

118 Effects of dietary ingredients and *Eimeria acervulina* infection of chick performance, ME_n and amino acid digestibility. M. E. Persia*, P. L. Utterback, E. L. Young, and C. M. Parsons, *University of Illinois*.

In each of four two-wk experiments, chicks were inoculated either on D 9 or 11 with 5.0×10^5 sporulated oocysts (acute infection) or D 9, 12, 15 and 18 with lower levels (5.0×10^4 to 1.5×10^5) of sporulated oocysts (chronic infection). In Experiment 1, crossbred chicks (New Hampshire x Columbian) were fed either normal or a pharmacologic level of Zn (1500 mg/kg) and were inoculated with various chronic levels of sporulated oocysts. The Zn had no effect and coccidiosis infection resulted in significant decreases in growth performance and ME_n, but not amino acid digestibility. In Experiment 2, both fishmeal (15%) and GroBiotic-B70™ (GB; 5%) diets completely ameliorated the negative effects of acute and chronic coccidiosis infection on growth performance of crossbred chicks. The acute coccidiosis infection greatly reduced ME_n and amino acid digestibility, and the magnitude of response varied with the timing of excreta collection after inoculation. Both fishmeal and GB diets reduced the large negative effects of coccidiosis infection on ME_n and amino acid digestibility. Experiment 3 evaluated the effects of coccidiosis infection in chicks fed a wheat/barley/pectin diet compared to a corn/soybean meal diet. The wheat/barley/pectin diet depressed chick weight gain but did not interact with coccidiosis infection. Commercial broiler chicks were used in Experiment 4 to evaluate the effects of various levels of GB (2 to 6%) on growth performance of coccidiosis-infected chicks. Diets containing GB did not improve the growth performance of the infected broiler chicks, but they did improve the growth of the non-infected chicks. The results of these experiments indicate that coccidiosis infection (*E. acervulina*) reduces ME_n and amino acid digestibility in chicks and that the coccidiosis effect is influenced by diet composition, type of infection (acute v. chronic) and timing of excreta collection.

Key Words: Coccidiosis, Chick, Digestibility, Fishmeal, GroBiotic-B70™

119 The effect of feeding yolk antibody to phospholipase A₂ (aPLA₂) on growth and feed conversion in broiler chicks. M. Yang*¹, M. Cook¹, and K. Roberson², ¹*University of Wisconsin-Madison*, ²*Michigan State University*.

One-day old commercially obtained broiler chicks were grown for three weeks to test the effects of yolk aPLA₂ on growth and feed conversion. Yolk aPLA₂ antibody was obtained by freeze-drying egg yolk from layers injected with PLA₂. Ground egg yolk powder was added into a chick mash diet that met or exceeded NRC (1994) requirements. A total of 300 broiler chicks were grown in three independent experiments. The doses of aPLA₂ in the diet were 0, 0.5 or 1.0 g/kg of diet. Birds were grown in batteries for three weeks with 5 birds per pen, 20 pens per battery. Data analysis showed that feed conversion (weight gain/feed consumption) was

significantly ($P < 0.05$) lower for both 0.5 (1.596) and 1.0 (1.584) g/kg of aPLA₂ groups compared to control (1.680). Pen weight from birds fed 1.0 g/kg aPLA₂ yolk powder (3169 g) was significantly heavier ($P < 0.05$) than birds fed 0.5g/kg aPLA₂ (2991 g) and control (2982 g). The use of dietary aPLA₂ may prove to be an alternative to antibiotics for improving growth and feed efficiency in broiler chicks.

Key Words: Broiler chicks, Yolk antibodies, Phospholipase A₂, Feeding trial, Feed conversion

120 Impact of glutamine (GLN) and Oasis® hatchling supplement on growth performance and immune responses of broilers vaccinated and challenged with *Eimeria maxima*. G. F. Yi*¹, G. L. Allee¹, and J. J. Dibner², ¹*University of Missouri-Columbia*, ²*Novus International, Inc.*

A total of 720 hatchling broilers were allotted to 12 treatments. Trt 1 and Trt 2 were fasted for 48 h posthatch followed by *ad lib* access to a common diet and water. Trt 3 and 4 were fasted for 48 h posthatch followed by *ad lib* access to 1% GLN diet and water. Trt 5 and 6 had *ad lib* access to a common diet and water, whereas Trt 7 and Trt 8 had *ad lib* access to a 1% GLN diet and water immediately after hatch for 48 h. Trt 9 and 10 were fed normal Oasis®, whereas Trt 11 and 12 were fed 1% GLN sprayed on Oasis®. The birds in Trt 2, 4, 6, 8, 10, 11, and 12 were vaccinated with 50 viable sporulated oocysts of *E. maxima* immediately after hatch. The Oasis® given to Trt 11 was sprayed with *P. Acnes*. All birds were orally challenged with 40,000 viable sporulated oocysts of *E. maxima* on d 22 posthatch. During the first 2 wk posthatch, birds in Trt 7 had the highest BW, gain, and G:F ratio among treatments ($P \leq 0.01$). Compared to birds in the non-GLN groups, birds in the GLN groups had higher BW, gain, G:F and livability ($P \leq 0.05$). Among the Fast, Feed and Oasis® groups, during pre-challenged period, birds in the Feed groups had the highest BW and gain ($P \leq 0.01$). During post-challenge period, birds in the Fast groups had the lowest BW and livability ($P \leq 0.01$), and in contrast to the first 2 wks, birds in the non-vaccinated groups had lower BW, gain, and G:F relative to *E. maxima* challenged groups ($P \leq 0.01$). On d 14, there were differences in serum interferon- γ ($P \leq 0.05$). During post-challenge period, compared to the *E. maxima* vaccinated groups, birds in the non-vaccinated groups had higher lesion scores of mid small intestine ($P \leq 0.01$). Those results indicated the beneficial effects of early access to feed or Oasis® and 1% GLN addition in improving the growth performance, livability, and immune function of young birds. Vaccination with *E. maxima* was effective to alleviate growth depression and intestinal infection associated with *E. maxima* challenge. (Oasis® hatchling supplement is a trademark of Novus International Inc., and is registered in the US and other countries).

Key Words: Glutamine, Oasis®, *E. maxima*

Physiology - General Physiology II

121 Bone mineral density of laying hens housed in enriched versus conventional cages. M. N. Kopka*¹, H. W. Cheng², and P. Y. Hester¹, ¹*Purdue University, Livestock Behavior Research Unit, West Lafayette, IN*, ²*USDA - ARS, West Lafayette, IN*.

Cages enriched with nests, perches, scratch pads, and dust baths may allow birds to display behaviors that they normally cannot express in conventional cages. In addition, these enrichments may increase bird activity and subsequently improve skeletal integrity. The objective of the current study was to determine the effect of cage enrichments on bone mineral density (BMD) of White Leghorns. Hens were housed in three caged environments: 1) conventional cages with 3 hens/cage (645 cm² of floor space/bird), 2) conventional cages with 6 hens/cage (645 cm² of floor space/bird), and 3) enriched cages with perches, dust bath, scratch pad, and nest box with 10 birds/cage (610 cm² of floor space/hen). For BMD, repeated measurements of the left leg (tibia and fibula) and wing (humerus) were taken from 12 live, unanaesthetized birds from each of the cage environments at 30, 40, and 50 wk of age using a Norland pDexa X-ray bone densitometer (Model No. 476D014). Using the mixed model procedure of SAS and body weight as a covariant, an analysis of covariance with repeated measurements (30, 40, and 50 wk of age) was conducted using the cage environment as the whole plot with the type of bone (tibia and humerus) within a bird as a sub-plot. Although the BMD of the tibia was always greater for hens housed in enriched cages

as compared to hens of conventional cages at 30, 40, and 50 wk of age, the increase was significant only at 40 wk of age. The humerus showed an increase in BMD at 30 but not at 40 and 50 wk of age (treatment x bone x age interaction, $P < 0.05$). There was no difference in the BMD of the tibia and humerus between the 3 hens/cages vs. the 6 hens/cage of conventional cages at any age. It is concluded that cage enrichments improved skeletal integrity perhaps through increased activity.

Key Words: Bone mineral density, Enriched cages, White leghorns

122 A comparison of bone densitometry in live birds with other bone tests using White Leghorns fed varying levels of dietary calcium. M. A. Schreiweis*¹, J. I. Orban², M. C. Ledur³, and P. Y. Hester¹, ¹*Purdue University, W. Lafayette, IN*, ²*Southern University, Shreveport, LA*, ³*Embrapa Swine and Poultry Research Center, Concordia, SC, Brazil*.

Bone densitometry is being investigated in our laboratory as a non-invasive tool to monitor bone integrity of live birds for osteoporosis. The objectives were to 1) assess the ability of bone densitometry in detecting changes in bone integrity of White Leghorns fed varying levels of dietary calcium and 2) to correlate densitometric scans with other bone test methods. Hens were fed hypercalcemic (5.4%), control (3.6%), or hypocalcemic (1.8%) diets from 32 to 58 wk of age. A Norland pDexa

X-ray bone densitometer was used to assess bone mineral density (BMD) and bone mineral content (BMC) of the left leg (tibia and fibula) and wing (humerus) in live, unanesthetized hens at 38, 48, and 58 wk of age ($n = 5$ hens/diet/age). Bones were excised, cleaned of tissue, measured for strength, and ashed. Using the mixed model procedure of SAS, an ANOVA was conducted using diet (5.4, 3.6, and 1.8% calcium) and age (38, 48, and 58 wk) as the whole plot with type of bone (tibia and humerus) within a bird as a sub-plot. For hens consuming 1.8, 3.6, and 5.4% levels of dietary calcium, diet main effect means for BMD were 0.147, 0.157, and 0.176 g/cm² (SEM = 0.005) and BMC were 1.61, 1.73, and 1.95 g (SEM = 0.08), respectively, resulting in a linear effect ($P < 0.001$). Bone ash weight, breaking force, stress, modulus of elasticity as well as egg shell traits also increased linearly in response to increased calcium level in the diet ($P < 0.05$). The BMD and BMC were correlated with bone breaking force ($r = 0.65$ and 0.49 , respectively, $P < 0.001$) and bone ash weight ($r = 0.77$ and 0.94 , respectively, $P < 0.001$). These results suggest that densitometric scans of live birds accurately reflects changes in skeletal integrity as a result of feeding varying levels of dietary calcium. Research supported by SCRP-USDA No. PL95-113 and NRI Competitive Grants Program No. 2001-02426.

Key Words: Bone mineral density, Dietary calcium, Bone breaking force

123 Osteocyte apoptosis in chicken radii following osteotomy.

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Recent research indicates that osteocytes have a more active role in bone homeostasis than previously believed. Osteocyte apoptosis has been observed in various instances of bone remodeling, such as in young animals near areas of bone turnover. Osteocyte apoptosis increases following microdamage in areas with induced microcracks and resorption spaces, and a link between apoptosis and repair has been suggested. In this study, a chick model was used to examine the incidence of osteocyte apoptosis during the first 96 hours following an osteotomy. It was hypothesized that apoptosis would increase near the site of the osteotomy within the first 24 hours. Osteotomies were performed on the right radii of 24 White Leghorn chicks at 23-24 days of age, with a mean weight of 198 g. The left radii served as the uninjured controls. Radii were collected and processed at six time points following surgery (0, 12, 24, 48, 72 and 96 hours). Bones were fixed, decalcified and sectioned longitudinally using a cryostat. Sections were stained for apoptosis using TdT-FragEL™ DNA Fragmentation Detection Kits (Oncogene Research Products). The percentage of apoptotic osteocytes within 1 mm of the osteotomy was determined, and in the same region on the control bone. The control limb data were subtracted from the osteotomized limb to identify differences due to surgical influence. The adjusted data were then analyzed using ANOVA procedures to compare 12, 24, 48, 72 and 96 hours to 0 hours post-surgery. Apoptosis was significantly higher at 12, 24 and 72 hours versus 0 hours post-surgery, and approached significance ($P < .10$) at 48 versus 0 hours. The highest incidences of apoptosis (adjusted for the control limb) occurred at 12 and 24 hours (9.7 and 12.3 %) versus < 1 % at 0 hours post-surgery. The data support the hypothesis that osteocyte apoptosis increases rapidly following osteotomy.

Key Words: Chick, Osteotomy, Osteocyte apoptosis

124 Effects of Pyrrolidine Dithiocarbamate (PDTC) on chicken chondrocytes in culture.

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Tibial dyschondroplasia (TD) is a metabolic cartilage disease of fast growing poultry for which the pathogenetic mechanisms are not understood. Certain dithiocarbamate fungicides such as thiram induce TD in chickens providing a useful experimental model to study its pathogenesis. However, unlike its monomeric component dimethyl dithiocarbamate (DMTC), thiram is water insoluble making its use tricky in cell culture, and DMTC is a poor inducer of TD. We recently found pyrrolidine dithiocarbamate (PDTC), a water-soluble dithiocarbamate, to be capable of inducing TD when fed to chickens. To understand, how PDTC may lead to the induction of TD, we studied its effects on tibial growth plate-chondrocytes in culture using selective genes that are essential for growth plate metabolism such as cartilage development, matrix modeling, and angiogenesis. Duplicate cultures were treated with 10 μ M PDTC for 0, 6, and 24 h, RNA extracted, and subjected to RT-PCR. The PCR products were separated and quantified using capillary electrophoresis

and laser induced fluorescence detection. We determined the expression of different genes relative to β -actin and compared the results at 6 and 24 h to the 0 h treatment group. Our results show that PDTC treatment down regulated the expression of most of the genes although the magnitude of changes varied depending on gene types. Type II collagen, nitric oxide synthase, and matrix metalloproteinase-2 showed time dependent down regulation whereas both type X collagen and ovotransferrin were transiently down regulated at 6h but appeared to recover by 24 h. The TGF- β , glyceraldehyde phosphate dehydrogenase, and vascular endothelial growth factor genes appeared to maintain a steady level after a transient down regulation at 6h. These results suggest that PDTC may cause a general metabolic slow down of chondrocytes thereby impeding their developmental maturation during a chronic exposure to this chemical.

Key Words: Tibial dyschondroplasia, Thiocarbamates, Chondrocyte

125 Productive characteristics of laying hens through 60 weeks of age as affected by strain and by body weight and age at puberty.

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A potential model for the study of osteoporosis is the laying hen, in which calcium metabolism reaches phenomenal proportions and in which osteoporosis occurs at high rates. In the hen, calcification failures lead to tremendous losses economically (shell-less or thin, cracked eggs; fewer eggs produced) and, more importantly, in bird health. This year-long study was designed to attempt to prevent the onset or severity of osteoporosis by maximizing bone density in the pre-lay pullet; a secondary objective was to determine whether age of onset of sexual maturity, accelerated or delayed by body weight manipulation, had an effect on later bone deficits. As chicks, these HyLine W36 and W98 birds had been fed to segregate into three weight classes, each one with and without addition of HyD. Onset of lay and plasma hormones were linked to body weight, and bone mineralization (BMC) was higher with HyD at 8 wk of age and in W98 pullets; at 17 wk, BMC was higher in W98 pullets and in heavier birds. In this part of the study, we measured a number of production parameters in hens of the two strains from 32 through 60 wk of age. Egg production data were collected daily; body weights and feed intake were measured weekly; blood samples were collected biweekly; and bones and duodenal samples were collected at the end of the study. Plasma estradiol, LH, and progesterone were measured by RIA. Once a week, eggs were weighed, and specific gravity was measured. Bones were analyzed for mineral content (BMC) and density (BMD). Duodenal tissue was analyzed for calcium uptake (CAT) in vitro. Body weight separation was maintained to some extent in both strains through the end of the study, and egg weight and specific gravity remained higher in the heavier birds. Hormone profiles were similar in both strains, with heavier birds having higher mean levels. After At 60 wk of age, W98 hens maintained greater BMC ($P = .03$) and BMD ($P = .1$), and BMD was slightly ($P = .15$) higher in heavier birds, in spite of a failure of CAT to be different between strains ($P = .53$). The lack of a sustained discernible effect of HyD suggests that dietary Ca insufficiency did not play a significant causative role in development of osteoporotic bones.

Key Words: Osteoporosis, Onset of puberty, Skeletal integrity

126 Inoculation of F-strain *Mycoplasma gallisepticum* at twelve weeks of age alters the effects of fasting on plasma protein and percentage serum LDL cholesterol concentrations in commercial laying hens.

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This study was conducted to determine the blood constituent levels and serum lipoprotein profiles of uninoculated and 12 wk F-strain *Mycoplasma gallisepticum* (FMG) inoculated commercial laying hens that were either fed *ad libitum* or subjected to 24-h feed withdrawal at both 34 and 46 wk of age. At 12 wk, birds were divided into 16 negative pressure biological isolation units, with 8 replicate units assigned to each treatment group. Four birds out of ten within each unit were tagged for bleeding. Variables measured were BW, whole blood hematocrit, plasma protein (PP), and serum cholesterol, triglycerides, and calcium. Very low density lipoproteins (VLDL) belonging to the 10th, 50th, and

90th population percentiles had small, medium, and large relative diameters, respectively. Mean VLDL particle diameter within each of these size categories and the mean diameter of the total population of VLDL particles were determined. Percentages of total serum cholesterol recovered in VLDL, low (LDL), and high density lipoprotein particle classes were also determined. A 12 wk FMG inoculation did not affect the parameters investigated, except for PP, and the percentages of cholesterol recovered in the VLDL and LDL particle classes. At 46 wk, fasting significantly decreased VLDL cholesterol percentages in both control and FMG-inoculated birds. However, at 46 wk, fasting resulted in signifi-

cantly lower PP concentrations in only FMG-inoculated birds. Fasting significantly decreased PP at 34 wk and percentage LDL cholesterol at 46 wk in only uninoculated birds. Conversely, fasting increased percentage LDL cholesterol at 34 wk in only uninoculated controls. FMG inoculation at twelve weeks of age alters the effects of fasting on PP and percentage serum LDL cholesterol concentrations in commercial laying hens. These effects may be mediated through age-related altered states in antibody formation and the assembly of lipoprotein particles in the liver.

Key Words: Fasting, Lipoproteins, *Mycoplasma gallisepticum*

Environment and Management - Enteric Bacteria

127 In vitro selection of enteric microflora for potential use as a competitive exclusion culture against Campylobacter in poults. H. P. Bhaskaran¹, L. R. Bielke¹, G. Nava¹, J. L. Vicente¹, P. J. Blore¹, G. Tellez¹, A. M. Donoghue², J. A. Byrd³, B. M. Hargis¹, and D. J. Donoghue^{*1}, ¹Department of Poultry Science, University of Arkansas, Fayetteville, Arkansas 72701, ²USDA/ARS PPPSRU Fayetteville, Arkansas 72701, ³USDA/ARS FFRSU College Station, TX.

The administration of nonpathogenic microflora in neonatal poultry has been employed to reduce or eliminate the colonization of enteric pathogens. This concept, also called competitive exclusion (CE), although effective against Salmonella, has not consistently worked against Campylobacter. Most CE cultures are developed by randomly collecting enteric bacteria without any preselection criteria for bacteria. It may be possible to enhance the efficacy of a CE against Campylobacter by preselecting enteric microflora with the ability to inhibit Campylobacter, in vitro. With this goal, an assay was developed to test individual isolates with the ability to reduce or eliminate Campylobacter growth, in vitro. Individual isolates were obtained from cecal material of both juvenile and adult poultry. Isolates were serially diluted (103, 104 and 105 CFU/well) and added to 96 well polystyrene plates containing 1x104 CFU C. jejuni or C. coli/well. Plates were incubated at 42 C in a microaerophilic environment for 22 to 24 hours. Following incubation, a 1 uL loop from each well was streaked onto Campy-Cefex and incubated at 42 C in a microaerophilic environment for 24-48 hours. Approximately 30 isolates were identified with the ability to inhibit C. jejuni or C. coli growth in vitro. Preliminary studies using combinations of these isolates in neonatal poults demonstrated some efficacy against Campylobacter colonization. This research demonstrates in vitro efficacy of isolates against Campylobacter, however additional research will be required to identify combinations of isolates with the ability to consistently inhibit Campylobacter colonization in vivo. Funded in part by the USDA Food Safety Consortium.

Key Words: Campylobacter, Enteric microflora, Competitive exclusion, Foodborne pathogens

128 Use of lactic acid bacteria in conjunction with a commercial organic acid treatment may reduce initial Campylobacter colonization in turkeys. J. S. Holliman^{*1}, G. Nava¹, J. L. Vicente¹, L. R. Bielke¹, K. Cole¹, A. M. Donoghue², J. A. Byrd³, B. M. Hargis¹, M. Tellez¹, and D. J. Donoghue¹, ¹Department of Poultry Science, University of Arkansas, Fayetteville, Arkansas 72701, ²USDA/ARS PPPSRU, Fayetteville, Arkansas 72701, ³USDA/ARS FFRSU, College Station, TX.

Foodborne pathogens pose significant health risks to consumers. The leading causes of foodborne illness associated with poultry consumption are Campylobacter and Salmonella contamination. One strategy to reduce these enteric pathogenic microflora is the administration of nonpathogenic bacterial cultures to poultry, known as competitive exclusion (CE). Although current CE cultures have efficacy against enteric Salmonella colonization, these cultures have little if any consistent efficacy against Campylobacter. Recently, using in vitro selection techniques we have identified lactic acid bacteria (LABS) with potential anti-Campylobacter activity. To evaluate the ability of these LABS to reduce Campylobacter colonization in turkeys, neonatal poults were dosed on the day of hatch with various combinations of LABS and/or the commercial organic acids (OA) treatment, Performax (n=10poults/treatment). Three days following LABS treatment, Campylobacter(102 to 104) was administered to poults by oral gavage. On day 10, all poults were sacrificed and cecal contents enumerated for Campylobacter. In two separate

trials, at best, there was a 1 log reduction with either LABS or OA, alone. However, when LABS and OA were used together, there was up to a 3 to 4 log reduction in cecal Campylobacter content compared to controls. These results indicate that it is possible to significantly reduce Campylobacter concentrations in poults with the use of selective bacteria in combination with OA. The enhanced efficacy of our LAB cultures in the presence of OA may be due to OA's ability to favorably alter the enteric environment promoting LAB colonization. Funded in part by the USDA Food Safety Consortium and the USDA Foreign Agriculture Service (MX120).

Key Words: Campylobacter, Lactic acid bacteria, Competitive exclusion, Organic acids

129 Use of biofunctionalized nanoparticles to bind Campylobacter jejuni in poultry. J. L. Franklin*, B. W. Sheldon, J. L. Grimes, and M. J. Wineland, North Carolina State University.

Previous studies have demonstrated that mannose binds to gram-negative bacteria, reduces virulence, and prevents bacterial colonization of the GI tract of poultry. Two trials were conducted to examine the use of biofunctionalized nanoparticles (BN) to bind *Campylobacter jejuni* in poultry. The objective of trial 1 was to determine the effect of polystyrene cores on turkey poult performance to 6 wk with observation to 14 wk. The second trial examined if BN have a specific affinity for *C. jejuni* and would bind to and promote aggregation *in vitro*. The BN were composed of a polystyrene core containing D-mannose (4 molar % mannose) or a tyrgly-gly peptide (3 molar %) attached by a polyethylene glycol-tethered polymerization reaction. In the first trial, 240 day-of-hatch female poults were placed in 6 pens (6 m² with slatted floors). At 1 wk, poults were banded, weighed and reduced to 198 (33 per pen) then gavaged with various liquid polystyrene core materials. One to two poults per pen were gavaged with 0.1, 0.5 or 1.0 mL of each of the treatments. In all pens (1-6), 3 control poults were gavaged with distilled H₂O. BW was determined at wk 1, 3 and 6 with observations to 14 wk. All poults were provided H₂O and commercial feed *ad libitum*. BW means and gains were analyzed using regression analysis (P < 0.05). The second trial utilized an *in vitro* application to examine BN-bacterial activity. A field strain of *C. jejuni* was cultured at 42C in Brucella broth (BB) for 48h under microaerophilic conditions and then serially diluted with BB to 10⁴ cfu/mL. Aqueous BN suspensions were diluted 1:1, 1:10 and 1:100 in 0.1% peptone H₂O and mixed with equal volumes (1.5 mL) of suspended *C. jejuni*. The mixture was sampled at 0, 1, 5 and 30 minutes, spiral plated in duplicate onto Brucella agar and incubated as previously described. Trial 1 resulted in no significant differences in BW or BW gains due to treatments. Thus, the cores proved to be non-toxic to the turkey poults. In trial 2, the recovered BN-treated *C. jejuni* populations were reduced from 0-0.86 logs (0-86.2%) depending on exposure time and BN concentration. Although population reductions were observed, reductions might be attributed to cell aggregation rather than cell death.

Key Words: biofunctionalized nanoparticle, *Campylobacter jejuni*, poultry

130 Effect of oxytetracycline on tetracycline resistance in poultry Campylobacter spp. A. S. Fairchild*, J. L. Smith, U. Idris, J. Lu, and M. D. Lee, University of Georgia, Athens, GA 30602.

Antibiotics used in the poultry industry are under scrutiny because there have been increasing percentages of antibiotic-resistant bacteria observed in poultry raised for food production. There is concern that normal flora found in poultry may transfer antibiotic resistance to food-borne human