

highly absorbable carbohydrate control. Body weight gain and feed efficiency were determined at 4, 7, and 14 days. Intestinal viscosity and cecal aerobic, enterobacteria and lactic acid bacteria counts were measured once in each period (prestarter and starter). In all experiments, mortality was low and not affected by dietary treatment. Body weight gain and feed efficiency were generally greater but not always significantly for chickens fed the PM diet through 4, 7 and 14 days posthatch ( $P < 0.05$ ). Intestinal viscosity and cecal bacteria were not significantly affected by diet. As a general trend, a positive dietary effect of PM on performance was maintained through both the prestarter and the starter period. The effect of PM was consistent throughout the experiments and proved highly satisfactory for both prestarter and starter periods. Results showed that PM appears to be as good and possibly better than the sorghum and corn employed in these studies for early chick performance. The reason for the improvements noted is not clear, but apparently is not related to intestinal viscosity or increased populations of beneficial bacteria.

**Key Words:** Prestarter diet, Grains, Pearl millet, Growth performance

**S25 Effects of  $\beta$ -Mannanase in corn-soy diets on commercial Leghorns in phase III of the second cycle.** G. Wu\*, M. Bryant, R. Voitle, D. Roland, Auburn University.

$\beta$ -Mannanase (Hemicell<sup>®</sup>) is a unique enzyme-based feed ingredient, which can hydrolyze  $\beta$ -mannan, an anti-nutritional fiber in feed. Because soybean meal contains  $\beta$ -mannan and its derivative, addition of  $\beta$ -mannanase may improve soybean-meal utilization. The purpose of this study was to evaluate the effect of  $\beta$ -mannanase on performance and profits of  $\beta$ -mannanase in commercial Leghorns fed corn-soybean meal based diets. In this experiment, three diets were formulated. The metabolizable energy content for Diet 1 (high-energy diet) was 2951 kcal/kg, which was 120 kcal/kg higher than Diet 2 (low-energy diet supplemented with  $\beta$ -mannanase) and Diet 3 (low-energy diet without  $\beta$ -mannanase). Hy-Line W-36 hens ( $n = 720$ , 98 wk old) were randomly divided into three dietary treatments (8 replicates of 15 hens per treatment). The trial lasted for 12 weeks. Overall average feed conversion in hens fed the low-energy diet supplemented with  $\beta$ -mannanase was similar to that of the high-energy diet, and both were significantly lower than the low-energy diet without  $\beta$ -mannanase ( $P < 0.01$ ).  $\beta$ -Mannanase had positive influences on egg production and egg mass of hens fed the low-energy diet. No significant differences in feed intake, egg specific gravity, egg weight, mortality, body weight,

and body weight variability (CV) were observed among three dietary treatments ( $P > 0.05$ ).  $\beta$ -Mannanase supplementation improved energy utilization of corn-soybean layer diets, and has the potential to reduce the cost of practical laying hen diets containing  $\beta$ -mannan.

**Key Words:**  $\beta$ -Mannanase, Energy, Hens

**S26 Microbial ecology shifts in the small intestine of broilers during feed withdrawal.** K. L. Thompson\*, K. M. Burkholder, J. Patterson, T. J. Applegate, Purdue University.

Broilers are withheld from feed for 8 to 24 hr prior to processing to empty the gastrointestinal tract (GIT) and reduce potential carcass contamination from GIT contents. Intestinal microbial changes during feed withdrawal (FW) have not been thoroughly defined. Two experiments (Exp) were conducted to examine the effects of increasing periods of FW on the microbial ecology in the small intestine. In two Exp, male broilers were fed corn-soy diets in floor pens. In Exp 1, 62d-old broilers were subjected to FW for 0, 8, 12, and 24hr. Eight birds were euthanized at each time point and ileal mucosa was collected. Microbial communities were determined by isolating bacterial DNA, amplifying the V3 region of 16S ribosomal DNA, and performing denaturing gradient gel electrophoresis. The microbial profiles from birds at 0hr FW had higher similarity values than those at 8 or 24hr FW ( $P < 0.05$ ), indicating that as FW time increased, uniformity of intestinal microbial populations decreased. Numbers of bands (an indicator of numbers of bacterial species present) at 0hr (9.13) were greater than those at 24hr (3.75;  $P < 0.05$ ), suggesting a reduction in microbial species and diversity as FW time increased. In Exp 2, 28d-old birds were randomly assigned to one of 3 diets containing no additive (control), 30g/ton bacitracin (Ab), or 1 lb/ton  $\text{CuSO}_4$  (Cu). At 42d of age, birds ( $n=24$ ) were subjected to 0, 10, and 24 hr FW. Ileal tissue and digesta (at 0hr FW) were collected and analyzed as in Exp. 1. Diet did not significantly alter mucosa microbiota similarities (0, 10, and 24hr of FW were 63, 37, and 52%; 50, 18, and 86%; and 32, 32, and 48% similar for the control, Ab, and Cu diets, respectively) or digesta similarities (16% for each diet). Neither FW or diet had an effect on mucosal and digesta similarities or band numbers. Data from these studies suggest that FW alters the microbial community of the intestine by decreasing similarity of the communities as FW increases, but that individual differences between birds preclude treatment differences.

**Key Words:** Antibiotic, Broiler, Feed withdrawal, Intestine, Microflora

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

**S27 Annual broiler litter production using recycled litter with and without top-dressing.** C. D. Coufal\*, P. R. Niemeyer, J. B. Carey, Texas A&M University.

Broiler producers are required to develop nutrient management plans for the disposal of litter materials from broiler grow-out facilities. Therefore, a key component of a nutrient management plan for a broiler production facility is to be able to accurately predict the amount of litter that will be produced on an annual basis. However, this type of data can be difficult to collect under large-scale commercial conditions. A long-term experiment was conducted in a controlled facility under conditions simulating commercial production to accurately access broiler litter production rates. Eighteen consecutive flocks were reared in an experimental broiler house managed as closely as possible to a commercial house. Rice hulls were used as the bedding material, and chicks and feeds were obtained from a commercial broiler integrator. In flocks 1-9, 562 broilers were reared in 4 large pens. Caked litter was removed between flocks, and the remaining litter recycled for the next flock. In flocks 10-18, the

recycled litter was split evenly into six pens. Three of these pens (420 birds) remained untreated, and three (420 birds) were top-dress with a thin layer (1-2 cm) of new litter between flocks following caked litter removal. Top-dressing of litter is used to reduce litter moisture, reduce caking and extend the useful life of litter without a complete clean-out. Cumulative litter production per kg of live marketed broiler (g/kg) was 170 g litter/kg, 79 g caked litter/kg and 249 g total litter/kg for untreated pens over all eighteen flocks. Top-dressing of litter significantly ( $P < 0.05$ ) significantly reduced caked litter production in flocks 12-18. Less caked litter resulted in significantly increased litter production in flocks 14-18. As a result, no significant difference in total litter production was observed between the untreated and top-dressed pens for flocks 11 and 13-18 on a cumulative basis. This data can easily be used by broiler producers to predict the amount of litter and caked litter that will be produced on an annual basis under these types of management practices.

**Key Words:** Broilers, Litter production, Top-dressing

**S28 Annual ammonia production from broilers measured by nitrogen mass balance.** C. D. Coufal\*, P. R. Niemeyer, J. B. Carey, *Texas A&M University*.

Many factors, such as season of the year, ambient temperature and humidity, bird health and management practices, can influence ammonia volatilization from broiler rearing facilities. Precise results are often difficult to attain from commercial facilities, particularly over long periods of time. Therefore, an experiment was conducted over a two and one-half year period to accurately access ammonia production from broilers in a controlled facility under conditions simulating commercial production. Eighteen consecutive flocks were reared in an experimental broiler house managed as closely as possible to a commercial house. Rice hulls were used as the bedding material, and chicks and feeds were obtained from a commercial broiler integrator. In flocks 1-9, 562 broilers were reared in 4 large pens. Caked litter was removed between flocks, and the remaining litter recycled for the next flock. In flocks 10-18, the recycled litter was split evenly into six pens. Three of these pens (420 birds) remained untreated, and three (420 birds) were top-dress with a thin layer of new litter between flocks following caked litter removal. Ammonia loss was calculated by the mass balance method, in which nitrogen loss was calculated as the difference between the nitrogen inputs and the nitrogen outputs. Ammonia loss can be expressed as g NH<sub>3</sub>/kg of live marketed broiler (g NH<sub>3</sub>/kg), g NH<sub>3</sub>/h-AU (1 AU=500 kg live weight) or a percentage of total nitrogen inputs. Ammonia loss in untreated pens for flocks 1-18 ranged from 4.1 to 19.7 g NH<sub>3</sub>/kg, and averaged 11.1 g NH<sub>3</sub>/kg. This corresponds to a range of 2.1 to 10.0 g NH<sub>3</sub>/h-AU, with an average of 5.6 g NH<sub>3</sub>/h-AU. Nitrogen partitioning as a percentage of inputs for untreated pens in flocks 1-18 was 15.1, 7.1, 55.4, 13.5, and 21.0% for litter, caked litter, broiler carcasses, mortalities and nitrogen loss, respectively. In flocks 10-18, ammonia loss was 10.6 g NH<sub>3</sub>/kg for untreated pens vs. 11.8 g NH<sub>3</sub>/kg for top-dressed pens when averaged for all nine flocks. Ammonia loss was significantly (P<0.05) greater for flocks reared in summertime vs. wintertime.

**Key Words:** Broilers, Ammonia, Nitrogen mass balance

**S29 Effects of drinking water acidification on turkey performance.** J. Cornelison\*, M. Wilson, C. Sartor, O. Antillion, S. Watkins, *University of Arkansas*.

A trial was conducted to explore the exact effects of water acidification in regards to weight gains, feed conversion efficiency and livability for turkey production. The treatments were a continuous pH adjustment beginning at poult placement. There were seven treatments compared to a control, Fayetteville city water, which has an average pH of 8.08. The treatments included were Poultry Water Treatment® (PWT) and Russell Citric Acid® both of which were tested at a pH of 4 and pH of 6, Dry Vin® and Acid-Sol® added to adjust the water to a pH of 6 and Ema-Sol® initially added to adjust the pH to 4. Birds received a commercial diet regime. The birds were group weighed at day 1 and then individually weighed at days 14, 28, 42, 56, 70 and 84. The feed consumption and mortality per pen were measured by phase for the determination of an adjusted feed conversion rate. At week six and twelve, six birds per treatment were sacrificed to determine the pH of the crop and gizzard. At day 14, the Acid-Sol® treated birds weighed significantly heavier and the Ema-Sol® birds weighed significantly lower than the other treatments, which were all similar including the control. When 14 day weights confirmed the Ema-Sol® treated birds were behind in production the pH of the water was adjusted to 6. Results after day 14 indicated that birds performed similarly on all treatments.

**Key Words:** Drinking water, Acidification, Turkeys

**S30 Effect of temperature during incubation and brooding on broiler chick development and growth.** N. Leksrisompong\*, P. Plumstead, H. Romero-Sanchez, J. Brake, *North Carolina State University, Department of Poultry Science*.

Two experiments were conducted to study the effects of incubation and brooding temperature on embryological development and early broiler performance. Ross 344 x Ross 308 broiler hatching eggs were set in two identical incubators. During the first 14 d incubation temperature was maintained between 37.5 and

37.7 C. After 14 d, one incubator was assigned to the HIGH (39.4-40.6 C) and one incubator to the NORMAL (37.5-38.3 C) temperature treatments. Relative humidity was maintained at 53% at all times. Egg temperatures were monitored from 15 d of incubation with a Braun Thermoscan infrared thermometer. At 18 d eggs were transferred to hatcher baskets in the same machine. Unhatched eggs were examined macroscopically at 21.5 d to determine fertility and/or stage of embryonic mortality. In both experiments, all chicks were sexed and randomly allocated to two brooding temperature regimes of 26.7-28.9 C (COOL) and 37.2-36.7 C (HOT). In Experiment 1, chicks were necropsied at hatching and 14 d to study organ development, while BW, FCR, and livability were determined at 7 and 14 d of age in both experiments. There was no interaction between brooding and incubation observed in either experiment. In Experiment 1, HIGH incubation decreased relative weights of heart, gizzard, proventriculus, and small intestine at 0 d and relative weight of the liver at 14 d. There were significant main effects for both incubation and brooding temperature with respect to broiler performance. In Experiments 1 and 2, HIGH incubation decreased BW at 0, 7, and 14 d. This effect was not affected by the brooding temperatures used. However, adjusted FCR was significantly increased by HOT brooding temperature up to 7 d in Experiment 1. Elevated incubation temperatures appear to negatively affect embryo development and early broiler performance.

**Key Words:** Incubation, Brooding, Temperature, Broiler, Organs

**S31 On farm hatching egg holding temperature for commercial broiler breeder flocks of varying ages.** S. Henderson\*<sup>1</sup>, A. Swaffer<sup>1</sup>, K. Bramwell<sup>1</sup>, S. Martin<sup>2</sup>, <sup>1</sup>*Department of Poultry Science, The University of Arkansas, <sup>2</sup>Cobb-Vantress, Inc.*

Hatching egg storage conditions have been evaluated in the past and recommendations presented to receive optimum hatchability. However, since most commercial hatcheries only have one egg storage room, it is not practical to alter storage condition for each specific flock at the hatchery. Therefore, this study was designed to determine the optimum egg storage conditions at the farm level for commercial broiler breeder flocks from four different age groups. Four commercial flocks were selected representing four age groups (25-30, 35-40, 45-50, and 55-60 wks of age). Hatching eggs were obtained from breeder farms the day of lay and prior to their placement in the existing on farm egg storage facilities. Hatching eggs were then randomly divided into five groups of 288 eggs per group and placed into egg storage chambers maintained at either 60, 65, 70, 75 or 80° F. Eggs were stored for three days and then returned to the breeder farm and placed directly on the egg transportation truck and sent to a commercial hatchery and subjected to the normal incubation and hatching process. Each treatment group for each age was replicated four times. Following egg storage and prior to their transportation, internal egg temperature, egg-shell thickness and sperm penetration values were determined for each flock. Following completion of the commercial incubation process, eggs from each group were subjected to a hatch residue breakout to evaluate hatchability, hatch of fertile and complete embryo diagnosis for each treatment group within every replicate. All data was analyzed by egg storage treatment group for each breeder age previously described. In summary, based upon this research, flock age was more of a factor affecting hatchability than the various egg storage temperatures previously described.

**Key Words:** Hatching egg storage, Hatchability, Embryo diagnosis, Broiler breeders

**S32 The impact of layer dietary threonine levels on egg yield, composition, and functionality.** P. Niemeyer\*, C. Coufal, J. Carey, *Texas A&M University*.

One hundred 42 week old Single Comb White Leghorn laying hens were housed in individual cages in an open sided laying facility with groups of 5 hens sharing access to a common feed trough. A typical layer diet containing 0.56% threonine (Thr) served as control. Three experimental diets containing 0.76%, 0.96%, and 1.16% Thr were fed to the hens for eighteen weeks. Egg samples were analyzed for egg weight, shell strength, and yolk and albumen yield, protein, and functionality. Yolk and albumen were separated, pooled by nutritional treatment, homogenized, and analyzed for protein and solids every 14 days

throughout the experiment. Yolk and albumen were separated and pooled by nutritional treatment at weeks 2, 6, 10, 14, and 18 to make three replicates each of sponge and angel food cakes. Cakes were evaluated for rapeseed displacement. Cake samples were cored, five cores per cake and subjected to double compression on an Instron Universal Testing machine for texture profile analysis. Cakes were measured for hardness, springiness, gumminess, chewiness, and cohesiveness. Whole egg weight was found to be significantly ( $p < 0.05$ ) higher in the control diet compared to the diet containing 0.96% Thr. Yolk protein was found to be significantly higher in the diet containing 1.16% Thr compared to all other diets. Sponge cake was found to be significantly harder in the diets containing 1.16% and 0.56% Thr compared to other diets. Sponge cakes containing 0.56% and 0.76% Thr were found to be springier than cakes baked from other diets. Albumen protein and angel food cake springiness were not significantly different among dietary treatments. Angel food cake from the diet containing 1.16% Thr was found to be significantly harder than all other dietary treatments. Significantly stronger shells were found among hens fed the diet containing 1.16% Thr compared to other diets. These data clearly indicate a potentially important impact of threonine nutrition of laying hens on egg component protein, functionality, and shell strength.

**Key Words:** Threonine, Egg composition, Egg functionality, Shell strength

**S33 The effect of stress on the intestinal microflora of broilers and layers.** M. Putsakum\*, J. Odhiambo, Y. Vizzier-Thaxton, J. P. Thaxton, S. Anderson, *Mississippi State University.*

There is little published research relating to the environmental factors that control the intestinal microflora of broilers and layers. This study evaluated the effects of stress on the bacterial population of the intestine. For laying hens, a total of 108 laying hens weighing 1700 - 1800 grams were randomly assigned to 3 locations: laying cages, battery cages, or floor pen. Eighteen birds from each location were randomly selected for implantation, on the back between the wings, of a mini osmotic pump administering 10 IU ACTH/day for 7 days. For control, the remaining 18 birds had pumps implanted which released sterile saline. After 7 and 14 days, bird weight and feed intake were determined. At day 14, the birds were euthanized and the entire intestine aseptically collected for analysis. A similar experiment was carried out with 184 broilers housed in research pens and implanted with mini-osmotic pumps to administer 8 IU ACTH/day for 7 days. At day 7, birds were euthanized and intestines collected for analysis. In both experiments, the samples were immediately placed in an ice bath for transportation to the lab. They were then stored at  $-20^{\circ}\text{C}$  until analysis. For analysis, samples were thawed in a cool water bath and cut into 2 parts to separate the small and large intestine for analysis. Each section was chopped and mixed with sterile tryptic soy broth. Serial dilutions were made for enumeration via standard plate counting techniques. Counts for total aerobic, anaerobic, coliform and mold CFU's were determined. The 7 day bacterial counts in the small intestine of the stressed layers were significantly higher than at 14 days and significantly higher than the controls at both times. In the large intestine the stressed birds had significantly higher counts than the controls, but not between sampling dates. In the broiler study, there was a numerical increase in the both the large and small intestine.

**Key Words:** Broiler, Layer, Intestinal microflora, Microflora

**S34 Application of acidified sodium chlorite in drinking water to control *Salmonella* spp. and *Campylobacter* spp. in commercial broilers.** P. G. H. Mohyla\*<sup>1</sup>, O. A. Oyarzabal<sup>1</sup>, S. F. Bilgili<sup>1</sup>, C. C. Warf<sup>2</sup>, G. K. Kemp<sup>2</sup>, <sup>1</sup>Department of Poultry Science, Auburn University, <sup>2</sup>Alcide Corporation.

The effect of acidified sodium chlorite (ASC), produced by the combination of sodium chlorite and different levels of citric acid (CA) or sodium acid sulfate (SAS), on the efficacy to reduce *Salmonella* and *Campylobacter* in market age broilers was studied. Eight-day old chicks were orally challenged with  $10^3$  CFU/ml of *Salmonella* spp. and  $10^5$  CFU/ml of *Campylobacter* spp. On the 29<sup>th</sup> day of age, chickens were divided in nine treatments: three concentrations of SC (0, 300, 600 ppm) with regular water or water acidified to  $\text{pH } 2.6 \pm 0.1$  with either CA or SAS. Treatment solutions were freshly mixed and replaced every six hours during the 12-hour light period of each day, and throughout the experiment. Treatments were applied for five consecutive days. At the end of

the experiment, body weight, water consumption, weight gain/loss and appearance of excreta were measured, and birds euthanized to collect their digestive tracts (DT). Each DT was split into 3 segments, upper (crop to gizzard), middle (duodenum to cecal junction) and lower (ceca to cloaca), and analyzed for *Salmonella* and *Campylobacter*. No significant changes were found in body weight, weight gain and appearance of excreta. Administering ASC at levels of 600 ppm significantly suppressed water intake. There was no significant difference between the acidifiers for water consumption, *Salmonella* or *Campylobacter* counts. However, ASC at 600 ppm significantly reduced *Salmonella* in the upper gastrointestinal tract. *Campylobacter* counts were not affected by ASC treatments.

**Key Words:** Acidified sodium chlorite, *Campylobacter*, *Salmonella*

**S35 Scheduled delivery of commercial broiler flocks to reduce cross-contamination with *Campylobacter* during processing.** L. P. V. Potturi\*, O. A. Oyarzabal, *Department of Poultry Science, Auburn University.*

The objective of our study was to determine the *Campylobacter* colonization status of flocks before slaughter to develop a scheduling system where cleaner flocks would be processed earlier on the sampling day to avoid cross-contamination. One week before processing, three flocks scheduled to be processed on the same day at the same commercial processing plant were tested for the level of *Campylobacter* colonization. Fecal samples from 10 birds per flock were collected in 9-ml Preston broth tubes. Samples were subjected to serial dilutions, plated onto modified Campy-Cefex (mCC) and modified charcoal cefoperazone deoxycholate agar (mCCDA). Plates were incubated at  $42^{\circ}\text{C}$  for 48 h and *Campylobacter* colonies enumerated. On the processing day, each flock was sampled for *Campylobacter* spp. with the carcass rinse technique. Fifteen carcass rinse samples were collected from each flock, five before the chiller and 10 after the chiller, and plated onto mCC and mCCDA agars for direct enumeration of *Campylobacter* colonies. Samples were also enriched in Bolton broth. The first two experiments showed that processing flocks with the highest *Campylobacter* incidence first cross-contaminated cleaner flocks. The third experiment showed that cleaner flocks processed first were negative for *Campylobacter* throughout processing. These studies suggest that processing *Campylobacter*-free flocks first helps maintain a low level of *Campylobacter* contamination in the final food product.

**Key Words:** *Campylobacter*, Cross-contamination, Poultry, Processing

**S36 Effect of nipple drinkers and a dietary probiotic on the performance of commercial large white turkeys.** S. M. Russell\*<sup>1</sup>, J. L. Grimes<sup>1</sup>, A. G. Gernat<sup>2</sup>, J. L. Godwin<sup>1</sup>, <sup>1</sup>NC State University, <sup>2</sup>Escuela Agrícola Panamericana, El Zamorano.

The use of nipple drinkers is of interest to the turkey industry. There is public concern about the use of antibiotics for poultry creating an interest in alternatives such as probiotics. PrimaLac® (Star Labs, Clarksdale, MO) is a direct-fed microbial that contains viable *Lactobacillus/Streptococcus* sp. Our objective was to test the efficacy of nipple drinkers & PrimaLac® on turkey performance. A 2 by 6 factorial was used (6 drinker types & 2 feed treatments): 1) Plasson Minibell (T<sub>1</sub>), 2) Plasson Easy Start (T<sub>2</sub>), 3) Lubing Traditional (T<sub>3</sub>), 4) Lubing Easy Line (T<sub>4</sub>), 5) ValCo Turkey (T<sub>5</sub>), & 6) Ziggity, BigZ Activator (T<sub>6</sub>). Typical turkey diets were formulated with/without PrimaLac®. BUTA Large White male poults (18/pen) were placed in 48 pens (8 pens/treatment) on d of hatch & reared to 15 wk. Feed consumption (by pen) & BW were determined at 3, 5-8, 10, 12, & 15 wk. Feed conversion (FC) was calculated. Data were analyzed using the GLM procedure of SAS. LS Means was used to separate treatment means ( $P < 0.05$ ). There were no feed by drinker interactions. At 6 wk, BW of the birds on T<sub>2</sub>-T<sub>6</sub> were less than those on T<sub>1</sub>. T<sub>1</sub> & T<sub>3</sub> drinkers were changed to the Plasson Turkey Drinker at 6 wk, T<sub>6</sub> drinkers at 7 wk, & T<sub>2</sub> drinkers at 8 wk. T<sub>2</sub> & T<sub>4</sub> drinkers were used until market age. Differences in BW due to drinker type remained through 10 wk. At 12 wk, BW of T<sub>2</sub>, T<sub>4</sub>, & T<sub>6</sub> birds were not significantly different from those reared on T<sub>1</sub>. At 15 wk, BW of birds reared on T<sub>3</sub> was less than BW of birds reared on T<sub>1</sub> with BW for T<sub>5</sub> intermediate. At 15 wk, there were no differences in FC among drinker treatments. At 6 wk, litter moisture beneath the drinkers was significantly less for T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>, & T<sub>6</sub> compared to T<sub>1</sub>. FC was significantly improved for birds fed PrimaLac® compared

to birds fed control feed from 3 to 15 wk. BW was significantly greater for birds fed PrimaLac® through 12 wk but not at 15 wk. We conclude that some nipple drinker systems are effective & that some probiotics can be viable alternative candidates to dietary antibiotics for rearing turkeys.

**Key Words:** Nipple drinkers, Probiotic, Turkey, Growth, Feed conversion

**S37 Acid resistance properties of fluoroquinolone-resistant *Campylobacter jejuni*.** B. W. Shaheen<sup>\*1</sup>, T. Barrett<sup>2</sup>, O. A. Oyarzabal<sup>1</sup>, <sup>1</sup>Auburn University, <sup>2</sup>Centers for Disease Control and Prevention.

The acid resistance of early exponential and stationary phase cells of *Campylobacter* was evaluated. Ten fluoroquinolone-resistant *C. jejuni*, two *C. jejuni* (ATCC 33560 and a chicken isolate), and two *C. coli* (ATCC 43473 and a chicken isolate) strains were grown at 42°C under microaerophilia on modified Campy-Cefex agar. *Campylobacter* colonies were transferred to tryptic soy broth (TSB, pH 7), grown to the appropriate phase growth under microaerophilic conditions, and transferred to TSB pH 5 for 4 h before transferring to TSB pH 4 for the final challenge. Survivals were determined at 2 h after final challenge by using viable cell count on modified charcoal cefoperazone deoxycholate agar (mCCDA). Results confirm that *Campylobacter* is sensitive to low pH, with no strain surviving at pH 4 for 4 h. At pH 5, a quick decline in the cell population was observed with no cell surviving at 24 h. In fact, cells exposed to TSB pH 5 exhibited a lower survival at pH 4 than non-adapted controls exposed to pH 7. Although stationary phase cells exposed to pH 5 had an increased survival compared to control cells, the results showed no significant differences between the two groups. Exponential and stationary phase cells of *C. coli* were extremely sensitive to pH changes, with all cells dying quickly at TBS pH 4. These results suggest that the fluoroquinolone-resistant *C. jejuni* strains do not exhibit any acid adaptation to mild acidic conditions in early exponential or stationary phase cells.

**Key Words:** *Campylobacter*, Acid, Adaptation, Stress

**S38 Evaluation of a *Lactobacillus*-based probiotic and a prebiotic on turkey performance under field conditions.** A. Torres-Rodriguez<sup>\*1</sup>, S. E. Higgins<sup>1</sup>, J. L. S. Vicente<sup>1</sup>, A. D. Wolfenden<sup>1</sup>, L. R. Bielke<sup>1</sup>, C. M. Pixley<sup>1</sup>, N. Neighbor<sup>1</sup>, G. Gaona<sup>2</sup>, X. Hernandez<sup>1</sup>, G. Tellez<sup>1</sup>, B. M. Hargis<sup>1</sup>, <sup>1</sup>Poultry Science Department, University of Arkansas, <sup>2</sup>Depto. Producción Animal: Aves, UNAM.

The effect of a commercially available *Lactobacillus*-based probiotic (FM-B11, IVS/Wynco), with or without dietary lactose (0.1% from whey permeate; WP), was evaluated for effects on turkey performance under commercial conditions. Two field trials were conducted on separate farms. Treatments consisted on the probiotic administered either in drinking water (DW) or in feed, along with WP. In experiments 1 and 2, 100 poults of 10- or 7-days of age respectively, were weighted to calculate descriptive statistics. Twenty poults with body weight within the mean  $\pm$  1 stdev of the samples were randomly assigned to wire-panel pens (1.46 m<sup>2</sup>, four replicates per trt) with individual drinkers and feeders. Treatments in the DW were administered for three consecutive days at initiation of experiment. In experiment 1, treatments were: 1. control; 2. FM-B11 in DW; 3. WP in feed + FM-B11 in DW; and 4. WP + FM-B11 in feed. In experiment two, treatments were: 1. control; 2. WP; 3. FM-B11 in DW + WP for two weeks; 4. FM-B11 in DW + WP, or 5. FM-B11 in feed + WP. Poults were leg-banded and released to the rest of the flock at the end of the experiment (26 and 28 days for Exp. 1 and 2, respectively). The groups treated with the combination of FM-B11 and WP, and WP alone were heavier ( $p < 0.05$ ) by 15.5 and 17.5 % as compared to the control groups for experiment 1 and 2 respectively. Market body weight of turkeys from experiment 1 was higher ( $p < 0.05$ ) with the combination of FM-B11 and WP ( $p < 0.05$ ) than the control group by up to 436 g. Turkeys given only FM-B11 tended to be significantly heavier than the controls ( $p = 0.08$ ). The combination of FM-B11 and WP increased body weight of poults during the experiment and the advantage was further increased during the grow-out period when WP was discontinued at 26 or 28 days.

**Key Words:** Probiotics, Prebiotics, Turkey, Performance

**S39 Effect of dietary protein level on performance during live oocyst coccidial vaccination and subsequent clinical coccidial challenge in broilers.** J. T. Lee<sup>\*1</sup>, N. Eckert<sup>1</sup>, K. A. Ameiss<sup>1</sup>, A. Barri<sup>1</sup>, S. M. Stevens<sup>1</sup>, H. D. Danforth<sup>2</sup>, A. P. McElroy<sup>3</sup>, D. Hyatt<sup>1</sup>, D. J. Caldwell<sup>1</sup>, <sup>1</sup>Texas A&M University, <sup>2</sup>USDA-ARS, <sup>3</sup>Virginia Tech.

Two pen studies were conducted to evaluate the effect of dietary protein level on broiler performance during vaccination with Coccivac®-B and subsequent field strain *Eimeria* challenge. Experiment 1 evaluated body weight gain and feed conversion of vaccinated broilers fed one of five corn-soy rations varying specifically for dietary protein level (20, 21, 22, 23, and 24%) during a 21 day grow-out in floor pens. Collected data revealed incremental increases ( $P < 0.05$ ) in body weights for broilers at 21 days relative to increased dietary protein level. Feed conversion during the 21 day period followed a similar trend, with 20% and 24% dietary protein levels resulting in the highest and lowest ( $P < 0.05$ ) calculated feed conversion values, respectively. Experiment 2 consisted of feeding three dietary protein levels (20, 22, and 24%) to vaccinated or non-vaccinated broilers, with or without clinical field strain *Eimeria* challenge at three weeks post-vaccination. Body weights to day 21 followed the trend of increase ( $P < 0.05$ ) observed in Experiment 1 relative to increased protein level. Non-vaccinated broilers were heavier ( $P < 0.05$ ) than vaccinated broilers. Dietary protein affected feed conversion similar to Experiment 1, as feed conversion in animals fed 24% protein were the lowest ( $P < 0.05$ ) calculated. Vaccinated broilers had an increased ( $P < 0.05$ ) feed conversion value when compared to non-vaccinated broilers, except at the 22% protein level ( $P > 0.05$ ). An effect of dietary protein on vaccination was also related to enhanced performance during challenge, as experimental animals fed a 22% or 24% dietary protein level performed better as compared to animals fed a 20% protein level. Interestingly, many observations from Experiment 2 suggest feeding a 22% dietary protein level was as effective as feeding 24% dietary protein in improving performance during coccidial vaccination and challenge.

**Key Words:** Vaccination, Broiler, Protein, *Eimeria*, Feed conversion

**S40 Evaluation of stocking density on eating and drinking behavior of broilers.** T. Beilmann<sup>\*1</sup>, J. Thaxton<sup>1</sup>, W. Dozier, III<sup>2</sup>, W. Roush<sup>2</sup>, D. Miles<sup>3</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.

Stocking density is reported to adversely affect several behaviors of broilers. However, the relationship of density to eating and drinking behavior in broilers is not totally understood. Thus, the purpose of this study was to determine if stocking density affects the number of eating and drinking events per bird per day. Also, number of eating and drinking events in the morning, afternoon and evening were determined. Cameras were mounted over each of two pens which possessed stocking 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 on a projected final BW of 3.27kg at 49d. Cameras were concealed and birds were not aware of the presence of these cameras. Cameras were operated by a computer and in-time recordings were made from 0600 to 0615, 1400 to 1415 and 2200 to 2215 daily from d35 through d49. Data were pooled over days, since a main effect for days was not found. Correlation coefficients ( $r^2$ ) of -0.26 ( $P < 0.00$ ) and -0.22 ( $P < 0.00$ ) were found, respectively, for increasing density and number of eating and drinking events per bird. Additionally,  $r^2$  of -0.26 ( $P < 0.00$ ) and -0.20 ( $P < 0.00$ ) were found for time of day and number of eating and drinking events per bird. As the day progressed, the number of both eating and drinking events per bird decreased.

**Key Words:** Animal behavior, Broiler, Feed consumption, Stocking density, Water consumption