

CPRC Update

GIVING BIRDS A BOOST – AN UPDATE

Summary

- Progress continues to be made on ways to stimulate natural immunity and help protect poultry from various infections
- Results thus far are promising, showing protection from bacteria and respiratory viruses
- Work is underway to further enhance protection, make it last longer, and make the technology practical for industry use

Introduction

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) is therefore supporting research designed to investigate the possibility of stimulating natural immunity in poultry to complement existing disease control 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 responses can be broadly categorized as “adaptive” or “innate”. Adaptive immunity involves recognition of specific components of an invading organism called antigens. Organisms or objects presenting 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 “remembers” the invading organism and is primed to launch a robust attack if it sees the corresponding antigen 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, whereby the immune system can rapidly respond to characteristic features, or molecular patterns, of invading pathogens. This 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 it into thinking a pathogen is present. Dr. Susantha Gomis at the University of Saskatchewan used small pieces of DNA with molecular patterns characteristic of bacterial DNA to stimulate innate immune responses. When injected into the egg, these molecules can protect chicks from *Escherichia coli* and *Salmonella Typhimurium* infections. The protective effect is relatively short-lived, however. Dr. Gomis' group is experimenting with different formulations that protect the molecules from degradation in the body; the longer they stick around, the longer the immune system remains primed and ready to combat potential invaders.

Similarly, Dr. Mohamed Faizal Abdul Careem at the University of Calgary has demonstrated that other compounds typically present in bacteria can be used to stimulate innate immunity and protect chickens

from challenge with Infectious Bronchitis virus. Lab studies also showed the ability of these compounds to inhibit replication of Infectious Laryngotracheitis (ILT) virus. A paper on the mechanism of ILT virus inhibition was published in the October 2013 issue of Veterinary Immunology and Immunopathology.

Industry application

Of course, these technologies would only be academic if they weren't of practical use to the industry; both Drs. Gomis and Careem are testing to see if their formulations are effective upon injection into the egg at day 18 of incubation. If so, they could easily be incorporated into egg vaccinations routinely performed at many commercial hatcheries. This research may provide industry with another tool to help protect poultry from disease. We'll provide more updates as things progress.

Funding for Dr. Gomis' work is provided by CPRC, Natural Sciences and Engineering Research Council of Canada (NSERC), Saskatchewan Chicken Industry Development Fund (SCIDF) and Alberta Livestock and Meat Agency (ALMA). Dr. Careem's work is funded by CPRC, University of Calgary Faculty of Veterinary Medicine, NSERC and ALMA.

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, or visit us at 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.