INFORMATION PAPER

Military Vaccine Agency
31 July 2012

SUBJECT: Influenza Infection and Influenza Vaccines

1. Purpose. To describe influenza disease and the influenza vaccines.

2. Facts.

a. Background. Influenza (the flu) is a contagious respiratory illness caused by influenza viruses. Flu seasons are unpredictable and have the potential to impact Department of Defense (DoD) force readiness and mission. In the US influenza results in over 25 million reported cases, over 150,000 hospitalizations due to serious complications, and over 30,000 deaths annually.

b. Microbiology. Influenza viruses are divided into three genera, *Influenzavirus* A, *Influenzavirus* B, and *Influenzavirus* C based on antigenic differences in two major structural proteins. Influenza A viruses are further classified by subtype on the basis of the two main surface glycoproteins, hemagglutinin (HA) and neuraminidase (NA). Hemagglutinin is the major antigen 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 antigenic change in their two surface antigens, the HA and NA, complicates vaccination against the disease. This ongoing process of antigenic drift ensures a constantly renewed pool of susceptible hosts and the repetitive occurrence of epidemics, necessitating annual review of strains to be included in the vaccine and frequent changes in vaccine strains. The strains prevalent in laboratory samples are submitted each year. Scientists use this information to estimate which types and strains of influenza virus will circulate during the next influenza season, and then identify these strains for use in the annual influenza vaccine formulation.

c. Disease. Influenza is spread through aerosolized respiratory droplets during close contact with an infected person or animal or through contact with a contaminated object. Primary influenza illness is characterized by the abrupt start of fever, sore throat, headache, myalgia, chills, anorexia, and extreme fatigue with major symptoms lasting an average of 7 days. The presence of cough and temperature are generally the best predictors of influenza illness in adults and children during periods of influenza circulation. Fever usually ranges between 100° and 104° Fahrenheit, but may be higher and usually lasts for 3-5 days. Illness typically improves within a week, but cough and malaise may persist for 2 or more weeks. The incubation period for influenza is commonly 2 days, but ranges from 1-4 days. Due to this short incubation period,

influenza outbreaks may be explosive, especially in highly susceptible populations as can occur in a pandemic.

d. Epidemiology. In temperate climates, influenza activity occurs during the late autumn and winter months. However, in tropical climates, influenza can occur year round. Influenza B viruses have been documented to be in continuous circulation in the human population since their first isolation in 1940; whereas influenza A (H3N2) viruses have been in circulation since their emergence in 1968. During influenza seasons, an estimated 5-20% of the U.S. population can develop influenza, but 40-50% within institutions such as nursing homes is not unusual. In communities, influenza cases often appear first among school-age children. Attack rates usually are the highest in this group and lowest among the elderly whereas rates of serious disease are highest among the elderly, the very young, and those with certain underlying chronic conditions.

e. Vaccine. Two forms of influenza vaccine are distributed in the United States. An inactivated, protein derived vaccine, given by intramuscular or intradermal injection, and a live attenuated (weakened) vaccine sprayed into the nose. Both the injectable and intranasal vaccines prepared for the 2012-2013 season include A/California/07/2009 (H1N1)pdm09-like, A/Victoria/361/2011 (H3N2)-like, and B/Wisconsin/1/2010-like antigens. All influenza vaccine must be stored in a refrigerator between 2-8°C (35-46°F) upon receipt and until use before the expiration date on the vial/sprayer label.

(1) Injectable influenza vaccines contain inactivated viruses that have been broken into pieces and then purified. *Fluzone*® is indicated for immunization in persons 6 months of age and older. *Afluria*® is licensed for immunization in persons aged 5 years and older; however, the CDC's Advisory Committee on Immunization Practices (ACIP) recommends that *Afluria*® be used in persons aged 9 years and older because of increased reports of febrile reactions noted in children 6 months through 8 years.

(2) The intranasal influenza vaccine, *FluMist*®, contains live attenuated influenza viruses. *FluMist*® is indicated for healthy people 2 to 49 years of age.

(3) The influenza *Fluzone*® High-Dose is a preservative free trivalent vaccine that is approved for use in persons 65 years of age and older. *Fluzone*® High-Dose vaccines contain 4 times the amount of antigen contained in regular *Fluzone*®. The additional antigen is intended to create a stronger immune response in older persons receiving the vaccine and therefore better protection against influenza. The Department of Defense did not procure this vaccine and facilities that are in need can purchase it through the Direct Vendor Distribution (DVD) program.

(4) The influenza *Fluzone*® Intradermal vaccine was licensed during the 2011-2012 influenza season. A single-dose prefilled microinjection system is used to administer the *Fluzone*® Intradermal vaccine into the deltoid muscle region. *Fluzone*® Intradermal vaccine is approved for use in persons 18 through 64 years of age. The Department of Defense did not procure for this vaccine.

f. Immunization. CDC's ACIP states that injectable and intranasal vaccines should be used to reduce the risk for influenza virus infection and its complications. Healthy, non-pregnant persons aged 2-49 years may choose to receive either type of vaccine; however, ACIP makes specific recommendations for which vaccine are most appropriate for other populations.

g. Adverse Events. The most common serious complications of influenza include exacerbation of underlying chronic pulmonary and cardiopulmonary diseases, such as chronic obstructive pulmonary disease, asthma, and congestive heart failure, as well as development of bacterial pneumonia. Influenza vaccines should not be administered to people with sensitivities to egg proteins (eggs or egg products), chicken proteins or any component of the vaccine. Influenza vaccine should also not be administered to anyone with an active nervous system disorder or a history of Guillain-Barrẽ syndrome. Report any adverse events to the Vaccine Adverse Events Reporting System (VAERS).

h. DoD Policy. Influenza vaccination is required for military personnel. In accordance with HA Policy 08-005, military treatment facilities (MTF) are directed to require all civilian healthcare personnel (HCP) who provide direct patient care in DoD MTFs be immunized against seasonal influenza infection each year as a condition of employment, unless there is a documented medical or religious exemption. Utilize first available vaccine doses to target high priority groups, including deployed or deploying personnel, critical support staff, and high risk groups as outlined in the 2012-2013 ACIP recommendations. Administration of the live, attenuated influenza vaccine (intranasal) is encouraged in eligible new accessions and beneficiaries 2 to 49 years of age without a medical contraindication.

3. References.

a. Centers for Disease Control and Prevention. Prevention and Control of Influenza with Vaccines. Recommendations of the Advisory Committee on Immunization Practices (ACIP), 2011. MMWR 2011;60;[1128-1132].

b. Centers for Disease Control and Prevention. Prevention and Control of Influenza with Vaccines. Recommendations of the Advisory Committee on Immunization Practices (ACIP), 2010. MMWR 2010;59(No. RR-8).

c. Centers for Disease Control and Prevention. Epidemiology and Prevention of Vaccine-Preventable Diseases. Atkinson W, Wolfe S, Hamorsky J, eds. 12th ed. Washington DC: Public Health Foundation, 2012.

d. Multiple resources (e.g., product insert, Vaccine Information Statements) assembled by Military Vaccine Agency: www.vaccines.mil/influenza.

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