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## SYMPOSIA AND ORAL SESSIONS

### Environment and Management I

**16 Can target body weight profile influence egg quality attributes of high-yield broiler breeders?** R. A. Renema\*, A. Naeima, M. J. Zuidhof, L. F. Romero, and F. E. Robinson, *University of Alberta, Poultry Research Centre, Edmonton, AB, Canada.*

In a normal broiler breeder flock, rate of lay peaks early and then gradually declines and egg quality drops through thinning of the shell and reduced albumen quality. In an investigation of the effects of 3 female broiler breeder target BW profiles on reproductive traits, the impact of increased or decreased target BW profile on subsequent egg composition and quality attributes was investigated. A total of 216 Ross 708 pullets were reared in floor pens. Birds were individually caged at 16 wk and assigned to a BW profile: STD (Standard BW control), HIGH or LOW (10% higher or lower BW than STD, respectively). Following peak feed at 30 wk, feed declined 3.3 (HIGH), 2.5 (STD) or 2 (LOW) g/wk, on average, until 43 wk of age. Feed then increased 1g/wk, on average, to 50 wk of age. Individual egg production records were kept, and egg composition and quality (% shell, shell thickness, albumen height, specific gravity) determined at 5 wk intervals from 30 wk of age.

At 60 wk of age, BW was 3.93 (HIGH), 3.59 (STD) and 3.26 (LOW) kg. Ovary weight of LOW hens was 16.2% lighter than that of the larger hens and, when combined with the 17 fewer eggs produced, suggested that egg production was inadequately supported by nutrition. While onset of lay was delayed in LOW birds, production declined at a similar rates in all BW profiles. The rate of feed withdrawal caused BW losses in HIGH and STD hens between 36 and 48 wk of age, while LOW hens stayed constant. The % yolk was greater in HIGH than in LOW eggs at 35 and 40 wk of age, but grew similar after this. Shell thickness, % shell and egg specific gravity were all higher in LOW than in HIGH eggs at 30 wk. The % shell measure, while least affected by age, was most affected by BW profile, averaging 8.4% (HIGH) vs. 8.7% from 35 to 40 wk of age. All measures of egg quality dropped between 30 and 40 wk. Shell thickness and egg specific gravity rose again once feed allocations climbed again. Hen BW was less important than feed allocation for egg composition and quality traits, which were negatively affected by rate of feed withdrawal.

**Key Words:** broiler breeder, growth profile, feed withdrawal, egg traits, shell quality

**17 Effect of body weight profile on growth and reproductive performance of high-yield broiler breeders.** A. Naeima\*, R. A. Renema, M. J. Zuidhof, L. F. Romero, and F. E. Robinson, *University of Alberta, Edmonton, AB, Canada.*

The effects of 3 female broiler breeder target BW profiles on the growth, sexual maturity, reproductive performance, and carcass characteristics

were investigated. A total of 216 Ross 708 pullets were reared in floor pens. Birds were individually caged at 16 wk and assigned to a BW profile: STD (Standard BW control), HIGH or LOW (10% higher or lower BW than STD, respectively) which were first reached by 20 wk of age. Individual sexual maturation age, BW and external carcass traits were measured and egg production (total and small [ $< 52$  g] eggs), laying sequence patterns, fertility and hatchability were determined to 60 wk of age, when all birds were dissected to assess internal traits.

The HIGH target profile birds reached sexual maturity 3.9 d earlier than STD birds and LOW hens began to lay 5.3 d later than STD hens. LOW hens laid 14.1 fewer eggs than STD or HIGH hens, on average (154.1, 168.2, 171.1 eggs, respectively). LOW birds produced more small eggs (11.2) than STD (8.9) or HIGH (7.5) birds and the opposite was true for double yolked eggs (HIGH=0.4%, STD=0.2%, LOW=0.05%). The prime laying sequence length differed among BW profiles (19.0, 16.6, and 9.7d in HIGH, STD, and LOW hens, respectively). In addition to laying fewer eggs, LOW hens also had lower egg weight and egg mass than STD birds. Despite similar rates of lay in STD and HIGH hens, STD birds were more efficient, consuming 306 g feed/chick compared to 344 g in HIGH hens and 314 g in LOW hens. Target BW profile did not significantly affect hatchability traits. Final chick numbers were 122, 135, and 133 for the LOW, STD, and HIGH birds, respectively. Despite differences in BW at 60 wk of age, birds had a similar proportion of breast muscle. LOW hens had only 3.8 ovarian large yellow follicles at that time compared to 4.2 in both STD and HIGH hens. This study suggests no improvement to production efficiency by shifting the target BW profile 10% higher or lower.

**Key Words:** broiler breeder, growth profile, sexual maturation, egg production, hatchability

**18 Feeding and lighting of male broiler breeders in tropical regions: From experimental research to field experience.** H. Romero-Sanchez<sup>1,3</sup>, C. Lozano<sup>2</sup>, and J. Brake<sup>4</sup>, <sup>1</sup>*Grupo Grica, Faculty of Agriculture, University of Antioquia AA, Medellin, Colombia,* <sup>2</sup>*Trouw Nutrition Hifeed B.V, Boxmeer, NL,* <sup>3</sup>*Grupo Itacol, Bogota, Colombia,* <sup>4</sup>*North Carolina State University, Department of Poultry Science, Raleigh.*

Male broiler breeder management in tropical regions has traditionally followed BW recommendations published in the management guides of the various genetic companies that produce and supply the males. These recommendations have been influenced by experimental research and practical experience under controlled environment conditions in subtropical conditions. Analyses of 40 Hybro and Cobb flocks reared under commercial conditions during the last four years in tropical

areas of Latin America were conducted to determine the effect of two lighting systems during rearing (brown-out house versus open house) as well as different feeding programs and BW profiles on fertility and hatchability. Males reared in open houses tended to reach a higher BW at the onset of the production period and exhibited better fertility and hatchability. Males that received higher crude protein diets in production and/or gained BW more consistently during the production period also exhibited significantly better reproductive performance. Analyses of data suggested that under commercial conditions in tropical Latin America, male broiler breeders performed better in open houses and required heavier BW than that suggested by breeder management guides in order to perform optimally. Therefore, it may be concluded that higher than normal nutrient intakes are required in such environmental circumstances to sustain fertility during the production period.

**Key Words:** broiler breeder males, rearing, lighting systems

**19 Broiler breeder males reared on a conventional vs. accelerated growth schedule.** W. Berry\*, S. Oates, L. Stevenson, and J. Hess, *Auburn University, Auburn, AL.*

Male broiler breeders are reared using feed restriction to control body weight and delay sexual maturation. Earlier maturation of breeder males, involving less feed restriction, may lower feed costs, improve breeder male fitness and welfare, and provide for more flexibility in scheduling. In this study, male breeder chicks reared using a conventional feeding/growth schedule (CON) were compared to males reared in an accelerated maturation group (ACCEL). The ACCEL males were grown on a linear growth line designed to reach the normal 22-week body weight at 16 weeks. Male broiler breeder chicks in both treatments were started on a standard starter diet and full fed for 3 weeks. ACCEL male chicks were started 5 weeks after CON. The birds were placed in 3 replicates containing 14 chicks per rep at 4 weeks of age. Both treatments were then fed 15% protein grower diet for the remainder of the rearing period. The birds received 8 hours light/day during rearing. The birds were transferred to breeder housing, with 22 week-old females, at 22 weeks of age (CON) or 17 weeks of age (ACCEL). Light was increased 0.5 hour/week to a maximum of 16 hours. Birds in both treatments were fed to maintain the same body weight profile from housing until termination of the experiment. Body weight, uniformity, and mortality were monitored throughout the experiment. Skeletal growth and organ weights were measured during the rearing period. Fertility was monitored starting at experiment week 28 and ending at week 60. Mortality was not different between the treatments. Birds in the ACCEL treatment had lower overall body weight uniformity (Body weight CV: CON=11.5, ACCEL=12.1). Life of flock fertility was higher for CON treatment males (CON=94.3%, ACCEL=92.9%). Rearing breeder males on a schedule accelerated by 5 weeks relative to a conventional rearing schedule did not improve body weight uniformity and appears to reduce overall fertility.

**Key Words:** broiler breeder, male, maturation, uniformity, fertility

**20 Sex-separate versus mixed-sex rearing of broiler breeder males.** J. T. Brake\*, *North Carolina State University, Department of Poultry Science, Raleigh.*

Broiler breeder males were reared sex-separate to 5 wk of age and then either mixed with females or reared separately on either a Low or High plane of feeding to 21 wk of age under a standard black-out lighting program. There were 4 pens that held 24 males each for each of the two

sex-separate male treatments. In order to avoid confounding, there were 24 males mixed into each of 12 replicate pens of 190 females each at 5 wk of age. At 21 wk the males were removed from 8 pens and replaced with either the High or Low sex-separate reared males. There were 4 mixed-sex pens that remained intact without disturbance. Furthermore, during rearing there were 6 pens of females that each received either a High or Low plane of feed intake. Thus, the experiment was a 3 X 2 completely randomized design. All birds were moved to a two-thirds slat breeder house and photostimulated at 21 wk of age. All birds were fed and managed similarly after 21 wk. Males were fed sex-separate during the production period and eggs were gathered twice daily. There were 180 eggs from each pen set every two weeks for determination of fertility and fertile hatchability. Mortality of males and females were determined daily. BW was determined on a regular basis throughout the growing and production periods. As expected, BW during rearing positively reflected plane of feed intake but no differences persisted during subsequent production. The High sex-separate reared males exhibited improved fertility at the initiation of lay but no cumulative effect was observed. However, females that were mated to sex-separate reared males exhibited an improved persistency of lay compared to females mated to mix-sex reared males. There were no effects on fertile hatchability or mortality of either males or females. These data show that mix-sex and sex-separate rearing of broiler breeder males can be equally successful.

**Key Words:** broiler breeders, rearing programs, fertility

**21 Reproductive assessment of two genetic strains of broiler breeder males reared on four different feed intake regimens.** D. P. Dimova\*, B. M. Stevens, S. M. Williams, J. L. Wilson, and A. J. Davis, *University of Georgia, Athens.*

The reproductive development of 2 meat strains (A and B) of broiler breeder males provided different levels of total feed intake during rearing was evaluated. Strain B is a newly developed parent line that is related to strain A. Six hundred d-old cockerels from each strain were divided among 4 feeding treatments (full fed; and low, standard, and high restricted feed levels) with each treatment and strain housed separately. The low and high feeding treatments were 5-10% above or below strain guidelines. All cockerels were full fed to 3 wk of age, with the 3 feed restricted treatments implemented at 22 d and continued to 20 wk of age. At 21 wk of age 20 cockerels from each feeding treatment and strain were moved to individual cages, photostimulated and fed to maintain target body weight. The remaining birds were maintained in the floor pens with 8 h of light and fed to maintain their target body weights until 28 wk of age. All of the birds were weighed at 7, 11, 15, and 20 wk of age. Testes were collected from 5 cockerels from each feeding treatment and strain at 6, 8, 11, 13, 15, 18, 21, 25, and 28 wk of age. Blood was collected biweekly from 10 randomly selected cockerels in each feeding treatment and strain from 6 to 28 wk of age and from the caged roosters until 40 wk of age. Plasma total testosterone concentrations were determined by RIA. Total testes weight relative to total body weight was greater in the full fed cockerels compared to restricted birds at all measured time points except at 6 wk of age. There were no differences in relative testes weight between any of the feed restricted birds. For the entire rearing period, the overall relative testes size was greater for strain B than strain A. Regardless of the feeding regimen total testosterone concentrations reached detectable levels 2 to 4 wk earlier in strain B than strain A. The caged strain B roosters had a greater concentration of testosterone through 25 wk of age. The ontogeny of detectable plasma testosterone levels was also negatively correlated with total feed intake.

The results suggest that sexual maturation in strain B may occur at a faster rate than strain A.

**Key Words:** testosterone

**22 Effect of feeder space during growing and feeding to peak program on growth of broiler breeder progeny.** N. Leksrisompong\*, M. Arguelles-Ramos, J. Small, E. Oviedo-Rondon, and J. T. Brake, *North Carolina State University, Department of Poultry Science, Raleigh.*

A study was conducted to determine if there were differences in growth of broiler progeny from two breeder strains (Ross 308 and 708) that had been subjected to two female feeder space allocations (5.3 cm vs 7.1 cm) during the growing period in floor pens followed by two female feeding to peak programs in cages. There were 16 pens of 75 females each assigned to the two feeder space allocations from 1 to 22 wk. At 22 wk, 128 females that represented the middle of the BW distribution in each pen, 8 per pen, were placed in individual cages and subjected to one of two feeding to peak feed increase programs (Slow or Fast) in a 2 x 2 x 2 factorial design with 16 hens per interaction cell and 64 hens per main effect. Individual females were weighed at 22 wk and 31 wk. Breeder females from the 708 strain were heavier than those of the 308 strain at both 22 and 31 wk and exhibited the greatest BW increase. Two eggs from each hen were weighed and yolk weight, shell weight, and albumen weight and height determined at 28 wk. The fast feeding to peak program and the 708 strain produced eggs with greater albumen height, while 7.1 cm of growing feeder space and the 308 strain produced eggs with greater percentage eggshell. Eggs produced at 31 wk of age were collected for 5 consecutive days and then incubated and chicks hatched for a broiler trial. Seven male and 7 female broiler chicks were randomly assigned together to 32 pens in the 2 x 2 x 2 design with 4 replicate pens per interaction cell. Broilers from the 308 strain and the slow feeding to peak program were heavier at 14, 28, and 42 d of age. There was no difference in BW due to growing feeder space but 5.3 cm of breeder female growing feeder space in combination with the slow feed increase to peak program produced the heaviest broilers at 42 d. The lower albumen height of the slow feed increase program may have positively affected embryological development and post-hatch growth.

**Key Words:** broiler breeders, broiler progeny growth, feeding programs

**23 Effect of genetics, breeder nutrition, and management practices on leg health of broiler progeny.** P. E. Eusebio-Balcazar\*<sup>1</sup>, E. O. Oviedo-Rondón<sup>1</sup>, J. T. Brake<sup>1</sup>, M. J. Wineland<sup>1</sup>, N. A. Barbosa<sup>1,2</sup>, C. E. Aker<sup>1,3</sup>, N. A. Ardón<sup>1,3</sup>, and H. R. Cutchin Evans<sup>1</sup>, <sup>1</sup>*North Carolina State University, Department of Poultry Science, Raleigh*, <sup>2</sup>*Universidade Estadual Paulista - UNESP, Jaboticabal, São Paulo, Brazil*, <sup>3</sup>*Escuela Agrícola Panamericana Zamorano, Tegucigalpa, Honduras.*

The objective of this study was to evaluate the effects of broiler breeder nutrition and management on progeny leg health. Broiler breeders of two strains (C vs R) were housed in 16 pens and fed either corn or wheat based diets during rearing and production. During rearing sigmoid late fast (LF) and sigmoid late slow (LS) feeding programs were used. At 23 wk, hens and roosters that represented the BW distribution from each treatment were moved to a cage breeder house and placed at either 1 or 2 hens/cage. At 31 wk, eggs were evaluated for yolk weight, 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). Hens were inseminated at 32 wks and eggs were collected for 8 d. The eggs were then incubated and all progeny were identified with neck tags and placed to track individual breeder hen effects. Broiler gait scores (GS) and leg problem incidence were evaluated at 28 and 45 d. Data was analyzed as a 2x2x2x2 factorial design with strain, diet type, feeding program, and cage space as main factors. Broilers from C strain had a higher (P<0.05) GS 2 incidence at 28 and 45 d. Also, C broilers had a higher (P<0.05) GS 3 and valgus incidence at 45 d. Eggs from breeders fed wheat diets had a higher (P<0.05) Y:A ratio but lower ESA. Eggs from C breeders had lower (P<0.05) Y:A ratio and higher haugh units. C breeders housed in 2 hens/cage laid eggs with the lowest (P<0.001) eggshell G, and their progeny had the highest (P<0.05) incidence of twisted legs at 28 d and highest (P<0.05) GS 3 at 45 d. Although, genetics may play a role in the incidence of leg problems, breeder management and nutrition affect egg traits that may be important in embryo development and affect bone growth post-hatch, and thus the incidence of leg problems and locomotion in broiler progeny.

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

**24 Prediction equation for feed allocation decisions for broiler breeder pullets.** A. Pishnamazi\*, M. J. Zuidhof, R. A. Renema, and D. Paul, *University of Alberta, Edmonton, AB, Canada.*

Determining feed allocation for restricted broiler breeders can be very challenging. Feed must be gradually increased to meet target BW gains without over- and under-compensating, which can lead to mixed messages to the bird's metabolism. Environmental temperature can also affect feed allocation though altering energy requirements for basal metabolism. A total of 800 Ross 708 pullets were randomly housed in 8 environmental chambers containing 4 pens each (total of 32 pens). Seven, 2-wk temperature treatments were imposed from 4 to 18 wk, with 4 rotating temperature treatments (15, 19, 23, and 27°C) randomly allocated to each chamber. Individual BW at start and end of each treatment period was recorded. Group BW was recorded twice/wk and kept to specific target BW via twice/wk feed allocations. Body weight and feed allocation data were used to determine temperature effects on BW gain and feed allocation. Amount of feed allocation was estimated using a mixed model, accounting for correlations between repeated measures within each chamber. The model was based on use of a 2,750 kcal ME/kg feed.

Temperature had large effect on feed allocation. During the 4 to 18 wk period, feed allocation should increase by 0.6 g/d to generate a 10 g/d BW gain when barn temperature is 21°C. For each 1°C increase in environmental temperature, feed allocation must decrease by 0.1 g to reach the 10 g/d BW gain target, with the opposite true for temperature decreases. According to the model, a 5 g/d increase in feed allocation would increase BW gain by 13.2, 15.3, 17.5 and 19.6 g/d at 15, 19, 23, and 27°C, respectively. This large difference in growth rates over a 12°C range in barn temperature demonstrates the importance of considering environmental temperature when allocating feed to broiler breeders.

**Key Words:** feed allocation, broiler breeder pullets, environmental temperature, body weight gain, feed restriction

**25 Modeling poultry physiological parameters using neural networks.** H. A. Ahmad\*, *Jackson State University, Jackson, MS.*

Artificial intelligence models were developed with poultry physiological variables, such as broiler growth, guinea fowl growth and egg production in layers. These models were validated using software validation, by comparing with actual published/unpublished data of the variable in question and by comparing with their counterpart mathematical models. The present research addresses two objectives: simulate data using published/unpublished literature for different poultry variables of interest; and develop artificial intelligence models with various architectures of neural networks. For example, in case of broiler, actual growth data were divided into five-day intervals, with known means and standard deviations and used to generate normal distributions for the growth curves using @Risk software. These simulated data were then used to recognize data patterns and model growth curves with various neural networks. Three neural networks, namely BP-3 (three layers back propagation, each layer connected to previous layer), BP-5 (five layers back propagation, each layer connected to previous layer) and Ward-5 (five hidden slabs with various activation functions) were used in this research. Once the networks were sufficiently trained, they were exposed to actual growth data that they were not previously exposed to predict growth over the next 50 days. BP-3 neural network gave the best fitting line with predictions tightly fitting to the actual data points. The  $R^2$  was 0.998, a near perfect. The  $R^2$  for BP-5 and Ward-5 neural networks were 0.967 and 0.973, respectively. To further test the approach, the same methodology was applied on guinea fowl growth and on egg production in layers. For guinea fowl growth prediction the  $R^2$  was 0.96, both for General Regression (GR) and Ward-5 neural networks. For egg production prediction GR neural network gave the best fitting curve with  $R^2 = 0.70$ . All three tested networks, GR, BP-3 and Ward-5 over-predicted egg production during the first few wk but were very efficient afterwards. The predicted egg productions were compared with other similar US strains to validate such prediction models.

**Key Words:** poultry, modeling, simulation, neural networks

**26 Effects of attic inlets on broiler performance.** E. O. Oviedo-Rondón\*<sup>1</sup> and L. Wang<sup>2</sup>, <sup>1</sup>*North Carolina State University, Department of Poultry Science, Raleigh,* <sup>2</sup>*North Carolina State University, Department of Biological and Agricultural Engineering, Raleigh.*

Tunnel ventilated houses have large roof areas of dropped ceiling that collect solar energy. Attic inlets are installed to use this energy to preheat the air coming into the house, reduce fuel usage and facilitate higher ventilation rates. Their benefits on improving energy efficiency have been verified, but there is not much data on broiler performance. This project evaluated the effects of attic inlets on house temperatures (T), ammonia concentrations [NH<sub>3</sub>], propane gas usage (PGU), and broiler performance under commercial conditions. On a single broiler farm, 2 paired houses were selected and actuated attic inlets were installed, while the other 2 houses served as controls. Two trials were conducted with Ross TP16 broilers (20600/house) placed on used litter and raised up to 63 d. Portable Multi-Gas Units equipped with 2 Draeger electrical-chemical sensors were used to continuously measure in-house [NH<sub>3</sub>] over a 48 h sampling period at 5 wk. PGU was recorded per house. Internal house, attic, and outside T were recorded with 2 Hobo data loggers per house. Individual broiler body weights (BW) were collected at 42 d and final flock performance was obtained at market age. In Trial 1 all houses had the same target T, but attic inlet houses were consistently hotter (3°F) during 2 to 32 d. The attic inlet houses had higher ventilation rate than the control houses causing 10 to 15 ppm reduction

in [NH<sub>3</sub>]. Air coming from attic inlets was 5°F hotter than air coming from sidewall inlets causing a 7.7% reduction on PGU (230 gallons). Broiler BW and flock uniformity was better at 42 d in houses with attic inlets. Conversely, broiler BW at processing plant were lower (4069 vs 4032g) and the FCR was worse (2.05 vs 2.10) for chickens in attic inlet houses. In Trial 2, fans were programmed to minimize house overheating, and attic inlets closed when T was 4°F above house target T. This programming kept T warmer only during the first week in attic inlet houses. Final BW was similar and FCR better (2.18 vs 2.14) in houses with attic inlets, while PGU was 10.4% (80 gallons) lower. Appropriate management of attic inlets is necessary to achieve benefits on broiler performance and energy use.

**Key Words:** broiler performance, attic inlets, energy, ammonia

**27 Hot air alternative heating sources for broiler houses has potential.** B. D. Fairchild\*<sup>1</sup>, M. Czarick<sup>1</sup>, and D. Dartnell<sup>2</sup>, <sup>1</sup>*University of Georgia, Athens,* <sup>2</sup>*Georgia Forestry Commission, Athens, GA.*

Most broiler houses in the United States use propane or natural gas as the primary fuel source. Propane prices have doubled over the last 10 years dramatically reducing grower profit margins. The objective of this study was to compare fuel savings and benefits of a biomass alternative heating system which utilized wood. Two houses were equipped with the treatment systems. In one house the heat system burned wood pellets while the other used wood chips as the fuel source. These houses were compared to two houses on the same farm using radiant brooders with propane as the fuel source. The treatment units were indirect fire units that pulled air from the houses passed it through a heat exchanger and then returned it to the house after heating it to 150 to 200°F. The heated air of one treatment house was distributed via a duct system at the ceiling while the second house used circulation fans hung from the ceiling to move air throughout the house. House temperatures, relative humidity, and fuel consumption were monitored. Ammonia, litter quality and fuel usage were also monitored.

The furnaces supplied sufficient BTUs and the distribution systems adequately distributed the heat throughout the house. Propane usage for the flock was reduced by 80% while the adjusted fuel savings for the flock in the pellet and chips houses were 25% and 60% respectively. Ammonia was lower in the furnace houses and can be attributed to lower house relative humidity and drier litter. Litter quality was better in the treatment houses compared to the controls but was best in the furnace house with circulation fans as the distribution method. While propane usage was significantly reduced in the treatment houses the cumulative fuel savings between the two treatment houses differed due to the expense of the fuel used. These alternative heating sources may have potential, especially if the trend of increasing propane and natural gas prices continues.

**Key Words:** broilers, alternative heating sources

**28 The potential for plants to trap odors from farms with laying hens.** P. H. Patterson\*<sup>1</sup>, A. Adrizal<sup>2</sup>, R. M. Bates<sup>1</sup>, R. C. Brandt<sup>1</sup>, R. M. Hulet<sup>1</sup>, E. F. Wheeler<sup>1</sup>, D. A. Despot<sup>1</sup>, and P. A. Topper<sup>1</sup>, <sup>1</sup>*The Pennsylvania State University, University Park,* <sup>2</sup>*Jambi University, Jambi, Indonesia.*

The potential for plants to trap odor discharged from exhaust fans at research and commercial hen houses was evaluated in Aug and Sept 2008. Poultry NH<sub>3</sub> emissions and particulate matter are a concern for

air quality, surface deposition, animal and human health and regulated by the US EPA in non-attainment areas. Odor is a nuisance issue for commercial farms near housing developments and other urban settings and often a constituent of dust and emissions. At a Penn State research hen house five tree species comprising a vegetative buffer were planted in pot-in-pot containers in five rows downwind of four hen house fans. Both laboratory olfactometry detection threshold (DT) and field olfactometry dilutions-to-threshold (D/T) measurements were made with and without the trees to study the impact of vegetation on odor thresholds. Odor samples for the laboratory olfactometry were secured in Tedlar™ bags and evaluated in 24h time. At a commercial hen complex with six 250,000 hen houses, vegetative buffers with four rows were established downwind of three house's fans (27 tunnel fans each) while the other three houses served as controls. Laboratory olfactometry DT measurements were made at both the Penn State and commercial hen complex with and without trees to study the impact of vegetation on odor thresholds. Six trained odor assessors made laboratory DT determinations, and four odor assessors using the Nasal Ranger™ made field D/T evaluations with and without trees at Penn State. Laboratory DT results for Aug and Sept at the commercial complex averaged 29 and 44 respectively for the houses with and without trees. Measurements made in Aug at the commercial site were significantly less when trees were present ( $P=0.10$ ). Laboratory DT results at the Penn State farm averaged 21 and 39 respectively, with and without trees ( $P>0.10$ ). However, using the Nasal Ranger™, D/T results averaged 4.3 and 9.4 with and without trees ( $P=0.01$ ). Despite low background odor levels at both research and commercial sites, both consistent numerical and statistically significant results suggest vegetation reduces odor.

**Key Words:** odor, olfactometry, laying hens, detection threshold, vegetation

**29 Evaluation of a new poultry house for the presence of *Salmonella* at different sites through the broiler production continuum.** J. A. Byrd\*, T. C. Crippen, C. L. Sheffield, T. L. Poole, and D. J. Nisbet, USDA-ARS, SPARC, Food and Feed Safety Research Unit, College Station, TX.

Poultry companies continue to produce safe and wholesome products while facing increased regulatory pressure to control foodborne pathogens. Although many risk factors that contribute to *Salmonella* concentrations have been identified, precise identification of the most effective sites for intervention have not been established. The present study evaluates a naïve (new) poultry house with different environmental parameters on *Salmonella* incidence at different points of production.

One broiler house with four consecutive flocks were studied. Preharvest sample points included: tray pads (2/sample point), litter (12/sample point), water (3/sample point), feed (3/sample point) and birds (20/sample point) sampled at days 0, 18, 32, 46, and 62. All samples were evaluated for *Salmonella*. Prior to placement on the farm, *Salmonella* were detected in all water, feed, hatchery (traypads), and in 18% of the litter samples. Water samples were 100% positive for *Salmonella* at Days 1 and 18 in Flocks 1-3. Similarly, *Salmonella* was detected in high levels (60-100%) in Flocks 1 and 3 on Days 1 and 18. However, ceca samples evaluated for *Salmonella* were found under 5% on all days except for Flock 3 which had *Salmonella* 95% (Day 1) and 25% (Day 18). *Campylobacter* was not detected on the farm during the entire study. The data demonstrates the importance of pathogen-free environmental conditions even on naïve farm. Data from this study may help poultry professionals understand how environmental factors may affect food-borne pathogens in poultry and the difficulty that may be encountered in making risk management decisions.

**Key Words:** new house, environmental, *Salmonella*, poultry

**30 Investigation of growth performance and ascites mortality in broiler chickens reared in a greenhouse or a conventional house at a high altitude area.** F. Khajali\*<sup>1,2</sup> and M. Faraji<sup>1</sup>, <sup>1</sup>Shahrekord University, Shahrekord, Iran, <sup>2</sup>University of Arkansas, Fayetteville.

In the present study, a greenhouse was constructed to meet the birds environmental needs and welfare and the response of broiler chickens (Ross 308) in terms of growth performance, physiological variables and mortality from ascites grown in the greenhouse were studied in relation to a conventional house with similar conditions. Four hundred day-old chicks were randomly distributed among 8 groups and placed either in the greenhouse (4 groups) or the conventional house (4 groups). The experiment was conducted in floor pens in both houses from 2 to 42d in a completely randomized design. Results showed that the birds in the greenhouse ate significantly ( $P<0.05$ ) more feed than those reared in the conventional house in the growing (21-42d) and throughout the trial (2-42d). Differences between the houses were not significant for body weight gain and feed conversion ratio in different periods of the experiment. FCR throughout the trial was 1.78 and 1.81 for the birds housed in the conventional house and the greenhouse, respectively. Mortality from ascites was 9.5 and 12% in birds housed in the conventional house and the greenhouse, respectively. There were no significant differences with respect to hematocrit and serum nitric oxide concentration between the houses.

**Key Words:** greenhouse, broiler, ascites

## Immunology I

**31 Susceptibility of commercial broiler chickens that differ in innate immune responsiveness to coccidial infection.** M. H. Kogut\*<sup>1</sup>, C. L. Swaggerty<sup>1</sup>, I. Y. Pevzner<sup>2</sup>, and J. R. Nerren<sup>1</sup>, <sup>1</sup>USDA-ARS, College Station, TX, <sup>2</sup>Cobb-Vantress, Inc., Siloam Springs, AR.

Traditionally, genetic selection of poultry based on immunity/disease resistance has centered on inherent resistance to a specific infectious agent. Given the ability of the innate immune system to recognize a variety of pathogens, we hypothesize that innate immunity could be a more useful marker when genetically selecting chickens for disease

resistance. We have identified two lines of broiler chickens divergent in their innate response (line A = highly efficient and line B = low efficiency). We have shown that this functional efficiency of the innate response can be genetically transferred to progeny, is sex-associated, and genetically influenced by the sire. Furthermore, we have shown that increased in vitro innate immune function corresponds with increased in vivo resistance to infections by Gram-positive and Gram-negative bacteria. Coccidiosis remains one of the most common and most expensive diseases of poultry worldwide. The objective of the current study was