

Poster Session: Environment and Management

255P A comparison of production performance between caged vs. free-range Hy-line Brown layers. D. V. Arbona*, J. B. Hoffman, and K. E. Anderson, *North Carolina State University, Raleigh.*

Despite the degree of environmental protection and economic feasibility offered by traditional poultry houses, the practice of housing laying hens in cages has been widely criticized worldwide due to the public perception that caged housing systems provide poor welfare for laying hens. As a result of this increasing public interest in laying hen welfare, alternative management systems such as free-range environments have been resurrected. To examine differences in production performance between hens reared in caged vs. range environments, a single cycle production performance for Hy-line brown layers was monitored from 17 to 82 weeks of age. Three range replicate flocks of 75 hens and 4-72 hen replicates in cages consisting of 513 flockmates were randomly assigned to either environment. Pullets were reared to prepare them for the environment they would be entering, in growing cages or on litter, for caged and range pullets, respectively. All other rearing procedures, dietary regimens, and vaccinations were identical for cage and range-reared flockmates. Cage birds had significantly better ($P<0.05$) feed conversion rates and higher ($P<0.01$) daily egg masses respectively compared to free-range hens (0.51 ± 0.005 vs. 0.49 ± 0.010) and (52.5 ± 0.34 vs. 49.4 ± 0.68). Additionally, cage birds produced significantly greater ($P<0.001$) numbers of HH (357 ± 5.2 vs. 304 ± 10.5) and ($P<0.0001$) HD eggs (81.9 ± 0.36 vs. 77.7 ± 0.72) compared to free-range hens. Total mortality was significantly higher in free-range hens (28.4 ± 3.50 vs. 8.9 ± 1.75) ($P<0.0001$) although no significant differences in egg weights or sizes were observed. Caged hens produced a greater ($P<0.05$) number of Grade A eggs (90.0 ± 0.76 vs. 85.9 ± 1.52) while free-range hens produced a greater ($P<0.0001$) number of Grade B eggs (5.9 ± 0.47 vs. 11.5 ± 0.94). Lastly, there was no overall difference in the number of checks or losses between the two groups. This indicates that the cage environment had much better overall performance than their range flockmates.

Key Words: chicken, free-range, caged, egg, production

256P Optimizing broiler breeder pullet uniformity through maternal management. D. E. Holm*¹, F. E. Robinson¹, R. A. Renema¹, M. J. Zuidhof¹, and V. E. Carney², ¹University of Alberta, Edmonton, AB, Canada, ²Alberta Agriculture and Rural Development, Edmonton, AB, Canada.

The effect of 5 rearing feed management practices on pullet BW uniformity, carcass traits and feed intake was assessed in Aviagen TP16 broiler breeders (BB). Chicks were placed in floor pens and managed according to Ross 308 guidelines to 3 wk of age when individual measurements of BW, shank length and breast width were taken. A total of 1,200 BB chicks were assigned to treatments (tmts): control, fibre (+25% oat hulls; ME=2200 kcal/kg & CP=11.4%), scatter (pelleted), skip-a-day (fed double amount on alternate d) and sorted. Standard rearing diet was used as the base for control, scatter, skip-a-day and sorted tmts (ME=2865 kcal/kg & CP=15%). Pelleted feed was scattered on the pen floor. Other tmts were fed a mash diet in pan feeders. Each tmt had 2 replicate sets of pens of 40 chicks/pen. Pullets were individually weighed every 4 wk; sorted birds were redistributed based on BW into low (below target), standard (target) and high (above target) pens. At 22 wk 450 pullets were dissected to assess fleshing, fatness and reproductive morphology.

Feed tmt significantly influenced 22 wk BW uniformity ($p<0.0001$). BW CV was significantly lower in sorted (6.2%), scatter (10.9%) and skip-a-day (12.8%) tmts compared to the control BB (15.4%). Improvements in BW CVs in sorted and scatter tmts (compared to control) started at 7 wk of age while skip-a-day did not improve until 19 wk of age. Fibre and control tmts did not differ in uniformity during the rearing phase. Breast width uniformity was higher in sorted (CV=5.5%) and scatter (CV=7.7%) tmts compared to the control (CV=9.8%; $p<0.0001$). Sorted, scatter and skip-a-day improved the uniformity of P. major ($p=0.0003$), P. minor ($p<0.0001$) and liver ($p=0.0073$) weights compared to control. Sorted had the lowest CVs for all measures. Total feed consumption during the rearing phase was higher in the fibre tmt (10.45 kg) compared to the control (8.11 kg; $p<0.0001$), while sorted (8.19 kg), scatter (7.98 kg) and skip-a-day (8.37 kg) tmts were not different from the control. This study indicated that pullet flock uniformity can be improved by using sorted or scatter feed management practices without increased feed consumption.

Key Words: broiler breeders, uniformity, management

257P Effect of broiler breeder diet type, feeding to peak of progeny, and feeder space change in production on leg health of progeny. P. E. Eusebio-Balcazar*¹, E. O. Oviedo-Rondón¹, J. T. Brake¹, M. J. Wineland¹, N. A. Barbosa^{1,2}, C. E. Aker^{1,3}, N. A. Ardón^{1,3}, and H. R. Cutchin Evans¹, ¹North Carolina State University, Raleigh, ²Universidade Estadual Paulista - UNESP, Jaboticabal, SP, Brazil, ³Escuela Agrícola Panamericana Zamorano, Tegucigalpa, Honduras.

This study examined the effects of broiler breeder nutrition and feeding practices on leg health of broiler progeny. Cobb 500 breeders were housed in 16 pens of 81 females each, and fed either corn (C) or wheat (W) based diets during rearing and production. Two feeding programs, sigmoid late fast (LF) and sigmoid late slow (LS) were used until peak of production. At 23 wk, 69 females that represented the BW distribution from each pen were placed in a two-thirds slat layer house where feeder space either remained the same (S) or was increased (M). Forty eggs per pen were collected to obtain yolk, albumen and shell percentages, yolk/albumen (Y:A) ratio, haugh units, egg shape index (SI), egg surface area (ESA), and additional eggs were incubated to obtain egg moisture loss and eggshell conductance (G). Eggs produced at 32 wks of age were incubated and 16 male and 16 female chicks were assigned to 48 pens using 6 replicates per broiler interaction cell and 2 breeder pens per interaction cell in the 2x2x2 factorial design with diet type, feeding program, and feeder space as main factors. Broiler gait scores (GS) and leg problem incidence were evaluated at 42 d. Eggs coming from breeders fed C based diets had lower ($P<0.05$) haugh units and Y:A ratio ($P<0.001$) compared with the group fed W; however, only broilers from LS breeders when fed C showed higher severe valgus incidence. M breeders eggs weighed less ($P<0.01$), had higher ($P<0.05$) SI and their progeny had higher ($P<0.05$) GS 2 at 42 d. Breeders raised with LS feeding program laid smaller ($P<0.05$) eggs with lower ($P<0.05$) percentage shell and their progeny had higher ($P<0.05$) incidence of mild valgus. It was concluded that breeder feeding programs and feeder space affect egg traits that could be important during embryo development and influence leg problems and ability to walk in the broiler progeny.

Key Words: broiler breeder, management, nutrition, bone development, leg health

258P Effects of warming end of lay broiler breeder eggs during the storage period on hatchability. T. Gamble*, J. Dowden, and D. Ingram, *Louisiana State University, Baton Rouge.*

This research was conducted to determine if any improvements in hatchability could be obtained by daily warming during storage of end of lay broiler breeder eggs, 6 experiments were conducted using Hubbard classic broiler breeders 51-58 wks of age. In all trials, 1,440 freshly laid eggs from 2 flocks were used. Eggs were transported for 4 hrs to the LSU farm where they were randomized and numbered, then put into a cooler operating at 15°C and 60% RH overnight. Eggs then began daily warming treatments on the following day. Trials 1-3 eggs were warmed for 0, 30, 60, 90, 120, and 150 min daily for 3d. After the 3rd day eggs were put back into the cooler overnight and were set on the 4th day of storage. Trials 4-6 eggs were also warmed for the same times daily but for 5d. After the 5th day eggs were put back into the cooler overnight and were set on the 6th day of storage. Eggs receiving the daily warming treatments were placed in a Natureform incubator set at 37.5°C and 60% RH, removed after treatment, and placed directly into the cooler. After the storage period eggs were set in the incubator operating at the same temperature as the treatments for 18d, then transferred to the hatcher until 21d. On the 7th day all eggs were candled, infertile and early dead embryos were removed. These eggs were broken to confirm infertility. After 21d of incubation all unhatched eggs were broken and embryo mortality was determined. A randomized block design was used for statistical analysis, with level in the incubator as the block. All percentages underwent arcsine conversion before analysis. Trials 1-3 and 4-6 were combined since there was no significant trial by treatment interaction.

In all trials, percent total hatchability, percent fertile hatchability, percent pips, percent early dead, percent mid dead, percent late dead, and percent dead were measured. The treatments did not significantly ($P>0.05$) improve fertile hatchability for eggs warmed for 3d or 5d. Percent pips was significantly ($P>0.06$) decreased by pre-incubation warming for 5d.

Key Words: hatchability, broiler breeder, incubation, embryo mortality

259P Effect of season of hatch (January and June) on growth of Japanese quail. K. L. Arora*, *Fort Valley State University, Fort Valley, GA.*

During routine reproductive studies with Japanese quail (*Coturnix japonica*), considerable variability was observed among hatches year round with respect to post-hatching growth parameters. This is the main objective of this report. Eggs of uniform weight and size were collected from hatch-mate females from 3:00 to 5:00 PM during the months of January (JA) and June (JU). After holding at room temperature for 4h, the eggs were transferred to the incubator set at 98°-99° F and 65-68% RH. with a built-in egg turner. Eggs were transferred to hatching trays on the 15th day. Hatch chicks were removed from the incubators after they were fully dried, weighed, and transferred to well prepared brooders for the next three weeks under continuous lighting. Brooder temperature was reduced, in a graduated manner, from 98°F to 75°F by the end of the second week. At the end of brooding, birds were weighed, numbered and transferred to wire cages under 14L:10D lighting period. Two groups of 25 males and 25 females of uniform weights were weighed at weekly intervals up to 105d of age starting with 3d of age. Data was analyzed for Means, SE and ANOVA for sex and seasonal differences. Data reflects that birds, males and females, hatched in JU grew faster than

those hatched in JA; the differences became very apparent after 10d of growth and continued to diverge further with age. Sexual dimorphism was evident by 16-18 days of age in both groups. Differences in growth rate, within these groups, appeared by 30-35 days; the females grew faster than males. Males, within each group, started plateauing between 50 and 60d of age; 114g for JA and 105g for JU ($p<0.05$). However, the females continued to grow to the end of this project (105d); 138g for JA and 126g for JU ($P<0.05$). When planning experiments on reproduction, endocrinology, toxicology, nutrition and other physiological aspects with Japanese quail, seasonal differences in their growth rate should be given due consideration.

Key Words: Japanese quail, season, body weight, growth

260P Relationship between body weight and reproductive organs in Japanese quail layers. K. L. Arora*, *Fort Valley State University, Fort Valley, GA.*

During an on-going reproductive studies with Japanese quail (*Coturnix japonica*), a considerable variability in growth of ovaries and oviducts was experienced among layers. The role of layers' weight was investigated as follows. Twenty layers which were in production for about 10 weeks were divided based upon their body weights, into two groups of 10 each. Group I: Birds weighing under 130 grams and Group II birds weighing above 145 grams. Birds were euthanize with carbon dioxide and oviducts and ovaries (including follicles) were removed and weighed to the nearest milligram (mg). Ovaries in both groups contained at least five follicles containing yellow yolk of varying sizes, which were also weighed and measured (diameter) individually using a vernier caliper. Oviducts in both groups weighed on average 5.78g and 7.13g ($P<0.05$) and ovaries 5.96g and 7.05g ($P<0.05$) in Group I and Group II, respectively. Ovarian follicles weighed on average 2.76, 1.63, 0.54, 0.21 and 0.07g in Group I and 3.29, 1.81, 0.81, 0.42 and 0.12g, in Group II. Average size of the follicle was 16.96, 13.83, 10.38, 6.50 and 4.60mm in Group I and 18.30, 14.58, 13.27, 8.45, and 5.95mm in Group II. Three ovaries in Group II had an additional 6th follicle weighing 0.06g and measuring 4.45mm. In short, both oviducts and ovaries weighed heavier in Group II birds. The same was true for each of the growing follicle, however, the difference was significant only between the first (the largest) follicles which were next in order to ovulate (2.76g vs.3.29g; $P<0.05$). In addition, the eggs laid by Group II birds were also comparatively larger as compared to Group I (10.2g vs. 9.7g; $P>0.05$). It was concluded that the heavier birds (Group II) had bigger reproductive organs. Accordingly, weight of bird should be given a due consideration while planning an experiment.

Key Words: *Coturnix japonica*, Japanese quail, body weight, ovary, oviduct

261P Assessment of light intensities for chicks during brooding. D. L. Everett*¹, C. D. Zumwalt¹, J. L. Purswell², and M. T. Kidd¹, ¹*Mississippi State University, Starkville,* ²*USDA, Starkville, MS.*

This experiment evaluated a titration of light intensity in chicks during brooding. Ross 308 chicks (straight-run) were exposed to continuous lighting during placement to 7 d of age: 25 (control), 50, 100, and 150 lux. Treatments were applied to 16 pens within two commercial broiler houses (32 total pens each containing 24 chicks; 8 replications per lux treatment). Treatments were derived by hanging one incandescent bulb over each pen (except the control) that varied in wattage to derive treat-

ment lux intensities at litter level. Lighting treatments were confirmed at placement and throughout experimentation in each pen by the use of light meter measurements at litter level. The light treatment in the control pen was achieved from incandescent lights mounted on the ceiling of the broiler house. Each pen was positioned in the commercial broiler houses to be equal distance from hanging infrared brooders. Treatments were blocked across the brood chamber to take minimum ventilation temperature differences into consideration. Built up litter was used and each pen contained one hanging pan feeder, feed lids containing supplemental feed, and one nipple drinker line. Birds were weighed at d 1 and 7, feed disappearance was measured from d 1 to 7, and dead birds were removed and recorded daily. Repeated t test comparisons indicated that BW gain, feed conversion, and mortality did not differ ($P > 0.05$) between treatments. Regression was applied to treatments and indicated that as lux increased mortality increased ($P = 0.11$) in a linear manner (1.1, 2.4, 4.2, and 2.6% for 25, 50, 100, and 150 lux, respectively). Trend lines for BW gain and feed conversion were not observed. This experiment indicates that brood chamber light intensity of 25 lux seems to be adequate for chick quality based on 7 d measurements.

Key Words: light intensity, broiler, brooding

262P Brooding light source on live performance and processing characteristics of commercial broilers. A. N. Hoover*¹, C. D. Zumwalt¹, J. L. Purswell², C. D. McDaniel¹, and M. T. Kidd¹, ¹Mississippi State University, Starkville, ²USDA, Starkville, MS.

This experiment investigated light sources during brooding in broilers reared in a two commercial houses. The houses utilized center brooding. The brood chamber was divided into two sections via mounting a black curtain in the center of the house. Each section utilized two rows of incandescent (INC) lights. However, a center row of high pressure sodium (HPS) lights was installed on one side of the brood chamber. Brooding treatments represented 24 h of light for the first 7 d of INC lights or the INC lights with the HPS lights (2 replicates per treatment). Each replicate brood chamber contained eight pens of 24 Ross x Ross 308 straight run broilers placed equal distances from the brooders and light sources (32 total pens; 768 total broilers/experiment). However, because light was administered to each side of the brood chamber, pens represented observational units and brood chambers represented experimental units. Photometric sensors were placed in the darkest and brightest pens of each brood chamber. Intensity was recorded every 15 min. The average light intensity for the 7 d period was 20 vs 106 lux in the INC and HPS light treatments, respectively. Birds were weighed by pen at d 1, 7, and 49, and feed intake was measured from 1 to 7 and 1 to 49 d of age. Dead birds were removed and recorded daily. All birds were processed at d 49. Carcass weight was obtained on all birds and half the carcasses were selected to obtain weights of Pectoralis major and minor, and abdominal fat. Light source did not significantly ($\alpha = 0.05$) impact BW gain, feed intake, feed conversion, or carcass yields. This experiment indicates that increasing light intensity via HPS lights to achieve a five fold increase in intensity during brooding is not warranted. However, this experiment utilized a split-house farm and was limited in terms of statistical power.

Key Words: broiler, light source, brooding

263P Induced and un-induced deep pectoral myopathy in broilers reared on different light treatments. R. J. Lien*, S. F. Bilgili, and J. B. Hess, Auburn University, Auburn, AL.

The effects of light treatments on the incidence of deep pectoral myopathy (DPM) were studied in male broilers. At 42 d, replicate groups from each treatment were either un-induced or subjected to 20 bouts of wing flapping in 32 s to induce DPM. DPM incidence and the percent of breast tenders affected were assessed upon slaughter at 47 d. In trial 1, light treatments provided a 20 h dim photoperiod (1-7 d, 23L:1D and 0.5 FC; 8-40 d, 20L:4D and 0.1 FC; 41-47 d, 23L:1D and 0.1 FC) (20D treatment), a 16 h bright photoperiod (1-3 d, 23L:1D; 4-44 d 16L:8D; 45-47 d, 23L:1D; all at 2 FC) (16B treatment), or 16 h of bright light split by 2 dark periods of 4 h (1-3 d, 23L:1D; 4-44 d, 14L:4D:2L:4D; 45-47 d, 23L:1D; all at 2 FC) (16B2D treatment). In trial 2, light treatments provided a 23 h bright photoperiod (1-47 d, 23L:1D, 2 FC) (23B treatment), increasing-dim photoperiods (1-7 d, 23L:1D, 8-14 d, 12L:12D; 15-21 d, 14L:10D; 22-28 d, 17L:7D; 29-35 d, 20L:4D; 36-47 d, 23L:1D; 1 FC to 7 d and 0.25 thereafter) (ID treatment), or 18 h of bright light split by dark periods of 4 and 2 h (1-47 d, 16L:4D:2L:2D and 2 FC) (18B2D treatment) to male broilers of tray pack and breast yield strains. In trial 1, un-induced DPM incidences were 7.5% in 16B2D, 3.75% in 20D, and 2.5% in the 16B treatment. Induced incidences were 67% in 16B2D, 64% in 20D, and 44% in the 16B treatment. The percent of tenders affected by induction was 62% in 16B2D, 56% in 20D, and 35% in the 16B treatment. In trial 2, un-induced DPM incidences were 15% in breast yield versus 4.2% in the tray pack strain; and 7.5% in 23B and ID treatments, versus 15% in the 18B-2D treatment. Induced incidences were 86% in breast yield versus 77% in tray pack strains; and 77% in 23B versus 88% in ID, and 79% in the 18B-2D treatment. The percent of tenders affected by induction was 77% in breast yield versus 66% in the tray pack strain; and 71% in 23B versus 73% in ID, and 72% in the 18B-2D treatment. These results suggest light treatments may influence DPM, and that induction may have potential in the assessment of management factors and strains on its occurrence.

Key Words: broiler, lighting, deep pectoral myopathy, induction

264P Impact of providing high moisture feed for chicks post-hatch. L. C. G. S. Barbosa*¹, L. Araujo¹, C. Araujo¹, S. L. Branton², and M. T. Kidd¹, ¹Mississippi State University, Department of Poultry Science, Mississippi State, ²United States Department of Agriculture, Mississippi State, MS.

Early viability of a broiler flock (i.e., good chick quality) is measured the first 7 d. One important factor in chick quality is hydration. Chick hydration can be influenced by hen age, hen performance, hatchery management, and chick transportation, in addition to broiler house management. This experiment was conducted to assess adding water to pre-starter feed in chick trays and measuring broiler performance to d 41. One thousand and eight hundred chicks (Ross 708) were obtained from a commercial hatchery and transported to the experimental facility. Upon arrival, chicks were distributed into chick trays of 50 chicks each (50% of normal density) and weighed. Chicks were provided treatments (454 g pre-starter crumbled feed) in the chick trays for 5 hr. Treatments consisted of: no feed, pre-starter feed, or pre-starter feed mixed with 10, 20, 30, or 40% potable water (6 treatments with 6 replications each). Each replicate was the chick tray (50 chicks/tray) which was subsequently placed in each pen (50 birds per pen). After 5 hr of holding in the experimental facility, chicks were placed and provided common feed from 1 to 14, 15 to 26, 26 to 35, and 36 to 41 d of age. BW was obtained before placement, and d 7, 14 and 42. Feed intake and dead birds were measured from 1 to 41 d of age. At d 41, a random sample of male and female broilers were obtained and processed for yields of carcass and breast muscles. Differences in live performance and most carcass

parameters were not observed ($P > 0.05$). However, chicks provided feed containing 40% water post-hatch had less abdominal fat ($P < 0.05$) than chicks provided other pre-starter feed. Results indicate that pre-starter moisture level may affect subsequent broiler metabolism.

Key Words: broiler, pre-starter, feed moisture, abdominal fat

265P Effects of graded levels of melamine in young turkey poults. L. M. Brand*, R. A. Murarolli, R. E. Kutz, D. R. Ledoux, G. E. Rottinghaus, A. J. Bermudez, and M. Lin, *University of Missouri, Columbia.*

A study was conducted to determine the toxicity of melamine (M) in young turkey poults fed dietary treatments from hatch to 21 days. One hundred and seventy-five day-old female turkey poults were purchased from a commercial hatchery and assigned to 7 dietary treatments with 5 replicate pens of five poults assigned to each treatment. The diets contained 0, 0.5, 1.0, 1.5, 2.0, 2.5 and 3.0% M. Significant mortality was observed in turkeys fed 1.5, 2.0, 2.5 and 3% M with 27, 63, 93, and 93% mortality, respectively. Due to the high mortality in birds fed $\geq 2\%$ M, growth performance could only be evaluated in birds fed 0, 0.5, 1, and 1.5% M. Compared with controls, feed intake was reduced ($P < 0.05$) in turkeys fed diets containing 1.5% M, whereas body weight gain was reduced ($P < 0.05$) in birds fed $\geq 1\%$ M. Compared with controls, relative kidney weights were higher ($P < 0.01$) in turkeys fed diets containing $\geq 1\%$ M. Relative liver weights were not affected ($P > 0.05$) by dietary treatments. The consistent gross lesions observed in turkeys fed 2-3% M that died were pale and enlarged kidneys. The bile of turkeys that died in these treatment groups contained crystals that were either microscopic (< 2 microns) in size or were large white crystals visible to the naked eye. Most of the birds that died on these treatments were still eating food at the time of death with food present in the crop and/or ventriculus. Renal histopathology of birds fed 2-3% M that died were relatively uniform, and could be summarized as moderate to severe tubulointerstitial nephritis with mineralized casts within the collecting tubules and ducts. Data indicate that compared to broilers, turkeys are more susceptible to the toxic effects of M. The gross and histopathology findings are compatible with lesions of melamine toxicity reported previously for broiler chicks. However, concentrations of M that caused toxic effects in this study are still well in excess of concentrations found in M contaminated ingredients that were reported to cause kidney failure in dogs and cats.

Key Words: turkeys, melamine, kidney lesions, crystal formation

266P Removed

267P Residual activity of *Metarhizium anisopliae* or plant extracts on laying hens for *Menacanthus stramineus* mite control by dipping. E. Pablo¹, A. L. Sandoval¹, E. Morales¹, M. Fernandez², G. Tellez^{*3}, and M. T. Quintero⁴, ¹*Universidad Autónoma Metropolitana, México*, ²*Instituto Nacional de Investigación Forestales Agrícolas y Pecuarias, Morelos, Mexico*, ³*University of Arkansas, Fayetteville*, ⁴*Universidad Nacional Autónoma de México, Mexico.*

In the present study, eighty-four Hy-Line W36 laying hens in two experiments were distributed in 7 treatments with 3 replicates of four hens each. Each treatment, hens received 3 dipping/2 minutes every 48 hours. Residual activity was done by counting mites one month after the dippings. Treated hens with no live mites were reinfested with 20 mites, and repeated during three months. In experiment one, aqueous suspensions of three plant extracts were tested as dips for control of MS mites: a) Neem (*Azadirachta indica*) 500 ppm; b) Ruda (*Ruta graveolens*) 11,700 ppm; or c) Solanacea (*Ardisia solanacea*) 50,000 ppm; d) Negative Control (water). After the first dipping, a significant difference ($P < 0.05$) in the number of death mites were observed in the hens that received Neem (84.1 %) or Solanacea (98.1 %), however, after the second and third dipping, all treated groups showed a significant increase in the number of death mites compared with the control. Average after the 3 dippings were: Neem (93.6 %); Ruda (85.2 %); Solanacea (98.2 %); Control (49.1%). One month later, all 3 treated groups had 0 mites compared with 38 mites in the control group. Counts of live mites at two months after first reinfestation were: Neem (0); Ruda (1); Solanacea (43); Control (51). Counts of live mites at three months after second reinfestation were: Neem (0); Ruda (15); Solanacea (NA); Control (60). In experiment two, 3 aqueous suspensions were tested: group 1) Ruda 50,000 ppm; group 2) *M. anisopliae* 50,000 ppm; or group 3) Coumaphos 1,000 ppm. After the first dipping, a significant difference in the number of death mites were observed in the hens that received Coumaphos (100 %), however, no significant differences were observed between treatments after the second and third dipping Counts of live

mites one month later were: group 1 (2 mites); group 2 (0 mites); group 3 (38 mites). Counts of live mites at two months after first reinfestation were: group 1 (13); (16). These results confirm the effectiveness of alternative bio control methods for mites in laying hens.

Key Words: mite, hens, *Metarhizium anisopliae*, biocontrol, plant extracts

268P Effect of diatomaceous earth on internal parasites of free-range, organic laying hens. D. C. Bennett*, Y.-J. Rhee, A. Yee, and K. M. Cheng, *University of British Columbia, Vancouver, BC, Canada.*

Parasitic infections can have a significant detrimental impact on free-range poultry production, but organic farming regulations do not allow the routine use of pesticides to control parasitism. Therefore, there is a need for an effective and safe method of treatment. One proposed treatment is the use of diatomaceous earth (DE). The purpose of this study, therefore, is to evaluate the effects of DE on internal parasites of free-range organic layer hens. Day old pullets of two commercial egg laying strains (Bovan brown, Lohmann brown) were reared indoors until 11 weeks of age, and then transferred to hen-houses with access to outdoor range. Birds were initially fed a certified organic grower mash, which was replaced with a certified organic layer mash at 18 weeks of age. Starting at 16 weeks of age, half the hens of each line began receiving these diets supplemented with 2 % diatomaceous earth. Body mass, and egg production and quality were monitored throughout the experiment. Parasitic load was assessed by bi-weekly fecal egg counts (FEC) performed on 40 individual hens (10 hens/diet/strain) at bi-weekly intervals between 16 and 28 weeks of age. These hens were sacrificed between 33 and 38 weeks of age, and their trachea and gastrointestinal tract examined for the presence of helminthic parasites. DE had no effect on the number of hens infected, FEC, or worm burdens. However, body mass and egg production were greater in hens consuming the DE diets. These hens also laid larger eggs with thicker shells. The results of this study suggest that there is no evidence that DE is an effective treatment to control gastrointestinal parasitic infections of free-range laying hens. However, DE as a feed ingredient may maintain body mass, increase egg production and improve egg quality in free range laying hens fed an organic diet.

Key Words: diatomaceous earth, helminthic parasites, organic layer production

269P Vaccination response in pullets from different genetic backgrounds and the impact of dietary yeast beta glucan. B. M. Rathgeber*¹, K. L. Thompson¹, K. L. Budgell², and J. L. MacIsaac³, ¹*Agriculture & Agri-Food Canada, Kentville, NS, Canada*, ²*Nova Scotia Agricultural College, Truro, NS, Canada*, ³*Atlantic Poultry Research Institute, Truro, NS, Canada.*

Poor immune response to vaccination in laying hens is a common problem in the egg industry. Dietary yeast beta-glucan (YBG) has been shown to improve or maintain growth performance in broiler chickens fed antibiotic free diets, and has been shown to improve immune response to vaccination in young piglets. A study was conducted with one commercial White Leghorn line and three heritage breeds (Barred Plymouth Rock, Brown Leghorn and Light Sussex) to determine the effect of a dietary yeast beta glucan product on immune response to

common disease vaccinations in pullets, and to evaluate the role of genetics in immune response. Eggs were incubated together and day old chicks were fed standard diets with or without supplemental YBG for 20 weeks. Pullets were vaccinated for Newcastle disease (ND), infectious bursal disease (IBD), infectious bronchitis (IB) and avian encephalomyelitis (AE) according to a standard schedule. Blood samples were collected at 14 and 20 weeks to measure antibody titer levels to each of these vaccinations. Immune response to vaccination was unaffected by dietary YBG supplementation. Antibody titer levels varied ($P < 0.05$) between heritage and commercial breeds with Light Sussex generally exhibiting greater immune response than commercial birds. Antibody titer levels also varied ($P < 0.05$) according to bird age, with immune response of most breeds being greater at week 20 than week 14, in particular for avian encephalomyelitis (AE) and Newcastle disease (ND) vaccinations. This is the first report on the effects of dietary YBG supplementation on immune response to vaccination in pullets. In light of the published reports on improved immune response to ND vaccination in broiler chickens, further research on the ability of dietary YBG to improve immune response in layers is warranted. The superior immune response to vaccination in heritage breeds, in particular Light Sussex will provide useful information for further studies. The significantly lower titer levels in the commercial breed provide evidence that vaccination response continues to be a problem with commercial egg laying chickens.

Key Words: pullet, vaccination, beta glucan, heritage breed

270P Differential effect of ascorbic acid supplementation on the stress response of turkeys from genetic lines differing in growth rate. G. R. Huff*¹, W. E. Huff¹, N. C. Rath¹, N. B. Anthony², and K. E. Nestor³, ¹*USDA/ARS, Fayetteville, AR*, ²*University of Arkansas, Fayetteville*, ³*The Ohio State University, Wooster.*

Genetic selection for fast-growth can affect the ability of male turkeys to cope with stressors common to commercial production, resulting in decreased immunity to opportunistic bacterial infection. The purpose of this study was to compare the effects of ascorbic acid (AA) on the stress response in birds selected for increased 16-wk-BW (F-line) with their random-bred parent line (RBC2). Male turkeys were raised in duplicate floor pens in a randomized 2 line x 2 treatment x 2 stress challenge (SC) design. At 5 wks of age AA (1,200 ppm, Stabilized-C, Alpharma) was provided in drinking water for 24h, during which all birds were weighed. After 24h of AA treatment the SC group was subjected to a transport protocol that included disruption of the social group, catching, loading, and movement to another building, and a 12 h feed and water withdrawal. Six h after the start of transport, SC birds were also inoculated in the thoracic airsac (AS) with 1×10^4 cfu of *Escherichia coli*. At the end of SC birds were returned to their original pens and provided feed and water. The following morning 4 birds from each pen were bled and all birds were weighed and necropsied 2 d later. BW and gain after SC was decreased in the F-line but not the RBC2 line and there were no AA effects on BW. The weight of the bursa of Fabricius relative to BW was higher in the RBC2 line ($P < 0.0001$), was decreased by SC ($P = 0.0006$), and was not affected by AA. The heterophil:lymphocyte ratio was higher in the SC F-line as compared to the SC RBC2 ($P = 0.03$) and was decreased by AA only in the SC F-line ($P = 0.01$). Corticosterone (C) levels were increased by SC only in the F-line ($P = 0.002$) and AA decreased C levels only in the RBC2 line ($P = 0.02$). The challenge strain of *E. coli* was cleared from the AS in all treatments except the AA-treated F-line SC birds ($P = 0.003$). These

results suggest that SC at 5 wks of age had a more deleterious effect on the fast-growing F-line than on its parent line, AA treatment had different effects in the two lines, and AA may have decreased resistance to *E. coli* in the SC F-line birds.

Key Words: turkeys, transport stress, genetics, ascorbic acid, immunity

271P Comparative growth performance of turkey hens fed additives in commercial and antibiotic-free diets. R. M. Hulet* and T. L. Cravener, *Pennsylvania State University, University Park.*

Increased costs for protein and energy feed ingredients and use of antibiotic-free diets have increased the use of additives to improve gut health and feed efficiency. A study was conducted on reused litter to compare a commercial turkey hen diet (Control) supplemented with Lasalocid™ (90.7 gm/ ton; 0 to 7 wk) and Virginiamycin™ (20 gm/ ton; 7 to 16 wk) with a test diet (NBM) supplemented with Natostat™ (907 g/ton; 0 to 7 wk), BioMos™ (907 gm/ton; 7 to 16 wk), and CoccoVac T™ (day 1) and an Antibiotic-free control diet with no additives (NEG). Eleven-hundred and fifty female Hybrid Converter poults were randomized into 8 pens (brooding) for 7 days and then spread into 24 pens at 7 days of age and placed into assigned dietary treatments. All birds and feed were weighed at 0, 7, 28, 51, 63, 84 and 111 days of age. Significant differences were found in bird weight starting at 28 days and continuing on to 111 days of age. Control hens (10.7 kg) were significantly greater in body weight than NBM hens (10.4 kg) which were significantly heavier than the NEG hens (10.2 kg) at 111 days of age. While some differences existed in feed consumption, no significant difference in cumulative feed conversion was found between the dietary treatments. A significant difference in feed conversion and mortality resulted at the 7 to 28 day period that was related to a mortality challenge. Mortality was significantly higher for the NBM (3.7%) treatment compared to the Control (0.80%) and NEG (0.26%) treatments. In conclusion, significant growth performance differences were found between all dietary treatments and showed production advantages for Control hens grown on reused litter.

Key Words: turkey, antibiotic-free diets, growth efficiency

272P Comparison of use of additives in two antibiotic-free broiler diets for growth efficacy and litter composition. R. M. Hulet*¹, T. L. Cravener¹, and S. Heintzelman², ¹*Pennsylvania State University, University Park*, ²*Alltech, Inc., Nicholasville, KY.*

Increased costs for protein and energy feed ingredients have increased the use of additives to improve growth rate and feed efficiency. Some additives are used to improve energy utilization and/or phosphorus utilization while others improve nutrient utilization or influence bird health. A commercial broiler antibiotic-free diet (Control) was supplemented with Clopidol™ (0.0125 %/ton) 0 to 18 days of age and Decoquate™ (27 g/ton) from 18 to 32 days while the test diet (NP) was supplemented with Natural Pak™ (mix of De-Ordorase, Bio-Mos, Sel-Plex, Bio-Plex, Allzyme SSP and Oregano; 1.4 kg / ton) from 1 day until marketing (42 and 52 days). Seventeen-hundred and twenty-four broilers were randomized into 48 pens at day of age and placed on randomized dietary treatments. All birds and feed were weighed at 0, 18, 32, 42, and 52 days of age.

No significant differences were found in bird weight between the Control (2.98, 3.95 kg) and NP (3.00, 3.97 kg) supplemented diets at 42 or 52 days of age, respectively. Feed intake was only significantly different

between the Control and NP treatments for the starter feed (0 – 18 days). No other differences in feed conversion (18 – 52 days) were found between the Control and NP treatments. Mortality was not significantly different by period or cumulatively between the Control and NP dietary treatments. Litter analysis showed a significant decrease in values for the NP dietary treatment when compared to the Control diet for Total and Organic Nitrogen, Total phosphate, potash, calcium, magnesium, and sulfur. In conclusion, no significant growth performance differences were found between the two antibiotic-free dietary treatments; however, improved nutrient utilization/ decreased litter nutrients were found in production of heavy broilers by using the NP additive.

Key Words: broiler, antibiotic-free diets, nutrient utilization

273P Effect of inclusion of adipic acid, calcium chloride and a protease in broiler diets differing in protein concentration on performance, N retention, excreta pH and nitrogen loss from stored excreta. E. Jimenez-Moreno*^{1,2}, R. Angel¹, J. Garcia², W. Powers³, and T. Applegate⁴, ¹*University of Maryland, College Park*, ²*Universidad Politecnica de Madrid, Madrid, Spain*, ³*Michigan State University, East Lansing*, ⁴*Purdue University, West Lafayette, IN.*

Effects of inclusion of feed additives and protease supplementation in diets differing in CP on broiler performance from 10 to 20 d of age, N retention, excreta pH and potential N loss during storage were studied. A 2 × 2 × 3 arrangement of treatments (TRT) were tested: 2 CP levels (22.4% and 20.8%), 2 protease inclusions (0 and 2000 ppm), and 3 additives (none, 1% adipic acid; and 1% CaCl₂). Broilers were housed in battery pens (6 chicks/pen) and TRT replicated 5 times. On d 20, all birds were sampled and ileal content taken for apparent N retention determination. Excreta were collected by pen, mixed and divided in 2 parts. To one of the parts, 4% Alum (aluminium sulphate) was added to determine its impact on pH and potential N volatilization during storage for 14 d in a poultry house kept at ambient conditions. Low CP diets reduced gain (P<0.001) and impaired (P<0.001) feed efficiency (FE). Proteases inclusion improved gain (P<0.01) and FE (P<0.001). The inclusion of CaCl₂ reduced gain (P<0.001) and impaired FE (P<0.001) with respect to the control diet or adipic acid. As compared to excreta pH from the birds fed the no additive diets, pH was reduced (P<0.001) after 7 d of storage with adipic acid and further reduced with CaCl₂ but these effects disappeared by 14 d of storage. Adding Alum resulted in a decrease in excreta pH at 7 and 14 days of storage. Potential N volatilization was affected by additive (P<0.05) and Alum addition (P<0.001). The inclusion of adipic acid as well as CaCl₂ reduced potential N volatilization. Samples with Alum lost 24.8% of the N in the samples after 14 d of storage while those with no Alum lost 63.3% N. We concluded that low CP diets (20.8%) and inclusion of CaCl₂ impairs broiler performance. The use of 1% adipic acid or CaCl₂ and 4% Alum reduced excreta pH and potential N volatilization.

Key Words: adipic acid, calcium chloride, alum, excreta pH, broiler

274P Effect of diet protein, protein source, and protease inclusion on broiler performance, excreta pH and nitrogen loss from excreta during storage. E. Jimenez-Moreno*^{1,2}, R. Angel¹, J. Garcia², W. Powers³, and T. Applegate⁴, ¹*University of Maryland, College Park*, ²*Universidad Politecnica de Madrid, Madrid, Spain*, ³*Michigan State University, East Lansing*, ⁴*Purdue University, West Lafayette, IN.*

Effects of diet protein (PRT), PRT source, and protease on performance, excreta pH and potential N loss from excreta during storage were studied

in broilers. A $2 \times 2 \times 3$ arrangement of treatments (TRT) were tested: 2 PRT levels (22.4% and 20.8%), 2 protease levels (0 and 2000 ppm), and 3 PRT sources (soybean meal (SBM), 15% meat meal, MM; and 20% DDGS). All diets were corn-SBM with or without partial SBM replacement by another PRT source. Each TRT was replicated 5 times (6 broiler chicks/battery cage). Diet TRT were fed from 10 to 20 d of age. At 20 d, excreta samples were taken, mixed, and subdivided in half. Alum (aluminium sulphate) was added (4% inclusion) to 1 sample per pen to determine the effect on excreta pH and N volatilization. Excreta was kept in a poultry house at ambient conditions and pH and N content monitored for 14 d post excretion. There was a PRT level and protease effect ($P < 0.001$) on gain and feed efficiency (FE). Broilers fed the low PRT diet gained less than the broilers fed the control diet (579 vs. 558 g gain) and those fed diets with added protease grew more ($P < 0.05$) and had a better FE than those fed diets with no added protease (1.37 vs. 1.42, respectively). Both diet PRT and protease inclusion had an effect ($P < 0.05$) on 14 d pH. Inclusion of MM reduced pH of the excreta ($P < 0.001$) as compared to the SBM-or DDGS (7.28 vs. 7.89 and 7.82, respectively). Alum inclusion reduced excreta pH at 7 and 14 d of storage ($P < 0.001$) as compared with the same excreta with no added alum (7.39 vs. 8.82 at 7 d, and 7.02 vs. 8.31 at 14 d, respectively). Neither PRT nor protease influenced potential N volatilization but PRT source and Alum inclusion had an effect ($P < 0.001$). Both MM and DDGS (43.2 and 39.4% N loss, respectively) decrease the potential N volatilization over 14 d of storage vs. the SBM diet (47.9% N loss). Alum addition to excreta reduced ($P < 0.001$) potential N volatilization by a factor of 2.2. Substitution of part of the SBM with MM or DDGS and the use of Alum reduced the potential N volatilization from stored broiler excreta.

Key Words: protein concentration, protein source, protease, excreta pH, broilers

275P Effect of dietary phytase or DDGS on nutrient contents of laying-hen manure. B. R. Behrends*¹ and S. A. Roberts², ¹*Sparboe Farms, Litchfield, MN*, ²*Iowa State University, Ames*.

The objective of this study was to evaluate the effect of dietary phytase or corn distillers dried grains with solubles (DDGS) on manure nutrient (P_2O_5 , N, K_2O , and Ca) contents in high-rise laying-hen houses. Thirty-four houses on 3 farms (3.2 M hens) owned by Sparboe Farms were used in this study. Manure was sampled annually from 2000 to 2008 by collecting 12 samples per house, mixing the samples, and sending one pooled sample per house to an EPA-certified laboratory for analyses. Diets were formulated to contain 4.5% Ca and 0.46% available P. During 2000, 2001, and 2002, neither phytase nor DDGS were fed. In 2003 and subsequent years, phytase was fed at 300 FTU/kg. In 2004, DDGS was fed at 8% and in 2005 and subsequent years, DDGS was fed at 12% of the diet. Data were analyzed by ANOVA with the model including treatment, farm, and the interaction farm by treatment. When the interaction was significant, means were separated by the Bonferroni test to determine if the response was consistent at all three farms. The effects of phytase or DDGS were evaluated separately to avoid confounding. House was the experimental unit and $P \leq 0.05$ was considered significant. Values are reported on dry-matter basis. The P_2O_5 content of manure decreased 19% from 6.35% to 5.31% ($P < 0.0001$) when dietary phytase was introduced. There were no significant differences in manure N, Ca, or K_2O content between the 300 or 0 FTU/kg phytase diets. The addition of DDGS to the diet increased ($P = 0.003$) the P_2O_5 content of the manure (5.31, 5.64, and 6.04% for the 0, 8, and 12% DDGS diets, respectively). The interaction was significant and the Bonferroni test

indicated that the treatment effect was primarily due to responses at 1 farm with no significant differences in manure P_2O_5 content at the other 2 farms. The DDGS inclusion did not affect manure N, Ca, or K_2O . In conclusion, manure P_2O_5 content was lower when hens were fed 300 FTU/kg phytase and tended to be higher when DDGS was fed. Neither phytase nor DDGS affected manure N, Ca, or K_2O .

Key Words: layer manure, phosphate, phytase, DDGS, nutrients

276P Spatial distribution of microorganisms as it relates to poultry litter depth. K. J. Barker*, H. M. Parker, C. D. McDaniel, and A. S. Kiess, *Mississippi State University, Starkville*.

A common practice in the poultry industry is to reuse litter over multiple flocks. Morbidity, mortality, and condemnation, due to pathogenic bacteria, have been attributed to this practice. Due to limited information on the distribution of bacteria in litter, it is possible that pathogenic anaerobes may prefer to colonize litter at deeper depths, where oxygen is less abundant. When litter is disturbed, these organisms may be introduced to the surface of the litter where they have the potential to cause disease outbreak. Therefore, the goal of this project was to investigate the distribution of bacteria at different depths of litter. In two commercial broiler houses, 6 PVC pipes measuring 1.5 inches in diameter and 24 inches in length were drove through the litter bed to the clay floor. Each pipe was transported up-right to the lab, where they were cut into their respective sections (top, middle, and bottom) exposing the litter material to be processed. Ten grams of litter from each section was added to 90 mL of peptone, serially diluted and plated onto TSA agar plates for aerobic and anaerobic bacteria and EMB agar plates for coliforms. Plates were incubated under the appropriate atmospheric condition for 48 hours at 37 degrees C. After 48 hours, plates were counted for total aerobes, anaerobes, and coliforms. Results indicated a significant difference ($P < 0.05$) in bacterial counts, with the bottom section having significantly lower counts of aerobes, anaerobes, and coliforms than the top and middle sections. In conclusion, the bottom section of litter has significantly less bacteria compared to the top and middle sections, suggesting that the bottom layer of litter does not provide a favorable environment for bacteria growth.

Key Words: litter depth, anaerobes, aerobes, coliforms

277P Development and validation of methods for the recovery of Salmonella and Campylobacter from watershed runoff after poultry litter application. J. H. Metcalf*¹, I. Reyes-Herrera¹, P. Blore¹, P. A. Moore Jr.², A. M. Donoghue², I. Hanning¹, S. C. Ricke¹, and D. J. Donoghue¹, ¹*University of Arkansas, Fayetteville*, ²*ARS-USDA, Fayetteville, AR*.

Science-based knowledge on the fate and transport of pathogens in mixed-land use watersheds is critically needed, allowing for identifying important sources and targeting areas of a watershed for remedial efforts in minimizing transport of contaminants. *Salmonella* and *Campylobacter* are food-borne pathogens present in poultry litter and assumed to potentially contaminate water runoff after litter application to agricultural fields. To accurately determine the possible pathogen contamination of runoff water a sensitive and reliable microbiological culture method was developed. *E. coli* O157:H7 was included in the study because cattle are often also associated with agricultural fields. Runoff water samples from land applied with poultry litter were spiked with *Salmonella*, *Campylobacter* and *E. coli* O157:H7 to evaluate the

efficacy of nine media for recovery and enumerative purposes: Brilliant Green with Novobiocin and Nalidixic acid (BGN+NA) agar, Brilliant Green Sulfa (BGS) agar, Campy Line Agar (CLA), CHROM (*Salmonella*) agar, Hektoen Enteric (HE) agar, Modified Brilliant Green Agar (MBGA), MacConkey Sorbitol (MacS) agar, Modified Lysine Iron Agar (MLIA), and Rainbow agar. Brilliant Green Sulfa (for *Salmonella*), CLA (for *Campylobacter*), and Rainbow (for *E. coli* O157:H7) agar were shown to have the greatest percent recovery of all the media tested (97%, 97%, and 100%, respectively) and gave accurate colony counts, while the other media tested were unreadable due to contaminant growth. Confirmation of positive colonies was performed by PCR. Results support the utility of these methods to detect possible pathogens in water runoff after poultry litter application.

Key Words: water runoff, poultry litter, *Salmonella*, *Campylobacter*, *E. coli* O157:H7

278P House characteristics and energy utilization in poultry houses raising large broilers. D. G. Overhults¹, A. J. Pescatore^{*2}, R. S. Gates³, J. P. Jacob², M. Miller⁴, and J. Earnest¹, ¹*Biosystems & Agricultural Engineering, University of Kentucky, Lexington, KY*, ²*University of Kentucky, Animal & Food Science, Lexington*, ³*University of Illinois, Agricultural & Biological Engineering, Urbana*, ⁴*Kentucky Poultry Federation, Winchester, KY*.

An energy efficiency assessment was conducted on 7 farms (with a total of 37 houses) growing 2.8-kg broilers with a 51-d growout. All

houses were 12.8-m x 128-m and were equipped with tunnel ventilation and evaporative cooling systems. All houses had 8-9 120-cm or 130-cm tunnel ventilation fans. Houses on all but 1 of the farms had dropped ceilings. All houses originally had sidewall curtains. Some curtains were either lightly insulated or fully insulated and covered. All houses used ½ house brooding with 24 pancake brooders (9.1 kW each) and 4 forced-air heaters (65.9 kW each). Propane was used on all farms. Annual propane use ranged from 10,603 to 22,194 L/house and electricity from 24,157 to 37,337 kWh/house. The average propane and electricity use were 14,308 L/house and 31,236 kWh/house, respectively. On a live wt basis, propane use was 31.4 to 75.2 L/1000 kg with an average of 44.7 L/1000 kg. Electricity use was 71.6 to 126.5 kWh/1000 kg with an average of 96.9 kWh/1000 kg.

Airspeeds during full tunnel ventilation were measured at broiler level in 12 houses about 23 m upstream from the tunnel fans at four equally spaced locations across the house. Mean airspeeds were 2.05 to 2.82 m/s with an average of 2.42 m/s for all houses. At each farm, a closed-house static pressure test was conducted in at least one house to evaluate house tightness. When operating 1 tunnel fan with the house closed, static pressure ranged from 14.7 Pa to 54.9 Pa, with an average pressure of 35.3 Pa. Fans for which in-situ performance data had been obtained were selected for this test, thus providing an estimate of the actual air leakage rate at the various static pressures recorded during the test. Sufficient data were available from 5 farms to estimate air leakage rate. At a static pressure of 24.9 Pa, estimated air leakage rates were 19,501 to 34,457 m³/h.

Key Words: broiler houses, energy efficiency

Poster Session: Extension and Instruction

279P Incorporating “problem-based learning” into an undergraduate introductory poultry science course. J. B. Hoffman*, *North Carolina State University, Raleigh*.

The standard instructional paradigm utilized in most introductory undergraduate courses consists of students learning identified content and processes through lecture, direct instruction, and guided discovery. Students then apply this new learning in well-structured situations or problem sets to see if they have “mastered” the lesson. The roles are quite clear in a standard instructional paradigm: teachers teach and students learn. However, poultry science instructors are not preparing students for “real-life” problems that they will have to solve as they enter the workforce by only utilizing this paradigm for teaching. In order to improve students’ problem-solving skills and analytical thinking, 27 students enrolled in Introductory Poultry Science (PO 201) at North Carolina State University were given a topic relating to poultry production, management, physiology, or nutrition and created their own problem-based case for their peers to solve. Students performed independent research in order to create their problem-based case studies and then presented these case studies to their classmates who investigated the problem and created problem resolutions. By incorporating problem-based learning into an introductory poultry science course instructors may put learning into context, teach students how to deal with real-life problems, promote higher order thinking, and improve students’ oral and written communication skills. This instructional methodology may meet the needs of pre-veterinary students, students interested in entering the poultry industry, and students pursuing graduate studies. Pre-veterinary students may improve their diagnostic and reference seeking skills while students interested in entering the poultry industry will learn how to trouble-shoot effectively. Lastly, students interested in

pursuing graduate studies will develop critical thinking and analytical skills necessary to be successful in scientific research.

Key Words: problem-based learning, introductory, poultry science

280P Survey of poultry nutrition and disease knowledge in exhibition poultry and small flock owners of the Mid-Atlantic States. B. A. McCrea^{*1}, T. Y. Morishita², and J. D. Latshaw³, ¹*Delaware State University, Dover*, ²*Western University of Health Sciences, Pomona, CA*, ³*The Ohio State University, Columbus*.

Survey responses from exhibition poultry and backyard flock owners from the Mid-Atlantic region were collected using a set of questions developed in a previous study at Ohio State University. Our objective was to determine the perception and level of knowledge in this group with regard to poultry health management and nutrition topics. Surveys were given to adult and youth poultry owners and exhibitors. Surveys were handed out at exhibition poultry shows and the Delaware Small Flock Education Series between March 2008 and February 2009. Shows locations were in Kent County, Delaware and Cecil County, Maryland. The Small Flock Education Series was held three times in each of Delaware’s three counties (New Castle, Kent, and Sussex) and provided the backyard poultry flock perspective.

In general, survey participants were equally knowledgeable about poultry health management and nutrition topics. Both groups, backyard poultry and exhibition poultry owners, indicated that there remains a lack of knowledge regarding antibiotic use and vaccination in the health management section. However, both groups were very knowledgeable