-dissociated while passing through the gastric system and capable of a broad-based microbial suppression at this time. Chicks given feeds supplemented with either HMB or methionine (M) were compared in experimentation that measured live performance and extent of infection through to 12 weeks of age. Ross X Ross 308 male chicks (1600) were distributed into 32 floor pens having fresh pine shaving litter. Corn and soybean meal feeds given 0-3, 3-6, and 6-12 weeks of age contained 0.28 vs 0.25 (0.98), 0.28 vs 0.25 (0.91), and 0.23 vs 0.20 (0.82) % of supplemental HMB vs DL-methionine to exceed M plus cysteine (TSAA) requirements, respectively. Water containing 10 log<sub>7</sub>/ml each of *S. typhimurium*, *montevideo*, *enteritidis*, *mbandaka*, and *thompson* together with five genotypes of *Campylobacter jejuni* was accessible to birds in each pen for 8 hours on day 6. These organisms had been isolated from Auburn Research Farm and passed through chicks to establish infectivity without adverse response. Repercussion on live performance and mortality immediate to exposure or anytime thereafter was not apparent. Both SAA supplements at the levels provided were similar in supporting body weight gain and occurrence of mortality, however, feed conversion was at significant advantage with birds receiving HMB through the first 6 weeks. Ceca and litter were extensively contaminated throughout experimentation, and no differences occurred between the two SAA treatments. Early improvement in feed conversion is a typical response to organic acids and suggests that complications from luminal microbes were mitigated by HMB while the mucosa endured broad-based *Salmonella* and *Campylobacter* infections.

**Key Words:** Broiler, Organic acids, Salmonella, *Campylobacter jejuni*

**S75 Gut microflora of organically grown broiler chickens differs significantly from that of conventional birds.** A. Kettunen<sup>\*1</sup>, R. Buresh<sup>2</sup>, E. Pierson<sup>3</sup>, J. Apajalahti<sup>1</sup>, <sup>1</sup>*Alimetrics*, <sup>2</sup>*Tyson Foods*, <sup>3</sup>*Danisco Animal Nutrition*.

Organic birds receive increased interest among consumers today, and, therefore, their production gets much attention. Feed and production constraints may cause difficulties in production, and increase the costs. This work was carried out to study the relationship between broiler performance and gut microflora. Organically grown and conventional broilers were analyzed for gut microflora (culture independent methods, total microbial numbers and microbial community profiles) and immunological status (intestinal IgA) at 9, 18-23, and 34-37, days of age, respectively. Performance data were obtained at the age of 50-54 days. Market age performance of conventional broilers was superior to that of organic broilers. Measured variables were combined in a multivariate analysis to capture significant system effects and interactions. A connection between microbial community variables and bird performance was obtained which suggested that the measured microbial variables were valid and contributed to performance. Compared to organic birds, ileal bacterial densities in conventional birds tended to be lower, whilst cecal bacterial densities were higher. Bacterial density in the cecum was positively related to performance. Bacterial community composition also significantly correlated with bird age and performance. The abundance of bacteria with DNA of high guanine + cytosine (G+C) content increased with age in organic, but not in conventional birds. A group of bacteria with lower G+C content correlated positively with animal performance. IgA levels in organic birds tended to be higher than in conventional birds possibly due to increased enteric pathogen challenge. These data augment our understanding of how microbial communities may be modified to obtain a healthier microbial environment, better performance, and, consequently, positive economical impact. These techniques can be applied in the design of high throughput screening programs for diet optimization.

**Key Words:** Organic, Microbial communities, Immunity, Broiler, Field data

**S76 Impact of sanitizers and line cleaners on aerobic bacteria levels in nipple drinker lines.** S. Watkins\*, J. Cornelison, M. Wilson, *University of Arkansas.*

The impact of drinking water cleaning strategies was evaluated on 4-foot miniature nipple drinker lines. The products tested were TR 100®, Citric acid and Poultry Water Treatment® at the rates recommended for drinking and line cleaning, a 6.5% and 12.5% sodium hypochlorite solutions mixed at 4 ounces/gallon stock solution and then added at a rate of 1 ounce to one gallon of water. This was compared to flushing the lines with an electrolyte mix, flushing with city water or to a control, no flush. Each treatment was replicated 6 times. Prior to treatment, the lines were filled with water that had been collected from breeder platoon drinkers. This water was blended, added to the lines and then allowed to sit for 4 days. Before the treatments were added to each line a sample of water was taken. Initial aerobic plate count (APC), pH and ORP values were determined. Then the lines were flushed with a minimum of one gallon of product. This was allowed to sit in the lines for two hours then after bleeding off another 1/2 gallon a sample was collected and the same analyses were conducted. APC values were converted to Log<sub>10</sub> prior to analysis with the GLM procedure of SAS. Initial APC counts were similar and post counts indicated that the 6.5 and 12.5% bleach solutions were the most effective in reducing the counts followed by the line cleaning rates for Poultry Water Treatment, Citric Acid and the TR 100. Flushing the lines with electrolytes and city water did not significantly reduce APC values.

**Key Words:** Water sanitizers, Poultry drinking water, Aerobic bacteria