RESEARCH ABSTRACT

SWINE HEALTH

Title: Broadening cross-protective immunity against swine influenza viruses: A path forward a universal influenza vaccine **(NPB #19-106)**

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Scientific Abstract:

Influenza A virus - swine (IAV-S), commonly also known as swine influenza virus (SIV), is the cause of acute, severe respiratory disease in pigs and is considered one of the top three health challenges facing the swine industry in the United States (U.S.). In addition, IAV-S is a zoonotic pathogen readily shared between pigs and people, representing a health and economic threat to humans and swine worldwide. Although Strict biosecurity, proper pig flow in a production system, and preventing transmission of human IAV to pigs through personal protective equipment are important control measures for IAV on swine farms, vaccinations for the virus are the most common and necessary methods to control swine influenza. Current inactivated virus vaccines, however, fail to cross-protect against the massive number of antigenically diverse strains circulating in swine. Hence, the industry must explore novel immunogens/antigens and vaccination strategies that will demonstrate broad, cross-protective immune responses in the pig.

Recently our team developed a HA stem-based immunogen designated "HIV6HB-HA_{STEM}" based on the hemagglutinin (HA) of a human H3 virus (A/Hong Kong/8/68). It had shown its binding with the monoclonal antibody specific for the most conserved epitope (CR9114) among influenza A and B viruses to date. More importantly, mice immunized with this antigen (10 µg, 3 times) not only developed a high level of ELISA antibody against the immunogen but also were protected from a lethal challenge of H1 and H3 IAV, even though no virus neutralizing antibodies were detected in these mice. Therefore, the following study was conducted to evaluate this immunogen in pigs against IAV-S as a proof-of-concept for the universal vaccine platform.

A pig study using a random block design was conducted to assess if the immunogenicity of HIV6HB-HA_{STEM} for swine and the degree of cross-reactivity of the antibodies with various H1 and H3 strains of IAV-S. Pigs were immunized 3 times with two different doses (200 and 400 µg/pig) of the immunogen via two different routes (IM and IN). Two different adjuvants (Zn-chitosan and Emulsigen) were used with the immunogen. All vaccinated pigs developed antibodies against the immunogen regardless of doses and routes, although IM injection and an oil-emulsion adjuvant induced a higher level of the antibodies, indicating the immunogenicity of the immungen for swine. However, the immunized pigs were not seropositive by HI assays against various H1 and H3 strains of IAV-S and IFA assay using cells infected with those IAV-S strains, implying that particular immunogen may elicit protective immunity in swine in a way different from what traditional vaccines induce. It remains, however, to further investigate if the immune response induced by this immunogen can provide pigs clinical protection against IAV-S challenge.