Environment and Management III

192 Ammonia concentrations downwind of broiler houses. B. D. Fairchild*, M. Czarick, J. W. Worley, C. W. Ritz, B. D. Hale, and L. P. Naeher, *University of Georgia*, *Athens*.

Ammonia (NH_3) concentrations have always been of concern from a bird performance and worker health standpoint. However, NH_3 emitted from poultry houses is receiving more attention from environmental and nuisance aspects. There are several reports on NH_3 emissions from poultry operations but these do not address how NH_3 disperses or the actual concentrations observed at varying distances from poultry houses. The objective of this study was to measure NH_3 concentrations downwind of broiler house tunnel ventilation fans located in the end wall when ventilation rates would be at a maximum. Data were collected during the last 4 weeks of grow-out during a summer flock on a 4-house broiler farm located in Southeastern United States. Climate conditions were monitored with a weather station and sonic anemometer. Open-path laser spectrometers were placed 100, 200, 300, and 500 ft downwind from the houses. In general, NH_3 concentrations were lower as distance from the houses increased with NH_3 levels at 100, 200, 300 and 500 ft being less than 1 ppm (5× lower than the NH_3 detectable odor threshold of 5 ppm) approximately 50, 75, 85 and 90% of the time, respectively. Ammonia concentrations approximately 100 ft from the houses were influenced by the tunnel fans themselves. Wind direction and wind speed significantly influenced downwind NH_3 concentrations beyond 100 ft. At no time were NH_3 levels measured that met or exceeded ammonia odor threshold values.

Key Words: ventilation, climate

193 Modeled ammonia plume dissipation from broiler houses. L. A. Harper*[1], C. W. Ritz[1], B. D. Fairchild[1], T. K. Flesch[2], M. Czarick[1], J. W. Worley[1], L. P. Naeher[1], and B. D. Hale[1], [1]*University of Georgia*, *Athens*, [2]*University of Alberta*, *Edmonton, AB, Canada*.

Ammonia can serve as a potential source for complaints against poultry producers expressed as an environmental impact or as perceived odor or health problems. The purpose of this study was to validate model predictions of ammonia concentration dissipation downwind of broiler houses under varying meteorological and operational conditions. Ammonia concentrations and climatic information were measured downwind of a 94,000-bird, 4-house broiler operation during the final weeks of production using open-path laser spectrometers and sonic anemometry. Measurements were made during summer maximum emission periods with fan configurations all directed parallel to the prevailing wind direction. Emission rates were calculated using inverse-dispersion analysis from measured concentrations and climatic conditions taken outside of the broiler houses downwind of the obstruction influence by the houses. Downwind concentration plumes were then determined using a Lagrangian dispersion analysis model based on the calculated emission rates and climatic information. Predicted downwind concentrations during stable (nighttime) climatic conditions were much larger than during unstable (daytime) conditions throughout all measurement periods. End-of-flock modeled average stable and unstable conditions' concentrations (3-day period) compared closely to measured concentrations at distances beyond the influence of the exhaust fans (about 300 ft). Daily average predictions compared more closely with daily average measured concentrations than 15-min predictions due to the inherent stochastic variability of short-term measurements. Comparison of the modeled and measured downwind concentrations suggests that the Lagrangian dispersion analysis model provides an accurate means of estimating downwind ammonia concentrations from poultry production facilities with nonobstructed downwind terrain. Additional comparisons would be desired to validate the model for other housing and fan configurations.

Key Words: emissions, climate, concentration

194 The potential of vegetative buffers to reduce dust, ammonia, and virus transmission from commercial poultry farms. H. K. Burley*, P. H. Patterson, R. M. Hulet, H. Lu, A. Adrizal, R. M. Bates, G. P. Martin, C. A. B. Meyers, and H. M. Atkins, *Pennsylvania State University*, *University Park*.

This study explored the potential of vegetative buffers to reduce transmission of avian respiratory viruses using vaccine strains of Newcastle disease virus (NDV) and infectious bronchitis virus (IBV) as a model. Six commercial layer houses, 250,000 hens each, were spray vaccinated once in June (trial 1) and once in September (trial 2) 2007. Before each vaccination, 10 to 12 7-wk-old specific pathogen free (SPF) white leghorn chickens were placed in each hen house and 24–32 7-wk-old SPF chickens were placed in a coop located 27.4 m downwind of each house's 27 tunnel fans. Between houses 2, 4, and 6 and their coops, a vegetative buffer (VB), including willow, arbor vitae, poplar, elm, maple, alder, oak and hackberry, and warm-season grass, was planted. Coops 1, 3, and 5 acted as controls (C). At 2, 7, and 17 d postvaccination (pv) in trial 1 and 4, 7, and 11 d pv in trial 2, blood samples, tracheal and cloacal swabs were collected from 2 house SPF birds and 6–8 coop SPF birds at each site. Vegetation clippings or swabs and the filters from aerial pumps used to capture dust were also collected. Swabs were placed in 15-mL sterile tubes containing viral transport medium (VTM). Mean temperature and relative humidity in trials 1 and 2 were 25.1°C, 50.0% and 19.0°C, 46.0%, respectively. Total dust measures (mg/h) in both trials and ammonia levels (ppm/h) in trial 1 were numerically greater at the VB coops than at the C coops. Ammonia levels were too low to measure in trial 2. In laboratory tests, all swab and dust samples were processed for virus isolation (NDV and IBV) in SPF embryonating chicken eggs (ECE). Serum was processed from the blood samples for NDV and IBV antibody detection by IDEXX ELISA. The vaccine strain of NDV was found in SPF sentinel birds placed in houses and coops, which demonstrated that virus transmission did occur from houses to coops. The same is true for IBV antibodies detected from the SPF sentinel birds. Further comparison studies between VB and C birds, regarding NDV and IBV transmission, will be conducted with an improved VB in our next experiment.

Key Words: vegetative buffer, Newcastle disease virus, infectious bronchitis virus

195 Varying dietary protein level during rearing affects breeder pullet growth and development. A. Pishnamazi*[1], R. Renema[1], F. Robinson[1], and M. Zuidhof[2], [1]*University of Alberta*, *Edmonton, AB, Canada*, [2]*Alberta Agriculture and Food*, *Edmonton, AB, Canada*.

A total of 600 female broiler breeders of a classic (Ross 308) and 600 females of a high breast yield strain (Ross 708) were reared to determine the effects of 3 dietary balanced protein (DBP) levels (HIGH = +20%, STANDARD = Control, and LOW = –20%) during 1 of 4 6-wk periods (1 to 7, 7 to 13, 13 to 19, or 19 to 25 wk of age) on change in individual BW and external frame size and fleshing measures, and on breast muscle, abdominal fat pad, liver and reproductive organ weights at the end of each test period. Shank and keel length were measured to assess frame size. The STANDARD DBP was fed during the remaining periods and all birds of each strain were allocated the same feed quantity. Each period was analyzed separately, with DBP and strain as main factors in the factorial design.
The higher BW targets of the Ross 308 compared to Ross 708 pullets resulted in higher BW, shank and keel length and shank width measures in all 4 test periods ($P < 0.0001$). In all test periods, Ross 708 pullets had more breast muscle as a % of BW, and a lower absolute and relative fat pad weight, exception 1 to 7 wk period ($P \leq 0.05$). Except for the 13 to 19 wk, feeding the HIGH DBP diet resulted in higher BW, BW gain, and breast width gain compared to the LOW DBP diet ($P \leq 0.05$). In the first period, the HIGH DBP diet increased absolute and relative breast weight and conversely, absolute and relative fat pad weight decreased. By the 13 to 19 wk period, abdominal fat pads of the LOW DBP group weighed much more than that of the STANDARD or HIGH groups ($P < 0.0001$) and relative ovary weight was also higher ($P = 0.04$). These differences grew larger in the last period ($P < 0.0001$), with the difference in relative ovary weight also increasing ($P = 0.05$). Ross 308 pullets fed the LOW DBP in this period, had higher reproductive organs weight than Ross 708 birds ($P < 0.006$). Skeletal development and body composition most were affected by DBP during the 1- to 7-wk and 19- to 25-wk periods.

Key Words: broiler breeder, dietary protein, frame size

196 Dietary acids for laying hens: Performance, and egg and environmental parameters. P. H. Patterson*, T. L. Cravener, E. F. Wheeler, and P. A. Topper, *Pennsylvania State Universiy*, *University Park*.

The impact of dietary acids were evaluated using 288 Hy-line W-36 hens divided equally into 4 dietary treatments (72 hens/each) including a Control (CON); 0.3% Caprylic acid (CA); 0.05% Galliacid (GA); and 0.4% Phosphoric acid (PA). There were 12 replicates per treatment with 2 cages of 3 birds/cage for each replicate. The hen diets were iso-caloric and iso-nitrogenous meeting NRC (1994) nutrient requirements for amino acids, minerals, and vitamins. Birds were provided the treatment diets and water ad libitum. Hen light intensity was 5 lux, and day length was 16:8, light:dark by 24 wk of age. The hens were on treatment diets from 19 to 49 wk of age in 9 4-wk experimental periods (P). Ammonia emissions were measured using a non-steady-state flux chamber for rapid detection in facilities with multiple-diet treatments (Innova model 1412, Photoacoustic Gas-Monitor, AirTech Instruments, Ballerup, Denmark). Hen BW at the beginning of the study was not different, but by 49 wk PA hens (1,679 g) weighed more than CA or GA hens (1,612 g) and CON were intermediate (1,641 g, ($P < 0.05$). Feed intake was consistently greater among PA hens ($P < 0.05$) compared to CON and CA hens in P5, P8 and P1 to 9, with GA hens intermediate. There were no significant trends in egg production or specific gravity; however, egg weight was significantly reduced in CON compared to the hens fed acid treatments (P2, P4, P8). Hens fed PA had the greatest egg weight in P2 and P4 and in P8 CA and PA eggs were 64.2 and 64.0 g, respectively, and more than 2 g greater than CON. Manure sampled at 23 and 36 wk from PA hens had less P2O5 than those fed GA, CA or the CON ($P < 0.10$ and $P < 0.05$). Manure from PA fed hens at 23 and 49 wk also contained more total-N, organic-N, and less NH4-N than the other treatments. Manure NH3 emissions (kg/d/m^2) from PA fed hens were numerically less than the others at 19 and 23 wk and at 49 wk flux was approximately on half the CON, CA and GA treatments ($P = 0.0712$). Ammonia emissions of PA hens expressed in mg/g manure, were numerically lower at 23 wk and significantly less than the other treatments at 49 wk (1.43 vs. 2.79 mg/g, $P = 0.0205$).

Key Words: laying hens, dietary acids, ammonia

197 Controlling postmolt body weight and egg weight with reduced crude protein and lower metabolizable energy. P. L. Ruszler*[1] and C. L. Novak[2], [1]*Virginia Polytechnic Institute and State University*, *Blacksburg*, [2]*Land O'Lakes Purina Feed*, *Kansas City, MO*.

In a trial to determine how to control egg weight and body weight in molted hens, 210 hens were full fed a low nutrient (FFLN) molt diet and 42 hens (controls) were molted with a 4-day fasting method. Each treatment (TMT) was replicated 14 times with 3 hens per replicate. On the 29th day of the molt, the 5 FFLN molt TMT were placed on 13% CP layer diets with energy ranging from 2,756 to 2,886 kcal ME/kg by increments of 26 kcal. The control hens were fed a 15.5% CP/2,822 kcal ME/kg layer diet. Control hens were on average 90 g/bird heavier ($P < 0.05$) between 12 and 24 wk postmolt as compared to the heaviest FFLN birds. At 24 wk the body weight of the control hens was 1,814 g vs. FFLN hens ranging from 1,631 to 1,733 g. The egg weight of eggs from control hens between 10 and 18 wk postmolt was significantly heavier as compared to the egg weight of eggs produced by FFLN fed hens. At 16 wk postmolt, the control diet was reduced to 14.5% CP and methionine in all 6 diets was reduced from 0.39 to 0.32%. Egg weight was similar from 18 to 24 wk postmolt with control fed hens producing a smaller egg due to the adjustment in protein and methionine while egg weight remained constant in the FFLN fed birds. As a result, the control hen's egg weight became nonsignificant but stayed 1 g heavier than the heaviest egg weight from hens on the FFLN diets. All TMT achieved zero egg production for 2 to 3 wk and peaked between 88.4 and 95.9%. Hen day egg production at 24 wk postmolt was not significantly different and ranged from 83.7% for the lowest FFLN fed hens to 90.1% for the control hens. This study shows that postmolt body weight and egg weight can be controlled using 13% CP with energy levels between 2,756 and 2,858 kcal ME/kg without adversely affecting egg production.

Key Words: egg weight, body weight, energy and protein