47  The effect of Brazilian propolis on body weight, weight gain, and gut microflora in broilers reared under heat stress. U. T. Mahmoud1,2, M. A. Abdel-Rahman1, M. H. A. Darwish1, T. J. Applegate1, M. H. Rostagno1, and H. W. Cheng1, 1Assiut University, Assiut, Egypt, 2Purdue University, West Lafayette, IN, 3Livestock Behavior Research Unit, USDA-ARS, West Lafayette, IN.

This experiment was conducted to examine the effect of dietary supplement with green Brazilian propolis on body weight (BW), weight gain (BWG) and cecal microflora in broiler chickens raised under heat stress condition. A total of 504 15-d-old male broiler chickens (Ross 708) were randomly allocated to 6 treatments, each with 4 replicate pens per treatment, 21 chickens per pen from hatch to 42 d of age. The dietary treatments were basal diet (control) and 5 different concentrations of propolis (100, 250, 500, 1,000, and 3,000 mg/kg diet). The average temperature and relative humidity during the day time was (31.7 ± 0.3°C and 56 ± 4) while at night were (28.8 ± 0.4°C and 58 ± 3), respectively. Performance data were normally distributed; while microbial data were logtransformed (log10). Data were analyzed using a complete randomized design and ANOVA was performed using PROC MIXED (SAS Inst. Inc., Cary, NC). Supplementation of diets with propolis did not significantly (P > 0.05) affect BW, BWG and cecal enumeration of Escherichia coli, coliforms, Enterococcus spp., and Lactobacillus. However, the Bifidobacteria spp. population was significantly (P = 0.005) lower in birds fed the diet with 1,000 mg of propolis/kg than controls and those supplemented with 100 mg of propolis/kg of diet. In conclusion, the results indicate that dietary supplement with green Brazilian propolis, from 100 to 3,000 mg/kg, does not induce favorable influences on BW, BWG, and cecal microflora of broilers reared under heat stress conditions.

Key Words: broiler, body weight, cecal microflora, heat stress

48  Effect of quercetin on performance, apparent metabolic rate of feed nutrients and cecal microflora in laying hens of different weeks. N. Teng1, Y. Li, D.-T. Sun, Y. You, and L. Li, Institute of Animal Nutrition, Northeast Agricultural University, Harbin, Heilongjiang Province, China.

This trial was conducted to evaluate the effect of quercetin on performance in laying hens during different periods by determining laying rate, feed:egg ratio, apparent metabolic rate of feed nutrients, and amount of cecal microflora. A total of 240 healthy Hessian laying hens at 29- to 39-wk-old with similar body weight and laying rate were randomly divided into 4 groups with 6 replicates of 10 each, respectively. The hens were fed a basal diet supplemented with 0, 0.02, 0.04, and 0.06 g of quercetin/kg for 8 wk. The results showed that compared with control, laying rate at 29 to 37 wk old was increased by 5.95% (P < 0.05) with 0.02 g/kg of quercetin, feed:egg ratio was significantly lowered by 9.33% (P < 0.01) at 0.04 g/kg of quercetin; laying rate was significantly increased by 7.14% (P < 0.01) and feed:egg ratio was significantly lowered by 11.72% (P < 0.01) at 0.04 g/kg of quercetin in laying hens at 39 to 47 wk old. Apparent metabolic rate of crude protein and Ca at 39 to 47 wk old was significantly increased by 52.9% and 18.85% (P < 0.01) at 0.04 g/kg of quercetin, respectively. The increase of apparent metabolic rate of crude protein and Ca at 39 to 47 wk old was more significant with the increasing quercetin than that at 29 to 37 wk old. The amount of total aerobic bacteria was significantly decreased (P < 0.01) at 0.04 g/kg of quercetin. The amount of Escherichia coli was decreased with the increasing quercetin at different ages. The amount of Bifidobacterium was significantly increased at 0.04 g/kg of quercetin. In conclusion, a certain dose of quercetin promoted Bifidobacterium growth and inhibited growth of total aerobic bacteria and E. coli, increased availability of dietary crude protein and Ca, and therefore, improved performance of laying hens. The older the bird, the greater the improvement in performance; the optimum level of quercetin in the basal diet was 0.4 g/kg for improving performance.

Key Words: quercetin, laying hen, performance, apparent metabolic rate, cecal microflora

49  Effects of commercially available antibiotic alternatives on 0- to 41-d-old male broiler chicken growth performance. X. Wang*, K. Wamsley, A. Kiess, and W. Zhai, Mississippi State University, Mississippi State, MS.

The objective of the current study was to determine the effects of commercial probiotics, or the combination of probiotics and prebiotics in feed from 0 to 41 d on growth performance of broiler chickens. A total of 832 one-day-old male Ross × Ross 708 broilers were randomly distributed to 80 floor pens (4 treatments, 16 replicates per treatment, 13 chicks per pen). Used litter from commercial chicken houses was used to simulate commercial broiler production environment, however, no traditional pathogen challenge was applied to the chicks. Five dietary treatments were as follows: (1) a negative control diet (NC, a basal diet without antibiotic and anticoccidial); (2) a control diet supplemented with probiotics (Pro, a basal diet with 3 Bacillus subtilis strains, 300,000 cfu/g of feed); (3) a control diet supplemented with probiotics and prebiotics (Pro+Pre, a basal diet with 3 Bacillus subtilis strains, 300,000 cfu/g of feed; mannanoligosaccharides, and β-glucans, 170 and 250 g/ton of feed, respectively); and (4) a practical diet (a basal diet with antibiotic and anticoccidial). Bacillus strains and counts in feed were confirmed by plate counting. Feed and BW were weighed at 0, 14, 28, and 41 d. From 0 to 41 d, dietary treatments did not affect feed intake, feed conversion ratio, or mortality during any phase (P > 0.05). From 0 to 14 d, BW gains were not affected by dietary treatments (P > 0.05). From 14 to 28 d, chicks fed practical diets exhibited higher BW gain than those fed the other 3 diets (P = 0.01). From 28 to 41 d, chicks fed Pro diets or Pro+Pre diets exhibited higher BW gains than those fed NC diets or practical diets (P = 0.01). Overall, chicks fed Pro diets or Pro+Pre diets exhibited higher BW than those fed NC diets, but similar BW to those fed practical diets at d 41 (P = 0.05). In conclusion, practical diets may benefit birds’ growth during early age. The growth of broilers fed Pro diets and Pro+Pre diets may catch up in later age, and finally reach similar BW as those fed practical diets.

Key Words: broiler, performance, prebiotic, probiotic

50  Effect of carvacrol and trans-cinnamaldehyde on Aspergillus flavus and Aspergillus parasiticus growth and aflatoxin production in poultry feed. H. Yin1, A. Kollanoo-Johny2, M. J. Darre1, and K. Venkitanarayanan1, 1University of Connecticut, Storrs, CT, 2University of Minnesota, St. Paul, MN.

Aflatoxins (AF) are toxic metabolites mainly produced by the molds Aspergillus flavus and Aspergillus parasiticus. Contamination of poultry feed with AF is a major concern to the poultry industry because of serious economic losses stemming from poor performance, reduced...
51 Supplementation of antibiotic alternatives on the growth performance parameters in broilers. P. A. Adhikari* and W. K. Kim, University of Georgia, Athens, GA.

A study was conducted to investigate the effects of plant extracts and essential oil complex (AntaphytMO and CapPlus ME) and feeding acids and probiotic substance mixture (PreAcid BA Forte) on body weight gain (BWG), feed intake (FI), and feed conversion ratio (FCR) in broiler chicks. A total of 528 male Cobb chicks were distributed into 11 treatments with 6 replicates/treatment (8 birds/cage) in battery brooder cages. Eleven treatment diets were fed from d 0 to 21: T1 (positive control with antibiotics), T2 (negative control without antibiotics), diets T3, T4, and T5 (negative control supplemented with 0.01, 0.03, and 0.06% AntaphytMO, respectively), diets T6, T7, and T8 (negative control supplemented with 0.2, 0.4, and 0.6% Caplus ME, respectively) and diets T9, T10, and T11 (negative control supplemented with 0.2, 0.4, and 0.6% PreAcid BA Forte, respectively). Weekly BWG, FI, and FCR were evaluated at 7, 14, and 21 d. Feed intake per bird did not differ among the treatments during any trial periods. Lowest BWG in chicks fed T9 and highest BWG in T5 were observed both in wk 1 (P < 0.01) and wk 2 (P < 0.05). Also, in wk 1, AntaphytMO showed BWG equal to both of the control diets. However in wk 3, BWG was lowest for both T6 and T7 (P < 0.01) and highest for T5 compared with control. In overall, T5 had highest and T9 had lowest BWG (P < 0.0001) compared with the others. Alternative antibiotic treatments significantly influenced FCR in all 3 weeks and overall. In wk 1, T9 had the highest FCR (P < 0.001), whereas the rest of the treatment diets did not differ from control diets. In wk 2, all levels of AntaphytMO had FCR similar to negative control (P > 0.001). In wk 3, the diet with the lowest level of AntaphytMO showed better FCR than the rest of the diets (P < 0.001). In overall, the birds fed T3 and T10 showed better FCR (P < 0.001) even though the values were higher than that of the positive control. Results of the present experiment indicated that the highest level of AntaphytMO showed better BWG and the lowest level of PreAcid BA Forte showed lower BWG. However, levels of CapPlus ME and PreAcid BA Forte did not show any consistent trend in growth performance.

Key Words: feed additive, poultry feed, aflatoxin, carvacrol, and trans-cinnamaldehyde

52 Effects of various antibiotics, anticoccidials, and antibiotic alternative products on gut characteristics and performance using broilers given a 10× live coccidiosis vaccine. C. Cardenas*, W. Zhai, and K. Wamsley, Mississippi State University, Mississippi State, MS.

The objective of the current study was to determine the effects of the inclusion strategies of several commercially available antibiotics (AB), anticoccidials (AC), and antibiotic alternative products (AAP) on bird performance given a 10× dose of live coccidiosis vaccine (LCV). Diets were corn and soybean meal-based and batched at a commercial mill. Birds fed treatment (Trt) 1 did not receive LCV, whereas birds fed Trts 2 to 8 received 10× LCV (sprayed at hatchery). Birds fed Trts 1 and 2 were fed diets without feed additives, whereas birds fed Trts 3 to 8 were fed diets containing AB1+AC1, AB1, AAP1+AB2, AAP2, AB2, and AB2+AC1, respectively. On day of hatch, 7 male and 7 female Ross × Ross 708 chicks were randomly assigned to 1 of 96 pens (0.08 m²/bird) containing used litter. Each Trt was replicated 12 times and allocated to pens (experimental unit) as a randomized complete block design. The experimental period was from 0 to 49 d. On d 17, intestine and selected organ sampling (2 birds/pen, 6 replicates), lesion scoring (2 birds/pen, 6 replicates), and ileal viscosity (1 bird/pen, 12 replicates) occurred. No significance was established for d 0–49 feed conversion ratio (FCR), mortality, or feed intake (P > 0.05). For lesion scoring, only Eimeria acervulina significantly decreased for Trt 3, compared with remaining Trts (P = 0.017), although overall lesion scores were low. Intestine and selected organ weights were not significant (P > 0.05). Birds fed Trt 3 demonstrated the highest ileal viscosity (P < 0.0001), but also had the highest d 49 BW and 0–49 d BW gain, whereas birds fed Trt 2 demonstrated the lowest (P = 0.034 and 0.018, respectively). Regression analyses using cumulative FCR for each feeding phase were performed to generate prediction equations; allowing birds to reach the same ending weight (3.4 kg) predicted Trt 3 to have the lowest FCR and Trt 5 the highest, 1.78 vs 1.81, respectively (R² = 0.77; 0.76). Overall, the data suggest that birds fed Trt 3 demonstrated improved performance; birds fed Trts 7 and 8 established similar performance to Trt 3 birds when given 10× LCV.

Key Words: antibiotic, anticoccidial, antibiotic alternative product, live coccidiosis vaccine, bird performance

53 Nutritional effects of egg shell membrane supplements on chicken performance and immunity. S. Makkar1, N. C. Rath2, G. R. Huff2, and W. E. Huff2,1University of Arkansas, Fayetteville, AR, 2USDA/ARS, PPRSU, Fayetteville, AR.

Eggshell membranes (ESM) contain a variety of proteins and peptides that help development and provide protection to the embryo. Proteinomic analysis of the ESM showed the presence of over 200 proteins, several of which are known to have antimicrobial properties. We hypothesized that the membrane byproducts derived from egg may act as nutritional supplements to improve performance and immunity of chickens. To explore the effect of this product we fed 3 groups of broiler chicks (n = 16 each) feed containing 0, 0.2, and 0.4% ESM from 1 d posthatch to 2 wk of age. The birds were individually weighed at the onset of the experiment and at weekly intervals until the termination of the experiment at third week. The birds were bled for differential counts of WBC and clinical chemistry, and relative weights of liver, spleen, bursa, and heart were determined at the time of necropsy. Serum was
evaluated for corticosterone, IgM, and IgY levels. The chickens in the ESM-treated groups showed a moderate but a statistically significant increase in body weight, increased immunoglobulins IgM and IgY, and a decrease in the corticosterone levels compared with the control group. Heterophil:lymphocyte ratios decreased numerically but monocyte levels decreased significantly. There was no change in relative heart, liver, spleen, and bursa weights. There was very little difference in clinical chemistry parameters except that the total protein content was elevated in the treated groups. Our results suggest that ESM supplements during early phases of growth may improve poultry immunity and stress variables without sacrificing growth performance.

Key Words: eggshell membrane, antimicrobial protein

54 The effect of dietary 25-hydroxycholecalciferol on growth and carcass traits in an unsanitary environment. S. A. Fatemi* and D. R. Korver, University of Alberta, Edmonton, AB, Canada.

Dietary 25-hydroxycholecalciferol (25OHD₃) increases broiler breast yield, and vitamin D metabolites influence innate immunity. The objective was to study the effects of dietary vitamin D₃ and 25OHD₃ on performance of broilers raised on clean or dirty litter. Day-old chicks (n = 512) were allocated (13.22 birds/m²) into a 4 × 2 factorial arrangement with 4 pens/treatment. Dietary treatments were vitamin D₃ at 2,760 IU/kg feed (D); 25OHD₃ at 2,760 IU/kg feed (25OHD₃); D₃ at 5,520 IU/kg feed (D×2); or D₃ at 2,760 IU/kg plus 25OHD₃ at 2,760 IU/kg feed (D+25OHD); each diet was fed to broilers on either fresh (clean) or used (dirty) litter. At 12, 22, and 41 d of age, bird performance was measured on a pen basis, and 3 birds from each pen were weighed, and pectoralis (P) major and minor weights and rectal temperature determined. At d 42, carcass and portion (P. major and minor, leg) weights and yields (portion as a % of carcass weight) were determined. Differences were considered significant at P ≤ 0.05. Breast yields and rectal temperatures did not differ between the same age. There was no impact of diet on BW at d 42. In the dirty pens, BW of D-fed birds by 6, 3, and 4% compared with 25OHD, D+25OHD, and D×2, respectively. In addition, P. major and minor yields were higher by 9 and 7%, respectively, in the clean than in the dirty environment. At d 42, P. minor yield was higher for D-fed birds by 6, 3, and 4% compared with 25OHD, D+25OHD, and D×2, respectively. In addition, P. major yield was almost highest (P < 0.055) for D-fed birds compared with 25OHD or D×2 by 5 and 4%, respectively. Leg yield was 3% greater in 25OHD birds than in D birds. Contrary to expectations, 25OHD increased leg rather than breast yield. The dirty environment reduced performance in young birds despite the lack of a measurable febrile response at any age.

Key Words: 25-hydroxycholecalciferol, vitamin D₃, breast yield, unsanitary environment, inflammation

55 A feed additive containing mixed enzymes and direct-fed microbial combination in comparison with antimicrobial growth promoters in broiler chickens. C. Flores*, M. Williams¹, J. Pieniazek, Y. Dersjian-Li, A. Awati, and J. Lee, Poultry Science Department, Texas A&M AgriLife Research, College Station, TX, 1Danisco Animal Health/Dupont, Marlborough, United Kingdom.

This study evaluated the effect of a feed additive containing mixed enzymes (xylanase, amylace, and protease) and direct-fed microbial (DFM, containing 3 Bacillus strains) on performance of broilers, in comparison with 2 commonly used antimicrobial growth promoters (AGP). Four treatments were tested using 1-d-old Ross 708 broilers (mixed sex at 50:50 ratio) in a completely randomized design with 8 replications per treatment (40 birds/pen) using built-up litter. Treatments were (1) a negative control (NC) based on corn/soy/wheat (10%) containing 500 FTU/kg phytase; (2) NC+ the feed additive; (3) NC+ BMD (50 g/ton); and (4) NC+ Virginiamycin (20 g/ton). Diets were fed in mash form at ad libitum in 3 phases: 1–10; 11–21 and 22 to 42 d. Body weight and feed intake (FI) were measured per phase and feed conversion ratio (FCR) was corrected for mortality weight. Treatment means were compared using a one-way ANOVA and separated via Duncan’s multiple range test. Overall 42-d data showed that the additive supplementation to NC diet significantly (P < 0.05) reduced mortality weight-corrected FCR compared with NC and did not differ from both AGP treatments (Table 1). Feed intake and body weight gain (BWG) were not significantly affected by treatments during the 42-d study. The results indicated that the additive containing mixed enzymes and DFM may be used as an alternative to AGP in broiler chickens.

Table 1. Effect of a feed additive containing mixed enzymes and DFM on performance of broilers compared with AGP

<table>
<thead>
<tr>
<th>Item</th>
<th>NC</th>
<th>NC + additive</th>
<th>NC + BMD</th>
<th>NC + Virginiamycin</th>
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</thead>
<tbody>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1–21 d</td>
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<td>0.677</td>
<td>0.668</td>
<td>0.670</td>
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<tr>
<td>1–42 d</td>
<td>2.234</td>
<td>2.295</td>
<td>2.282</td>
<td>2.273</td>
</tr>
<tr>
<td>Mortality-corrected FCR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1–21 d</td>
<td>1.565</td>
<td>1.567</td>
<td>1.551</td>
<td>1.535</td>
</tr>
<tr>
<td>1–42 d</td>
<td>1.841b</td>
<td>1.805b</td>
<td>1.806b</td>
<td>1.816b</td>
</tr>
</tbody>
</table>

Values without a common superscript are significantly different (P < 0.05).

Key Words: broiler, growth performance, enzymes, DFM, feed efficiency

56 The effect of probiotic or prebiotic supplementation on gut morphology in young turkey pouls. S. L. Loeffler*, M. S. Lilburn, and M. Wick, The Ohio State University, Columbus, OH.

The gastrointestinal tract in the newly hatched poult is functionally immature and during the first week posthatch grows rapidly with significant increases in villus height and crypt depth. In the current study, we investigated the effects of 2 commercial probiotics (A, B) and a yeast fermentation probiotic on intestinal morphology and development. Hatchlings were randomly assigned to 10 of 4 dietary treatments (control, probiotic A, probiotic B, or prebiotic) on the day of hatch and each treatment had 4 replicate pens. Each product was used at the manufacturers’ suggested levels of inclusion. Birds (n = 40) were fed from 1 to 9 d posthatch when 20 were randomly selected and euthanized, with the remaining 20 being fed through d 11 posthatch, then euthanized. Five pouls from each of the 4 treatments were randomly selected on d 9 and 5 from each treatment on d 11 posthatch and euthanized; intestinal segments were then taken from the lower small intestine. Each segment was fixed and embedded in paraffin, and 4 µm sections were stained with PAS. Measurements were taken for villus height, area, and crypt depth using ImageJ and the data analyzed using ANOVA. At both sampling days, crypt depths were the same in the pouls fed the probiotic and probiotic B diets (P > 0.05). The crypt depths in the pouls fed the prebiotic and probiotic B diets were greater than those of the unsupplemented control, with all 3 being greater than the crypt
depths in the poult fed probiotic diet A ($P < 0.001$). At both sampling days, villus heights and areas were the same in the poult fed the control, prebiotic, and probiotic A diets ($P > 0.05$). The villus heights and areas in the poult fed probiotic diet B were greater than the other 3 diets ($P < 0.0001$). In summary, dietary supplements that are designed to change the microbial population structure within the young poult can potentially alter the developmental morphology of the small intestine.

**Key Words:** intestine, probiotic, prebiotic, villus, crypt depth

57  **Microbial influence on intestinal development and mode of action of mannan oligosaccharides in broiler chicken.** N. S. Withama Gamage*, S. L. Cheled-Shoval2, Z. Uni2, and A. G. Van Kessel1, 1University of Saskatchewan, Saskatoon, SK, Canada, 2Hebrew University of Jerusalem, Rehovot, Israel.

This study examined the effect of intestinal microbiota and dietary supplementation of mannan oligosaccharides (MOS) on mucosal architecture and digestive physiology in broiler chicks. In experiment 1, pre-sterilized eggs were placed in HEPA (high efficiency particulate air—filtered) isolator units at d 19 of incubation. Germ-free chicks in one isolator were conventionalized by exposure toecal contents from a laying hen. Bacterial contamination occurred in a second germ-free isolator found to be monoassociated with a gram-negative bacteria related to Acinetobacter spp. Thus the modified experiment comprised germ-free (GF, n = 10), conventional (CV, n = 19), and monoassociated (Mono, n = 13) birds. Dietary treatments assigned each isolator included a negative control (NC, 0 g/kg of MOS in the basal diet) and MOS (2 g/kg of MOS in the diet). Body weight of chicks was recorded at d 7 of age before euthanization and collection of visceral organs, intestinal tissues and contents. Body weight, relative length of small intestinal segments and relative bursa weight were significantly increased ($P < 0.05$) in CV birds. These birds also had a significantly increased ($P < 0.05$) crypt depth and lamina propria area (LPA) than others. The CV birds supplemented with dietary MOS had increased ($P < 0.05$) villus height and villus surface area compared with GF and Mono birds fed MOS. Compared with birds fed the control diet, MOS significantly increased ($P < 0.05$) the abundance of proliferative cell nuclear antigen (PCNA), toll-like receptor (TLR)-4, avian β-defensin (GAL6), interleukin (IL)-8, peptide transporter (PepT)-1, and sodium-dependent glucose transporter (SGLT)-1 mRNA and the brush border activity of maltase. However, the effect of microbial status on selected gene expression profiles was surprisingly limited. These studies demonstrate that under good hygienic conditions, CV chicks thrive similar to GF birds. The observation of MOS effects in both GF and CV birds supports the conclusion that MOS is a ligand interacting with host transmembrane receptors directly affecting host response.

**Key Words:** chicken, microbiota, germ-free, small intestine, mannan oligosaccharides

58  **Evaluation of Calsporin and IMW50 on production performance in laying hens from 16 to 32 weeks of age.** K. Susmilch*, S. Johal1, T. Lohrmann2, J. Walls2, and K. Livingston1, 1California Polytechnic State University, San Luis Obispo, CA, 2Quality Technology International Inc., Elgin, IL.

Research has shown that the addition of probiotic and prebiotics to the diets of broilers improves performance parameters. Little research has been done in laying hens to determine if similar improvements in performance are observed. Therefore, we conducted a 15 week study to evaluate the effect of the prebiotic IMW50 and the probiotic Calsporin on the production performance of laying hens. Five hundred sixty-seven 16-wk-old Hy-Line W-36 layers were fed a diet containing either Calsporin (Bacillus subtilis C-3102; 0.05%), IMW50 (mannan-oligosaccharide; 0.05%), or Calsporin and IMW50 (0.05% each). Hen-day egg production (HDEP), body weight gain (BWG), and feed conversion ratio (FCR) were calculated for each treatment group. In addition to daily egg collection, on wk 4 and wk 8, eggs were collected and analyzed for specific gravity, and egg mass. The dietary treatments did not alter the mortality of the birds. There were no significant differences for specific gravity, egg mass, BWG, or FCR between treatment groups. Calsporin ($P = 0.0004$) and IMW50 ($P = 0.0032$) both had a significant improvement on HDEP. However, there was no significant interaction between Calsporin and IMW50. In addition, there was a significant effect of week ($P < 0.0001$) on HDEP. Evaluation of all 15 wk showed a Calsporin × week interaction ($P < 0.0001$) whereby at wk 9 and wk 12, Calsporin was not significantly improved over the control. The results show that the addition of Calsporin and IMW50 improves HDEP in layers. However, the combination diet of Calsporin and IMW50 were not significant in HDEP improvement.

**Key Words:** probiotic, prebiotic, Bacillus subtilis C-3102, layers, hen-day egg production

59  **Impact of aflatoxin B1 and hydrated sodium calcium aluminosilicate on hepatic gene expression in broiler chicks and Pekin ducks.** X. Chen*, N. Horn2, and T. J. Applegate3, 1Purdue University, West Lafayette, IN, 2JBS United Inc., Sheridan, IN.

Two experiments were conducted to determine the effects of aflatoxin B1 (AFB1) and hydrated sodium calcium aluminosilicate (HSCAS) on hepatic gene expression in male broiler chicks and Pekin ducks. The broiler experiment consisted of 8 dietary treatments, with 4 concentrations of AFB1 (0, 0.5, 1, and 2 mg/kg) with or without HSCAS (0.5%). Each diet was fed to 8 replicate cages per diet (6 chicks per cage) in a completely randomized design from 0 to 21 d of age. The duck experiment consisted of 4 dietary treatments with 4 concentrations of AFB1 (0, 0.1, 0.2, and 0.3 mg/kg). Each diet was fed to 6 replicates per diet (6 ducks per replicate) in a completely randomized design from 0 to 14 d of age. Hepatic expression of 9 and 6 genes for the broiler and duck experiment were determined, respectively, using quantitative real-time PCR. Data from the broiler experiment were analyzed as a 2-way ANOVA, whereas data from the duck experiment were analyzed as a 1-way ANOVA using the GLM procedure of the SAS system; orthogonal polynomial contrasts were performed to determine the linear and quadratic effect of increasing AFB1 concentration on duck gene expression. Results showed that 2 mg/kg AFB1 upregulated interleukin 6, glutathione peroxidase, epoxide hydrolase, and glutathione S-transferase, and downregulated superoxide dismutase (SOD) and cytochrome P450 1A1 (CYP1A1) expression in broilers ($P < 0.001$). The HSCAS supplement increased interleukin 1β, catalase, SOD, and CYP1A1 expression ($P ≤ 0.034$). In ducks, liver expression of peroxisome proliferator-activated receptor-α was downregulated linearly by increasing AFB1 concentrations ($P < 0.05$), but no other genes were affected by AFB1, even though as little as 0.1 mg/kg AFB1 reduced performance. The current study shows that AFB1 from 0.5 to 2 mg/kg can negatively affect hepatic gene expression in broilers, and HSCAS stimulates transcription of antioxidant genes, which may mitigate effects of aflatoxicosis; in ducks, AFB1 up to 0.3 mg/kg has minimal effect on hepatic gene expression, even though growth was impaired.

**Key Words:** aflatoxin B1, broiler, duck, liver, gene expression
Effects of dietary enzyme supplementation on nutrient digestibility and growth performance of chicks fed diets with high amounts of meat and bone meal.

A. M. Evans* and J. S. Moritz, West Virginia University, Morgantown, WV.

Solid state fermentation (SSF) is a naturally fermented product with multiple enzyme activities including carbohydrase and protease. Vegetable protein (VegPro) is an enzymatic complex that improves energy and amino acid digestibility of dietary protein sources. Efficacy of these products has been demonstrated in all-vegetable diet formulations but not in diets containing high amounts of meat and bone meal (MBM). The objective of the current study was to identify the effect of SSF and VegPro separately or in combination on the digestibility of complete diets containing 8% MBM using cecotomized roosters and broilers. In experiment 1, 72 roosters (8 replications per treatment) were precision fed negative (NC) and positive control (PC) diets containing MBM that differed in crude protein and digestible amino acids by 15% as well as NC containing SSF, VegPro, or a combination to determine true amino acid digestibility (TAAD). Roosters were also precision fed MBM with or without the enzyme combinations. The diet containing SSF partially resolved the NC detriment for methionine \( (P < 0.0001) \), whereas diets containing SSF or VegPro partially resolved the NC detriment for lysine \( (P < 0.0001) \). Enzyme addition to MBM did not improve TAAD. In experiment 2, 360 Cobb 500 broilers were randomly assigned to pens and similar dietary treatments and reared from d 1 to 21. On d 21, birds were euthanized and contents of the lower ileum were analyzed for amino acids. Birds fed SSF and VegPro partially resolved the NC detriment, gaining significantly more weight and resulting in a lower feed conversion ratio than birds fed NC \( (P < 0.0001) \). Ileal digestible proline, cysteine, valine, isoleucine, leucine, and lysine were greatest for PC, lowest for NC, and intermediate for the diet containing the enzyme combination \( (P < 0.0001) \). Digestibility of MBM was not improved with either enzyme or combination, suggesting the enzymes have a greater effect on non-MBM components of complete diets.

Key Words: solid state fermentation, vegetable protein, cecotomized rooster, broiler, amino acid digestibility