A surplus of digestible amino acids helps 21-d-old broilers cope with a challenge by coccic vaccine. Ariane Helmbrecht*1, Sunday A. Adedokun2,3, and Todd J. Applegate2,1 Evonik Industries AG, Hanau, Germany, 2Department of Animal Science, Purdue University, W. Lafayette, IN, 3Department of Animal and Food Science, University of Kentucky, Lexington, KY.

Feed accounts for 60 to 70% of broiler production costs. Thus, improvement in feed efficiency is needed. Ileal digestibility (ID) and total-tract amino acid (AA) utilization are the parameter used to evaluate feed ingredients. However, ID of AA can be affected, for example, by gut inflammation as a result of a coccidial vaccine challenge. Adedokun et al. (2014) showed significantly high ileal endogenous AA losses and a significant decrease in apparent ID as a result of gut inflammation. The hypothesis that surplus AA above recommendation will ameliorate the effect of inflammation from mild coccidial vaccine challenge was tested in 192 male Ross 708 broilers randomly allocated to 3 treatments (8 replicates each of 8 birds): PC (unchallenged) fed diet without AA uplift, NC (challenged with 10× Coccicavac B) fed diet without AA uplift, and NC (challenged with 10× Coccicavac B) fed diet with AA uplift. Diets with AA uplift contained an increased amount of digestible AA. After individual weighing and randomization (CRD), half of the birds were gavaged with 0.6 mL of distilled water containing (10× Coccicavac B) vaccine on d 15. All birds were sampled on d 21 after 7 d being on the experimental diets. Control diets were formulated according to AminoChick (2010), test diet was formulated by using coefficients for standardized AA ID according to Adedokun et al. (2014). Diets were iso-caloric and fed ad libitum. Cocci challenge resulted in a decrease (P < 0.05) in BWG (358, 287, 307 g for PC, NC, +AA). However, the AA uplift improved feed efficiency to that of the PC birds (0.737, 0.671, 0.715 g/g for PC, NC, +AA). AA uplift resulted in numerical improvement for nitrogen ID in challenged birds (76.8, 75.8, 77.1% for PC, NC, AA uplift). Majority of growth depression resulted from a decrease in digestible energy (about 3.5%). In conclusion, an uplift in AA ID improves growth performance of coccic challenged growing broilers although the digestibility of energy still accounts for the biggest part in growth depression.

**Key Words:** broiler, digestible amino acid, coccic challenge, amino acid balance, amino acid recommendation

Influence of dietary amino acid reductions on the response of chicks to an *E. acervulina* infection. Samuel J. Rochell*, Carl M. Parsons, and Ryan N. Dilger, University of Illinois, Urbana, IL.

An experiment was conducted to evaluate the influence of an acute coccidiosis challenge on growth performance and plasma carotenoids of chicks fed diets with reduced dietary concentrations of potentially limiting amino acids. Ross 708 male broiler chicks (n = 648) were housed in battery cages (6 chicks/cage) from 0 to 28 d post-hatch. A dextrose-cornsoybean meal-based (17.6% CP) control diet (CON) was formulated to meet digestible amino acid recommendations, and 8 additional dietary treatments were formulated by reducing a single or pair of amino acids by 40% compared with CON to include (1) CON, (2) CON – Lys, (3) CON – [Met + Cys], (4) CON – Thr, (5) CON – Val, (6) CON – Ile, (7) CON – Arg, (8) CON – [Phe + Tyr], and (9) CON – [Gly + Ser]. Chicks received a common starter diet for 9 d and were provided experimental diets at 10 d post-hatch. Chicks were inoculated at 15 d post-hatch with 1 mL of water (uninfected) or 4.0 × 10⁷ sporulated *E. acervulina* oocysts. There were 6 replicate cages for each of the 18 experimental treatments (9 dietary treatments × 2 infection treatments). Growth performance was measured, and blood was collected from 2 birds per pen at 21 and 28 d post-hatch for determination of plasma carotenoids as an indicator of *Eimeria* infection severity. From 10 to 15 d post-hatch, body weight gain (BWG) and feed efficiency were lowest (P < 0.01) for chicks fed diets with reduced Val or Lys compared with chicks fed CON. From 15 to 28 d post-hatch, infection with *E. acervulina* reduced (P < 0.01) BWG of chicks by an average of 25% compared with uninfected chicks, but reductions were dependent upon dietary treatment. Reductions in BWG ranged from 35% for chicks fed the reduced Thr diet to 13% for chicks fed the reduced Lys diet when compared with uninfected chicks fed the same diet. Interactive effects of diet and infection status were also observed (P < 0.01) for plasma carotenoid concentrations of chicks at 21 and 28 d post-hatch. These results indicate that the severity of growth depressions due to *E. acervulina* infection is differentially influenced by individual dietary amino acid reductions.

**Key Words:** amino acid, broiler, growth, *Eimeria*, coccidiosis

The effects of phytase and mild coccidial vaccine challenge on jejunal and ileal nutrients and energy digestibility and the expression of markers of intestinal inflammation in broiler chicks. Sunday A. Adedokun*,1,2 and Olayiwola Adeola1,1 Department of Animal Sciences, Purdue University, West Lafayette, IN, 2Department of Animal and Food Sciences, University of Kentucky, Lexington, KY.

The objective of this study was to determine the effect of phytase supplementation and intestinal inflammation as a result of mild coccidial vaccine challenge on jejunal and ileal energy and nutrient digestibility and on the expression of genes of some markers of inflammation and nutrient transporters in broiler chickens. A total of three hundred eighty-four 42-d-old Ross 708 broiler chickens were randomly assigned to 6 treatments in a factorial arrangement with 2 levels of coccidial vaccine (Coccicavac B) challenge (0 and 20×) and 3 levels of phytase (0, 1,000, and 5,000 FTU/kg diet) with 8 birds per pen and 8 replicate pens per treatment. Phytase was supplemented to the basal diet that contained 0 FTU phytase and was deficient in nPP (0.11%) and calcium (0.60%). Feed intake was higher (P < 0.05) in challenged birds (49–55). Jejunal DM and energy digestibility decreased (P < 0.05) with coccidial challenge but phytase supplementation increased (P < 0.05) N and P digestibility. Ileal N, calcium, and P digestibility increased (P < 0.05) with phytase supplementation. Ileal calcium digestibility increased (P < 0.05) with coccidial challenge. Coccidial challenge (P = 0.053) and phytase (P = 0.063) showed a tendency to decrease the expression of active sodium dependent phosphate transporters (NaPi-IIb) in the jejunum. Phytase supplementation also showed a tendency to reduce (P = 0.066) the expression of interleukin-6 in the jejunum. In the cecal tonsil, coccidial vaccine challenge decreased (P = 0.008) the expression of claudin-1. Results from this study show that the effects of gut inflammation, as a result of coccidial vaccine challenge on energy and nutrient digestibility may be greater in the jejunum and that phytase supplementation, at 5,000 FTU/kg, enhanced DM, P, and energy digestibility in the jejunum of challenged birds.

**Key Words:** broiler, coccidial challenge, digestibility, gene expression, phytase

The study aimed to assess the effect of dietary methionine sources with vitamin E levels on broiler muscle redox status. In total, 576 day-old Ross PM3 chicks were allocated into 4 treatments of 8 replicates in a 2 × 2 factorial design (2 Met sources: DLM or HMTBA × 2 vitamin E levels: 25 or 50 mg/kg). Birds were reared during 35 d, divided in 3 feeding phases following Rhodimet NG digestible amino acid recommendations. At the end of trial, 16 birds per treatment were slaughtered in a slaughter house for cut part yields while 8 birds per treatment were used for pectoralis and thigh muscles sampling for antioxidant enzymes (Catalase, SOD, GPx) and antioxidant components (Vit E, total GSH) analysis. Growth performance were analyzed using a 2-way ANOVA, whereas redox parameters were submitted to a 3-way ANOVA, adding muscle type as main factor. Growth results were in line with breeder performance goal with 2.624 kg of average BW at 35 d and FCR of 1.482 for the 0–35 d period. No significant differences were observed among treatments for performance, breast and thigh weights. Muscle type affected redox parameters with higher Catalase ($P < 0.001$), GPx ($P < 0.003$) activities and higher Vit. E content ($P < 0.001$) in the thigh than in the breast. HMTBA fed birds showed higher total glutathione (386 to 483 nmol/g; $P < 0.001$) and Vit. E content (5.56 to 6.38 µg/g; $P = 0.01$) but lower GPx activity (1.73 to 1.21 U/g; $P = 0.001$) than DLM fed birds. Overall, high levels of Vit. E increased Vit. E content (5.29 to 6.66 µg/g; $P < 0.001$) and decreased GPx activity (1.78 to 1.16 U/g; $P < 0.001$) compared with the low levels of Vit. E. No interaction between methionine sources and Vit. E levels was observed. These results indicated that practical range of changes of Vit. E in the diet can significantly affect redox status of broiler muscles. An increase of Vit. E from 25 to 50 ppm appeared equivalent to switch from DLM to HMTBA on the GPx activity possibly due to the increase in muscle Vit. E level observed in HMTBA treatments. The interactive effects of “structural” antioxidants such as GSH and Vit. E on antioxidant enzymes such as GPx underlines the complexity of dietary redox management.

**Key Words**: vitamin E, HMTBA, redox status, muscle

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**Withdrawn.**

**Dietary lysine requirement of Korean native ducklings for hatch to 21 days of age.** S. S. Wickramasuriya¹, J. Yoo¹, J. C. Kim², K. N. Heo³, B. Koo¹, and J. M. Heo*,¹. ¹Department of Animal Science and Biotechnology, Chungnam National University, Daejeon, Republic of Korea, ²Department of Agriculture and Food, South Perth, WA, Australia, ³Poultry Science Division, National Institute of Animal Science, Cheonan, Republic of Korea.

A study was conducted to determine the dietary lysine requirement of Korean native ducklings for hatch to 21 d of age. A total of 720 one-day-old male Korean native ducklings were used in a completely randomized design having 8 dietary treatments to provide a range of digestible lysine content from 0.50 to 1.20%. A wheat and corn-based basal diet was formulated to meet the NRC (1994) nutrient specifications, and also to achieve ideal amino acid pattern except dietary lysine. Ducklings were randomly allotted to 24 floor pens (6 replicates per treatment and 15 ducklings per pen) and were offered the respective diets on an ad libitum basis for the period of study. This study was conducted in 2 consecutive batches due to limited research facility. Body weight and feed intake were measured weekly to calculate feed conversion ratio. Two ducklings per pen (n = 12) were euthanized via cervical dislocation to weigh empty body and drumsticks. Digestible lysine requirement was determined by fitting the data to a linear-plateau model. Digestible lysine requirements for Korean native ducklings for hatch to 21 d of age were estimated to be 0.97, 0.85, 0.69 and 0.98% for maximum body weight, average daily gain, average daily feed intake, and for minimum feed conversion ratio, respectively, when data were fitted to a linear-plateau model.

**Key Words**: digestible lysine, Korean native duckling, linear-plateau model, lysine requirement