

Understanding Avian Influenza Virus: Infection, Pathogenicity and Prevalence

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Project Scope: Influenza is a highly contagious respiratory disease, caused by influenza viruses that result in significant morbidity and mortality in humans and animals worldwide. In addition to causing annual epidemics, type A influenza viruses have periodically caused serious pandemics that spread rapidly on a global scale. Wild waterfowl are considered natural reservoirs for type A avian influenza viruses (AIV) and the source of influenza viruses that affect humans and species of high economic importance (poultry, swine and equine). Infection of these other species with type A influenza viruses of wild-bird origin requires adaptation. Influenza virus infections are mediated by specific interactions between the viral glycoprotein hemagglutinin (HA) and the host cell membrane. During our DHS internship at the FAZD Center, Texas A&M University, we investigated the presence of human (α 2-6) and avian (α 2-3) Sialic acid (SA) residues on the respiratory track of several species (domestic turkey, wild turkey, chicken, quail and pig) that can act as intermediate species for the adaptation of wild-bird influenza viruses to humans. Our results indicate the presence of both human and avian specific receptors in the examined species, suggesting that they may play an important role in interspecies transmission.

Recent Progress: As a preamble of the AIV surveillance project in Puerto Rico (PR) (University of PR in Ponce), we gained experience on procedures required to carry out surveillance of AIV in wild waterfowls, by screening over 300 cloacal swab samples (viral isolation in embryonated eggs, Hemagglutination test, and Real Time-PCR) from hunter-killed birds collected along the Texas Gulf Coast. These strategies are currently being used to screen resident and migratory waterfowls in Puerto Rico and evaluate those as potential carriers or intermediate hosts for the virus.

Relevance to DHS research area of Biological Threats and Countermeasures: This project is directed to prevent the introduction and adaptation of wild-bird origin AIV to non-commercial and commercial poultry (*detection and warning systems*). In order to carry out this strategy, it is important to understand the prevalence, ecology, and evolution of wild bird avian influenza viruses between geographic locations. Early detection of AIV in the PR region will contribute to minimize the impact of this virus in the public health and poultry industry of PR and the US.

Future Plans: To establish an official AIV Surveillance Program in Puerto Rico. As well as to coordinate such, with local (PR) and National Agencies' (Interagency National Early Detection System for Highly Pathogenic AI Virus in Wild Birds in the United States, NIH Centers for Excellence on Influenza virus Research and CSREES AICAP among others) research efforts.