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### Protection against influenza virus lethal challenge by HA2-M2e fusion protein in BALB/c mice

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The error-prone polymerase and segmented nature of influenza virus A genome cause antigenic drift and shift respectively. These phenomena make influenza vaccines inefficient along time and against different viral subtypes. In this study for the first time protection properties of a new recombinant fusion protein including HA2 and M2e proteins originated from influenza virus A/Brisbane/59/2007-like (H1N1) in BALB/C mice model, was determined via lethal challenge by homologous (mouse adapted, A/PR8/34 (H1N1)) and heterologous (mouse adapted, A/Brisbane/10/2007 (H3N2)) influenza virus subtypes. The protection properties of the recombinant HA2-M2e fusion protein determined by measurement of IgG class responses and neutralizing assay after immunization mice by the fusion protein and monitoring the lung viral titers, body temperature changes and survival rate of the immunized mice after lethal homologous and heterologous challenges. The study showed immunization by HA2-M2e caused a good protection against homologous challenge and a weaker protection against heterologous challenge. The results showed that HA2-M2e fusion protein can be recommended as a universal vaccine candidate, however more studies need to optimize this recombinant construction as a universal vaccine candidate.

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### Limiting mutations in avian influenza viruses through effective poultry disease management

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Although avian influenza outbreaks occur periodically in poultry flocks, only recently we have considered avian influenza as a significant threat to human health and the global economy. The 1997 emergence of H5N1 first brought our attention to avian influenza's ability to cause disease in humans. More recently the H7N9 virus was reported in China that causes severe respiratory illness resulting in death in about one-third of infected patients. Other avian influenza subtypes, including H7N7 and H9N2, have also infected people. The 2015 outbreak of Highly Pathogenic Avian Influenza (HPAI) in the United States illustrates the economic impact of an avian influenza outbreak. 219 detections of HPAI resulted in the death of nearly 50 million birds and a total economic impact of \$3.3 billion dollars U.S. The longer these viruses remain in circulation, the greater their potential to mutation into forms that can cause disease in humans or increased pathogenicity in poultry. Testing near the turkey farm infected with HPAI H7N8 in Indiana this year revealed 8 additional farms with LPAI H7N8, suggesting that the virus mutated into a more lethal form as it spread. Historically, poultry carcasses have been disposed of by a variety of methods including burial, incineration, land-filling and more recently, composting. The success of the composting method during outbreaks in Delaware in 2004 and Virginia in 2007 resulted in composting being a key carcass disposal method during the 2015 HPAI outbreak. In Minnesota, for example, 108 of the 109 commercial poultry operations successfully composted their flocks. Animal carcass disposal remains a significant weakness in many nations' comprehensive national strategy for biodefense. While incidents of high consequence foreign animal diseases are increasing, response plans often lack comprehensive carcass disposal considerations. Now is the time to revisit and update foreign animal disease response plans.

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