

procedures. The number of dead, non-ambulatory, injured (NAI), and non-ambulatory, non-injured (NANI) pigs were recorded during loading, unloading, and the final drive. Data were analyzed using a generalized mixed effects model (GLIMM, SAS® macro GLMM800). Effects of ractopamine on total losses (dead + NAI + NANI) were dependent upon region. Ractopamine had no impact on total losses (1.35% vs. 0.85% vs. 1.55%, respectively for 0, 5, and 10 ppm) in the Southeast. However, in the Midwest, pigs fed ractopamine had higher total losses than control pigs (1.33% vs. 2.63% vs. 2.26%, respectively for 0, 5, and 10 ppm). It is possible that differences in transport times and conditions across the two regions may have contributed to these conflicting results. On average, pigs in the Midwest had 61 min longer journeys, 24 min longer waiting times prior to unloading, 33 min longer unloading times, and 194 min shorter lairage times than pigs in the Southeast. Also, electric prods were used on 52% and 97% of the loads during unloading and during the final drive in the Midwest, while electric prods were not used at these stages in the Southeast. These data suggest that the effects of ractopamine on transport losses are dependent upon other factors such as transport times and conditions.

Key Words: Pig, Ractopamine, Transport losses

23 Value of anesthesia in the dehorning of dairy calves. K. N. Patel*, A. L. Magliaro, J. R. Werner, D. A. Pape-Zambito, and R. S. Kensinger, *The Pennsylvania State University, University Park.*

Dehorning calves is a common management practice in the dairy industry. Both producers and the public would like dehorning to

have as little impact on calf growth and health as possible. Studies have suggested using anesthetics with dehorning to improve calf performance; but there is little objective data on which to base these recommendations for this age group. The purpose of this study was to determine if the use of xylazine and lidocaine in dehorning would affect growth rate, calf health and haptoglobin concentrations. Ninety Holstein heifer calves (6-8 wk old, 64.85 ± 8.1 kg BW) were blocked by age and randomly assigned to: sedative and anesthesia (SA) or control (C) treatment groups. SA calves received 0.2 mg/kg of xylazine IM and cornual nerve blocks with 3 mL of 2 % lidocaine in each cornual cleft. C calves received no drugs. Calves were dehorned by a veterinarian with an electrical iron at 600 C with a mean contact time of 35 s per horn bud. Calves were fed farm-pasteurized milk twice daily and were given calf starter ad libitum. BW was determined using a digital scale equipped with an averaging function (Arlyn 320-LLA). Fecal scores were recorded on days 0, 1, 3, 7, 14, and jugular blood samples were collected on days 0, 1, 3 and 7 relative to dehorning. Calves were observed on each experimental day and a fecal score between 1 (normal) to 4 (watery) was assigned for each calf. Data were analyzed using PROC MIXED in SAS. Health of calves during the study was generally good with 0% mortality, normal respiratory function and average fecal score of 2. Average daily gain from d 0 to d 14 of the study averaged 1.0 kg/d for both SA and C calves and was not affected by treatment. Hematocrit averaged 28 %; and plasma protein averaged 4.7 g/dL for all calves, and neither was affected by treatment. Use of sedative and anesthesia prior to dehorning in the current study provided no detectable change in growth of the calves.

Key Words: Dehorning, Anesthesia, Performance

Animal Health - Livestock and Poultry: Poultry and Swine I

24 Over-supplementation of Vitamin D as a risk factor for chronic heart failure in fast growing commercial broilers. S. Nain*, B. Laarveld, and A. A. Olkowski, *University of Saskatchewan, Saskatoon, SK, Canada.*

Broiler diets are frequently fortified with Vitamin D (D3) above the recommended levels to prevent commonly occurring leg problems. Over-supplementation with D3 has been shown to have detrimental effects on the heart. In order to evaluate the risk of D3 over-supplementation on the incidence of chronic heart failure in fast growing broilers, we examined the effects of high dietary D3 in commercial male broilers. 364 Ross male chicks were randomly assigned to six pens and offered a commercial broiler diet (vitamin D 5,000 IU/kg) or a vitamin D enriched diet (80,000 IU/kg). The birds were housed in floor pens in an environmentally controlled room. During the first 7 days the temperature was maintained at 34°C followed by a gradual decrease to a level approximately 30% lower than that set for normo-thermal brooding. Feed and water were provided ad-lib. All birds were monitored several times daily for overt signs of disease and periodically electrocardiographic measurements were obtained. Morbidity and mortality data were collected daily. Electrocardiographic examination revealed a numerically larger number of birds with cardiac arrhythmia and negative QRS axis on lead-II (an indication of left heart failure) in the D3 fed group in comparison to the control group. The blood gas analysis revealed marked hypoxemia, hypercapnia and lower Hb O₂ saturation percent-

age, with the incidence of cyanosis being 33.0% in the D3 fed group vs control group 24.8% (P<0.05). The risk of ascites was 3.33 fold higher (P<0.05) in birds fed the D3 enriched diet, with the incidence of ascites being 3.3 % in the control and 11.0 % in D3 group. The present findings indicate that over-supplementation of vitamin D increases the risk of chronic heart failure in broilers.

Key Words: Broilers, Heart Failure, Vitamin D

25 Evaluation of Vitamin U on *Salmonella typhimurium* in broilers. A. L. Shaw*, K. S. Macklin, and J. P. Blake, *Auburn University, Auburn, AL.*

Vitamin U (DL-methionine methylsulfonium chloride) is a sulfur-containing methionine derivative previously shown to modulate the immune system and protect intestinal membrane cells in humans and swine. Two 28-day trials were conducted to evaluate the effect of Vitamin U on controlling *Salmonella typhimurium* in broilers. Each trial utilized day-old straight-run broilers that were randomly allotted to one of four dietary treatments (3 reps/trt) employing a corn-soy basal diet (21.5% CP, 3142 kcal/kg). Cecal samples were collected from 12 birds and cultured to ensure they were negative for salmonellosis. On day 1, all birds were challenged with 1 ml of *Salmonella typhimurium* (10⁸ cfu/ml) via oral gavage. Cecal samples (3 birds/trt in Trial 1;

6 birds/trt in Trial 2) were collected weekly to derive colonization counts. Liver samples were also collected and enriched to determine if birds were septic. In Trial 1, treatments consisted of the basal diet containing no feed additive (control), Bio-Mos (900 mg/kg), low Vitamin U (300 mg/kg), or high Vitamin U (600 mg/kg). Significant differences in salmonella colonization increased among all treatments compared with the control during week 2. Treatments for Trial 2 were comprised of the basal diet containing no feed additive (control), Bio-Mos (900 mg/kg), BMD (50 mg/kg), or Vitamin U (300 mg/kg). Intestinal tissue samples were collected and measured from four birds per treatment on day 14. Results indicated that *Salmonella* colonization during week 1 was lower ($P < 0.05$) for Bio-Mos than Vitamin U, and during week 3 Vitamin U was lower ($P < 0.05$) than BMD. The villi length of the jejunum and ileum, and crypt depth of the duodenum and ileum were significantly longer ($P < 0.05$) in the control in comparison to the three treatments tested. It was concluded that the overall effects of Vitamin U on salmonella colonization and septicemia are comparable to Bio-Mos. Vitamin U was not found to have an effect on intestinal tract integrity.

Key Words: Vitamin U, Bio-Mos, *Salmonella typhimurium*

26 Arginine and vitamin E modulate the subpopulations of T-lymphocytes in broiler chickens. S. T. Abdulkalykova* and C. A. Ruiz-Feria, *McGill University, Montreal, QC, Canada.*

We examined the effects of vitamin E (VE) and ARG (ARG) on the subpopulations of T lymphocytes in peripheral blood after an IBDV vaccination. Broiler chickens were fed diets with normal levels of ARG (NARG) or high levels of ARG (HARG, 1% added to the feed); and three levels of VE (40, 80, or 200 IU / kg of feed) in a factorial arrangement of treatments. Fifty four broiler chickens were vaccinated at 20d of age. The percentages of T-helper (Th) and T-cytotoxic (Tc) cells 9d after vaccination were not different in birds fed the HARG or NARG feed, but they were higher in birds fed the VE80 diet than in birds fed the VE40 diet. Birds fed the VE200 feed had similar levels of Th and Tc cells than birds fed the VE40 diet ($P = 0.02$). However, 19 after vaccination, the percentage of Th cells were higher in birds fed the HARG (43.93 ± 1.05 ; $P = 0.045$) diet than in birds fed the NARG diet (41.14 ± 1.05 ; $P = 0.045$), and in birds fed the VE80 (44.1 ± 1.28 ; $P = 0.003$) diet as opposed to the VE40 (39.04 ± 1.28 ; $P = 0.003$), yet similar to that of VE200 (44.42 ± 1.28 ; $P = 0.003$) diet. The percentage of Tc cells was highest in birds fed the HARG and VE80 feed compared with all the other ARG and VE combinations. The B-cell:T-cell ratio was higher in birds fed the HARG (0.27 ± 0.009 ; $P = 0.01$) diet than in birds fed the NARG diets (0.24 ± 0.009 ; $P = 0.01$) and birds fed the VE40 (0.32 ± 0.01 ; $P < 0.001$) than in birds fed VE80 (0.22 ± 0.01 ; $P < 0.001$) and VE200 (0.23 ± 0.01 ; $P < 0.001$) diet 9 d after vaccination. Neither ARG nor VE had an effect on the Th:Th cell ratio, and on the percentage of immature (CD4+CD8+) T-lymphocytes. These results suggest that ARG and VE have synergistic effects on cellular immune function and may enhance the resistance of broilers to infectious diseases.

Key Words: Arginine, Vitamin E, Cell-mediated Immunity

27 Effects of arginine and vitamin E on antibody production against sheep red blood cells and immune bursal disease virus. S.

T. Abdulkalykova* and C. A. Ruiz-Feria, *McGill University, Montreal, QC, Canada.*

The objective of this study was to evaluate the combined effects of arginine (ARG) and vitamin E (VE) on antibody response to sheep red blood cell (SRBC, agglutination assay) inoculation, and antibody titers (ELISA) to the infectious bursal disease virus (IBDV) before and after vaccination. Broiler chickens were fed diets with normal levels of ARG (NARG) or high levels of ARG (HARG, 1% added to the feed); and three levels of VE (40, 80, or 200 IU / kg of feed) in a factorial arrangement of treatments. The antibody titers to SRBC were higher in birds fed the HARG diet than in birds fed the NARG ($P < 0.013$), and in birds fed the VE80 diet compared with birds fed the VE200 ($P < 0.001$) diets at 5, 8, and 12 d after inoculation. Antibody titers (\log_{10}) to the IBDV 2d before and 19d after vaccination were higher in birds fed the HARG diet compared with birds fed the NARG diet ($P < 0.001$), whereas birds fed the VE80 diet showed a higher antibody titers compared with birds fed the VE40 diet ($P < 0.001$), but similar to those of the VE200 birds. However, the antibody titers against IBDV 5d after vaccination were higher in birds fed the NARG (963.3 ± 8.9 ; $P < 0.001$) diet than in birds fed the HARG (857.1 ± 8.9 ; $P < 0.001$), and in birds fed the VE40 (953.7 ± 10.1 ; $P < 0.001$) diet as opposed to the VE80 (841.1 ± 10.1 ; $P < 0.001$), yet similar to that of VE200 (935.8 ± 10.1 ; $P < 0.001$) diets. In summary, birds fed HARG and VE80 diets showed the best response against SRBC and IBDV vaccination, which may enhance the resistance of broilers to infectious diseases in the field.

Key Words: Arginine, Vitamin E, IBDV

28 Effect of tribasic copper chloride on performance of broiler chickens facing health challenges. J. I. Cohen*, *Micronutrients, Indianapolis, IN.*

Two experiments were conducted to evaluate the role of tribasic copper chloride (TBCC) in mitigating the detrimental effects of health challenges. In Experiment 1, 96 1-day-old Ross broiler chicks were divided into the four groups (three replicates each of 8 broiler chicks); Control (basal diet), AF (1 ppm), TBCC (200 ppm copper as TBCC) and AF plus TBCC (1 ppm aflatoxin plus 200 ppm copper as TBCC). The chicks were maintained on these treatments for 42 days. Serum biochemical analyses were performed at the end of the experiment and growth performance parameters of chicks were evaluated weekly during the experiment. The AF-induced changes in the levels of albumin, total protein and total cholesterol, and in the activities of serum ALT, LDH and ALP were detrimentally altered by AF, and significantly improved by adding TBCC to the AF-containing diet. While supplementation of TBCC to the AF containing diet did not improve the BWG, adverse effects of AFs on FCR were reversed by TBCC supplementation. Experiment 2 was a 21-day floor pen study conducted with 300 Cobb chicks divided into five groups (five replicates each of 10 chicks) inoculated with *Candida albicans* and *Coccidia* to induce crop mycosis at 3 days of age and fed a corn-soybean meal diet supplemented with 0, 125 or 250 ppm Cu from either feed-grade Cu sulfate or TBCC. As measured by disease scores for spread of infection in crop membranes and for number of observed intestinal lesions, both copper sources at both treatment levels gave a significant improvement over untreated, infected birds, with 250 ppm Cu being statistically better than 125 ppm. Only TBCC at 250 ppm gave crop mycosis scores equal to the negative control. Body weight gain and feed conversion were significantly improved versus the positive control at both 125 and 250 ppm added Cu, regardless of

source. A linear regression of the data showed TBCC to be 112% as bioavailable as copper sulfate. Both studies suggest that TBCC is effective in preventing performance reduction often associated with toxins which challenge broiler health.

Key Words: Tribasic Copper Chloride, Performance, Toxins

29 Detection of bacteria in the vas deferens and testes of broiler breeder roosters. C. R. James*, L. M. Stevenson, S. S. Oates, S. Martin, K. S. Macklin, R. A. Norton, and W. D. Berry, *Auburn University Poultry Science, Auburn, AL.*

There have been relatively few studies characterizing the microflora of the rooster reproductive tract with respect to effects on fertility. The ultimate objective of this study is to determine whether fertility of the broiler breeder rooster is affected by reproductive tract microorganisms. Four broiler breeder roosters were euthanized by CO₂ inhalation. The left vas deferens of each rooster was ligated at its attachment to the cloaca. The vas deferens and the left testis of each rooster was then excised en bloc, rinsed in 70% alcohol, followed sterile .85% saline and placed in a vial of ice cold sterile saline until used for culture. Samples of the vas and testes were minced in phosphate buffered saline. The samples were plated out onto MacConkey agar, blood agar, and plate count agar, and cultured at 37C in an aerobic incubator to detect the presence of aerophilic bacteria; chocolate agar cultured at 37 C in a CO₂ incubator to detect the presence of microaerophilic bacteria; blood agar, and prerduced blood agar cultured at 37C in an anaerobic chamber to detect the presence of anaerobic bacteria; and potato dextrose cultured at room temperature and atmosphere to determine if fungi were present. These plates were incubated for 24 hours and counted. In both trials a second set of the samples underwent enrichment in BPW prior to culture as above to ensure that any bacteria present would grow. Bacterial colonies grown in this trial were collected and streaked for isolation. They were then fixed onto slides, Gram stained and examined. Aerophilic bacteria, anaerobic, and microaerophilic bacteria were identified, with the majority of the bacteria identified as Gram positive cocci. No fungi were evident. This experiment demonstrates that a complex bacterial community consisting of aerophilic, anaerobic, and microaerophilic bacteria exists in the rooster reproductive tract. Further studies are underway to identify individual bacterial species and their potential effects on reproduction. This work was supported by the Alabama Agricultural Experiment Station and the U.S. Poultry and Egg Association.

Key Words: Reproductive Tract, Bacteria, Broiler Breeder

30 Acquisition of immunity to *Eimeria maxima* in newly hatched chickens reared on new or reused litter. S. Rayavarapu* and H. D. Chapman, *University of Arkansas, Fayetteville.*

The acquisition of immunity by chickens infected 18 hours post-hatch with 100 oocysts of *E. maxima* and reared in floor-pens in contact with their droppings was investigated. In the first experiment birds were placed on new litter and immunity was measured at 2, 3, 4, and 5 weeks of age. Immunity had developed in birds challenged at 3, 4, and 5 weeks, judged by weight gain and oocyst production, but at 2 weeks immunity was not complete. In the second experiment birds were placed on new litter or reused litter from the first experiment and challenged at 1, 2, and 3 weeks of age. Immunity had developed in

birds challenged at 1, 2, and 3 weeks measured by either criterion. In both experiments birds produced small numbers of oocysts in their feces following challenge. Judged by weight gain following challenge, no significant difference in the acquisition of immunity was observed whether birds were reared on new or reused litter.

Key Words: Eimeria, Immunity, Litter

31 Evaluation of Coccivac-B® and Bio-Cox® (salinomycin) for control of 3 species of *Eimeria* in broilers. C. Brown*¹, R. G. Teeter¹, A. Beker¹, M. Singh¹, C. Broussard², S. Fitz-Coy², and J. Radu², ¹Oklahoma State University, Stillwater, ²Schering-Plough Animal Health, Union, NJ.

An experiment was conducted utilizing Cobb x Cobb males to evaluate coccidiosis control in 6 treatments: control-nonchallenged (CNC); control-challenged (CC); Bio-Cox®-nonchallenged (60g/ton; 0-35 days; SNC); Bio-Cox®-challenged (SC); vaccinated-nonchallenged (Coccivac-B® at hatch; VNC); and vaccinated-challenged (VC). Challenge consisted of an oral dose of sterile saline or a mixture of 3 *Eimeria* species administered as oocysts at 14, 21, 28, 35, and 42 days. Variables examined six days post challenge included live weight, FE, gross lesion scores (upper small intestine: USI; mid small intestine: MSI; ceca: C), and microscopic lesion scores (*E. maxima*; *E. tenella*; and *E. acervulina*). CNC birds exhibited higher live weight than CC birds at all ages (P<0.01) while results for other treatments are age dependent; VNC birds were similar to VC birds except on 20 and 41 days where VNC exceeded VC (P=0.05); SNC birds were similar to SC birds to 35d (P>0.10) but exceeded SC live weight thereafter (P<0.05). Live weights for CNC, VNC, and SNC birds post challenge were similar for all ages with the exception that SNC birds were depressed on day 48 (P<0.05). VC and SC birds were superior to CC birds (P<0.05) post 20d. The VC bird weights were similar to SC bird weights to 35d (P>0.10), superior post 35d (P<0.05) and markedly superior (P<0.01) for challenge period live weight gain. Feed efficiency (FE) of challenged birds favored SC only on day 34, while VC birds exhibited a marked superiority post 34d. Indeed, FE following oocyst challenge at 42d was -0.04 for SC and 0.41 for VC on day 48. Lesion scores (0=none; 4=high) for CNC, VNC, and SNC birds did not differ from zero (P>0.10) throughout the testing period, while other scores were inversely correlated (P<0.01) with live weight, weight gain, and FE. Results demonstrate the importance of time dependency on coccidiosis control.

Key Words: Eimeria, Vaccination

32 Benefits of the broiler feed additive Roxarsone. G. Mathis*¹ and M. LaVorgna², ¹Southern Poultry Research, Inc., Athens, GA, ²Alpharma Animal Health, Fort Lee, NJ.

As early as 1946, it was demonstrated that the feed additive 3-nitro-4 hydroxyphenylarsonic acid (Roxarsone) (ROX) improved growth rate and feed conversion and had some anticoccidial activity. Over the years studies were performed examining these findings. A coccidial battery study showed that ROX was particularly effective against *E. tenella*. The NMI coccidial lesion score was 3.2 and ROX 45. 4 g/t was 1.3. An Anticoccidial drug sensitivity test demonstrated that the addition of ROX to ionophore anticoccidial drugs improves total anticoccidial control. Lesion scores for NMI 2.3, salinomycin 60 g/t

1.7 and salinomycin 60 g/t plus ROX 45.4 g/t 0.4. An improvement in performance of coccidial vaccinated broiler chickens was demonstrated in a 42 day floor pen study. Weight gain for nonmedicated birds was 1.873 kg compared to 1.992 for ROX 34.5 g/t vaccinated birds. In a salmonella challenge study, pens had less salmonella when ROX was fed compared to NM. As the early research indicated, 3-Nitro is beneficial for broiler production especially due to its anticoccidial activity.

Key Words: Roxarsone, 3-Nitro, Anticoccidial

33 A comparison of performance of coccidia vaccinated broilers fed RepaXol, AciXol, or Bacitracin Methylene Disalicylate. G. Mathis*¹ and N. Scicutella², ¹*Southern Poultry Research, Inc., Athens, GA*, ²*SODA Feed Ingredients, Monaco*.

The objective of the two studies was to determine the influence of RepaXol, a blend of double coated essential oils, AciXol, an encapsulated blend of organic and inorganic acids along with RepaXol or Bacitracin Methylene Disalicylate (BMD), an antibiotic, on the performance of coccidial vaccinated broiler chickens reared to 42 days of age. Both studies had a similar experimental design. The second study used built up litter with a higher level of coccidial oocysts and Clostridium. The stocking density was 0.77 sq. ft. per male bird. All chicks were spray vaccinated with a commercial coccidial vaccine. A randomized block design with 8 replications was used. The test treatments were nonmedicated, RepaXol 50 ppm (study 1) and 100 ppm, AciXol 500 ppm (study 1), or BMD 55 ppm. Results showed a significant improvement in Day 42 performance, both feed conversion and weight gain with RepaXol 50 and 100 ppm, AciXol 500 ppm, and BMD 55 ppm compared to the nonmedicated controls. The feed conversion and weight gain for RepaXol and BMD were not significantly different in either study. No matter the background challenge level, RepaXol, AciXol, and BMD improved performance of coccidial vaccinated broiler chickens.

Key Words: RepaXol, AciXol, BMD

34 Identification of *Eimeria* species using Denaturing Gradient Gel Electrophoresis. A. Martynova-Van Kley¹, A. Syvyk*¹, A. Nalian¹, I. Teplova¹, and M. Hume², ¹*Steven F. Austin State University, Nacogdoches, TX*, ²*USDA, ARS, SPARC, Food and Feed Safety Research Unit, College Station, TX*.

The avian protozoan disease known as coccidiosis causes economic losses to the poultry industry worldwide and costs the U.S. economy an estimated \$700 million per year. The causative agent of coccidiosis in the domestic fowl is the protozoan *Eimeria*. Although it is not usually life threatening, coccidiosis has a significant negative impact on growth and feed utilization in chickens. Chickens are known to be infected with at least eight species of *Eimeria*. Application of appropriate preventive and treatment measures depends upon correct identification of the *Eimeria* species affecting a flock. The goal of this project was to identify an appropriate genetic marker and to develop a rapid, accurate, and highly discriminating assay for *Eimeria* species in

chicken fecal samples. A multiple sequence alignment of full-length 18S rDNA sequences from seven *Eimeria* species conserved regions were compared for primer design. The theoretical melting profiles of the sequences were overlaid on the alignment to identify a single melting domain which provides the best temperature differentiation. DNA from a live oocyte vaccine (Advent, Viridus, Inc.) was used to create a Novel Ladder-Marker. PCR-DGGE analysis was performed on ~200 fecal samples collected from vaccinated birds, experimentally infected birds, and control birds. The results showed that the proposed approach based on PCR/DGGE analysis can be used for *Eimeria* species detection and identification. The designed primers were shown to be specific for amplification of *Eimeria* species from fecal DNA extracts as well as directly from oocysts. This PCR-based technique offers a rapid and highly discriminating assay for *Eimeria* species identification and with the potential for fast-response strategic intervention targeting coccidia at distinct locations along the digestive tract.

Key Words: Coccidiosis, *Eimeria* Identification, DGGE

35 *Eimeria acervulina* and *E. mivati*: Are they one and the same? S. Fitz-Coy*, *Schering-Plough AH, Summit, NJ*.

An experiment was conducted using Cobb x Cobb broiler chickens in cages. At 2 days of age, one group was inoculated with *E. acervulina*, a second group was given *E. mivati* and the third group kept coccidian-free, given robenidine in the feed at 33ppm for two weeks. Chickens were inoculated with *E. acervulina* or *E. mivati* three times per week, for three weeks. At 28 days of age, birds were randomized into challenge cages. Each bird received 500,000 sporulated oocysts of either *E. mivati* or *E. acervulina* by gavage. Trial terminated on day 6 post challenged; weight, gross lesions and microscopic parasite burden evaluated. Birds immunized with *E. acervulina* or *E. mivati*, challenged with homologous species grew at comparable rates, 420g and 389g, respectively ($P>0.05$). Birds immunized with *E. mivati* or *E. acervulina* and challenged with heterologous species grew at comparable rates, 313g and 264g, respectively ($P>0.05$). Control birds challenged with *E. acervulina* or *E. mivati* gained 278g and 91g, respectively; less ($P<0.05$) than birds immunized and challenged with homologous species. Gross lesions for controls-challenged with *E. acervulina* or *E. mivati* were highest among the groups (<0.05). Birds immunized with *E. acervulina* or *E. mivati* and challenged with homologous species had good protection. But *E. acervulina* or *E. mivati* immunized birds and challenged with heterologous species demonstrated no protection, 2.42 and 1.42, respectively. Microscopic parasite load for controls-challenged with *E. mivati* and *E. acervulina* immunized *E. mivati*-challenged birds had the highest scores, 10.73 and 10.5, respectively, ($P<0.05$). Birds immunized with *E. acervulina* or *E. mivati* and challenged with homologous species had good protection. Birds immunized with *E. mivati* or controls-challenged with *E. acervulina* had similar levels of parasitism, 5.5 and 6.33, respectively ($P>0.05$). Control birds challenged with *E. mivati* has 18% mortality. *E. mivati* was more pathogenic than *E. acervulina*, caused greater growth suppression, higher gross lesions and microscopic parasitism and caused mortality.

Key Words: *Eimeria*, *Acervulina*, *Mivati*