Immunology and Pathology Symposium: Immunity, Nutrition, Genomics, and Gut Microbiota

463 Direct fed microbial supplementation alters hosts' immune response and repartitions energy to the immune system. M. D. Koci* and W. J. Croom, *North Carolina State University*, *Raleigh*.

Direct fed microbials (DFMs) are used in animals and humans as dietary supplements to improve health. In recent years, increased scrutiny by the Food and Drug Administration, regarding the use of subtherapeutic levels of antibiotics in food animal production has stimulated new interest in DFMs. Currently, our understanding of the mechanism(s) of action of DFMS and the factors that influence their effects on health and performance is limited. This is due to our incomplete understanding of how the gut microflora and the hosts' tissues communicate; the effects of DFMs on host animal metabolism; our limited understanding of the dynamics regulating the microbial ecosystem in the gut, and our inability to culture and/or identify the majority of the organisms living in the host′s intestine. In spite of these challenges, contemporary studies, using different host species, demonstrate DFMs can, and do, augment health. Although the extent of biological activity varies among different model consortia, there appear to be common mechanisms. These include the prevention of colonization of pathogenic and opportunistic organisms, enhancement of nutrient digestion and absorption, and increased immune function. Research in our laboratory suggests DFMs can mediate changes in host tissue energy partitioning which may help facilitate enhanced immune response. Collectively, published studies underscore both the complexity of the DFM/host interaction, and the need for a greater understanding of how intestinal physiology and immunity are interrelated.

Key Words: direct fed microbials, immunity, animal health

464 Role of antibiotics on gut microbiota and incidence of gangrenous dermatitis in commercial broilers. G. Ritter*[1], G. Siragusa[2], S. Dunham[2], and A. Neumann[2], [1]*Mountaire Farms Inc.*, *Millsboro, DE,* [2]*Danisco*, *Waukesha, WI*.

Gangrenous dermatitis (GD) is a bacterial translocation disease of commercial broilers and turkeys caused by *Clostridium perfringens* (CP) and *Clostridium septicum* (CS). In affected birds, CP/CS that are part of the normal gut flora of poultry escape from the gut and invade target tissues of skin, liver and joints producing rapid toxicosis and death. The incidence of GD in a 1.5M birds per week commercial broiler complex was tracked for 5 years. Increased incidence of GD during the study period was positively correlated to feeding programs containing ionophore coccidiostats (polyether antibiotics) included in grower feed diets fed to broilers from 19 to 28 d of age. A gastrointestinal (GIT) microbiota field study was conducted on 6 GD endemic commercial broiler farms. Four farms were fed a diet including ionophore grower feed (correlated with high incidence of clinical GD) and 2 farms were fed grower feed without ionophores that is not associated with clinical expression of GD. GIT bacterial communities in birds on each farm were characterized using molecular techniques of 16S cloning/sequencing and terminal restriction fragment length polymorphism (T-RFLP) from pooled gut samples collected from 6 presumably healthy birds at 16, 24, 25 and 41 d of age. Results of 16S cloning/sequencing revealed that birds fed ionophores in grower feed had the most *Clostridiaceae* and least *Lactobacillaceae* in their GITs while birds not fed ionophores had the least *Clostridiaceae*. T-RFLP results showed differences in bacterial community profiles and individual T-RFLP peaks between treatment groups. These observed differences may be important to GD disease development and clinical expression.

Key Words: gangrenous dermatitis, antibiotics, commercial broilers

465 Antibiotics disrupt the microbiota-host-pathogen interaction. B. Willing*, *University of British Columbia*, *Vancouver, BC Canada*.

The mucosal immune system is essential for protecting the host from a steady barrage of bacterial, fungal, and viral pathogens that it encounters. However, proper functioning of the mucosal immune system requires continual stimulation by a resident gastrointestinal microbiota. When a healthy microbiota is absent as a consequence of antibiotic therapy or other disturbances, the mucosal immune system fails to control pathogens allowing the host to become sick. Each bacterium affects the immune system in a different way, therefore the effects of an antibiotic regimen on the mucosal immune system are dependent upon which bacteria the antibiotic targets. Understanding the changes in mucosal immunity and how they relate to deviations in gut bacteria will be important in the development of strategies to bolster the mucosal immune system and promote intestinal health.

Key Words: antibiotics, microbiota, host-pathogen

466 Nutrigenomics: Understanding how nutrients influence host innate immunity and modulate host-pathogen interaction. H. Lillehoj*[1], S.-H. Lee[1], D.-K. Kim[1], and D. Bravo[2], [1]*Beltsville Agricultural Research Center, USDA-Agricultural Research Service*, *Beltsville, MD,* [2]*Pancosma S.A.*, *Grand Saconnex, Geneva, Switzerland*.

With anticipated human population growth to 9.5 billion in 2050 (2.5 people every second), we need more efficient and safe animal production system to meet the demands for high-protein meat products. In 2006, the European Union banned antibiotics growth promoters in animal feed due to increasing concerns with the drug uses and resistances for human antibiotics. This new constraints for animal and pharmaceutical industry was the driving force for a new thrust in research to find alternative non-drug dependant strategies for growth promoting and disease control for farm animals. Recently, there has been increasing interest and research activities on the nutrition-based strategy to enhance host immunity, especially using plant-derived products in clinical medicine. However, there is very limited information on the use of phytonutrients in veterinary medicine and knowledge on the nutrient-host gene interaction in poultry is scarce. To best utilize the available information in nutrition, immunity and gut microbiota for developing alternative disease control strategies against poultry diseases, we are applying new technology in nutrigenomics to develop dietary immunomodulation strategy as an alternative to antibiotics in poultry disease control.

Key Words: nutrigenomics, host-pathogen, poultry