

CPRC Update – Recently Funded Immune System Activation Research

The CPRC 2015 funding process approved projects that addressed several poultry industry priorities. A major industry priority is improving the immune system, and two projects that specifically address this in poultry have recently acquired all necessary funding in addition to CPRC funding. These projects are now currently under active research.

Activation of Innate Immunity

The emergence and spread of resistant bacteria are rendering current antibiotics less useful. Furthermore, the controversial practice of prophylactic use of antibiotics encourages the emergence of antibiotic-resistant microbes. Therefore there is a need for the development of novel alternative strategies to antimicrobials for infectious disease control.

CPRC has recently funded a project that will investigate an innate immune-based method of disease protection as an alternative strategy to antimicrobial use. During initial exposure to pathogens, birds are reliant on their innate immunity for protection against infection. Innate immune responses are not pathogen-specific but are activated by features/patterns characteristic of pathogens. The innate immune system is capable of limiting a variety of infections once activated. Although the innate immune system of chickens is developed at hatch, it is not activated; therefore, microbial agents (particularly bacterial pathogens) can infect chicks at the time of placement in the barn.

Professor Susantha Gomis, from the University of Saskatchewan has studied the effects of a pattern characteristic of bacterial DNA, known as CPG-motifs to induce or activate the innate immunity. Research has shown that synthetically generated CPG-motifs or 'CpG-ODN' as an immune system stimulant is capable of protecting neonatal chickens against specific bacterial infections. Results obtained to date show that intranasal delivery of CpG-ODN is advantageous to *in ovo* delivery as innate immune stimulation coincides with the first week of the birds' life, which is the most vulnerable period for bacterial infections. Dr. Gomis's current research will develop an effective method of intra-nasal delivery of CpG-ODN at hatch. The research approach will be to initially develop a CpG-ODN delivery prototype for intranasal delivery of the CpG-ODN to neonatal chicks followed by field efficacy and safety trials.

This research is also funded by NSERC, Chicken Farmers of Saskatchewan, (Saskatchewan Chicken Industry Development Fund), Alberta Livestock and Meat Agency Ltd., Western Economic Diversification Canada, Sunrise Poultry Hatchery, BC and Prairie Pride Natural Foods Ltd., SK.

Activation of Adaptive Immunity

Respiratory viruses have a negative impact on the poultry industry. Although vaccination against respiratory viruses is used to control these common viral diseases, 'vaccine failures' remain common.

CPRC has recently funded a project that will investigate the use of innate immune stimulants to induce adaptive immunity against respiratory viruses. Adaptive immune responses are pathogen-specific and recognition of the pathogen results in both antibody-related and cell-mediated immunity. Adaptive immune responses are slow to develop and may take up to a week before the responses are effective.

Associate Professor Faizal Careem, from the University of Calgary, has studied the effects of synthetic Pathogen Associated Molecular Patterns (PAMPs) in activation of innate immune responses. Research has shown that these PAMPs are effective in reducing the impact of a number of avian bacteria and viruses. PAMPs are also known to increase the immune response of experimental vaccines when incorporated with these vaccines as 'immune response enhancers'.

Dr. Careem, will investigate the role of innate immune stimulants in the induction of adaptive immunity to respiratory viruses. Results obtained in his prior research have demonstrated that *in ovo* delivered PAMPs can reduce a specific viral load in the respiratory tract of embryos and neonatal chicks. *In ovo* delivered PAMPs also increases innate immune cell responses in neonatal chicks. These responses have been shown to promote the development of adaptive immune responses in mammals. Overall, this study will determine the efficacy and mechanism of *in ovo* delivered PAMPs in inducing pathogen specific adaptive immune responses against respiratory viruses. The approach is centralized on stimulation of the innate immunity to reduce the viral replication at the site of entry allowing birds to acquire adaptive immunity.

This research is also funded by NSERC and Alberta Livestock and Meat Agency Ltd.

CPRC, its Board of Directors and member organizations are committed to supporting and enhancing Canada's poultry sector through research and related activities. For more details on these or any other 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.