

CPRC Update

FIGHTING THE 'FLU'

Progress towards understanding avian influenza

The February 2011 issue of the CPRC update introduced a new avian influenza (AI) research program initiated as part of the Poultry Science Cluster*. Since that time, scientists from across the country have been working collaboratively to answer the following questions about AI:

How does AI virus adapt?

Certain subtypes of AI virus have moved beyond their natural reservoir of wild birds and have developed the ability to infect domestic poultry, sometimes with devastating results. To better understand the biological basis for this adaptation, Dr. Yohannes Berhane and his team at the Canadian Food Inspection Agency (CFIA) are using modern molecular biology techniques to, in essence, tear apart and re-assemble the viral genomes in different configurations to mimic mutations observed in the field. Many so-called "reassortment" AI viruses have been developed and characterized. These studies are revealing how the virus induces immune responses and causes disease in chickens.

How is it transmitted?

AI viruses are mainly transmitted by direct bird-to-bird contact and by contact with virus-contaminated materials; however indirect contact or airborne transmission has been implicated in a number of AI outbreaks. By studying aerosolized virus in carefully controlled experiments in the lab, as well as under commercial conditions, Dr. Jiewen Guan's lab, also at CFIA, has confirmed that infectious virus can be transmitted to chickens from the air and from other chickens through indirect contact. The amount of virus required to cause infection through indirect contact is surprisingly small. The results of this research have important implications for how AI is spread.

How does the chicken react?

Dr. Shayan Sharif at the University of Guelph is the lead on research that continues to produce new information on chicken immune responses to AI virus infection and to a commercial vaccine (not approved for use in Canada). Dr. Sharif's team has identified components of the virus that elicit the greatest immune responses and may therefore be suitable components to include in vaccines. A number of molecules that act as adjuvants (immune system boosters) have also been identified that could improve the efficacy of these vaccines.

Is vaccination a viable strategy?

Among the main goals of the overall research program is to develop a rational strategy to control AI infection in commercial poultry. Such a strategy may include vaccination. Dr. Éva Nagy and her team at the University of Guelph has developed a vaccine system, based on fowl adenovirus (FAdV), that can deliver AI virus antigens to the bird, and that can be administered via injection in the egg pre-hatch, or given orally in feed or water. Dr. Sharif's group developed a different type of vaccine, based on what is known as a virosome, that can elicit protective immune responses against AI virus. Dr. Dele Ogunremi and his team of researchers at CFIA have been working with Drs. Nagy and Sharif to assess various administration routes for candidate vaccine systems. The plan now is to build upon the foundation laid by this research and develop a strategy which combines virosome and FAdV-based vaccines for control of AI virus. These two vaccines should complement and synergize each other, leading to enhanced

protection against infection. Furthermore, several adjuvants will be screened for their ability to further enhance vaccine efficacy. Candidate vaccine formulations will be tested against a range of low pathogenicity or highly pathogenic AI virus using various routes of administration to determine which is most protective and practically feasible for the purpose of mass vaccination. It is expected that this research will lead to creation of vaccine formulations that can mitigate the negative health effects of AI and control spread of the virus from vaccinated and infected birds.

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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.