Choice feeding of organic meat chickens. A. C. Fanatico*,1, V. B. Brewer2, C. M. Owens2, and A. M. Donoghue3, 1Appalachian State University, Boone, NC, 2University of Arkansas, Fayetteville, 3USDA Agricultural Research Service, Fayetteville, AR.

Specialty poultry production is growing, including free-range, organic, and small flocks; however, feed cost is high. Choice feeding, using a high-protein feed with mineral/vitamin supplements provided separately from a grain feed, may allow birds raised in relatively open housing with largely uncontrolled environmental conditions to more precisely meet their nutritional requirements by self-selection compared with feeding a fully-formulated diet. Choice feeding may also allow producers to use feed grains produced on their own farms to reduce transportation and milling. A study was conducted to determine the impact of choice feeding on performance in organic meat chickens. Pens of medium-growing chickens (20 birds per pen) were randomly assigned to one of 2 treatments: fully formulated diet (F) or choice (C) diet. There were 4 replications of these treatments. Birds were raised in floor pens in a naturally ventilated house; popholes provided access to grassy yards during the day. During the starter period (0–27 d), the C treatment received formulated feed as well as high-protein feed and grain, but during the grower/finisher period (28–64 d), only high-protein feed and grain. Birds were commercially processed at 64 d. The organic formulated diet had 21% CP, while the choice diet selected by birds from 28 to 34 d had 13.2% CP and the choice diet at 57–64 d was 12% CP. Performance data were subjected to a t-test. There was no difference between treatments in weight gain during the grower/finisher period, but overall weight gain was higher for F birds (P < 0.05). However, feed intake was higher and feed efficiency was inferior for F birds compared with C (P < 0.05). Although carcass weights and breast fillet weights were heavier in F birds, there was no difference in yields (carcass, breast, wing, or leg) between treatments (P > 0.05). The Choice diet was less expensive than the Fully Formulated diet ($0.58/kg based on the diet selected the last week of production vs. $0.66/kg). These data indicate that while F birds gained more weight than C, feed efficiency was poor and the opportunity for organic chickens to self-select feeds may be more efficient and save costs.

Key Words: organic, feeding, self-selection, meat chickens

Cage design and management effects on ammonia levels in laying hen houses. J. A. Mench*,1, A. S. Keiss2, P. Y. Hester3, R. C. Newberry4, and J. P. Garner1, 1University of California, Davis, CA, 2Mississippi State University, Mississippi State, MS, 3Purdue University, West Lafayette, IN, 4Washington State University, Pullman.

Excessive ammonia levels in commercial laying hen houses can negatively affect hen health and performance. However, ammonia may be difficult to manage because levels are influenced by a complex interaction of factors. This interaction is difficult to study in a conventional experiment where only a few factors can be manipulated. Epidemiological approaches, which use the variation between houses and producers to study outcomes, provide a tool to approach this problem. The objective of this study was to use such an approach to identify features of cage design and house management influencing indoor ammonia levels both within producers (across houses) and between producers. A universal cage measurement system and a management survey were developed in consultation with industry. Commercial houses (n = 188) were then visited. Atmospheric ammonia was recorded from 9 standardized locations per house using a Dräger Pac III ammonia meter. For analysis, variables without sufficient variation were removed. Highly correlated variables were condensed into single summary variables, and the GLM was used to identify a model that best described variance in ammonia. Overall the resulting analysis explained 90% of the variation in ammonia levels within and between producers. The mean ammonia level found was 13.7 ppm, but 25% of houses had levels exceeding 25 ppm. Within producers, ammonia was higher in vertical than A-frame cages (P = 0.004). Between producers, cooled houses had less ammonia (P < 0.001). Both within and between producers, nipple drinkers (P < 0.001) and drinkers placed at the back of A-frame cages (P = 0.002) were associated with increased ammonia, and ammonia decreased with increasing house area (P = 0.001). Although removing manure from the house decreased ammonia, particularly between producers for vertical cages (P = 0.007), drinker design and placement had a greater influence than manure handling (e.g., within a producer, drinker type explained over 3 times more variation in ammonia than manure handling). Together, these results suggest that ammonia release from manure under warm conditions can be most effectively minimized through drinker design and placement to avoid moisture build-up.

Key Words: ammonia, drinker, manure management

Bacterial community dynamics in poultry litter treated with LitterGuard studied by DGGE and 454 pyrosequencing. A. K. Kaushik*, A. Nalian, J. Bray, and A. M. Van-Kley, Stephen F. Austin State University, Nacogdoches, TX.

Bird performance is largely affected by intestinal and litter bacterial communities in poultry houses. Poultry litter, a mixture of sawdust and manure, provides a baseline to analyze the bacterial communities found in the poultry houses. LitterGuard is designed to reduce the presence of pathogenic bacteria and lower ammonia production in litter. LitterGuard was studied using denaturing gradient gel electrophoresis (DGGE) and pyrosequencing. DNA was extracted from samples collected at 8 different time points from 4 broiler houses during 2 flock rotations. A total of 128 samples were analyzed with DGGE and 40 samples with pyrosequencing. Overall, we found an average of 250 taxa in each sample from DGGE results. However, there were no significant differences in richness or composition of the bacterial communities between the houses. Pyrosequencing analysis resulted in 300,000 genomic sequences and we were able to identify a total of 188 taxa in the pretreated samples and 199 taxa in the post treated samples. It was found that Corynebacterium spp., Staphylococcus spp., Lactobacillus spp., Salinicoccus spp., Nocardiopsaceae spp. and Yinia spp. were highly abundant in both the pre-treated and post-treated samples. Using multivariate analysis we found that the bacterial structure before treatment was significantly different than after treatment. However, no significant difference was found in the composition and relative abundance of bacterial communities between the treated and untreated houses. There was no difference found in bird performance between the treated and non-treated houses. Pyrosequencing can be used with DGGE for in-depth analysis of patterns of bacterial communities in a variety of habitat.

Key Words: poultry litter, bacterial communities, DGGE, pyrosequencing, multivariate analysis
Development of a novel polymer plenum floor for broilers to replace litter and reduce house/environmental ammonia. M. Dekich* and J. Harter-Dennis, Avihome LLC, Salisbury, MD.

Alternative fuel for brooding turkey poults: Bird and environmental impacts. A. J. Bardella*, P. H. Patterson, R. M. Hulet, and T. L. Cravener, Penn State University, University Park.

Evaluation of air and litter quality with microbiological fluctuations in commercial broiler facilities using a biological and a chemical litter treatment. D. B. Gholap*, K. S. Macklin, J. P. Blake, and S. F. Bilgili, Department of Poultry Science, Auburn University, Auburn, AL.


Evaluation of a compressed air foam system for euthanasia of caged layer chickens. K. Stringfellow*, D. Caldwell1, J. Byrd2, D. Abi-Ghanem1, L. Berghman 1, J. Hoffman1, J. Lee1, and M. Farnell1.

Greater energy costs and nutrient management concerns are motivating Pennsylvania poultry producers to consider cost saving, energy efficient heating alternatives and management options to stabilize waste nutrients. This field study compared a conventional propane-fueled (P) brooder/heating system for turkey poults to one fueled by spent turkey litter (L) which could potentially address both energy efficiency and waste management problems. On 2 farms L and P fueled houses were monitored for propane and litter consumption, ash production, temperature, relative humidity, air quality (NH3 and CO2, ppm) and litter score (0 as highest quality and 5 as lowest). One farm had a single house with a conventional P brooding/heating system. The second farm had 2 houses utilizing a 586kW (2 mill BTU/hr) L fueled boiler to produce heat for brooding and rearing and 7 ceiling mounted heat exchangers per house for distribution. The houses were 15.2 × 183 m with approximately 8,450 birds/house. The L fueled furnace consumed 309 t of litter and produced 13.7 t of ash, which reduced propane usage by 90%. House levels of CO2 were significantly lower for the 2 L fueled houses (2140, and 2085 ppm) compared with the P house (3570 ppm). House NH3 levels and litter quality were not significantly different between treatments, with values ranging from 0.80 to 49 ppm NH3 and litter scores between 0 and 4.33 corresponding with low values at placement on new litter and higher values at the conclusion of the brooding phase. House temperatures were similar in both systems and not significantly different averaging 25.4 C for the P, and 27.3 and 26.7 C for the L houses during the brooding phase. However, average relative humidity was reduced by 18% utilizing L fuel (59.4 and 59.3%) vs. 71.6% for P fuel. Overall, lower humidity and CO2 levels were an environmental benefit to the birds. Grower propane usage was reduced 90% and litter tonnage was reduced 20-fold. The houses were monitored for propane and litter consumption, ash production, temperature, relative humidity, air quality (NH3 and CO2, ppm) and litter score (0 as highest quality and 5 as lowest). One farm had a single house with a conventional P brooding/heating system. The second farm had 2 houses utilizing a 586kW (2 mill BTU/hr) L fueled boiler to produce heat for brooding and rearing and 7 ceiling mounted heat exchangers per house for distribution. The houses were 15.2 × 183 m with approximately 8,450 birds/house. The L fueled furnace consumed 309 t of litter and produced 13.7 t of ash, which reduced propane usage by 90%. House levels of CO2 were significantly lower for the 2 L fueled houses (2140, and 2085 ppm) compared with the P house (3570 ppm). House NH3 levels and litter quality were not significantly different between treatments, with values ranging from 0.80 to 49 ppm NH3 and litter scores between 0 and 4.33 corresponding with low values at placement on new litter and higher values at the conclusion of the brooding phase. House temperatures were similar in both systems and not significantly different averaging 25.4 C for the P, and 27.3 and 26.7 C for the L houses during the brooding phase. However, average relative humidity was reduced by 18% utilizing L fuel (59.4 and 59.3%) vs. 71.6% for P fuel. Overall, lower humidity and CO2 levels were an environmental benefit to the birds. Grower propane usage was reduced 90% and litter tonnage was reduced 20-fold. The residual ash is a nutrient dense, stable by-product with potential value as a fertilizer (26.5% P2O5, 13.8% K2O) or feed phosphate (11.6% P, 19.4% Ca).

Evaluation of air and litter quality with microbiological fluctuations in commercial broiler facilities using a biological and a chemical litter treatment. D. B. Gholap*, K. S. Macklin, J. P. Blake, and S. F. Bilgili, Department of Poultry Science, Auburn University, Auburn, AL.

For 6 commercial broiler houses (12.2 × 152.4 m), 3 were treated with Litter Guard (LG) 7 d before placement; 18.9 L of LG was mixed into the litter bed. At processing, 500 paws were collected from each house and visually scored for quality. PLT effectively (P < 0.10) reduced ammonia levels during the first week, while LG reduced ammonia on d 22 (P < 0.10). Differences (P < 0.10) between and within houses were also noted with 6 flock houses exhibiting higher ammonia levels. Decreases (P < 0.10) in litter pH occurred the first week in PLT treated houses (8.45 vs. 7.96) and on d 36 in LG treated houses (8.24 vs. 8.40). There were no differences (P > 0.05) in litter moisture while a lower (P < 0.05) water activity (0.902 vs. 0.983) occurred with the LG treatment on d 36. There were no significant differences (P > 0.05) in microbial counts (cfu/g) for the entire experiment except for total enterobacteria, which showed a gradual increase in counts. Birds in one of the PLT houses exhibited a high incidence of foot pad dermatitis where 43% were scored as 1 (moderate lesions) and 15% scored as 2 (severe lesions); whereas, the other 5 houses exhibited <3% foot pad lesions.

Key Words: turkey, alternative fuel, relative humidity, carbon dioxide, ammonia


In recent years, pressure from consumers and government regulation has driven an interest in eliminating the use of antibiotics in commercial poultry feeds. Probiotics have shown the potential to replace growth promoting antibiotics in that they improve feed conversion and weight gain. In this experiment the competitive exclusion product GalliPro Max (containing B. subtilis) was evaluated for its effect on live bird performance, footpad lesions, and litter scoring when fed in a corn-soy diet. In this study 1,000 Ross males were raised to 42 d under commercial conditions. Four treatments were added to standard diets and randomly assigned to 10 pens: negative control (NEG), virginiamycin at 5g/tom (POS), GalliPro Max (GPM) and GalliPro Max with virginiamycin (GPM-V). Pen body weights, feed consumption, feed conversion, percent mortality, footpad lesion scores and indexing of caked litter were measured on d 0, 21, 35, and 42. No statistical significance (P < 0.05) was found between the 4 treatments for pen body weights, foot pad lesion scores, caked litter indexing and mortality. Feed consumption and adjusted feed conversion were significantly higher in NEG at d 21 compared with the other 3 treatments, but no significance was observed on subsequent days. Contrast analysis showed that treatment GPM-V had better feed conversion at both d 35 and 42 compared with NEG. Although not significant, the treatments containing GPM improved bird live performance over the controls. GPM and GPM-V had 4 and 6 point improvements in adjusted feed conversion over the controls and these 2 improved bird average final weight by 0.21 and 0.20 lb over the controls. POS had more footpad lesions than the 2 groups containing GalliPro Max. Mortality was lower in the 2 treatments containing GalliPro Max compared with NEG and POS. Caked litter was higher in the 2 treatments that contained virginiamycin compared with NEG and GPM. According to our results GalliPro Max was effective in improving overall bird live performance either with or without the addition of virginiamycin.

Key Words: broiler, probiotic, virginiamycin

Evaluation of a compressed air foam system for euthanasia of caged layer chickens. K. Stringfellow*, D. Caldwell1, J. Byrd2, D. Abi-Ghanem1, L. Berghman1, J. Hoffman1, J. Lee1, and M. Farnell1.
From a log of 6.41 to 4.85 and 3.52 to 2.41 cfu/in² bacteria. The foaming cleaner reduced ( < 0.05) aerobic plate counts used by firefighters. All swabs were incubated for 24 h at 37°C before agents were mixed to manufacturer recommended concentrations and A bioluminescent ATP test was conducted concurrently. Foaming template and a gauze swab pre-enriched with buffered peptone water. Environmental samples were collected before and post treat - were located on the same farm and had a significant load of organic matter. Evaluation of compressed air foam to clean and disinfect poultry rearing facilities. The USDA Veterinary Services and AVMA have conditionally approved the use of water-based firefighting foam as a means of mass depopulation for poultry during a disease outbreak. The technique works well with floor reared poultry, but it has not been adapted for poultry reared in cages. The objective of this study was to develop a thicker foam produced by utilizing a compressed air foam system (CAFS). The hypothesis of this study was that CAFS can be used to humanely euthanize caged layers similarly to the aspirated foams used for broiler and turkey depopulations. Treatment groups (n = 8/treatment) consisted of a negative control (no treatment other than venipuncture), carbon dioxide, aspirated foam (1% foam concentrate) and CAFS (3.5% foam concentrate). This study was replicated 3 times. Blood was collected from the jugular vein in the negative control birds and from the femoral artery in the euthanized birds. Blood was allowed to clot overnight at 4°C and the serum was removed and frozen for later use in a commercially available corticosterone assay. The respiratory tract was immediately evaluated post euthanasia for signs of trauma or drowning. We observed no significant differences (P < 0.05) in corticosterone levels among any of the treatments, and following examination of the trachea there were no signs of tissue damage. Foam was present in the upper respiratory tract but did not enter the lung which indicates that the foam did not drown the birds. These data demonstrate that CAFS may be used to humanely euthanize layers during a reportable disease outbreak.

Key Words: foam, depopulation, stress, euthanasia, layer

Evaluation of compressed air foam to clean and disinfect poultry rearing facilities. The use of foaming agents to rapidly clean and disinfect poultry processing facilities and hatcheries is a common practice. The objective of this study was to evaluate the effects of foaming agents on Salmonella Typhimurium (ST) and Campylobacter jejuni (CJ) contaminated surfaces in a poultry rearing facility. A 21-d broiler grow out trial was conducted to uniformly contaminate plastic rearing panels with organic matter from broilers challenged with ST and CJ. Four BSL-2 rooms were utilized to challenge day-of-hatch broiler chicks with ST and CJ using a horizontal transmission challenge model. On Day 21, all birds were removed from the premises and pens were disassembled for treatment application. Water alone, foam concentrate alone, 1% peracetic acid (PAA) with a foam concentrate, and a foaming cleaner were applied individually to each treatment room. Environmental samples for bacterial recovery were collected before and post treatment application. A bioluminescence ATP test was concurrently conducted for each sample. All treatments were left on the panels for 30 min of contact time and then gently rinsed. Despite good colonization of broilers, levels of ST and CJ were low and variable on pen materials. However, total aerobes and ATP tests yielded viable data. The water, foam concentrate, PAA and foam cleaner treatments reduced (P < 0.05) aerobic bacteria from a log of 6.19 to 4.33, 6.14 to 4.03, 5.68 to 3.04 and 5.65 to 2.74 cfu/in², respectively. ATP bioluminescence was reduced (P < 0.05) from 2,098 relative light units (RLU) to 784, 3,139 to 653, 2,098 to 345, and 2,129 to 104, respectively. These studies demonstrate that foaming agents may be an effective means to clean and disinfect poultry facilities.

Key Words: Salmonella Typhimurium, Campylobacter jejuni, disinfectants, foaming agents, aerobic bacteria

Reducing litter ammonia emission and Salmonella concentration using two Bacillus subtilis strains. Control of ammonia emissions from commercial poultry houses has become increasingly important with recently proposed environmental regulations. Litter amendments have been developed that reduce ammonia production; however, many of these amendments are chemical and only work for a short time period. Bacterial amendments have the capability to last indefinitely, if bacteria can be isolated that reduce ammonia and persist in the litter environment, and furthermore many bacteria produce antibacterial compounds that may inhibit the growth of bacterial pathogens. Two Bacillus subtilis strains (01 and 301) were isolated that could reduce ammonia and exhibited antibacterial effects to several Salmonella species in vitro. A trial was performed consisting of 6 treatments. Treatments consisted of 01 and 301 at rates of 106 or 107 cfu/g, sodium bisulfate at 45.4 kg/92.9 m², and a negative control. In addition a cocktail of 5 Salmonella species was added with each
Footpad dermatitis (FPD) is a skin condition that affects the plantar surface of the footpad in broilers and turkeys. This condition is an issue for the poultry industry with concerns from animal welfare, food safety, and economic loss standpoints. Previous histopathological examinations of this condition have centered on existing lesions. It may be more useful to understand the early progression of these lesions to better understand the causes and possible methods of prevention. In this study, microscopic changes in early lesion development associated with FPD were examined. Samples of the plantar surface of the footpad from 14 d broilers were stained with routine hematoxylin and eosin. The samples were then examined at a magnification of 100x. Upon examination, it appears that the keratin layers became degenerate, possibly due to moisture, and began to shear. The shearing led to a rapid turnover of keratinocytes. The type of keratin changed from compact to basket weave which weakened the keratin layer. When these layers sheared off completely, heterophils infiltrated the area, and lesions developed. The progression of these lesions occurs long before any changes in the skin structure can be observed by the naked eye.

Key Words: broiler, footpad dermatitis, lesion, histology

201 Distillers dried grains with solubles (DDGS) and its effects on necrotic enteritis development in broiler chickens. K. S. Macklin*, L. N. Rose, and W. A. Dozier, Auburn University, Auburn, AL.

There has been an increase in availability of DDGS for use in animal feeds. The effect DDGS has on poultry gut health is relatively unknown. Previous work by our labs had shown a negative impact of increasing levels of DDGS on necrotic enteritis (NE) development. The objective of this study was to determine if the previously observed effects can be mitigated by the addition bacitracin and monensin into the diets. In this experiment 360 straight run broilers were evenly distributed into 36 battery pens (10/pen). These pens were then randomly assigned to one of 4 dietary treatments (9 replicates/treatment). The diets were: basal (Con), basal with monensin and bacitracin (Con-Ab), 15% DDGS and 15% DDGS with monensin and bacitracin (DDGS-Ab). On d 18 all of the birds were given a mixed Eimeria challenge. On d 21–23 all of the birds were administered C. perfringens via oral gavage. Pen fecal scoring was performed on d 22–28. On d 28 all of the birds were euthanized and intestinal lesion scoring was performed. Collected data was analyzed using GLM and any significant differences ($P < 0.05$) were further separated using Tukey’s Multiple Comparison Test. There were statistically significant different fecal scores on d 23–25. On 2 of those days (23 and 24) the Con group had higher fecal scores than Con-Ab. By d 25 DDGS had higher fecal scores than Con-Ab. On all 3 d the other 2 diets gave intermediate results. An observable trend was that on the final 3 d (26–28) the 2 diets not containing antibiotics (AB) had higher fecal scores than the 2 diets that did contain them. There was no significant difference in the intestinal NE lesion scores between treatments; however there was the trend that the 2 diets not containing AB (0.47 and 0.51 for DDGS and Con, respectively) had higher NE lesion scores compared with the diets containing AB (0.39 and 0.43, for Con-Ab and DDGS-Ab, respectively). The results from this experiment imply that DDGS may influence severity of NE development; however the addition of AB (bacitracin and monensin) reduced the severity of both fecal scores and intestinal lesions.

Key Words: DDGS, necrotic enteritis, antibiotics

†This abstract from the American Association of Avian Pathologists (AAAP) is available in the AVMA Convention Notes at www.avmaconvention.org and at www.aaap.info/2011meeting.