RESEARCH ABSTRACT

SWINE HEALTH

Title: Development of novel mucosal vaccines against swine influenza in pigs - **NPB # 11-073**

Investigators: Mahesh Khatri (contact) and Renukaradhya J. Gourapura

Institution: The Ohio State University

Date Submitted: 1/6/2014

Scientific Abstract

Swine influenza virus (SIV) causes an acute respiratory disease in pigs of all ages, and pigs are infectable by both avian and mammalian influenza viruses. Activation of innate immune cells including invariant natural killer T (iNKT) cells induces heightened heterologous protection against influenza viruses in rodent models. We discovered CD1d-restricted iNKT cell in pigs. Our goal was to determine the efficacy of UV-inactivated bivalent SIV vaccine, comprising of triple reassortant zoonotic H1N1 (Sw/OH/24366/07) and H3N2 (Sw/CO/99) viruses; coadministered intranasally with iNKT cell specific adjuvants, α-Galctosylceramide (α-GalCer) and phosphatidylinositolmannosides-2 (PIM2) or Poly I:C as mucosal adjuvants to provide cross-protective immunity against influenza in pigs. In monovalent vaccine inoculated homologous H1N1 virus challenged pigs, reduced viral load in the lungs associated with increased IFN-γ^+ lymphocytes in the lungs and tracheobronchial lymph nodes by ELISPOT, and an increase in IFN-γ^+CD8$^+$ T cells and IFN-γ^+ γδ cells was observed. Further, increased specific IgA and hemagglutination inhibition (HI) antibody responses in the BAL, and enhanced lung NK cytotoxicity were detected. However, in bivalent vaccine inoculated, heterologous pandemic 2009 H1N1 virus challenged pigs, enhanced nasal viral shedding and increased lung viral load was detected. Immunologically, reduced frequency of total lymphocytes, CD8$^+$ T cells, and frequency of total IFN-γ^+ T cells was detected in the lungs. On the other hand, Poly I:C adjuvanted vaccine was able to initiate cross-protective immunity and provided protection against antigenic variant H1N1 and heterologous H1N2 virus challenge in commercial pigs. In conclusion, Poly I:C may be a promising candidate for the development of novel cross-protective mucosal vaccine against influenza in pigs.