

necropsy, the proventriculi are enlarged with thickened walls. Microscopically, the glands are dilated, with necrosis of secretory cells, hyperplasia of ductular epithelium and mucosal and glandular inflammation caused by lymphocytic infiltration. The mucosa has cystic lesions and expansion of the lamina propria. These microscopic inflammatory lesions are distinct from lesions caused by noninfectious causes of enlarged proventriculi.

Currently, the cause of this condition is not known. Studies have implicated viruses such as reovirus, adenovirus, infectious bronchitis virus and infectious bursa disease virus (IBDV).

A proventricular homogenate (2054) that originated from clinically ill broiler from northern Alabama caused both gross and microscopic lesions typical of TP at 14 days post infection (PI) of one-day-old SPF broilers. Proventriculi of 2054-infected chickens were significantly enlarged and the lesions were con-

sistent with those seen in commercial chickens diagnosed with TP at the Alabama State Diagnostic Laboratory. Infected chickens did not seroconvert to IBDV. Moreover, on the 14th day PI, IBDV RNA was not detected and bursa did not atrophy; their size and weight were the same as controls. Microscopic examination of the bursae showed neither lymphocytic depletion nor inflammatory reaction typical of IBD.

The TP agent was present in the 2054 homogenate and it may not be IBDV, as evidence of IBDV was not apparent when TP was fully reproduced. This agent(s) that caused TP will be isolated, purified and identified, then re-inoculated back into chickens with the main goal of fulfilling Koch's postulates to ascertain etiology of TP.

Key Words: Proventriculus, Lesions, Broilers, IBDV, Etiology

Tuesday, January 25 Nutrition Room: B313

S94 Metabolizable energy of feed grade and pet food grade poultry by-product meals. N. Dale^{*1}, W. Dozier², ¹University of Georgia, ²USDA-ARS.

The by-products of poultry processing are popular ingredients in both poultry feed and animal protein blends. During the past decade, poultry by-product meal (PBM) has become available in two basic forms, popularly referred to as feed grade and pet food grade poultry by-product meal. The pet food grade variety is assumed to have been produced using higher quality inputs. Previous reports from this laboratory documented the proximate composition, amino acids, and fat stability of these products. The current study was conducted to determine the metabolizable energy of these ingredients.

Eight PBM samples, four feed grade and four pet food grade, were submitted by commercial feed mills located in the Delmarva region and also the southeastern U.S. during the spring of 2004. Samples were evaluated for proximate composition and TMEn. No significant differences were noted in the TMEn of the pet food grade vs. feed grade PBM (3351 and 3249 kcal/kg, respectively, 95% DM). However, the standard deviation for the feed grade samples (333 kcal/kg) was approximately 10X greater than that of the pet food grade (36 kcal/kg). In this set of samples, protein was significantly higher in the pet food grade, while ash was numerically higher in the feed grade samples ($P < .12$).

Previously published prediction equations for the metabolizable energy of PBM tended to underestimate the caloric value of currently produced feed grade and pet food grade PBM. However, the higher values obtained in this study are reasonable based on the energies and digestibilities of respective protein and fat components.

Key Words: Poultry by-product meal, feed grade, pet food grade, metabolizable energy

S95 Optimizing dietary energy for profit and performance of two strains of White Leghorns. M. Bryant^{*}, G. Wu, D. Roland, Auburn University.

Egg producers use a wide range of dietary energy levels for commercial leghorns. This study was designed to compare the effect of four diets with increasing energy levels on two strains (Bovans White and DeKalb White) of commercial layers and to compare their responses. Hens (768) from each strain were housed three per cage in an environmentally controlled cage house. The study was conducted as a randomized block design to control for cage level effects. Each experimental unit consisted of four adjacent cages (12 hens) with 16 replicates per treatment. Hens were fed one of four diets with increasing amounts of added fat (0, 1.68, 3.36 and 5.05 %) to yield 2719, 2798, 2877 and 2959 kcal/kg of energy. Diets were fed for 16 weeks (21-36 weeks of age). Both strains at all energy levels peaked in egg production between 95% - 97%. Bovans Whites had higher average (wk21-36) egg production (85.8% vs 80.2%) and higher average feed consumption (106 g/h/d vs 103 g/h/d) than DeKalb Whites ($p < .05$). The Bovans Whites had lower average egg weights (60.8 g vs

61.6 g) and lower average egg specific gravity (1.089 vs 1.091) than DeKalb Whites ($p < .05$). There were no interactions between strain and diet. Increasing dietary energy levels by adding fat had a linear effect on both egg weights increasing from 60.9, 61.0, 61.5 to 61.4 grams and feed consumption decreasing intake from 108, 105, 103 to 101 g/h/d. Egg specific gravity was also decreased with increasing energy levels from 1.090 to 1.089 ($p < .05$). Dietary energy level had no effect on egg production, body weight and hen mortality. Hens adjusted their feed intake to compensate for the differences in dietary energy resulting in the same 5.8 kcal/g egg for all diets. An economic analysis of the data indicated that the profitability of using fat is dependent on the price of fat, grain, protein and the price spread of eggs due to size.

Key Words: Energy, Hens, Fat

S96 Growth responses and meat yield of broilers provided three and four feed programs formulated to moderate and high nutrient density during a 56-day production period. W. Dozier, III^{*1}, R. Gordon², M. Kidd³, S. Branton¹, ¹USDA, ARS, South Central Poultry Research Laboratory, ²Gold Kist, Inc., ³Department of Poultry Science, Mississippi State University.

Broiler chickens marketed to heavy weights are typically provided either a three- or four-phase feeding program. High nutrient density diets improve live performance and meat yield, but economical advantages are dependent upon live cost and net return based on meat yield. This study examined live performance and meat yield responses of broilers provided three- or four-phase feeding programs formulated to a high (H) or moderate (M) nutrient density during a 56-d production period (4 treatments and 8 replications/treatment). The periods consisted of 1 to 17, 18 to 35, and 36 to 56 d, or 1 to 17, 18 to 35, 36 to 46, and 47 to 56 d. Sixteen-hundred and sixty-four Ross x Ross 508 chicks (26 males and 26 females per pen; 0.08 m²/bird) were randomly distributed to 32 floor pens. Birds were provided H and M up to 35 d and from 36 to 56 d. However, half of the birds in this period (36 to 56 d) received H and M diets from 36 to 46 d and 47 to 56 d. In the three-phase feeding program, amino acid nutrient regimes for the 36 to 56-d period represented average amino acid levels of the four-phase feeding program from the 36 to 46-d and 47 and 56-d periods. Providing a three vs. four-phase feeding program did not influence broiler growth performance or breast fillet yield. From 1 to 35 d, BW gain and feed conversion were better ($P = 0.001$) in birds fed H vs M diets. In the three-phase program, birds receiving H diets had higher cumulative BW ($P=0.05$) and BW gain ($P=0.05$), fillet weight ($P=0.06$), and tender weight ($P=0.04$) over birds fed M diets. Although providing a four-phase feeding program is advantageous based on diet cost, increasing nutrient density with a three-phase program provided benefits with performance and meat recovery. However, benefits of providing a three-phase program based on live performance and breast meat yield in comparison to the four-phase feeding were not realized in this experiment.

Key Words: Broiler, Amino acid, Phase-feeding

S97 Evaluation of essential oils and organic acids in diets for broiler chickens. K. Y. Zhang*, F. Yan, C. A. Keen, P. W. Waldroup, *University of Arkansas*.

Antibiotic growth promoters (AGP) have been banned from poultry diets in the EU and pressure from consumer groups and major poultry buyers has threatened their removal from diets in the U.S. Herbs, spices, and various plant extracts have received increasing attention as possible AGP replacements. Essential oils (EO) are volatile oils extracted from plant materials by steam or water that are reported to have desirable attributes including appetite stimulation, antibacterial effects, or antioxidant properties. This study was conducted to evaluate two commercial products, a mixture of EO and a mixture of EO and organic acids (EO+OA). A corn-soybean meal diet void of animal protein served as the test vehicle. One group of birds received no antibiotics or test products. A second group received 50 g/ton of BMD from 0 to 35 d and 15 g/ton of virginiamycin from 35 to 42 d. A third group received the diet fortified with the mixture of EO+OA at manufacturers recommended level (0.5 kg/ton). Three additional groups received the diet fortified with the EO at 100 g/ton continuously or diets in which the starter diet received 100 or 150 g/ton with reductions at later ages. Male and female chicks (37 of each gender, 0.70 ft² per bird) were placed in each of 48 pens with new softwood shavings. Eight pens were assigned each of the dietary treatments. Birds were weighed and feed consumption recorded at 14, 35, and 42 d. Litter samples were taken at the same intervals to determine litter moisture. Samples of birds were processed for parts yield.

Body weight, feed intake, and feed utilization of birds were not significantly improved over the negative control by any of the dietary treatments, including the antibiotic program. Mortality was similar among treatments. No significant differences in dressing percentage or breast yield (total weight or percentage of carcass weight) were observed among treatments. Litter moisture at 42 d was not different among treatments. Results indicate no beneficial effects from adding the EO or EO+OA; however in this study no response was seen to AGP suggesting that stress situations were not observed.

Key Words: Essential oils, Organic acids, Antibiotics, Broilers

S98 Evaluation of essential oils and organic acids in diets for broiler chickens. 2. Dose response studies. K. Y. Zhang*, F. Yan, C. A. Keen, P. W. Waldroup, *University of Arkansas*.

Antibiotic growth promoters (AGP) have been banned from poultry diets in the EU and pressure from consumer groups and major poultry buyers has threatened their removal from diets in the U.S. Searches for alternative products are taking place. Essential oils (EO) are volatile oils extracted from plant materials by steam or water that are reported to have desirable attributes including appetite stimulation, antibacterial effects, or antioxidant properties. In a previous study we evaluated two commercial products, a mixture of EO and a mixture of EO and organic acids (EO+OA). Both were evaluated at manufacturers recommended levels. Neither of the two products resulted in a significant improvement in performance in litter floor pens; however the birds also did not respond to an antibiotic. This trial was conducted to evaluate higher levels of dosage of the two essential oil products. A corn-soybean meal diet void of animal protein served as the test vehicle. One group of birds received no antibiotics or test products and served as the negative control. A second group received the EO+OA at manufacturers recommended level (0.5 kg/ton) and a third group at twice the recommended level (1.0 kg/ton). Three additional groups of birds received the EO at manufacturers recommended level (100 g/ton) or at two or three times recommended levels. Five male broilers were placed in each of 48 battery pens with eight pens assigned each of the dietary treatments. Birds were weighed and feed consumption recorded at 14 and 35 d. Contrast comparisons were made against performance of chicks fed the negative control diet. No significant differences in body weight were observed among the various treatment groups. However, chicks fed the higher levels of EO or EO+OA consumed significantly less feed ($P < 0.05$) than those fed the negative control and had better feed utilization ($P < 0.10$) than those fed the negative control diet. These data suggest that EO or EO+OA might be beneficial in broiler diets but response may be strongly dose dependent.

Key Words: Essential oils, Organic acids, Antibiotics, Broilers

S99 The nutritional value of dehulled-degermed corn for broiler chickens and its impact on nutrient excretion. T. Applegate*, *Purdue University*.

Two experiments were conducted to determine the nutritional value and impact of dehulled-degermed corn (DDC) in diets of broiler chickens. In the first experiment, four experimental diets were fed from 14 to 21 d of age with increasing quantities of DDC replacing corn as the sole source of energy and protein (93.4% of diet). The AMEn was determined to be 3267 and 3364 kcal/kg for the corn grain and DDC, respectively. Apparent ileal amino acid digestibility was determined with birds at 21 d of age. Digestibility of threonine, lysine, arginine, and tryptophan was significantly less in birds fed the DDC versus a corn diet ($P < 0.05$). In the subsequent experiment, birds were fed diets from hatch to 42 d of age with either corn or DDC as the primary grain source. By 42 d of age, BW and feed consumption between birds fed the corn or DDC diet were similar ($P > 0.05$). However, birds fed the DDC diet excreted 78.1 g less DM and 1.54 g less phosphorus (P) by 42 d of age ($P < 0.05$). In conclusion, replacing corn with DDC resulted in similar performance of broilers to 42 d of age with reduced excretion of DM and P.

Key Words: Broiler, Corn, Dry matter, Manure, Phosphorus

S100 Comparisons between alimet® and DL-methionine (DLM) at non equimolar levels are misleading and inconclusive. R. Gonzalez-Esquerria¹, C. Lopez-Coello², E. Avila-Gonzalez², J. M. Arce³, M. Vazquez-Anon¹, C. D. Knight¹, *Novus International Inc.*, ²National University of Mexico, ³University of Morelia.

Objectives were to illustrate the flaws of comparing the methionine (Met) efficacy of Alimet® feed supplement (88% Met activity; Novus International, Inc.) vs. DLM (99% Met activity) at unpaired-equimolar levels, and to assess the effect of feeding these products at commercial levels of addition. A factorial 3x2 plus a control experiment was conducted in a floor pen facility located in Morelia, Mexico with 4 reps of 50 Ross308 birds per treatment. Alimet or DLM were added at three equimolar levels to sorghum/soy starter, grower and finisher basal diets (at 14, 35 and 49d of age, respectively) deficient in TSAA. The highest level of addition met TSAA requirements assumed at 0.931, 0.894, and 0.789% for starter, grower, and finisher diets, respectively. The levels of supplementation were added in such a way that the lowest level of DLM (DLM 65) corresponded to 65% of the highest level of Alimet (Alimet 100) on a product to product basis. A response over the basal treatment was found in all performance parameters tested ($P < 0.001$). As levels of supplementation were near TSAA requirements, no differences in growth parameters among the levels of supplementation for any Met source were found. Consequently, no differences between Alimet 100 and DLM 65 were observed nor between Alimet 100 and its equimolar DLM counterpart. Therefore, concluding that the efficacy of Alimet is 65% based on the mere comparison between Alimet 100 and DLM 65 is invalid. Given the fact that birds respond to Met addition in a quadratic manner, non-equimolar comparisons are misleading. Comparing Alimet and DLM at equimolar levels eliminates the confounding factor introduced when feeding these products at different levels of the dose response curve. Based on equimolar comparisons, birds fed Alimet exhibited optimum breast yield and significantly better carcass yield ($P < 0.05$) than those fed DLM at around requirements. This is in agreement with previous observations suggesting that Alimet and DLM have a different dose response characterized by better performance in birds fed Alimet, rather than DLM, added at around TSAA requirement levels.

Key Words: Broilers, Methionine, Alimet

S101 Broiler responses to amino acid density in a digestible ideal pattern during various feed phases throughout life. M. T. Kidd¹, A. Corzo¹, W. A. Dozier, III², E. R. Miller³, D. Hoehler⁴, ¹Mississippi State University, ²USDA, ³Aviagen North America, ⁴Degussa Corporation.

Dietary amino acid patterns dictate white meat yield in broilers. As genetic advances in tissue accretion and growth rate of high-yield broilers are realized, it is important to know the level and time period of amino acid optimization to coincide with feed intake patterns. Growth and carcass responses were evaluated in Ross x Ross 708 broilers. Male and female broilers (2,592, placed sex

separate) were randomized across 144 floor pens containing 18 birds per pen. Dietary treatments consisted of moderate (M) amino acid density representing commercial US conditions and high (H) amino acid density based on an ideal pattern. Diets were fed to broilers from 1 to 5, 6 to 14, 15 to 35, 36 to 44, and 45 to 55 d. Diets were steam pelleted and based on corn, soybean meal, and poultry meal. Combinations of M and H diets across the five feeding phases resulted in the following treatments: (1, HHHHH; 2, HHHHM; 3, HHHMM; 4, HHMMM; 5, HMMMM; 6, MMMMM) resulting in a 2 (sex) x 6 (diet) factorial design with 12 replications per treatment. Live performance responses were measured by period. At 35 and 55 d, 4 birds per pen were randomly selected for processing. Interactions ($P < 0.05$) occurred for 1 to 5 d BW and feed conversion (FC) indicating that female BW, but not male BW, responded positively to H diets whereas male FC, but not female FC, was improved with H diets. At 55 d, male broilers were heavier ($P < 0.05$) and had lower FC ($P < 0.05$; 5 points) than female broilers. Optimal BW and FC ($P < 0.05$) occurred by feeding H diets to d 35 and d 55, respectively. Carcass and breast meat yields followed the same pattern ($P < 0.05$) as BW indicating the importance of H amino acid density to d 35. Based on performance criteria in the various feeding phases, different scenarios were calculated in order to maximize economics of broiler production.

Key Words: Amino acid, Broiler, Phase feeding, Economics

S102 Six trials demonstrate economic benefits of increasing amino acid fortification in broiler diets under a wide variety of conditions. R. Gonzalez-Esquerre*, M. Vazquez-Anon, C. D. Knight, *Novus International, Inc.*

Six floor pen trials assessed the economic impact of increasing dietary AA density in broilers. Studies included multi-purpose (MP; Cobb500, Ross308 and Arbor Acres), high-yield breeds (HY; Cobb700, Ross508, Ross708 and Hubbard HiY) and MPxHY crosses. Factorial designs with 6-8 reps of 15-48 birds each were used to test the effects of diet, breed and/or sex. Diets were considered either standard (SD) or high AA density (HD) by the time studies were conducted. HD had in average 12, 10, 9 and 8% higher Lys than SD diets (St, Gr, Fi and Wt periods, respectively). Performance and carcass quality were collected at the end of the Fi and Wt periods (42 and 56d, respectively). Using the ingredient composition for all diets in each trial and the corresponding performance and carcass quality, calculations were made to estimate return over investment (ROI) when feeding HD rather than SD diets. Annual average corn and SBM prices reported by Feedstuffs from Sep 03 to Sep 04, and prices of live birds and breast meat reported by Feedstuffs on Sep 04, were referred to as Average scenario. Changes in ROI under scenarios of high or low corn and SBM prices ($\pm 15\%$ Average), and high and low live bird and breast meat prices ($\pm 25\%$ Average) were estimated. Increasing AA density in average improved BW, FCR and breast yield of about 3.9, 2.3 and 3.2 %, respectively by 42d of age while improvements of 2.0, 1.2 and 2.2%, respectively were found by 56d of age. The benefits of HD in those measurements were more noticeable on males rather than females. The ROI after feeding HD diets increased from USD 34K to USD 112K per million birds under the Average scenario depending on age and gender. Greater ROI was observed with low ingredient costs and high prices for live chickens and breast meat as expected however increasing AA density improved ROI under all scenarios tested. In general, greater ROI was observed in males rather than females, and for 42 rather than 56d old birds. It is concluded that increasing dietary AA density beyond SD diets results in better performance, carcass quality and ROI under a wide variety of scenarios.

Key Words: Broilers, Amino acid density, Breeds

S103 Interactions between ideal protein level and feed form in broiler production. D. Hoehler*¹, A. Lemme¹, P. J. A. Wjitten², J. van Wichen², ¹*Degussa Corporation*, ²*Provimi B. V.*

The use of ideal protein (IP) diets for broilers have demonstrated marked improvements in performance as the level of amino acids in the diet increase. Apart from improved nutrient utilization, increased weight gain is often driven by enhanced feed intake. One important factor influencing feed intake is feed form. Therefore, an experiment with growing broilers was conducted where increasing levels of IP (90, 100, 110, 120%; corresponding to crude protein

levels of 19.5 to 24.6%, and total lysine levels of 1.07 to 1.41%) were fed as coarse mash, pellets with poor quality (high level of fines, low durability) and pellets with good quality (minimal fines, high durability) in order to examine potential interactions. A total of 1440 male 14 d old Ross 308 broilers with an average live weight of 516 g were equally allocated to 72 cages with 20 birds each. Twelve dietary treatments in a 3 (feed form) x 4 (IP levels) factorial design were used, each treatment was replicated six times. Diets consisted mainly of wheat, corn, and soybean meal. The calculated energy density was 13.5 MJ ME/kg. Weight gain performance from 14 to 35 d ranged from 1761 g (poor pellet, 90% IP) to 1978 g (good pellet, 110% IP). For the pelleted diets, a clear improvement with increasing IP-levels could be observed confirming previous experiments. Weight gain of the broilers fed the coarse mash was unaffected by IP level. At lower IP levels there was no advantage for the broilers fed the poor quality pellet compared with those fed mash. Weight gain of the broilers fed the good quality pellet was 108, 127, 132, and 82 g higher than those receiving poor quality pellets. Feed intake decreased with increasing IP-levels especially for the broilers fed mash. Feed conversion linearly improved as IP levels increased, and it was lowest in birds fed the coarse mash feed. Based on the performance data, different scenarios were calculated revealing that both feed form and IP levels significantly affect economics of broiler production.

Key Words: Broiler, Ideal Protein, Feed form, Economics

S104 Relative efficacy of Alimet® vs. DL-methionine (DLM) in broilers fed chinese commercial-type diets supplemented with cottonseed or rapeseed meal. R. Gonzalez-Esquerre*¹, Y. L. Liu², G. L. Song³, Y. Q. Huo², ¹*Novus International, Inc.*, ²*Wuhan Polytechnic University*, ³*Novus International (Shanghai) Trading Co., Ltd.*

Two trials estimated the Met efficacy of Alimet® feed supplement (88% Met activity, Novus International, Inc.) vs. DLM (99% Met activity) in broilers fed Chinese commercial-type diets containing cottonseed or rapeseed meal (trial 1 and 2, respectively). 2x3x2 factorial-plus a control designs were used. The effect of Met source, level of addition and sex was tested. Basal diets were deficient in TSAA. Equimolar levels of addition were 0.08, 0.16 and 0.24% for the starter (10-21d), and 0.07, 0.14 and 0.21% for the grower and finisher periods (22-42, and 43-49d, respectively). Five pens of 10d old sexed Arbor Acres birds were randomly assigned to each treatment. Six or seven chicks per pen were used for trials 1 and 2, respectively. Bioefficacy was determined by imposing linear, quadratic or exponential regressions to the BWG over the control of each Met source. Met intake over the control was used as independent variable. The Schwarz Bayesian Information Criteria (BIC) was used as an unbiased index of goodness of fit to select the appropriate regression model. Performance and carcass quality improved after Met addition in both trials ($P < 0.05$). Sex did not interact with other main effects ($P > 0.1$) therefore males and females were blocked and analyzed together. No differences between Alimet and DLM were observed for any parameter measured at any time ($P > 0.05$); however, in trial 1 BWG and intake were numerically higher for birds fed Alimet near requirements while in trial 2 values were very close. From linear regression, the efficacy of Alimet vs. DLM was 120 \pm 52% and 100 \pm 37% on a molar basis for trials 1 and 2, respectively. It is concluded that the molar efficacy of Alimet vs. DLM as a Met source is 100%. Interestingly, the reflectance values for breast and thigh meat were significantly lower ($P < 0.01$) for birds fed Alimet rather than DLM in both trials. Low reflectance is associated with more acceptable meat color (less pale) and therefore higher carcass quality.

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Key Words: Broilers, Methionine, Alimet

S105 Optimum dietary threonine to lysine ratio based on economic criteria in growing broiler chicks. D. Hoehler*¹, A. Lemme¹, J. R. Blackman², ¹*Degussa Corporation*, ²*Shur-Gain Agresearch*.

Threonine (Thr) is the third limiting amino acid in most common broiler diets. A trial was conducted to examine the responses of male Ross 308 broilers to dietary Thr to derive optimum dietary Thr to Lys ratios based on economic considerations. Male day-old broilers were fed a commercial starter diet from d 1 to 20. From d 21 to 42, broilers were fed 5 different experimental diets con-

taining 0.49 to 0.69% Thr in a randomized complete block design using 10 pens with 10 birds each per treatment. New wood shavings were used as bedding. Lighting program, temperature, and other management practices were typical of commercial broiler chicken producers in the local geographic area. Data were analyzed by ANOVA and $p < 0.05$ (Scheffe) was considered statistically significant. Exponential regression analysis was performed to describe the dose-response relationship between performance criteria and increasing dietary Thr. Exponential regression equations were combined with economic parameters such as feed cost, L-Thr price and revenues per kg live weight in order to determine the dietary Thr level which minimized feed cost per kg weight gain or maximized earnings above feed cost. Increasing Thr levels from 0.49 to 0.69% resulted in improved weight gain, feed conversion, and breast meat yield. Responses followed non-linear trends for weight gain, feed conversion and breast meat yield with r^2 values of 0.96 to 0.98. Feed cost per kg weight gain and earnings above feed cost (gross margin) were calculated based on two scenarios, where costs of basal feed ranged from 130 to 160 US Dollars per ton, and L-Thr costs ranged from 2.50 to 3.50 US Dollars per kg. Revenues of 1.30 US Dollars per kg weight gain were assumed in both cases. Considering economics, optimum dietary Thr to Lys ratios were 65% for minimizing feed cost per kg gain and >69% for maximizing earnings above feed costs. These threonine levels were relatively constant across the various scenarios, i.e. neither feed nor threonine price variations significantly affected minimum feed costs or gross margins.

Key Words: Broiler, Threonine, Economics

S106 Lysine needs of heavy late-developing broilers. A. Corzo^{*1}, M. T. Kidd¹, W. S. Virden¹, W. A. Dozier, III², ¹Mississippi State University, ²USDA.

Data related to Lys needs for late-developing broilers is sparse. Two studies were conducted simultaneously to evaluate Lys needs for growth and carcass traits from 42 to 56 d of age for male and female broilers. In each study, 480 d-old Hubbard Ultra broiler chicks were randomly allocated to 96 pens and fed common feeds from placement up to 42 d of age. Then, a corn-soybean meal basal diet (3,200 kcal/kg; 15.0% CP) with progressive amounts of 0.08% dietary Lys from 0.68% (0.60% digestible) up to 1.10% was fed to broilers (7 treatments; 6 replications/treatment). In both studies, an isocaloric corn-soybean meal diet with 17% CP and 0.96% Lys (0.86% digestible) served as control (12 replications). Dietary Lys supplementation was accomplished by adding L-Lys-HCl to the basal diet at the expense of an inert filler. Regression analysis (95% of the maximum or minimum response) was performed to extrapolate dietary Lys optimization values. In both studies, broilers fed the control diet did not differ ($P > 0.05$) in BW, feed intake, or feed conversion when compared to those fed the dose-response diet at 0.96%, thus validating the

dose-response diet. Female broilers did not respond to dietary Lys for any parameter measured. Gradient addition of Lys improved feed conversion linearly ($P < 0.01$) with male broilers. Fillet weight, tender weight, and their composite had a linear increase ($P < 0.05$) with Lys supplementation in male broilers. Carcass yield, fillet yield, and total breast meat yield displayed quadratic responses, resulting in Lys optimization levels of 0.87, 0.93, and 0.93 %, respectively in male broilers. Based on results from this study, high-yield male broilers should be fed a minimum of 0.93% Lys (0.85% digestible) from 42 to 56 d of age. Lack of response on female broilers indicates that less dietary Lys may be needed for adequate growth.

Key Words: Amino acid, Breast meat yield, Broiler, Lysine

S107 Effect of feeding time on the reproductive performance of Pharaoh quail and Pekin duck. M. Petek^{*}, Department of Zootechnics, Faculty of Veterinary Medicine, University of Uludag, Bursa, Turkey.

Whether feeding early or late during the day can be used as a means to improve the fertility, hatchability, and embryonic mortality in quail and duck is unknown. Therefore, three feeding periods were used to measure the impact of feeding time on reproductive performance of Pharaoh quail (*Coturnix coturnix* Pharaoh) and Pekin Duck (*Anas platyrhynchos*). Male and female quail and duck breeders were housed colony cages and free-range housing systems, respectively. They were fed ad libitum between 0900 to 1300 or 1300 to 1700 or 24 h (control) daily. 738 quail eggs and 272 Pekin duck eggs were used to determine reproductive performance. Eggs were incubated in a commercial setter and hatcher. The setter was operated at $37.5 \pm 0.5^\circ\text{C}$ dry bulb and $29.0 \pm 0.5^\circ\text{C}$ wet bulb temperatures. The hatcher was operated at $37.0 \pm 0.5^\circ\text{C}$ dry bulb and $31.0 \pm 0.5^\circ\text{C}$ wet bulb temperatures. Eggs in the setter were turned 15 times per day. Three days after removing the chicks from the hatcher all unhatched eggs were classified as infertile, early dead, late dead, or dead pipped. Hatchability was calculated as the number of chicks hatched per fertile or total eggs. The fertility results were reported as apparent fertility on clear egg basis. All traits were analysed with Chi-square test using SPSS[®] computer software (version 10.00). Results indicated that feeding between 0900 to 1300 h reduced apparent fertility when compared with the effects of feeding between 1300 to 1700 or control in both species. Hatchability of total eggs was significantly increased in duck and significantly decreased in quail due to limited time of feeding. And also, the different feeding times affected the total embryonic mortality. Further investigations are needed to determine the optimum length of feeding time for each bird species. Meanwhile, the egg production of breeders must be evaluated in comparison with its beneficial or detrimental effects.

Key Words: Feeding time, Hatchability, Quail, Duck

Tuesday, January 25 Environment/Management Room: B314

S108 Impact of woods around poultry farms on microclimate. G. Malone, G. Van Wicklen^{*}, S. Collier, University of Delaware.

Emissions of ammonia, dust, odor and noise from poultry operations are an increasing concern for the poultry industry from both an environmental and neighbor-relations standpoint. On-going research is evaluating the ability of a vegetative environmental barrier (VEB) to capture airborne emissions (ammonia, dust, odor) and surface plus groundwater nutrient losses around poultry houses. The purpose of this research was to assess the microclimate around poultry farms surrounded by trees. Four poultry farms were chosen to compare the microclimate of poultry houses surrounded by woods to those in open areas. Two farms were oriented in a north-south (NS) direction and two in an east-west (EW) direction. One NS farm and one EW farm were surrounded by woods, while the remaining two farms were situated in open areas. The open farms were surrounded by cropland with no trees within 450 ft. A weather station and 5 temperature-relative humidity recorders were deployed on a one-

month rotation with instrumentation first placed on each of the NS farms, then switched to the EW farms the next month. Data were collected for one year, two months on each farm during warm, moderate and cool weather. Open and wooded farms oriented NS had similar temperatures. From noon to 2 p.m., the wooded EW farm had a 2F rise in temperature over the open EW farm. The EW wooded farm had a 4F rise in temperature from 9AM to 4 PM during warm weather, and had 1.5F lower night temperatures during moderate and cool weather. The rise in mid-day, warm weather temperatures on the EW wooded farm reflects apparent heat accumulation on the S and W sides of the farm. Since this farm had a thick density of mature trees surrounding the farm, it is speculated the prevailing summer winds from the SW were restricted by the woods. To potentially avoid this heat buildup, when planting a shelterbelt of trees around a farm, more porosity (less vegetative density) may be needed on the prevailing summer time wind side of farms.

Key Words: Poultry housing, Trees, Vegetative barriers, Microclimate, Emissions