

viability (VIAB) showed no significant effects on the related periods. Considering the experimental period, it was observed that post-hatching supplement used positively influence the feed consumption and consequently weight gain.

Key Words: nutrition, gastrointestinal tract, post-hatching phase, average weight gain, feed intake

452P The effect of dietary apparent metabolizable energy during the finishing phase on broiler carcass yields. V. S. de Avila*, E. L. Krabbe, C. H. Klein, L. dos S. Lopes, and D. Surek, *Embrapa Swine and Poultry, Concordia, SC, Brazil.*

Nine hundred d-21 broiler chicks were used to evaluate the effects of increasing dietary apparent metabolizable energy (AME) by added refined soybean oil on broiler carcass parameters. A basal diet (AME 2,980 kcal/kg, 21.4% crude protein) was given from d-old to 21 d. The experimental diets were based on corn, soybean meal, and refined soy oil and were produced and formulated to achieve calculated (AME) values of 2,850, 2,950, 3,050, 3,150, and 3,250 kcal/kg and 18.5% crude protein (22 to 42 d) by replacing the inert material (kaolin) by refined soybean oil. Diets were fed as pellets/crumbled. At d 21, all birds were weighed and distributed equally according to 5 treatments with 9 replicates per treatment and 20 birds per experimental unit (floor pens). Two birds were randomly taken from each pen at d 42 for processing. Data were submitted to polynomial regression. There was no significant difference in 42-d live body weight (g). Dietary AME did not influence the hot carcass, cold carcass, breast, wings, thighs and drumstick yields. There were no significant effects of dietary AME on abdominal fat, liver, heart and gizzard weight. It is concluded that dietary AME did not significantly affect the live body weight, carcass yield, abdominal fat and organs weight under the applied conditions.

Key Words: kaolin, soy oil, pellet, poultry

453P Effects of immunomodulatory nutrients on growth performance and cytokine expression in layer chicks challenged with lipopolysaccharide. E. L. Wils-Plotz* and K. C. Klasing, *University of California, Davis, CA.*

Immunomodulatory nutrients alter the immune response to pathogens; modulating individual immune status. The objective of this study was to characterize the immune response of layer chicks treated with known immunomodulatory nutrients: fish oil, CLA, corn oil, lutein or vitamin E, during a LPS challenge. Four-week-old, mixed-sex layer chicks (n = 100), were weighed and randomly allotted to 1 of 5 dietary treatments (TRT). The study was a 5 × 5 × 4 factorial with 5 dietary treatments and 5 replicate pens of 4 chicks (2 male and 2 female). After 2 weeks of TRT, all birds were injected with 1.5 mg/kg BW LPS in 1 mL of PBS. Samples were collected at 12 h post-challenge. Liver and spleen weights were recorded and samples were analyzed for cytokine gene expression using rtPCR. Males and females lost the same % BW with no effect of dietary TRT. FI was reduced ($P = 0.002$) in the lutein TRT when compared with all other TRT's. There was no effect of LPS challenge on liver weight, but the spleens of the fish oil TRT were heavier ($P < 0.05$), than the CLA TRT. In the duodenal mucosa, the corn oil and lutein fed birds had higher ($P = 0.02$) TLR-4 expression than the fish oil TRT, with females having higher ($P < 0.0001$) TLR-4 expression than males. In the liver, females had higher ($P < 0.05$) IL-1B, IL-10, IL-12 and iNOS expression than males, but males had higher ($P = 0.04$) IL-6 expression. Both IL-10 and iNOS expression was higher in the fish oil TRT than the corn oil or CLA TRTs. Females fed either Lutein

or Vitamin E had greater IL-12 expression compared with all male birds regardless of TRT. In the spleen, IL-4 and IL-6 expression were increased ($P < 0.05$) in females compared with males. For IL-1B, the CLA TRT had higher ($P = 0.006$) expression than the fish and corn oil TRT. Interleukin 10 expression was increased ($P = 0.009$) in both the lutein and CLA TRT when compared with the corn oil TRT. Therefore, each immunomodulatory nutrient added to the diets of layer chickens results in a different immune response to an LPS challenge.

Key Words: layer chicken, LPS, immunomodulatory nutrients, lutein, fish oil

454P Dietary calcium and phosphorus requirements in the finisher phase from 1,280 to 2,200 g of body weight in broiler chickens. E. Jimenez-Moreno¹, C. R. Angel*¹, W. Li¹, S.-W. Kim¹, M. Proszkowiec-Weglarz¹, and N. E. Ward², ¹University of Maryland, College Park, MD, ²DSM Nutritional Products, Parsippany, NJ.

More closely defining the calcium (Ca) and phosphorus (P) requirements of broilers in the finisher phase is essential to optimize performance. An experiment was done to determine the Ca and nonphytate P (nPP) requirements for Hubbard 99 male × Cobb 500 female male broilers from 27 to 36 d of age (finisher phase). Birds were fed at requirements until 27 d of age. A central composite rotatable design was used, such that the 9 resulting treatments (Trt) contained, by formulation, Ca and nPP of 0.67 and 0.09%, 0.55 and 0.14%, 0.79 and 0.14%, 0.50 and 0.25%, 0.67 and 0.25%, 0.84 and 0.25%, 0.55 and 0.36%, 0.79 and 0.36%, 0.67 and 0.40%; respectively. Two extra Trt were included in the design containing the lowest nPP (0.09%) and the lowest (0.50%) or highest Ca (0.84%). Ratios of Ca to nPP arranged from 1.53:1 to 9.33:1. Statistical analysis was run on analyzed values. Starting BW was 1,277 g, and ending BW ranged between 2,150 and 2,330 g depending on Trt. Each Trt was replicated 9 times (3 birds/battery pen). Requirement ranges were determined and estimated recommendations are shown below in parenthesis. Based on BWG, Ca requirements ranged from 0.66 to 0.82% (0.70%) and nPP, from 0.27 to 0.44% (0.30%). Calcium requirements as mg Ca consumed per g BWG, ranged from 10.27 to 12.70 (11.42 mg Ca consumed/g BWG), and nPP as mg nPP consumed per g BWG, from 4.16 to 6.77 (4.62 mg nPP consumed/g BWG). Based on femur ash in mg/kg BW, Ca requirement was 0.50 to 0.82% (0.64%) and nPP, 0.27 to 0.44% (0.32%). Calcium requirements as mg Ca consumed per g BWG, ranged from 7.82 to 12.70 (9.97) and nPP as mg nPP consumed per g BWG, from 4.16 to 6.77, and nPP as mg nPP consumed per g BWG, 4.95. Calcium to nPP ratios expressed as g Ca consumed per g nPP consumed, based on requirement estimates for broilers in the finisher phase were 2.47:1 for BWG and 2.01:1 for femur content relative to BWG.

Key Words: calcium, phosphorus, performance, finisher phase, broiler

455P Broiler carcass composition determined by NIR-FoodScan. E. L. Krabbe*¹, V. S. de Avila¹, V. L. Kowski¹, W. A. Marcon², and R. M. Belló³, ¹Embrapa Swine and Poultry, Concordia, SC, Brazil, ²FACC, Concordia, SC, Brazil, ³FOSS, São Paulo, SP, Brazil.

Nine hundred broiler chicks, male, Cobb 500, were used to evaluate the effect of increasing dietary apparent metabolizable energy (AME) by adding vegetable fat on carcass composition using FOSS FoodScan analysis (AOAC Official Method 2007.04: Fat, moisture, and protein in meat and meat products). FOSS FoodScan is a near infrared spectrophotometer analysis with artificial neural network calibration model and

database for the determination of fat, moisture and protein in meat and meat products. From 1 to 21 d, a basal diet (AME 2,980 kcal/kg, 21.4% crude protein) was used and from 22 to 42 d broilers were fed with diets containing increasing dietary AME. The experimental diets were based on corn, soybean meal, and refined soy oil and were formulated to be isonutritive except for AME, calculated for values of 2,850, 2,950, 3,050, 3,150, and 3,250 kcal/kg, obtained replacing the inert material (kaolin) by refined soybean oil, and fed ad libitum as pelleted/crumbled. At d 21, all birds were weighed and distributed equally according to 5 treatments with 9 replicates per treatment and 20 birds per experimental unit. At d 42, 2 birds/replicate were sampled based on average body weight for carcass composition analysis. Data were submitted to ANOVA. Carcass composition (moisture, fat and protein) was not influenced by treatments ($P > 0.05$). Average carcass moisture was $70.13 \pm 0.13\%$, fat was $11.35 \pm 0.13\%$ and protein was $18.61 \pm 0.06\%$. In summary, the present study indicates that dietary AME does not alter the broiler carcass composition as analyzed with the FOSS FoodScan.

Key Words: fat, moisture, near-infrared spectrophotometer, protein

456P Nitrogen-corrected apparent metabolizable energy (AME_n) of a low fat distillers dried grains with solubles (LF-DDGS) in male broilers aged 21 and 42 d. E. J. Kim*, J. L. Purswell, and S. L. Branton, *ARS-USDA Poultry Research Unit, Mississippi State, MS.*

The objective of this study was to determine the nitrogen-corrected apparent metabolizable energy (AME_n) of a low fat corn distillers dried grains with solubles (LF-DDGS) sample in male broiler chicks at 21 and 42 d. Three dietary treatments were used in a CRD. A corn-soybean meal basal diet (BD) was formulated to meet the nutritional requirements for both ages of broilers, with the exception of energy, which was formulated at 2,900 kcal/kg. Titanium dioxide was added as an indigestible marker. The remaining treatments comprised of the BD supplemented with either 15 or 20% LF-DDGS. The same diets were fed at both ages to allow for comparison. Male broiler chicks were obtained from a commercial hatchery at day of hatch and raised in common floor pens. On d 14, 192 broilers were randomly allocated into 24 battery cages (8 replicate cages of 8 birds) and allowed to acclimate to cages. On d 17, after an overnight fast, experimental treatments were fed. On d 21, birds and feed were weighed and excreta subsamples collected. Birds were returned to floor pens until d 35, when 120 (8 replicate cages of 5 birds) broilers were randomly allocated to battery cages and the same procedures were repeated until d 42. All excreta and feed samples were oven-dried and analyzed for gross energy, titanium, and nitrogen content. AME_n of the experimental diets was then calculated and AME_n of the LF-DDGS was then subsequently calculated using the difference method. All AME data were analyzed via PROC GLM. For the 15% LF-DDGS supplemented diets, AME_n was calculated to be 2,811 kcal/kg and 2,252 kcal/kg and for the 20% LF-DDGS supplemented diets, AME_n was determined to be 2,599 kcal/kg and 2,180 kcal/kg at 21 and 42 d, respectively. Age was found to have a significant effect ($P \leq 0.001$) on AME of LF-DDGS, with 21 d broilers having a significantly higher AME than 42 d broilers. Inclusion rate of LF-DDGS also had a significant effect ($P \leq 0.05$) on AME of the LF-DDGS. The difference in AME_n at 15 and 20% inclusion may be due to the variability in BD intake. These data indicate that age may play an important role in determining AME of LF-DDGS.

Key Words: low fat DDGS, broiler, metabolizable energy

457P Effects of spearmint powder on performance and blood variables of growing Japanese quail. M. Ghazaghi, M. Mehri*, and F. Bagherzadeh-Kasmani, *University of Zabol, Zabol, Iran.*

An experiment was conducted to evaluate the effects of dried spearmint on growth performance and blood variables in growing Japanese quail. A total of three hundred, 7-d-old quail chicks were fed 5 experimental diets containing different levels of dried spearmint (0, 1, 2, 3, and 4% of diet) in a completely randomized design with 4 replicates until 35 d of age. ANOVA showed that the feed conversion ratio (FCR) was not significantly affected by dietary treatments during the experimentation. However, body weight gain (BWG) and feed intake (FI) were significantly affected by different levels of dried spearmint from 7 to 14, 7–21, and 7–28 d of age ($P < 0.05$). Regarding the whole of experiment, no significant effects of treatment were observed on growth performance of quail chicks. Dried spearmint had a hypocholesterolemic effect on serum composition ($P < 0.05$). Regression analysis revealed that the lowest cholesterol concentration may be obtained with 1.17% ($0.79 \leq 1.17 \leq 1.53$) of dried spearmint and the lowest low density lipoprotein (LDL) may be achieved with 2.46% ($1.07 \leq 2.46 \leq 3.86$) of dried spearmint. No significant differences were observed for protein components (e.g., total protein and albumin) in the sera of quail chicks. This study showed that 2% of dietary spearmint may have beneficial effects on blood profile.

Key Words: Japanese quail, spearmint, performance, blood variable

458P Quality of eggs, blood calcium, and phosphorus in broiler breeders fed on different schedules. A. Londero*, A. P. Rosa, C. B. Santos, C. E. B. Vivas, T. S. Toledo, J. Forgiarini, C. Orso, G. D. Schirmann, H. M. Freitas, V. Lucca, M. F. Kuhn, H. E. Palma, and S. M. A. Mazzanti, *Federal University of Santa Maria, Santa Maria, Rio Grande do Sul, Brazil.*

The objective of this study was to evaluate the influence of 3 feeding times over the quality of the broiler breeder's eggs and on the levels of calcium and phosphorus in their blood. The experiment had 330 female and 45 male Cobb 500 broiler breeders ranging from 40 to 55 weeks of age. The experimental design was completely randomized, based on 3 treatments (only at 0800 h; dual [50% at 0800 h and 50% at 1500 h]; at 1500 h) and 5 groups of 22 females and 3 males. The diets were based on corn and soybean meal with the same nutrients levels. The evaluated parameters were: total egg production, egg specific gravity, eggshell thickness, egg weight and eggshell weight. The laying rate was determined by 6 daily collections during the period of the experiment. An electronic outside micrometer 0.001 mm was used to measure the thickness of the eggshell. To determine the effect of the 3 feeding programs it was evaluated the total plasma calcium and inorganic phosphorus at the oviposition and 21 h following the oviposition. When significant differences were founded, data were submitted to ANOVA and Tukey's test. The total egg production was not different among the treatments ($P > 0.05$). The eggshell thickness were not affected by the different feeding schedules ($P = 0.3759$). The egg specific gravity ($P = 0.0087$), egg weight ($P = 0.0039$) and eggshell weight ($P = 0.0076$) were significantly higher in broiler breeders fed at 1500 h (1080.99g/mL, 73.02 g and 6.91 g). The total of calcium and phosphorus in the plasma were not affected by the different feeding schedules. It can be concluded that broiler breeders fed at 1500 h produced better shell quality eggs without changing the rate of egg laying.

Key Words: feeding times, egg production, broiler breeder, eggshell quality, blood composition