

## **CPRC Update**

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### **GIVING BIRDS A BOOST**

Poultry disease prevention draws on a broad range of tools. Management, biosecurity, genetic selection, vaccination and antimicrobials all play important parts. While often used to great effect, these tools are not without their shortcomings. For example, vaccines are not available for certain diseases and are not effective when an immediate protective effect is required, such as in a disease outbreak. Furthermore, the use of antimicrobials is under increasing scrutiny and pressure is mounting to find alternatives to these compounds. The Canadian Poultry Research Council (CPRC) has therefore supported several research projects designed to investigate the possibility of stimulating natural immunity in poultry to complement existing disease mitigation strategies.

#### **Nature's defense**

The avian immune system is the product of a remarkable evolution that defends the body against a range of pathogens. Immune response can be broadly divided into two categories: "adaptive" and "innate". Adaptive immunity involves recognition of specific components of an invading organism called "antigens". Cells in the body presented these antigens are recognized as foreign and, through a complex cascade of events involving many molecules and cell types, are attacked and eliminated from the body. The adaptive arm of the immune system is the one that "remembers" an invader and is primed to launch a robust attack if the corresponding antigen is encountered again.

The innate component of the immune system can clear an infection even before an antigen-specific immune response is developed. Years of immune system research has led to the development of the "danger" hypothesis, wherein the immune system can rapidly respond to characteristic features, or patterns, of invading pathogens. The innate or "natural" immune response is the first line of defense against a broad range of pathogens, including bacteria, viruses, parasites and fungi.

#### **Enhancing natural immunity**

Researchers are attempting to enhance the innate immune system by presenting it with elements typical of various pathogens, in essence fooling into thinking a pathogen is present. For example, Dr. Susantha Gomis at the University of Saskatchewan is studying a pattern characteristic of bacterial DNA, known as CpG motifs. When these motifs are encountered, the innate immune system's danger alarm is sounded and it is primed to respond to a bacterial infection. Small pieces of DNA containing these motifs can be synthesized in the lab and administered to the animal. Dr. Gomis' previous work demonstrated that the molecules, when injected in the egg, protected chicks against *Escherichia coli* and *Salmonella Typhimurium* infections and helped improve the response to *E. coli* infections in adult chickens. Dr. Gomis is currently working on improving the utility of the molecules and exploring better delivery methods via egg, oral and nasal routes of the embryo and chick.

Dr. Moussa Sory Diarra at Agriculture and Agri-Food Canada's research station in Agassiz, British Columbia is building on research that showed another molecule, known as c-di-GMP can be used to protect mice from bacterial challenge. Human immune cells in culture have also shown responses to the molecule. Based on this information, Dr. Diarra looked at the effect of c-di-GMP on immune responses in broiler chickens. His results showed that orally administering c-di-GMP increased concentrations of Immunoglobulin A (one of the major classes of antibodies) in blood serum. Dr. Diarra is now determining if c-di-GMP could be used to improve the performance of various vaccines.

Dr. Mohamed Faizal Abdul Careem, University of Calgary, is working on a similar project to determine if certain candidate compounds can stimulate innate immunity in chickens. This enhanced immune function will be tested by viral challenge. The project will also investigate the anti-viral mechanism, as well as any effect immunomodulation may have on subsequent performance of the bird. These latter components of the project are important to understand the effects of the intervention and ultimately decide if it is applicable in an industry setting.

While there remains much to be learned, research results thus far suggest that enhancing natural immunity may soon be another tool in the poultry industry's chest to help prevent poultry diseases.

For more details on any CPRC activities, please contact The Canadian Poultry Research Council, 350 Sparks Street, Suite 1007, Ottawa, Ontario K1R 7S8, phone: (613) 566-5916, fax: (613) 241-5999, email: [info@cp-rc.ca](mailto:info@cp-rc.ca), or visit us at [www.cp-rc.ca](http://www.cp-rc.ca).

The membership of the CPRC consists of Chicken Farmers of Canada, Canadian Hatching Egg Producers, Turkey Farmers of Canada, Egg Farmers of Canada and the Canadian Poultry and Egg Processors' Council. CPRC's mission is to address its members' needs through dynamic leadership in the creation and implementation of programs for poultry research in Canada, which may also include societal concerns.