

**63 Effects of egg size and eggshell conductance on poult livability and body weight gain.** S. Funderbunk<sup>\*1</sup>, V. Christensen<sup>1</sup>, J. Grimes<sup>1</sup>, M. Wineland<sup>1</sup>, M. Mann<sup>1</sup>, R. Neely<sup>1</sup>, D. Ort<sup>1</sup>, D. Rives<sup>2</sup>, and G. Campbell<sup>2</sup>, <sup>1</sup>North Carolina State University, Raleigh, <sup>2</sup>Prestage Farms Inc., Clinton, North Carolina.

A high rate of poult mortality can occur within 10 days of placement. A better understanding of how egg size and eggshell conductance (G) affect the livability of a poult is needed. The objective of this study was to determine the effects of egg size and G on the livability of commercial turkey poults. An equal number of eggs from an induced molted flock (large eggs) and from a first cycle flock (small eggs) were weighed, numbered, set and incubated under standard operating procedures in a commercial turkey hatchery. All eggs were reweighed at d25 (transfer) and G (or moisture loss) was calculated. The eggs were then divided and sorted into 3 groups: high, average, and low G. At hatch poults were marked for identification according to G group and flock. The poults were then

processed and sexed. Thirty poults from each group and sex were then randomly selected and individually weighed on the day of hatch (d1) and again at d4 of the brooding period. Poult mortality for each group and sex were also monitored through d8 of brooding. Data were analyzed using the GLM procedure of SAS. Percent mortality was calculated. There was a flock by G interaction for d1 body weights and flock by sex interaction for d4 body weights. The best quality poult came from a large egg with a low G and conversely poor quality poults came from small eggs with low G. The percent mortality was lower for the better quality poults. At d4 tom poults weighed more than hen poults. Within the two flocks each of the low G groups weighed more at hatch than the other G groups. This could be due to the amount of residual yolk that is present in the poult and therefore could have affected the livability of that poult. It is concluded that poult quality may be a function of both egg weight and G.

**Key Words:** Incubation, Poult, Egg size

## Environment and Management: Broilers I

**64 The effect of holding time without water on broiler performance, yolk sac retention and gut integrity.** B. D. Fairchild<sup>\*1</sup>, J. M. Mauldin<sup>1</sup>, J. K. Northcutt<sup>2</sup>, M. B. Cole<sup>3</sup>, M. D. Darby<sup>3</sup>, and R. J. Buhr<sup>2</sup>, <sup>1</sup>University of Georgia, Athens, <sup>2</sup>USDA Russell Research Center, Athens, Georgia, <sup>3</sup>Cole Services, Stockbridge, Georgia.

Providing nutrients to chicks as soon as possible after hatching can influence chick growth and development. Using a device designed to deliver water to chicks in baskets at the hatchery, after removal from the hatcher, the effect of duration of holding time without water was evaluated on broiler performance, unabsorbed yolk sacs and intestine tension strength. Two trials were conducted utilizing 1,200 Cobb 500 male broilers. In Trial 1, chicks were divided into two treatment groups: water or no water, and both held for 24 h before being placed into floor pens. Each treatment group was distributed into eight pens. Body weights and feed consumption, and daily mortality were recorded weekly. At 6-wk-of-age broilers were processed through defeathering but prior to evisceration, the New York dressed carcasses were opened and the presence or absence of an unabsorbed yolk sac was determined. Intestinal strength (maximum load) in the region of the yolk stalk was evaluated on three intestines with and without unabsorbed yolk sac per pen (6 per treatment). In Trial 2, chicks were held for either 24 or 48 h with or without water prior to placement. At placement, each treatment group was distributed in 6 pens and measurements taken were the same as in Trial 1. In both trials, body weights at placement were greater for chicks provided water during the holding period. However, no differences were observed in final body weight, feed consumption, or mortality due to treatment. In Trial 1, the incidence of unabsorbed yolk sacs was 15% for chicks that were provided water and 19% in control chicks. In Trial 2, the incidence of unabsorbed yolk sacs was 28% for chicks that were provided water and 23% in control chicks. No differences were detected in intestine strength. The provision of water during the holding period prior to chick placement did not influence broiler performance, intestinal strength, or the incidence of unabsorbed yolk sacs. These data suggest that the presence of unabsorbed yolk sacs at processing age does not affect intestine strength and therefore would not have a greater tendency to tear during evisceration.

**Key Words:** Broilers, Water, Unabsorbed yolk

**65 Evaluation of lactose on clinical intestinal lesions in poultry with Necrotic Enteritis.** J. McReynolds<sup>\*</sup>, J. Byrd, L. Kubena, and D. Nisbet, USDA-ARS-SPARC, College Station, Texas.

In the commercial poultry industry there are many management tools used to control enteric pathogens including antibiotics, vaccines, and competitive exclusion cultures. Growth promoting antibiotics (GPA) have been used in the poultry industry, to target Gram-positive organisms which are associated with lower levels of performance and health. One target organism controlled with GPA is *Clostridium perfringens* (CP), the etiologic agent of Necrotic Enteritis (NE). Due to increasing consumer demands to remove GPA from the market,

our laboratory is currently evaluating the effects of dietary lactose on the disease condition of NE. Birds were administered CP ( $10^7$  cfu / mL) daily via oral gavage for three consecutive days starting on day seventeen. In Exp. 1, broilers were fed a control, 2.5% lactose, or 5% lactose diet from day-of-hatch until termination of the experiment. When evaluating the intestinal lesions associated with NE, birds fed 2.5% lactose had significantly lower ( $P < 0.05$ ) lesion scores of .70 compared to the control with a mean lesion score of 1.55 on a scale of 0-4. In Exp. 2, day-of-hatch broilers were fed a control, or 2.5% lactose diet. Broilers in the 2.5% lactose treatment group had a significant reduction ( $P < 0.05$ ) in intestinal lesion scores with a mean of 1.26 compared to the control with a mean lesion score of 1.80. These experiments suggest that lactose could be used as a potential alternative to GPA to help control this costly disease.

**Key Words:** Necrotic enteritis, *Clostridium perfringens*, Lactose

**66 Evaluation of lactose on the gastrointestinal microbial ecology in poultry with necrotic enteritis.** J. A. Byrd<sup>\*</sup>, J. L. McReynolds, L. F. Kubena, and D. J. Nisbet, USDA/ARS/SPARC, College Station, Texas.

*Clostridium perfringens* is the etiologic agent of Necrotic enteritis and is normally found in the soil and the intestines of healthy poultry. The incidence of Necrotic enteritis has increased in countries that have stopped using antibiotic growth promoters. The mechanisms of colonization of *Clostridium spp.* and the factors involved in onset of Necrotic enteritis are not fully understood. Previously, our laboratory has demonstrated that lactose could reduce *Salmonella* and *Clostridium spp.* in ceca of poultry. In the present investigation our working hypothesis is that dietary lactose will reduce the clinical signs of Necrotic enteritis and could be used as an alternative to antibiotics. In the present experiment, we evaluated the microbial ecology associated with Necrotic enteritis in the gastrointestinal system of birds being fed dietary lactose. Day-of-hatch broilers were assigned to one of the following groups: negative control, 2.5%, 4.0%, dietary lactose; dietary lactose was fed from day one until termination of the experiment. Experimental animals were euthanized and the gastrointestinal contents were evaluated at 7, 14, and 21 d of age for *Clostridium*, *E. coli*, *Enterococcus* and *Lactobacilli*. By d 14, broilers demonstrating clinical signs for Necrotic enteritis had significant decreases ( $P < 0.05$ ) in *Enterococcus* populations 3.77 and 4.15  $\text{Log}_{10}$  at both concentrations of lactose 2.5%, and 4.0% respectively as compared to the controls 5.93  $\text{Log}_{10}$ . At day 21, broilers fed 2.5% lactose had significant increases in *Lactobacillus* populations (8.31  $\text{Log}_{10}$ ) as compared to the control (6.82  $\text{Log}_{10}$ ). Although there were no significant bacterial predictors in this model, lactose in the diet did significantly reduce the clinical infection of birds. The results of the present study suggest that the incorporation of lactose into the broiler diet may reduce the signs associated with Necrotic enteritis.

**Key Words:** *Clostridium perfringens*, Necrotic enteritis, *Lactobacillus*

**67 The effect of ascorbic acid on the intestinal microflora of stressed broilers.** M. Putsakum\*, Y. Vizzier Thaxton, J. P. Thaxton, and S. Anderson, *Mississippi State University, Mississippi State.*

This study evaluated the effects of feeding ascorbic acid (AA) on the intestinal population of bacteria in stressed broilers. Two hundred and forty day old chicks were randomly assigned to 6 different treatments and placed in 24 pens (10 birds per pen). There were 3 feeding regimes, 1) basal diet, 2) basal diet with 250 ppm AA from day 0 to the end, and 3) basal diet with 250 ppm AA beginning at day 29. At 30 days of age, birds in one set of pens were implanted with a mini osmotic pump administering 8 IU ACTH/day for 7 days. At day 7 and day 21 after pump insertion, birds were euthanized and intestines collected for analysis. The samples were immediately placed in an ice bath for transportation to the lab. They were then stored at -20C until analysis. For analysis, samples were thawed in a cool water bath and cut into 3 parts to separate the small intestine, large intestine and cecal pouches 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 CFUs were determined. In the small intestine, the microbial populations were not significantly different between non-stressed birds (no ACTH) and stressed birds (ACTH) in all feeding regimes, and for both days. In the large intestine, the mold and yeast count was significantly different ( $P < .05$ ) between day 7 and day 21 in stressed birds fed basal diet whereas the microbial populations of the other groups were not significantly different ( $P < .05$ ) both in day 7 and day 21. In cecal pouches, the microbial populations were not significantly different between non stressed birds and stressed birds in all feeding regimes while the microbial populations between day 7 and day 21 were significantly different ( $P < .05$ ) in all feeding regimes. From this study, ascorbic acid had no effect on the intestinal microbial population of stressed birds.

**Key Words:** Ascorbic acid, Intestinal microflora, Stress

**68 Effect of glutamine supplementation on intestinal levels of *Salmonella* in broiler chicks.** J. W. J. Bowers\*, Y. O. Fasina, and S. R. McKee, *Auburn University, Auburn, Alabama.*

Consumption of Salmonella-contaminated poultry products (meat and eggs) is the second leading cause of food-borne illness in United States. In young poultry, attachment of Salmonella to intestinal epithelial cells results in inflammation of intestinal mucosa and development of intestinal lesions. Glutamine is an amino acid that maintains intestinal mucosa structure and function, and stimulates intestinal immune activities that culminate in increasing host resistance to pathogens. Therefore, we hypothesized that inclusion of glutamine at a 1% level of broiler starter diet will reduce Salmonella colonization in the intestine of broiler chicks. An experiment was conducted to examine the efficacy of glutamine in reducing intestinal *Salmonella typhimurium* (ST) colonization in broiler chicks. Day-old Salmonella-free chicks (126) were obtained from a commercial hatchery and randomly allocated to 3 treatments; treatment 1 (control, CN) with no glutamine and no ST challenge for chicks; treatment 2 (ST) with no glutamine and with ST challenge; treatment 3 (GST) with 1 % glutamine addition to diet and ST challenge for chicks. Each treatment consisted of 3 replicate pens, with each pen containing 14 chicks. On day 3 of the experiment, chicks in ST and GST were challenged by oral gavage with *Salmonella typhimurium* (Nalidixic acid resistant) inoculum containing  $10^6$  CFU/mL. On days 7 (36 chicks) and 14 (36 chicks) of experiment, performance parameters of chicks (weight gain, feed intake, and feed conversion (FC)) were evaluated and the intestine of chicks were cultured to enumerate Salmonella levels. At the end of experiment (day 14), chicks in the GST treatment had the poorest FC ( $P < 0.05$ ). In addition, intestinal Salmonella levels were highest ( $P < 0.05$ ) for GST on day 7 and at least similar to Salmonella levels in the ST treatment on day 14. We concluded that glutamine supplementation at 1% was not effective in reducing intestinal Salmonella levels in young chicks.

**Key Words:** Glutamine, Salmonella, Broiler chicks

**69 Genotypes, serotypes and antibiotic resistance profiles of *Salmonella* isolated from commercial North Carolina turkey farms.** F. Santos\*, D. D'Souza, L. Jaykus, P. Ferket, and B. Sheldon, *North Carolina State University, Raleigh.*

Bacterial typing methods such as serotyping, pulsed-field gel electrophoresis (PFGE), and antibiotic resistance patterns (AbR) have been used in epidemiological investigations to elucidate the origin and mode of transmission of pathogens. Once the route of transmission is identified, control measures are implemented to avoid future outbreaks. The objective of this study was to determine the serotypes, genotypes and AbR patterns of 42 *Salmonella* isolates recovered from either fecal or litter samples of 12 commercial turkey farms across two seasons (summer, winter) and two ages (3, 19 wk). Isolates were serotyped based on the Kauffmann-White Scheme. Genotyping was done by restriction digestion of chromosomal DNA (*Xba*I) and subsequent PFGE, and AbR was determined by Sensititre susceptibility plates. Serotype Kentucky was the most prevalent serotype (26%), followed by Senftenberg (19%), Muenster (17%), Mbandaka (10%), Javiana (7%), Hadar (5%), Heidelberg (5%), 8,(20):nonmotile (5%), Agona (2%), Infantis (2%) and 4,12:r:- (2%). Serovar Kentucky, Heidelberg, Hadar and 8,(20):nonmotile were only isolated from the 19-wk bird samples, whereas Senftenberg and Muenster were only isolated from young birds. Isolates within any one serotype showed minor PFGE banding pattern differences, but dendrogram analysis indicated that sequence variability between serotypes was more significant than within serotypes. Isolates were resistant to tetracycline (86%), sulfisoxazole (71%), streptomycin (64%), gentamicin (41%), ampicillin (36%), kanamycin (26%), sulfamethoxazole trimethoprim (7%), nalidixic acid (5%), ceftiofur (2%) and ceftiofur (2%). One isolate (Muenster) was resistant to 9 antibiotics, the others were resistant to 6 (17%), 5 (12%), 4 (10%), 3 (21%), 2 (24%) and 1 (10%) antibiotics. Only 2 isolates (5%) were susceptible to all drugs tested. AbR patterns were affected by age. On average, strains recovered from young birds were resistant to >4 drugs compared to <3 in older birds ( $P < .05$ ). This study showed that *Salmonella* serotypes, genotypes and AbR patterns were affected by bird age but not by season or farm.

**Key Words:** *Salmonella*, Turkey, Typing methods

**70 Impact of alternative broiler genotype and production system on growth performance and carcass yield.** A. Fanatico\*, P. Pillai, C. Owens, and J. Emmert, *University of Arkansas, Fayetteville.*

Consumer interest in natural and organic poultry is growing. An experiment was conducted to assess the impact of alternative genotype and production system on growth performance and carcass yield. A slow-growing genotype (S) and a commercial fast-growing genotype (F) (all females) were raised for 91 and 63 days, respectively. The placement dates were staggered in order to achieve a similar final body weight and each genotype was processed on the same day. Each genotype was assigned to four pens of 20 birds each and raised in indoor floor pens in a naturally ventilated facility. Each genotype was also assigned to four floor pens in a small portable facility with outdoor access (during daylight hours). The F birds were provided with a 3-phase diet and the S birds were provided with a 4-phase diet. The feeds were formulated to be low in energy and protein for a slower rate of production as in the French Label Rouge program. Birds were commercially processed. The F birds gained more weight than the S birds ( $P < 0.05$ ) even though they were placed 4 weeks later. The outdoor birds had a higher feed intake than indoor ( $P < 0.05$ ), and consequently a poorer feed efficiency ( $P < 0.05$ ). The F birds had a higher breast yield ( $P < 0.05$ ), while the S birds had a higher wing and leg yield ( $P < 0.05$ ) as a percent of body weight. Production system had less of an effect, although the indoor birds had a higher wing yield than birds with outdoor access ( $P < 0.05$ ). These data indicate differences among genotypes and provide information about the efficiency for alternative poultry systems.

**Key Words:** Broiler, Organic, Free-range

**71 Essential oil blends and *Eimeria* spp. vaccination and/or infection over microbial uricase activity in ileal and cecal contents of broilers.** J. Edwards<sup>1</sup>, E. O. Oviedo-Rondón<sup>\*1,2</sup>, S. Clemente-Hernández<sup>1,3</sup>, and B. A. Clack<sup>1</sup>, <sup>1</sup>Stephen F. Austin State University, Nacogdoches, Texas, <sup>2</sup>North Carolina State University, Raleigh, <sup>3</sup>Universidad Autónoma de Chihuahua, Chihuahua, México, Chihuahua, México.

Methods to reduce microbial uricase in poultry manure are important to decrease NH<sub>3</sub> volatilization. The objectives of this trial were to evaluate the potential effects of one specific essential oil (EO) blend to reduce microbial uricase activity (MUA) in digesta contents of coccidia vaccinated and non-vaccinated broilers, measure the impact of coccidia challenge, and observe possible differences in MUA between ileal and cecal contents. One trial was conducted in Petersime brooding units with 288 Cobb chickens distributed in 48 cages. Six treatments were evaluated. All chickens were fed with a starter diet until 13 d of age, and a grower diet from 13 to 26 d of age. The non cocci-vaccinated treatments correspond to two control treatments, Uninfected-Unmedicated (UU) and Unmedicated-Infected, and treatments with the following feed additives (FA) combinations: BMD<sup>®</sup>+Coban<sup>®</sup> and Crina<sup>®</sup> POULTRY, Cocci-vaccinated groups received Advent<sup>®</sup> at 1 d of age, and were fed diets that contained no-FA or Crina<sup>®</sup> POULTRY. All chickens but those in UU were challenged at 19 d of age. Ileal and cecal contents were collected from 12 birds per treatment just before and 7 d after mixed oocyst *Eimeria* spp. challenge. Samples were analyzed with Amplex<sup>®</sup> Red/Uric Acid/Uricase assay kit and data measured in Uricase mU/mL. Data was analyzed as a completely randomized design with orthogonal contrasts, and Tukey's test used for mean separation. Significant (P<0.01) effects of treatments were observed in the MUA. No significant (P>0.05) differences in MUA were observed between samples obtained from ileal or cecal contents. A significant two-fold increment was observed in MUA (4.16 vs 9.03) between UU and UI. In the same way, samples after challenge had significantly (P<0.05) higher (7.28) MUA than the pre-challenge samples (5.77). EO or cocci-vaccination did not cause significant changes in MUA compare to control treatments. We concluded that mixed *Eimeria* challenge can increase intestinal MUA, this specific EO blend does not affect MUA, and either ileal or cecal samples can be used to evaluate MUA in broilers.

**Key Words:** Microbial uricase activity, Essential oils, Coccidia

**72 Incorporation of antibiotic residues within different sections of breast muscle tissues of broiler chickens.** I. Reyes-Herrera<sup>\*</sup>, K. Cole, P. J. Blore, and D. J. Donoghue, University of Arkansas, Fayetteville.

The United States Department of Agriculture (USDA) monitors edible poultry tissues for veterinary drug residues to ensure the safety of our food supply. The USDA follows the requirements of the Code of Federal Regulations, which does not specify which type of muscle tissue to test. This may cause a problem because some muscle tissues may incorporate different residue concentrations and not accurately represent any safety concerns. In previous studies, we reported that breast muscle had higher residue concentrations of the antibiotic enrofloxacin when compared to thigh muscle. As an extension of that finding, this pharmacokinetic study was conducted to determine any differences in antibiotic residues concentrations in different sections of breast muscle from broiler chickens. One hundred and sixty five, 5 wk-old chickens were dosed with the FDA approved dose of enrofloxacin (Baytril<sup>®</sup>) in drinking water. The 4 treatment groups were: 25 ppm/3d, 25 ppm/7d, 50 ppm/3d or 50 ppm/7d. Five chickens from each treatment group were randomly selected and breast fillets were collected prior to dosing (controls n=5), during dosing (n=5/group/d) and for a 3-d withdrawal period (n=5/group/d). Each breast fillet was measured and divided in four sections (upper right UR, upper left UL, lower right LR and lower left LL). Each section was individually prepared and evaluated with a quantitative antibiotic bioassay. Results indicated no significant differences in the distribution of the enrofloxacin residues between breast sections within treatment groups (P>.05). The overall concentrations detected during the dosing period for all 4 treatment groups were: UL=332 ±145 ppb, UR=328±128 ppb, LL=324±133 ppb and LR=321±126 ppb. Based on these results, we concluded that, at least in the case of enrofloxacin, antibiotic residues are evenly distributed in all four breast sections, and evaluations for monitoring procedures can be performed in any section of the breast.

**Key Words:** Antibiotic residues, Muscle, Chicken

**73 Recovery of *Campylobacter jejuni* from broiler house samples during four consecutive flocks: Isolate distribution.** B. McCrea<sup>\*</sup>, K. Macklin, R. Norton, J. Hess, and S. Bilgili, Auburn University, Auburn, Alabama.

*Campylobacter jejuni* is frequently found in broilers yet research into reservoirs in the house environment has yet to elucidate a consistent source. Processing plants often produce product that carries the bacteria despite control measures. In the interest of identifying environmental reservoirs for this bacterium on the farm, this study was undertaken to follow *Campylobacter* from chick placement day through the processing plant. Two commercial broiler farms, each with four houses, were monitored for four successive flocks. Samples on the farm were taken on chick placement day, at 3, 5 weeks of age, and on processing day. On the day of processing, in addition to the environmental samples, birds were followed through the processing plant. At the plant, transport crates were swabbed and carcass rinses were taken before the chiller, immediately after the chiller, and after the antimicrobial dip.

Those samples that yielded characteristic results via traditional biochemical tests were then placed in an automated ribotyping system for subtyping. *Campylobacter* was never recovered from samples taken on chick placement day for the duration of the study. There was 55.8% genetic similarity between all *C. jejuni* isolates (n=105). The majority of identifiable isolates were from one farm with the second farm yielding only two unique isolates. A total of 9 different *C. jejuni* strains and were recovered with 88.6% of isolates hailing from just 3 strains. Over 55% of isolates were dominated by a single strain, which was recovered in cecal droppings, drag swabs, surgical shoe covers, transport crates, and pre-chiller carcass rinses. Cecal droppings yielded the largest variety of strains while surgical shoe covers yielded the same strains as drag swabs. If a sample yielded *C. jejuni*, the majority (50.0%) carried two different strains.

**Key Words:** *Campylobacter* spp., Broiler house, Processing plant

**74 Effects of nitrocompounds on uric acid-utilizing microorganisms isolated from poultry manure.** W. K. Kim<sup>\*1</sup>, A. L. Ratliff<sup>1</sup>, R. C. Anderson<sup>2</sup>, D. J. Nisbet<sup>2</sup>, and S. C. Ricke<sup>1</sup>, <sup>1</sup>Texas A & M University, College Station, <sup>2</sup>USDA-ARS, Southern Plains Agricultural Research Center, College Station, Texas.

Ammonia emissions from poultry facilities are an important environmental issue. Uric acid-utilizing microorganisms in poultry manure are key microorganisms influencing ammonia production. Because these microorganisms break down uric acid excreted in poultry manure, they contribute to an increase in ammonia volatilization. A study was conducted to evaluate effects of different nitrocompounds: nitroethane, nitroethanol, nitropropanol, and nitropropionic acid on inhibiting the growth of uric acid-utilizing microorganisms isolated from poultry manure. In Experiment I, there were 5 treatments: Control, 50mM nitroethane, 50mM nitroethanol, 50mM nitropropanol, and 50mM nitropropionic acid. Uric acid-utilizing microorganisms were incubated in uric acid medium with or without nitrocompounds at 37C for 6hr. Optical density (OD) values were measured at 2, 4, and 6hr, and plate counting was performed at 6hr in order to evaluate inhibitory effects of these nitrocompounds on growth of these microorganisms. All nitrocompound treatments significantly reduced growth of uric acid-utilizing microorganisms compared to the control. Nitropropanol and nitropropionic acid treatments exhibited greater inhibitory effects than nitroethane and nitroethanol treatments. In Experiment II, inhibitory effects of nitrocompounds on uric acid-utilizing microorganisms were evaluated compared to their alcohol counterparts ethanol, propanol, and propionic acid. There were 7 treatments: Control, 50mM nitroethanol, 50mM ethanol, 50mM nitropropanol, 50mM propanol, 50mM propionic acid, and 50mM nitropropionic acid. Uric acid-utilizing microorganisms were incubated in uric acid medium with treatments at 37 C for 24hr. OD values were measured at 2, 4, 6, and 24hr, and plate counting was performed at 24hr incubation. Nitrocompound treatments showed significant inhibitory effects on growth of uric acid-microorganisms compared to ethanol, propanol, and propionic acid. This study suggest that nitrocompounds have potential to reduce ammonia emission by inhibiting the activity of uric acid-utilizing microorganisms in poultry manure.

**Key Words:** Ammonia emission, Uric acid-utilizing microorganisms, Nitrocompounds

**75 Weights of yolk reserves and carcass traits of broiler chicks from selected parent stock and pure lines.** N. Wolanski<sup>\*1</sup>, F. Robinson<sup>1</sup>, R. Renema<sup>1</sup>, V. Carney<sup>2</sup>, and B. Fancher<sup>3</sup>, <sup>1</sup>University of Alberta, Edmonton, AB, Canada, <sup>2</sup>Alberta Agriculture, Food and Rural Development, Edmonton, AB, Canada, <sup>3</sup>Aviagen, North America, Huntsville, Alabama.

This trial investigated chick yolk utilization across ten strains of broiler chicks. All eggs were collected in Alabama on one day and shipped to Alberta. Upon arrival, eggs were re-weighed and then randomly assigned to one of three experimental fates; 150 eggs per strain were incubated, 52 eggs per strain were broken for determination of egg characteristics, and 8 eggs per strain were placed in desiccators to measure moisture loss. Egg characteristics included specific gravity, yolk wt, albumen height, albumen wt, eggshell thickness, and eggshell wt. Following 21d of incubation chicks were weighed and individually neck tagged. Each chick underwent manual palpation of the abdomen (range of 1-5; where 1 = emaciated abdomen 5 = grossly distended abdomen), and chick length and shank length measurements. On day 0, half of the birds per strain were dissected to assess yolk sac wt, heart wt, liver wt, and breast muscle wt. All other chicks were randomly distributed into 4 pens and reared to 14 d of age, as part of a parallel experiment.

Eggs from strain 8 had the most yolk (22.6 g) ranging to a low of 20.9 g in strains 7 and 10. In terms of chick wt, strains 1, 2, and 3 had the highest hatch wt (46.3 g, 46.5 g, and 45.4 g) while strains 4 and 7 had the lowest hatch wt (43.1 g and 43.0 g). The residual yolk wt at hatch ranged from 5.50 g (Strain 1) to 3.70 g in strains 5, 6, and 7. This experiment demonstrated that residual yolk can account for as much as 10-12% of a chick's BW at hatch. The abdominal score correlated well with actual day 0 residual yolk sac wts ( $r=0.50$ ;  $P<0.0001$ ). At hatch, differences in breast muscle and internal organ wt were apparent among the strains examined. Shank length at day 0 and hatch wt both were correlated with 14 day BW ( $r=0.39$ ;  $P<0.0001$  and  $r=0.35$ ;  $P<0.0001$  respectively). This trial demonstrated differences in internal organ wt, residual yolk sac mass, and chick carcass which together result in observable differences in chick weights across strains.

**Key Words:** Residual yolk, Chick quality, Hatch weight

**76 Effects of organic selenium (Sel-Plex) on oxidative stress induced by an in-feed toxin.** R. Davis<sup>\*1</sup>, V. Stanley<sup>1</sup>, V. McWhinney<sup>1</sup>, and A. Sefton<sup>2</sup>, <sup>1</sup>Prairie View A&M University, Prairie View, Texas, <sup>2</sup>Alltech, Guelph, Canada.

A study was conducted to examine the effects of organic selenium (Se) on oxidative stress reduction induced by gossypol in cottonseed meal (CSM) in broilers. One hundred and eighty day-old unvaccinated male broiler chicks were separated into 1) control group (without CSM or Se), 2) 25% CSM diet (without Se), and 3) 25% CSM (with Se). The diets, containing 23% crude protein (CP) and 3300 Kcal/kg of metabolizable energy (ME), were isocaloric and isonitrogenous. The crude protein levels in the diets were maintained with the addition of soybean meal. Results showed that 25% CSM significantly decreased BW (742 vs 463 g) which was partially restored with Se (463 vs 492 g). Relative weights of the pancreas (0.49 g/100g BW) and liver (3.42 g/100g BW) increased significantly ( $P<0.05$ ) with CSM, but decreased to the control level (0.37 and 2.47 g/100 gBW, respectively) with SE (0.36 and 3.25 g/100 gBW, respectively). Compared to the control (0.27 mg/dL) CSM at 25% significantly ( $P<0.05$ ) elevated BUN level (6.38 mg/dL) which was reversed to 2.47 mg/dL with Se. Serum triglycerides and creatinine levels (32.8 and 0.13 mg/dL, respectively) that were significantly decreased with CSM were further lowered ( $P<0.05$ ) (19.2 and 0.07 mg/dL, respectively) with the addition of Se. Liver GSH-Px and TBARS concentrations, the indicators of oxidative stress, were significantly ( $P<0.05$ ) reduced (1595.6 IU/L and 3.48  $\mu$ mole/mL, respectively), compared to controls (3527.1 IU/L and 6.25  $\mu$ mole/mL, respectively). Addition of Se reversed GSH-Px and TBARS levels (3440.4 IU/L and 8.79  $\mu$ mole/mL, respectively). In conclusion, the dietary inclusion of Sel-Plex significantly suppressed the oxidative stress induced by gossypol.

**Key Words:** Gossypol, Selenium, Oxidative stress

**77 Ciprofloxacin resistance of *Campylobacter* isolated from broiler gastrointestinal tracts.** M. Farnell<sup>\*1</sup>, A. Donoghue<sup>1</sup>, K. Cole<sup>2</sup>, I. Reyes-Herrera<sup>2</sup>, P. Blore<sup>2</sup>, K. Pandya<sup>2</sup>, and D Donoghue<sup>2</sup>, <sup>1</sup>Agricultural Research Service, USDA, Fayetteville, Arkansas, <sup>2</sup>University of Arkansas, Fayetteville.

The agricultural use of antibiotics may increase antibiotic resistance of foodborne pathogens and make these diseases more difficult to treat in humans. However, there has been little research on the kinetics of antibiotic and foodborne pathogen susceptibility in various locations of the avian gut. The objective of this study was to evaluate the relationship between gut fluoroquinolone concentrations and changes in *Campylobacter* susceptibility to ciprofloxacin. Chickens ( $n=139$ ) were given a combined challenge of seven fluoroquinolone sensitive *Campylobacter jejuni* at two weeks post hatch and treated at 26 d with 0 ( $n=29$  birds, controls), 25 ( $n=45$  birds) or 50 ( $n=65$  birds) ppm of the fluoroquinolone, enrofloxacin (Baytril<sup>®</sup>) in the drinking water for 3 or 7 d, respectively. The crop, upper ileum, lower ileum, ceca and colon were aseptically collected from five birds per enrofloxacin treatment per day during the dosing and 14 d withdrawal period. *Campylobacter* susceptibility and the corresponding antibiotic concentrations within the gut locations were determined on each collection day. The ciprofloxacin minimum inhibitory concentration (MIC) for *Campylobacter* isolated from both enrofloxacin treatments increased within the first day of dosing compared with controls and the average ranged from 1.6 to 6.5  $\mu$ g/mL ( $n=5$  birds/day/dosing group) during the treatment and withdrawal period. Gut location did not affect fluoroquinolone concentrations or *Campylobacter* susceptibility within either treatment group. These data indicate, for the doses used, differences in gut fluoroquinolone concentrations do not produce differences in *Campylobacter* susceptibility to ciprofloxacin.

**Key Words:** *Campylobacter*, Enrofloxacin, Antimicrobial resistance

**78 Effect of bismuth citrate on *Campylobacter* colonization in broilers.** M. Farnell<sup>\*1</sup>, A. Donoghue<sup>1</sup>, K. Cole<sup>2</sup>, I. Reyes-Herrera<sup>2</sup>, F. Solis de los Santos<sup>2</sup>, M. Dirain<sup>2</sup>, P. Blore<sup>2</sup>, K. Pandya<sup>2</sup>, and D. Donoghue<sup>2</sup>, <sup>1</sup>Agricultural Research Service, USDA, Fayetteville, Arkansas, <sup>2</sup>University of Arkansas, Fayetteville.

Bismuth compounds have been used since the 16th century to treat gastrointestinal ailments in man. Colloidal bismuth subcitrate (De-Nol<sup>®</sup>) is currently used to reduce enteric *Helicobacter pylori* colonization as a treatment for stomach ulcers. We evaluated if bismuth citrate or its parent compound, colloidal bismuth subcitrate, would reduce colonization of the closely related poultry food borne pathogen, *Campylobacter jejuni*. In the first study, we fed bismuth citrate (50 or 200 ppm in feed) before, during and after an oral challenge with seven combined strains of *C. jejuni* ( $n=66$  birds). We observed a 2 log reduction in cecal *Campylobacter* colonization with a treatment of 200 ppm of bismuth citrate for 9 d when compared with controls ( $P<0.05$ ). In a follow up study, additional doses of bismuth citrate were administered at 50, 100, 200 or 500 ppm for 9 d to determine the efficacy against *Campylobacter* ( $n=80$  birds). We found no significant reduction of *Campylobacter* cecal colonization in any of the treatments when compared to the control group. Due to the inconsistent effect of bismuth citrate on *Campylobacter* colonization, we tested the ability of the parent compound, colloidal bismuth subcitrate (De-Nol<sup>®</sup>) to reduce enteric *Campylobacter* concentrations. Similar to the first study, chickens were fed colloidal bismuth subcitrate (50 or 200 ppm) before, during and after an oral challenge with *C. jejuni* ( $n=110$  birds). A two log reduction ( $P<0.05$ ) was observed in the treatment group which received a 200 ppm treatment for 9 d compared with controls. Replicate studies are needed to determine if colloidal bismuth subcitrate will consistently reduce enteric *Campylobacter* concentrations.

**Key Words:** *Campylobacter*, Bismuth citrate, De-Nol