

## CPRC Update

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### TOWARDS A NECROTIC ENTERITIS VACCINE

Dr. John Prescott and his team of researchers at the University of Guelph have taken significant steps towards a better understanding of Necrotic Enteritis (NE) and developing a vaccine that can protect broiler chickens from the disease.

#### Why a NE vaccine?

Necrotic enteritis (NE) is among the most common enteric (intestinal) diseases in poultry. It is caused by the bacterium *Clostridium perfringens* which adheres and causes damage to gut tissues. Left unchecked, this damage can impair nutrient absorption, reduce growth performance and, in severe cases, cause mortality. While a NE-affected flock may suffer from increased mortality, often “sub-clinical” cases don’t present any signs other than reduced flock performance. Without obvious signs, these cases can go unnoticed and therefore untreated. Reduced performance, increased mortality and correlation with other diseases add up to significant losses for the industry, with some estimates as high as \$2 billion a year globally, which includes the cost of antibiotic prevention. NE is currently controlled with antibiotics; however increasing concern over antibiotic resistance is putting pressure on the industry to find alternative methods of disease control.

#### NE is more complex than we thought

Research from around the globe suggests that *C. perfringens* carries specific genes associated with its ability to cause disease. However despite extensive study, it is not entirely clear why some strains of the bacterium cause disease while others do not. Dr. Prescott’s group has confirmed that several of these so-called ‘virulence’ genes can be found on small, portable strands of DNA known as plasmids that are readily passed from one bacterium to another. Genetic analysis reveals the plasmid DNA sequences are often re-arranged during transfer resulting in a variety of plasmids among bacteria; some strains have the information that confers the ability to cause disease, others do not. Dr. Prescott’s group has been able to identify genes common among virulent strains of *C. perfringens* and determine which are important for causing NE. What is becoming clear from this and other research around the world is that it is likely the combined effects of several bacterial genes, each with different functions, that contribute to the development of NE. For example, one of the genes identified is responsible for production of a secreted protein that may be crucial to the bacterium’s ability to adhere to cells in the bird’s intestine. Another gene directs bacterial production of a toxin that contributes to the intestinal cell damage associated with NE. Continuing research into the complexities of this disease is revealing insights into potential strategies for its control.

#### A vaccine in the making

Dr. Prescott’s approach to controlling NE is to identify the bacterial proteins that contribute to development of NE and then immunize the bird against them; if the bird’s immune system can neutralize the effect of one or more of these proteins, NE is much less likely to develop. To be effective, this strategy would elicit an immune response in the intestine. The researchers started with a *Salmonella* vaccine that can do just that. Using modern molecular biology techniques, they modified the vaccine so it could confer resistance to clostridia in addition to *Salmonella*. Early tests of this strategy show that immunized broiler chickens can be protected from NE. Further tests are underway to confirm these exciting results.

#### Next steps

The researchers will further characterize the roles that selected virulence genes play in development of NE. Based on these results, additional vaccine vectors may be engineered that elicit immune responses to one or more gene products. Candidate vaccines will be tested for their ability to protect birds from *C. perfringens* challenge and vaccination protocols will be optimized.

Establishing an effective, stable vaccine platform with which to mitigate the effects of NE would be of great benefit to the poultry industry, especially in the face of increasing pressure to find alternative means to control this important disease.

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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.*