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SYMPOSIA AND ORAL SESSIONS

Environment and Management: General Environmental Effects on Poultry

131 Including corn distiller's dried grains with solubles, wheat middlings, or soybean hulls in laying-hen diets lowers manure ammonia emission. S. Roberts*, H. Xin, B. Kerr, J. Russell, and K. Bregendahl, *Iowa State University, Ames.*

Ammonia (NH₃) emission is a major concern for the poultry industry. We hypothesized that fiber in corn distiller's dried grains with solubles (DDGS), wheat middlings (WM), and soybean hulls (SH) would lower NH₃ emission by increasing bacterial growth in the large intestine, which would 1) repartition N excretion from uric acid to bacterial protein and 2) produce volatile fatty acids that could lower manure pH, slowing bacterial conversion of uric acid to NH₃ and shifting the NH₃ equilibrium towards less volatile ammonium (NH₄⁺). Hy-Line W-36 hens, 45 wk of age, were housed 2 per cage in a randomized complete block design (16 blocks, 2 replications/block). The 4 corn and soybean meal-based diets included a control and experimental diets containing 10% DDGS, 7.3% WM, or 4.8% SH, which contributed equal amounts of neutral-detergent fiber. Diets contained 2,840 kcal/kg ME, 0.67% digestible TSAA, and 0.71% digestible Lys. Uric acid, Kjeldahl N, pH, and DM contents of fresh manure (n = 32) were measured and NH₃ emission was measured over 7 d by placing pooled 24-h manure samples (n = 6) in NH₃-emission vessels. Egg production was recorded daily and egg weight measured weekly. Data were analyzed by ANOVA with treatments compared to the control using contrasts. Dietary DDGS, WM, or SH lowered (P ≤ 0.01) 7-d cumulative manure NH₃ emission from 3.9 g for the control to 1.9, 2.1, and 2.3 g, respectively, and lowered (P ≤ 0.05) daily NH₃ emission rate. The treatments did not affect (P > 0.10) total manure N excretion or uric acid N as a percent of total N, indicating that N excretion was not repartitioned to bacterial protein. However, dietary DDGS, WM, and SH lowered (P ≤ 0.06) manure pH (6.77, 6.80, and 6.85, respectively) compared to the control (7.08). There were no treatment effects (P > 0.10) on egg production or egg mass (egg production × egg weight). Results of this study show that dietary inclusion of 10% DDGS, 7.3% WM, or 4.8% SH lowers NH₃ emission from laying-hen manure by up to 50% without affecting egg mass.

Key Words: ammonia, laying hen, fiber

132 The use of an urease inhibitor to control ammonia release from layer manure. W. D. King*¹, A. J. Pescatore¹, A. Singh², R. S. Gates², K. D. Casey³, M. J. Ford¹, and A. H. Cantor¹, ¹University of Kentucky, Lexington, ²University of Kentucky, Lexington, ³Texas Agricultural Experiment Station, Texas A&M University, Amarillo.

Ammonia emissions from layer operations are becoming increasingly important. One approach to decreasing ammonia emissions in poultry houses is to block the activity of the urease enzyme. Two experiments were conducted using an equilibrium chamber gas sampling technique.

In both experiments, twelve containers were placed below groups of three cages of two hens each, such that the bird feces dropped into the respective trays. At the start of experiment one, 5 kg of broiler litter was placed into each of the 12 containers, 6 of which, were treated with, the urease inhibitor, N-(n-butyl) thiophosphoric triamide (NBPT) at the rate of .0792 ml/kg of litter, and the rest were retained as untreated controls. The urease inhibitor was again applied at day seven of the experiment. The application of urease inhibitor decreased equilibrium ammonia concentrations. A further decrease was seen after reapplication at day seven. Mean equilibrium ammonia concentrations for the treated trays were significantly lower than for the control to day 21. In experiment two, layer manure was allowed to accumulate in the trays for ten days prior to the experiment. Urease inhibitor was applied at 0 and 31 days and samples were taken 3 times a week for 48 days (22 total samples). A significant reduction in equilibrium ammonia concentration was seen at day 2 and day 5 in the treated trays. This effect was no longer significant after day 7 due to wide variation in ammonia equilibrium measurements. After the second application there was a reduction in the ammonia equilibrium concentration however this was not significant. Based on this work, urease inhibitors demonstrate potential in the reduction of ammonia emissions from high moisture content layer feces; however frequent reapplication appears necessary to sustain the effect.

Key Words: ammonia, urease inhibitor, layer manure

133 Determination of the nitrogen budget of commercial broilers raised from 0 to 42 days of age. L. Mitran*¹, J. Harter-Dennis¹, J. Timmons¹, and J. Meisinger², ¹University of Maryland Eastern Shore, Princess Anne, ²USDA-ARS, Beltsville, Maryland.

The emission of ammonia from poultry houses contributes to odor problems, decreased birds productivity and increases the risk of nitrogen (N) deposition to neighboring ecosystems. To quantify the rate of ammonia (NH₃) emission from commercial broilers, an experiment was conducted to determine a nitrogen budget including the major sources of N input and output. Five environmentally controlled chambers (37.2 m²) equipped with automatic feeding and watering systems were used. Used wood shaving/sawdust litter was thoroughly mixed, weighed and equally distributed into the chambers. Five hundred one-day old birds (250 males, 250 females) were placed per chamber and raised for 42 days. Samples of litter, feed and birds were collected at the beginning, at the end, and at every feed change (feed only) during the experiment to determine the nitrogen content. Ammonia emissions were directly determined throughout the trial by sampling the exhaust air and trapping the ammonia in large gas scrubbing tubes containing dilute phosphoric acid. Mean daily ammonia emissions ranged from 0.13 to 0.78g (NH₃-N)/bird/day, with a mean of 0.37g NH₃-N/bird/day and a coefficient of

variation (CV) of 6.3%. Ammonia emissions were relatively constant (<25 g NH₃-N /bird/day) during the early growth period (0-16 days) followed by a linear increase from 16-42 days of age. The majority of NH₃-N (81%) was emitted from 16-42 days of age.

The highest levels of N input into the chambers resulted from nitrogen in the feed (57%), and nitrogen in litter (42%), while the nitrogen input into the chambers as N from one day old chicks and NH₃-N in ventilation intake air was lower (0.35% and 0.65%, respectively). The majority of the total N output was accounted for by the accumulation of N in broilers and litter (63% and 25%, respectively). Ammonia N lost to the atmosphere through exhausted air was approximately 12 % of feed N input. The average recovery of total N additions into the chambers was 103 % indicating that the major N outputs were quantitatively estimated and that other potential N losses (denitrification) were minor.

Key Words: broilers, nitrogen, ammonia

134 Superabsorbent polymers as a poultry litter amendment.

J. R. Timmons* and J. M. Harter-Dennis, *University of Maryland Eastern Shore, Princess Anne, Maryland.*

Ammonia volatilization from poultry litter commonly causes a buildup of ammonia in the atmosphere of chicken houses which can have a negative impact on both farm workers and birds. The release of ammonia from poultry houses can also contribute to environmental problems such as haze and acid rain. The objective of this study was to determine the effect of superabsorbent polymers (SAPs), a nontraditional litter amendment, on the long term control of ammonia volatilization from poultry litter. Ammonia emissions from used wood shavings/sawdust poultry litter that contained a 6% level of SAPs were compared to ammonia emissions from untreated litter. Ammonia levels were sampled throughout the life of three flocks of 42-49 day old male broilers without reapplication. A Randomized Complete Block (RCB) design was used for all trials. Dependent variables measured were weight gain, feed efficiency, litter ammonia levels, moisture, water activity, pH and final nitrogen content. Results of these studies indicated that bird performance was not effected ($P>0.05$) by the SAP litter application compared to the performance of birds raised on untreated litter. However, the 6% SAP litter application reduced ($P<0.05$) ammonia output by 70.3 and 51.3% throughout the life of flocks one and two, respectively. No significant reduction in ammonia output was detected during the third flock. Similar results were found with the litter pH values. Additionally, litter treatments had no significant effect on the water activity of the litter. However, the final nitrogen content of the litter after the first flock was higher ($P<0.05$) in the 6% SAP treated litter (28.7 mg N/g DM) compared to the nitrogen content of the untreated litter (24.3 mg N/g DM). Unlike the first flock, no differences in the final litter nitrogen content were detected between the 6% SAP litter treatment and the untreated litter after the second and third flocks. Results from these trials indicated that a 6% SAP litter application may be a viable labor saving alternative to traditional litter amendments to control ammonia emissions in poultry houses.

Key Words: ammonia, superabsorbent polymer, broiler

135 Reducing broiler air emissions through diet. W. Powers*¹, R. Angel², S. Zamzow¹, and T. Applegate³, ¹*Iowa State University, Ames,* ²*University of Maryland, College Park,* ³*Purdue University, West Lafayette.*

The impact on air emissions of feeding broilers reduced protein (LP) diets and diets with typical industry protein (control, C) were determined. Ross 308 male broilers were allocated to each of eight emission chambers at hatch and grown for 42 d. Three sequential experiments (Exp.) were conducted; each constituting a flock. The C treatment (Trt) was a four phase feeding program: starter (St), grower (Gr), finisher (Fn), and withdrawal (Wd) diets. The LP Trt was a six phase feeding program: prestarter (PreSt), St, Gr1, Gr2, Fn, and Wd diets. Formulated CP were 22.1, 20.0, 17.2, and 16.6% for the C Trt St, Gr, Fn, and Wd diets, while those for the LP Trt PreSt, St, Gr1, Gr2, Fn, and Wd diets were 22.0, 18.6, 18.1, 17.3, 15.8, and 15.0%. Synthetic Lys, Met, Ile, Thr, Val, Trp, and Arg were included in LP diets while Met and Lys, only, were added in C diets. Emissions of NH₃, H₂S, CO₂, CH₄, and non-methane total hydrocarbons (NMTHC) were calculated by sampling the incoming air followed by sequential sampling of each of the chambers for 15 min (10 min purge followed by a 5 min data recording period). Concentrations and airflow were measured every 30 sec and averaged for the 5-min period. At the start and end of each phase chamber BW was determined. Mean daily concentrations of NH₃, H₂S, CO₂, and CH₄ did not differ ($P>0.05$) by diet (207 ppb, 1.72 ppb, 1153 ppm, 2.153 ppm, respectively). Mean NMTHC concentration was greater in rooms offered the C diet than in rooms offered the LP diet (299 ppb and 294 ppb, respectively). Average daily NH₃ emissions were greater in rooms where the C diet was fed (1663 vs. 1407 mg/d). Daily emissions of H₂S, CH₄, and NMTHC were not different by Trt (13.2, 323.6, and 863.2 mg/d). Daily CO₂ emissions were greater from rooms offered the LP diet than rooms offered the CP diet (4.01 vs. 3.90 kg/d). Average daily chamber BW of broilers fed the C Trt was greater (50.8 kg vs. 49.9 kg); however, both groups were within typical industry performance. Results show that a 15% reduction in NH₃ emissions can be achieved by feeding reduced CP diets without compromising performance relative to that observed in industry.

Key Words: air emissions, broilers, protein

136 Percent carbon and C:N of broiler litter and cake over consecutive flocks. C. D. Coufal*¹, A. D. Collins², and J. B. Carey², ¹*Mississippi State University, Starkville,* ²*Texas A&M University, College Station.*

Broiler production generates large amounts of litter material that must be properly disposed of each year. Quite often litter materials are directly land applied after removal from the broiler house. However, if weather conditions, equipment availability, or soil nutrient load does not allow for the immediate application of litter, then this material must be temporarily stored until final disposal is possible. Stored litter materials are often used as a carbon source for the composting of mortality carcasses. Composting of broiler litter can also increase the value of broiler litter as a soil amendment. However, little data has been published regarding the carbon content of loose and caked broiler litter. The C to N ratio (C:N) is also important information to assure the success of the composting process. Litter and cake samples from a previous study were analyzed for carbon content on a dry matter basis.

Samples were collected after each of eighteen consecutive flocks that were reared under simulated commercial conditions to 40-42 days of age with an average ending body weight of 2.2 kg. New rice hulls were used for litter in flock 1, and litter was decaked and recycled after each flock. All birds and feeds were obtained from a commercial broiler integrator. The C content of new rice hulls was 38.2% and the C:N was 82:1. Litter C content dropped significantly (0.9%) after the first flock, but then leveled off for several flocks. Litter C at the end of each flock averaged 36.5% for all 18 flocks. Cake C was similar to litter C, averaging 36.7%. Litter C:N dropped significantly to 18:1 after the first flock. Litter C:N continued to decrease for the next 4 flocks, and leveled off at approximately 9:1. Higher N values for cake resulted in lower cake C:N compared to litter. Cake C:N for flock 1 was 10.7:1, with cake C:N ranging from 6.7 to 8.7:1 for all other flocks. This data demonstrates that additional carbon materials will need to be added to broiler litter that has been recycled for several flocks to achieve the C:N needed for successful composting.

Key Words: broiler litter, carbon, C:N

137 Potential for reducing manure mineral levels of trace minerals by using low levels of dietary mineral proteinates. A. E. Sefton*¹ and S. Leeson², ¹Alltech Canada, Guelph, ON, Canada, ²University of Guelph, Guelph, ON, Canada.

With increasing concern about the impact of animal agriculture on the environment it was of interest to look at methods for reducing trace mineral content of layer manure. Three mineral levels were looked at in this study: Control, inorganic premix with commercial trace mineral levels; Treatment 1, proteinated trace minerals (Bioplex™, Alltech, Inc. Nicholasville, KY) at approximately 10% levels compared to the inorganic premix; and Treatment 2, no supplemental trace minerals. The trial ran from 28 to 60 weeks of age, 8-28 day periods. Percent egg production, and total eggs did not differ. Egg weight was reduced slightly in late lay in the no supplemental trace mineral treatment. Layers fed Bioplex or no supplemental minerals had similar manure levels of Zn, Mn and Cu. In both cases Zn manure level was reduced by 67% while Mn and Cu were reduced by 80% and 10% respectively, compared to the inorganic control. These results indicate that, Bioplex minerals, fed at reduced levels, is a strategy for reducing manure mineral levels while maintaining productivity and thus reducing the environmental impact.

Key Words: layer, organic trace minerals, manganese

138 Humoral immunity of chickens in different housing environments. H. Karami* and H. Sunwoo, *University of Alberta, Edmonton, AB, Canada.*

Current poultry housing environments create increased risk of pathogens and bacteria exposure within the flock. Because of these present bacteria, a strong immune system is crucial for both chickens and chicks. The objective of this study is to examine the humoral immunity of chickens against different bacterial species in two different housing environments. Table eggs from caged and free-run chickens were purchased from local markets. Egg yolk antibodies (IgY) were isolated by water-dilution method. The specific IgY titer against 13 different bacteria, including *Aeromonas hydrophila*, *Bacillus cereus*, *Campylobacter jejuni*, *Clostridium perfringens*, *Escherichia coli O157*,

Lactobacillus, *Listeria monocytogens*, *Pseudomonas aeruginosa*, *Saccharomyces cerevisiae*, *Salmonella enteritidis*, *Salmonella typhimurium*, *Staphylococcus aureus*, and *Staphylococcus epidermidis* were measured by indirect ELISA. The result from ELISA showed that both caged and free-run chickens had similar levels of antibody responses against specific bacteria, indicating that the chickens could have been exposed to those bacteria during their growth period. However, the specific IgY activities against *Aeromonas hydrophila* and *E. coli O157* were significantly higher ($p < 0.01$) in eggs collected from caged chickens than in those collected from free-run chickens. In addition, specific IgY titer against *Pseudomonas aeruginosa* was significantly higher ($p < 0.01$) in eggs from free-run chickens than those from caged chickens. Specific IgY against *Staphylococcus aureus* was the highest titer observed in both free-run and caged chickens compared to all other bacterial species. We found that the two housing systems, cage and free-run, were similarly infected with different bacterial strains and influenced the chicken's humoral immune system.

Key Words: chicken housing systems, Humoral immunity, IgY

139 Viable chicken egg assay used to evaluate metabolites of the herbicide Diuron. T. Carro*¹, V. Gaddamidi², S. W. Bookhart, III², M. E. Persia¹, and W. W. Saylor¹, ¹University of Delaware, Newark, ²DuPont Ag Products, Inc., Newark, Delaware.

Laying hen assays have been the industry standard in pesticide development to determine nature (metabolites) and magnitude of residues. There is interest in a more economical, less time-consuming methodology to predict hen metabolites. An experiment was conducted to compare metabolites produced by Single Comb White Leghorn (SCWL) hens with those produced by a viable egg assay when Diuron, a nonpolar herbicide was administered. ¹⁴C N₂-(3,4 dichlorophenyl)-N₂, N-dimethylurea (Diuron) was solubilized in polyethylene glycol-400 (PEG) to create a dosing solution (DS) of 6.4 mg/ml (specific activity 6.04 μCi/mg). Fertile SCWL eggs were incubated at 99°F and 50% RH for 6 d. Viable eggs were allotted to replicates of 10 eggs and randomly assigned to treatments (200 μl/egg): DS into yolk, DS into albumen, PEG into yolk, PEG into albumen, and sham (shell puncture). On d 15, fractions were harvested from viable eggs for analysis: allantoic fluid, yolk, embryo, shell, and remaining fluid (pooled by treatment). The final supernatants from extracted samples were subjected to reverse phase HPLC analysis using similar conditions prescribed for the hen assay procedure. Metabolites were confirmed using electrospray ionization liquid chromatography/mass spectroscopy. Total radioactive recovery was 86% for the albumen injection site and 92% for the yolk site. Site of injection had no influence on radioactivity distribution among fractions or metabolites produced in each fraction. Metabolites identified and confirmed in this study were analogous to those of the SCWL assay: N₂-(3,4 dichlorophenyl)-N₂, N-dimethylurea (parent compound), 3,4-dichlorophenylurea, N-(3,4 dichlorophenyl)-N¹methylurea, N-(4,5-dichloro-2-hydroxyphenyl)acetamide, 3,4-dichlorobenzeneamine, N-(2-hydroxy-4,5-dichlorophenyl)urea. This methodology may provide an economical preliminary assay for evaluating metabolites of pesticides.

Key Words: metabolites, pesticides, viable egg assay

140 The effect of L-arginine supplement on intestinal nitric oxide and microflora of broilers. M. Putsakum*, L. L. McWilliams, Y. V. Thaxton, J. P. Thaxton, A. Corzo, and S. W. Anderson, *Mississippi State University, Starkville.*

This study evaluated the effects of L-arginine supplementation on the intestinal nitric oxide and microflora in broilers. Eighty-four cecal pouches and large intestines were collected from two groups of six weeks old broilers that were fed either basal diet (0.98% digestible arginine; control group) or basal diet supplemented with 0.1% L-arginine (1.08% digestible arginine; treatment group). Cecal and large intestine contents were analyzed for nitric oxide as nitrite by using Griess reagents, and were analyzed for microbial populations (total aerobic and anaerobic) by standard plate counting techniques. The nitric oxide contents and bacterial populations between each intestinal section and each group were correlated (Pearson correlation coefficient). In cecal contents, nitric oxide was increased ($P < .05$) in birds that were supplemented with L-arginine, whereas nitric oxide in large intestines was not different between control and treatment groups. The microbial populations in both intestinal sections were not significantly different between two treatments. In control group, a positive correlation coefficient between nitric oxide contents and bacterial populations was found both in ceca and large intestine ($r = 0.324$ and 0.381 , respectively, $p < 0.05$). However, in the treatment group, a positive correlation coefficient ($r = 0.403$, $p = 0.01$) between nitric oxide contents and bacterial populations was found only in large intestine. These results indicate that arginine does not affect nitric oxide production by bacteria, but does stimulate nitric oxide production by intestinal tissues.

Key Words: nitric oxide, microflora, broiler

141 Influence of lighting program, strain, and temperature on broiler live performance and parts yield. L. B. Hooie*, R. J. Lien, and J. B. Hess, *Auburn University, Auburn, Alabama.*

Two strains of broilers were subjected to bright-long or dim-step-up lighting programs and typical or cooler temperatures late in the growing period to assess effects on live and processing performance. Fifty males of two strains (Strain A, moderate yield; and Strain B, high yield) were placed by strain in two pens in each of 12 light and temperature controlled rooms. Six rooms were subjected to bright-long (2 FC, 23L:1D) and six rooms to dim-step-up (0.1 FC; 20L:4D, 1-10 d; 12L:12D, 10-21d; 15L:9d, 21-28 d; 18L:6D, 28-35 d; 20L:4D, 35-55 d) lighting programs. Beginning at 35 d, half the rooms of each lighting program were exposed to either typical (avg. daily low and high of 21 and 27°C) or cooler (avg. daily low and high of 17 and 24°C) temperatures. Ten birds per pen were processed at 55 d to determine parts weights and yields. Data were analyzed for main effects and their interactions as a 2x2x2 factorial arrangement with rooms as experimental units. Dim-step-up lighting reduced BW to 28 d, feed consumption to 35 d, and feed conversion (FC) to 42 d; however, these variables were not affected at 55 d. Dim-step-up lighting generally reduced weights and yields of total breast, fillet, and tender; however, fat pad, wing, and leg weights and yields were generally increased. Strain A had greater BW and feed consumption from 7 to 55 d, and reduced FC to 35 d. Fillet and total breast yields of Strain B were greater; however, wing and leg weights and yields were reduced. Cooler temperatures increased BW at 55 d and feed consumption from 42 to 55 d, but did not affect FC. Cooler temperatures generally increased parts weights; however, yields were generally unaffected.

Uniformity and mortality were not significantly affected by lighting program, strain, or temperature. There were no notable interaction effects on any of these variables. These results indicate that the processing performance of different strains may be negatively impacted by lighting programs generally accepted to improve live performance.

Key Words: broiler, lighting program, temperature

142 Assessing the performance of an actively heated and ventilated broiler transport prototype. S. L. Cochran, K. P. C. Hui*, T. G. Crowe, K. Bligh, H. L. Classen, and E. M. Barber, *University of Saskatchewan, Saskatoon, SK, Canada.*

Animal welfare based challenges are encountered when moving large numbers of broilers in a wide range of ambient conditions. Previous research conducted by the University of Saskatchewan discovered broiler chickens experience heterogeneous temperature and humidity conditions during transportation in extreme Canadian Prairie climates. Results showed that current passive (natural) ventilation systems on transport vehicles are not efficient in providing a comfortable environment for broilers during winter transport.

A research project was developed to improve environmental conditions inside poultry transport vehicles. The project included the development and assessment of an actively heated and ventilated transport vehicle. A prototype was built by the Department of Agricultural and Bioresource Engineering at the University of Saskatchewan. A series of paired road tests were conducted during the winter of 2005, comparing environmental conditions inside commercial vehicles versus the prototype system. The field data were then analyzed using the modified AET (Apparent Equivalent Temperature) model. This model is used to identify locations inside the loads presenting unsafe combinations of temperature and relative humidity levels, which may subject birds to physiological stress.

This presentation will provide an overview on how the original AET model (developed by Malcolm Mitchell & Peter Kettlewell) was modified to assess typical conditions presented within transport vehicles during Canadian winters. Results of the analysis show that approximately half of the space within commercial trailers could compromise bird welfare. The prototype vehicle, with supplemental heat and active ventilation, was able to reduce the proportion of space presenting dangerous conditions to less than 10% of the load. This demonstrated that the concept has merit and should be considered in future designs of poultry transport vehicles.

Key Words: broiler transport, active ventilation, heating

143 Timing of photostimulation affects female broiler breeder carcass and reproductive traits at sexual maturity. A. Naeima*, R. A. Renema, A. Pishnamazi, and F. E. Robinson, *University of Alberta, Edmonton, AB, Canada.*

The effects of age at photostimulation (PS) on carcass characteristics and ovarian morphology at sexual maturity (SM) (first oviposition) were investigated in Ross 308 pullets. Upon arrival, the 720 pullets were housed in one of 8 floor pens and reared to 16 wk of age. A total of 240 pullets were randomly assigned to individual cages (16/room) and photostimulated (PS) at 17, 19, 21, or 23 weeks of age. Body weight and external measures of frame size were taken at SM. Each bird was dissected and weights of breast muscle, abdominal fatpad,

oviduct, ovary, and ovarian stroma recorded. Timing of sexual maturity, frame size, breast muscle fleshing, and ovarian morphology traits were assessed, and variation in BW and timing of sexual maturity calculated.

As age at PS increased, the time from PS to sexual maturity decreased. Mean time to SM was 49 d in PS17 birds compared to 24 d in PS23 birds. In this study, the highest variation in age at SM was recorded for PS17 birds (CV=4.9) and the lowest value for PS21 birds (CV=3.0). Body weight, girth, ovary weight and fat pad weight at SM were increased with later PS. Body weight at SM differed among all but the PS19 and PS21 birds. The relative abdominal fatpad weight

increased incrementally between 17 to 23 weeks PS ages (1.57%, 1.69%, 1.91%, 2.01%). At SM, ovary and oviduct were heavier in the later photostimulated groups. Ovary weight of PS17 (49.1g) and PS19 (49.7g) birds were less than that of PS21 (55.6g) or PS23 (56.4g) birds. Large yellow follicle (LYF) number at SM also increased between the 17 and 21 wk PS ages (PS17=6.7, PS19=6.9, PS21=7.6, PS 23=7.3 LYF). Later PS in modern broiler breeders appeared to be more advantageous than the early PS — particularly with regard to development of the reproductive tract. These differences have grown larger than what has been reported in previous studies. Interestingly, the birds PS at 21 wk of age had the most uniform onset of lay.

Key Words: broiler breeder, photostimulation, ovarian morphology

Metabolism and Nutrition: Nutrition A - Protein and Amino Acids

144 Effects of a reduction of dietary crude protein on performance and economics in commercial Ross 308 broilers. E. A. Guaiume*¹, J. Firman¹, D. Hoehler², P. B. Tillman³, D. Burnham⁴, and J. Parcell¹, ¹University of Missouri, Columbia, ²Degussa Corporation, Kennesaw, Georgia, ³Ajinomoto Heartland LLC, Chicago, Illinois, ⁴Aviagen Inc., Huntsville, Alabama.

A study was conducted to determine the effects of reduced dietary crude protein (CP) on biological and financial performance of Ross 308 broilers fed from hatch to week 7. 1440 straight-run broiler chicks were randomly assigned to 4 treatments with 12 replicate pens containing 30 birds each. Diets were formulated to be isocaloric and to have the minimum digestible level for lysine (Lys), and the same minimum ideal amino acid ratios to lysine for total sulfur amino acids (TSAA), threonine (Thr), valine (Val), isoleucine (Ile), arginine (Arg), and tryptophan (Trp) across the four phases [starter (0-2wks), grower (2-4wks), finisher (4-6wks), and withdrawal (6-7wks)]. An industry standard diet served as the control (A) and the benchmark for performance. The remainder of the treatments (A-0.5%, A-1.0%, and A-1.5%) had CP reduced in 0.5% increments. Birds were weighed at 2, 4, 6, and 7 weeks of age for feed to gain calculation. At week 7, 4 birds per pen (48/trt) were sacrificed and had fat pad and carcass weighed, and carcass and meat yield determined. Feed cost savings (FCS) per metric ton (MT) of live body weight (BW), FCS/MT carcass, FCS/MT breast meat, income over feed cost/MT carcass, and income over feed cost/MT breast meat, were calculated. Treatments had no effect ($P>.05$) on performance throughout the 7-week period. At week 7, birds fed A-1.5% had a higher ($P<.05$) percentage of fat pad when compared to A (2.98% versus 2.52%, respectively for A-1.5% and A). The remainder of the treatments did not differ from the control ($P>.05$). In addition, treatments had no effect ($P>.05$) on carcass and breast meat yield at 7 weeks of age. For BW, relative to A, FCS was \$2.50/MT when A-1.5% was fed; for carcass, \$3.42/MT; and for breast meat, \$15.01. Therefore, birds fed A-1.5% CP resulted in an increased income of \$3.42/MT carcass and \$15.00/MT breast when compared to A. Overall, these results a decrease of CP by 1.5%, as compared with industry standards, did not affect performance, carcass, and meat yield, and resulted in significantly higher revenues.

Key Words: low crude protein, Ross 308, economics

145 Influence of grower period length and amino acid level in the finisher period on broiler performance and economics. D. Hoehler*¹, A. Lemme¹, C. Fisher², and C. Kemp², ¹Degussa Corporation, Kennesaw, Georgia, ²Aviagen Ltd., Edinburgh, Scotland.

Broiler nutritionists need to make decisions about the energy and nutrient content of feed during the grow-out period, and the length of time or amount each feed should be fed as part of the feeding program. This trial considered two sexes x 4 finisher diets x 3 times of change from grower to finisher diets x 4 replicates which resulted in a total of 96 pens with 90 Ross 308 birds per pen. All birds received the same feed up to 21 d. Male birds were fed 80, 90, 100, and 120%; female birds were fed 70, 80, 90, and 100% balanced amino acid (AA, related to the Ross recommendations) diets in the finisher period. Age at change from grower to finisher diets were 21, 28, or 35 d. Broilers were weighed at 10, 21, 28, 35, 42, and 49 d; processing samples were taken at 28, 35, and 42 d. Both AA level and the age when birds are changed from grower to finisher feed significantly affected rates of growth, feed conversion, carcass yield, breast meat yield and bird fatness. There were no effects on mortality or on the yield of leg or wing portions. When the protein content of the finisher is low there is a large effect of age at change from grower to finisher. If the AA content of the finisher is higher or the change from grower to finisher is made at a later age, then the effects are smaller. This is because the degree of AA deficiency being caused by the change (if any) is smaller. In males the effects of time of change disappear at 120% AA and in females it appears that this would occur at about 110% AA. Economic inputs and revenue outputs were combined with the bird performance data to give an estimate of margins and costs. In males the treatment 120% AA/21 d change produced the highest margin at all weights. In females, the highest AA level tested (100%) also produced the highest margin in small birds (1.7 kg), but the 70% AA feed introduced at 28 or 35 d tended to produce higher margins in higher body weight females. The results demonstrate that effective phase feeding can only be achieved by the application of a simple economic model customized for local broiler production conditions.

Key Words: broiler, amino acids, economics