

## INFORMATION PAPER

DHA-IHB  
5 January 2017

SUBJECT: Influenza Infection and Influenza Vaccines

1. Purpose. To describe influenza disease and supporting vaccines to prevent its spread.

2. Facts.

a. Microbiology. Influenza viruses are divided into three genera, *Influenzavirus A*, *Influenzavirus B*, and *Influenzavirus C* based on antigenic differences. *Influenzavirus A* and *Influenzavirus B* cause the most serious human disease. Influenza A viruses are further divided on the basis of the two main surface structures, hemagglutinin (HA) and neuraminidase (NA). Hemagglutinin is the major antigen (structure) against which the host's protective antibody response is directed and is responsible for attachment of influenza viruses to the cell surface during early stages of infection. Neuraminidase is less abundant on the viral surface and facilitates release of mature virus from infected cells. Antibody to NA is believed to restrict virus spread and reduce severity of the influenza infection. The capacity of influenza A and B viruses to undergo gradual mutation in their HA and NA proteins, complicates vaccination against the disease. This ongoing process of "antigenic drift" produces continual novel influenza strains that ensure a constant pool of susceptible hosts, resulting in seasonal influenza. Annual review is required to keep up with continually changing influenza viruses and ensure the seasonal influenza vaccine formulation includes the most recently circulating influenza strains.

b. Disease. Influenza is a contagious respiratory illness caused by influenza viruses. The virus is spread through aerosolized respiratory droplets during close contact with an infected person or animal or through contact with a contaminated object. The incubation period is commonly 2 days, but ranges from 1-4 days. Due to this short incubation period, influenza outbreaks may escalate very quickly, especially in highly susceptible populations. Influenza illness is characterized by the abrupt start of fever, sore throat, headache, myalgia, non-productive cough and extreme fatigue with major symptoms lasting an average of 2-3 days. Fever usually ranges between 100° and 104° F. Illness typically improves within a week, but cough and malaise may persist for 2 or more weeks. The most common complications of influenza is pneumonia but may include exacerbation of underlying chronic pulmonary and cardiopulmonary diseases, such as chronic obstructive pulmonary disease, asthma, and congestive heart failure.

c. Epidemiology. In temperate climates, influenza activity occurs during the late autumn and winter months. However, in tropical climates, influenza can occur year round. During influenza seasons, an estimated 5-20% of the U.S. population can develop influenza; within institutions such as nursing homes an infection rate of 40-50%

is not unusual. In communities, influenza cases often appear first among school-age children. Infection rates usually are the highest in this group; whereas rates of serious disease and complications are highest among the elderly, the very young, and those with certain underlying chronic conditions. In the U.S., influenza results in an estimated 25 million reported cases, over 150,000 hospitalizations due to serious complications, and up to 30,000 deaths annually.

d. Strains. Each year the strains prevalent in laboratory samples are submitted and scientists at the World Health Organization use this information to estimate which types and strains of influenza virus will most likely circulate during the next influenza season. The identified strains are then used in the annual influenza vaccine formulation. The 2016-17 influenza vaccine strains are: A/California/7/2009 (H1N1), A/Hong Kong/4801/2014 (H3N2), and B/Brisbane/60/2008. The additional strain for quadrivalent vaccines is B/Phuket/3073/2013.

e. Vaccine. Multiple varieties of influenza vaccine are distributed in the United States. All influenza vaccine must be stored in a refrigerator between 2-8°C (36-46°F) upon receipt and until use before the expiration date on the package/vial/sprayer label.

(1) Injectable: All trivalent and quadrivalent inactivated influenza vaccine (IIV3/IIV4), cell culture-based (ccIIV3), and recombinant hemagglutinin (RIV3) are administered by intramuscular injection. One IIV4 version uses a very small needle which allows for intradermal (under the skin) injection.

(2) Intranasal: Live, attenuated (weakened) influenza vaccine, quadrivalent (LAIV4) vaccine is administered into each nostril of the nose.

f. DOD Procured Vaccines: The following trivalent and quadrivalent, inactivated, injectable influenza vaccines, and live attenuated intranasal vaccine were purchased for the 2016-17 influenza season:

(1) Fluzone® Pediatric (IIV4) [Sanofi-Pasteur] is licensed for immunization of persons 6 – 35 months of age. All single-dose syringes are preservative and latex free. This vaccine does contain small amounts of egg and gelatin protein.

(2) FluLaval® (IIV4) [Glaxo-Smith-Kline] is licensed for immunization of persons 6 months and older. The multi-dose vials contain preservative but are latex free. The vial must be discarded 28 days after puncture.

(3) Fluarix® (IIV4) [Glaxo-Smith-Kline] is licensed for immunization of persons aged 3 years and older. The single-dose syringes are preservative and latex free. This vaccine does contain a small amount of egg protein.

(4) Afluria® (IIV3) [CSL] is licensed for immunization of persons aged 5 years and older; however, the Advisory Committee on Immunization Practices (ACIP) guidelines recommend that Afluria® be used in persons aged 9 years and older due to

the increased risk of febrile seizure noted in children 6 months to 8 years of age. The single-dose syringes and multi-dose syringes are latex free. However, the multi-dose vials contain a preservative. This vaccine does contain a small amount of egg protein. The multi-dose vial must be discarded 28 days after puncture.

g. Immunization. ACIP continues to recommend annual influenza vaccinations for all persons 6 months of age and older. Protection of persons at higher risk for influenza related complications should continue to be a focus of vaccination efforts to include children 6 months through 4 years, those aged 50 years and older, pregnant women, those with chronic health conditions and/or who are immunosuppressed. Due to concerns over poor efficacy, the ACIP did not recommend LAIV for use this season (2016-2017). ACIP's full summary of vaccination recommendations is noted in the annual MMWR.

h. Adverse Events. Local reactions are the most common side effects after administration of IIV. Reactions include soreness, redness and swelling and generally last 1-2 days. Systemic reactions include fever, chills, muscle aches and fatigue. Side effects after receipt of LAIV include cough, runny nose, nasal congestion, sore throat, and chills. Hypersensitivity to vaccine components to include egg protein is rare, but may occur.

i. DOD Policy. Influenza vaccination is mandatory for all Active Duty, Guard, and Reserve component personnel and will be administered in accordance with Service-specific guidelines and immunization regulation. In accordance with HA Policy 08-005 "Policy for Mandatory Seasonal Influenza Immunization for Civilian Health Care Personnel Who Provide Direct Patient Care in Department of Defense Military Treatment Facilities," dated April 4, 2008, requires all civilian HCP who provide direct patient care in MTFs to be immunized against seasonal influenza infection each year as a condition of employment, unless there is a documented medical or religious reason not to be immunized.

### 3. References.

a. Prevention and Control of Influenza with Vaccines: Recommendations of the Advisory Committee on Immunization Practices, United States, 2016–17 Influenza Season.

b. Multiple resources (e.g., package inserts, Vaccine Information Statements, DOD and Service-specific policies) assembled by DHA-PHD-IHB: [www.health.mil/flu](http://www.health.mil/flu).

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