Coccidiosis II


AAAP abstract†

231 The synergistic effects of plant-derived nutritional mixtures on recombinant antigen vaccination against avian coccidiosis. II. Lillehoj**1, S. H. Lee1, S. I. Jang1, K. W. Lee1, M. S. Park1, and D. Bravo2, 1Animal Parasitic Diseases Laboratory, Animal and Natural Resources Institute, Agricultural Research Service-U.S. Department of Agriculture, Beltsville, MD, 2Pancosma S.A., Geneva, Switzerland.

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Cellular immune responses, chemokine, and cytokine profiles were investigated in 20 d old turkey pouls following an oral infection with 12.5 × 10³ oocysts of E. adenoideas, a protozoan parasite of the genus Eimeria that develops in the ceca. Large numbers of oocysts were produced in the feces of infected birds from d 5 after infection followed by a rapid decline by d 7. Local immune activities were characterized by observing the extent of leukocyte infiltration in the ceca by histology, measuring subsets of the lymphocyte population by immunohistochemistry, and determining the relative expression of cytokines by real-time RT-PCR. Inflammation, assessed by scoring the extent of cellular infiltration of leukocytes in sections of ceca, was significantly higher in infected pouls compared with uninfected pouls on d 4, 7, 9 and 11 following infection. The percent area occupied by CD4+ and CD8+ cells in the ceca was significantly greater on d 9 and 11 for CD4+ cells and d 11 for CD8+ cells in infected pouls compared with uninfected controls. The relative expression of the chemokine CXCLi2 and the cytokines IL1β, IFNγ, IL13 and IL10 was investigated in tissue samples taken from the ceca. Increased expression of CXCLi2 occurred on d 4 and d 7. Increased expression of IL10 and IFNγ occurred on d 4, and IL1β and IL13 on d 7 post-infection. The increased leukocyte infiltration in the ceca, alterations in the lymphocyte subpopulations, and changes in expression of chemokines and cytokines are an indication of the cell and humoral immune activities occurring in the host as a result of exposure to E. adenoideas.

Key Words: Eimeria, turkey, immunity, CD4+, CD8+ lymphocyte, cytokine

233 Probiotic strains alleviating coccidiosis. K. Teichmann*, S. Henik1, I. Giannenas2, and G. Schatzmayr1, 1Biomin Research Center, Tulln, Austria, 2University of Thessaly, Karditsa, Greece.

In search for alternative ways to control chicken coccidiosis, probiotics are currently investigated for their potential in reducing the disease’s impact on animal health and productivity. Probiotic strains from the BIOMIN culture collection were assessed for their ability to counteract coccidiosis in a stepwise procedure. In previous studies distinct strains of Enterococcus faecium, Bifidobacterium animalis and Lactobacillus salivarius isolated from chicken gut reproducibly inhibited in vitro parasite invasion by > 50% (P < 0.05). In a subsequent challenge trial with E. tenella body weights of broilers fed a mixture of the same probiotic strains (PS) were significantly higher (P < 0.05) than bird weights of an infected control group, but not significantly different from a group fed a conventional anticoccidial drug. Parasite impact on gut health parameters was markedly reduced. A vaccine challenge experiment employing a 10-fold dosage of a commercial vaccine confirmed the beneficial effects of the probiotic combination on performance parameters. Consequently, a challenge trial including E. acervalina, E. maxima and E. tenella was conducted to examine effects of feeding PS to broilers during a mixed parasite infection. PS protected weight gain, gut integrity and reduced parasite shedding (P < 0.05) in birds challenged with Eimeria species inhabiting different sections of the intestinal tract. Thus, previous findings on beneficial effects of a combination of probiotic strains (PS) during coccidiosis were confirmed in an experiment using a mixed infection with 3 Eimeria species. Probiotics have shown a great potential in alleviating coccidiosis and should be further investigated as a serious alternative to anticoccidial drugs.

Key Words: Eimeria, coccidiosis, direct-fed microbials, probiotics, vaccine

234 Effects of direct fed microbials supplementation on broiler performance under simulated coccidial infection. G. R. Murugesan* and M. E. Persia, Iowa State University, Ames.

A broiler coccidial challenge model was used to evaluate the effects of direct fed microbials (DFM; Aspergillus oryzae and Bacillus subtilis) supplementation on broiler performance under disease stress. Male Ross 308 chickens were brooded in 3 environmentally controlled (EC) chambers on 3 experimental diets. On d 7, the chicks were divided into 4’x4’ floor pens located within 8 EC chambers arranged in a 2 x 3 factorial. The treatments consisted of 2 health status groups (control and cocci infected) and 3 dietary groups with a corn-soybean meal control diet (C), C with DFM, and C with antibiotic growth promoter (AGP). Each treatment consisted of 5 experimental units (EU) with 10 chicks per EU resulting in total of 300 chicks raised in a deep litter system (230 in2/chick). Four of the EC chambers served as controls (sham inoculation) and the rest housed challenged birds. The EC chambers were chosen to allow the bird’s access to the floor and litter for possible re-infection, but to maintain biosecurity between the control and challenged groups. The challenge consisted of a 10x oral vaccination dose of a live-modified commercially available coccidiosis vaccine that contained a combination of Eimeria sp that was administered on d 9. Feed intake and body weight were recorded on d 7, 21 and 28 and feed conversion was calculated between 7 to 28 d. On d 21, 2 chicks from each EU were euthanized to collect ileal samples and the nutrient transport was measured by a modified Ussing chamber method. There were no significant interactions between coccidiosis challenge and the dietary treatments on bird performance. Dietary treatment, either DFM or AGP, had no significant effect on chick performance, regardless of coccidial status of the birds. Coccidiosis challenge resulted in a significant reduction in feed intake (4.5%), body weight gain (7.4%) and feed efficiency (15.7%) over the 7 to 28 d period. These data indicate that a successful coccidiosis model has been established with a 10x vaccination dose and floor rearing of commercial broiler chicks.

Key Words: broiler, DFM, coccidiosis, performance
235 Statistical handling of ordered categorical data (coccidial lesion scores). L. P. Taylor* and C. D. Smothers, Pfizer Animal Health, Kalamazoo, MI.

Scoring assessments for coccidial lesions have been established for decades and are widely used in the poultry industry. The scoring system for coccidial lesions (0,1,2,3,4) is commonly known in statistical terms as an ordered categorical system. An increase in the number is associated with an increase in the severity. Verbal descriptions are given to each category that describe the severity of the lesion. Ordered categorical scales are seen in many other disciplines and have been very useful in describing subjective outcomes for various disease states. Proper statistical analysis techniques that produce results with a high level of confidence have not always been the method of choice when analyzing such data. It is common to see such data subjected to mathematical calculations that are properly suited for continuous data such as body weights or body temperatures. The temptation to employ such analysis techniques and subsequent presentation of results should be avoided. Although ordered categorical scoring systems reflect degrees of severity, they are not additive or equally spaced. Summing or calculating averages of such data has no real meaning as the ordered numerical scores could just as easily be replaced by other notation, such as letters or colors, to convey the same meaning. Statistical methodologies for ordered categorical data have not advanced as quickly as those for continuous data, but categorical data analysis using mixed model methods are now readily available and being used to support efficacy and safety outcomes. These methods are based in practicality, have strong statistical support and are more reflective of the true nature of ordered categorical outcomes. Proper statistical methods of analyzing and presenting results from ordered categorical data are required by a growing number of regulatory agencies and scientific journals. Examples of these techniques and real world outcomes will be presented and discussed.

Key Words: lesions, ordered categorical, statistical method, scoring, coccida

236 Effect of probiotic administration on avian beta-defensin expression in coccidiosis vaccinated broilers. K. Stringfellow*1, Y. Wang1, H. Zhou1, Y. Farnell2, D. Caldwell1, J. Lee1, S. Anderson1, M. Mohl3, R. Beltran3, G. Schatzmayr3, S. Fitz-Coy4, C. Broussard4, and M. Farnell1, 1Department of Poultry Science, Texas AgriLife Research and Extension, College Station, 2Department of Neuroscience and Experimental Therapeutics, Texas A&M University Health Science Center, College Station, 3Biomin GmbH, Herzogenburg, Austria, 4Intervet/Schering-Plough Animal Health, Summit, NJ.

Defensins are a family of cysteine-rich antimicrobial peptides that play important roles in the innate immune system. In addition to their defense mechanisms against a variety of microorganisms, they have been demonstrated to play a significant role in the regulation of host adaptive immunity. Probiotic administration has a myriad of physiological effects on the host immune system and has been demonstrated to induce defensin gene expression in mammals. To understand the effect of probiotics on defensin expression in chickens, we used TaqMan® real-time PCR to examine mRNA expression of avian-beta defensins (AVBD) 2 and 9 in the liver of coccidiosis vaccinated broilers. The hypothesis of this study was that probiotic administration would modulate the expression of AVBDs in vaccinated broilers. Treatments consisted of a negative control, probiotic alone, vaccine alone, or a probiotic + vaccine group. Probiotic was administered through the drinking water and coccidiosis vaccination was performed on day-of-hatch by oral gavage. Probiotic was administered on days 0-3, 9-11 and 16-18 to respective groups. On day 21, liver tissue was collected and stored in RNAlater for subsequent RNA extraction. The results showed that AVBD2 expression increased ($P \leq 0.05$) in the probiotic + vaccine group relative to the probiotic alone group. Avian beta-defensin 9 was demonstrated to have an increased ($P \leq 0.05$) expression in the vaccine group when compared to the control birds. These findings indicate that increased AVBD2 and AVBD9 expression may be associated with a host immune response to probiotic and vaccine administration in broilers.

Key Words: defensins, probiotic, broilers, vaccine, coccidiosis

†This abstract from the American Association of Avian Pathologists (AAAP) is available in the AVMA Convention Notes at www.avmaconvention.org and at www.aaap.info/2011meeting.