INFORMATION PAPER

Military Vaccine Agency
1 March 2007

SUBJECT: Tuberculosis, Tuberculin Skin Test, and BCG Vaccine

1. Purpose. To describe tuberculosis, the skin test to detect it, and the vaccine occasionally used to prevent it.

2. Facts.

a. Microbiology. Tuberculosis (TB) is a disease caused by bacteria called *Mycobacterium tuberculosis*. These bacteria usually invade the lungs, although they can be found anywhere in the body. There are two main forms of TB: latent TB infection and TB disease. People who have latent TB infection, but not TB disease, have inactive *M. tuberculosis* bacteria in their bodies. These people are not sick with TB today, but they may develop TB disease sometime in the future. People with actual TB disease are sick from *M. tuberculosis* bacteria actively reproducing in their bodies. Symptoms of TB disease include fatigue, cough, weight loss, fever, and night sweats.

b. Epidemiology. TB spreads from person to person via airborne respiratory droplets. The bacteria are transmitted when people with active TB bacteria in their lungs or larynxes cough, talk, sneeze, or sing. Prolonged, close exposure to a person with active TB is usually needed to spread the bacteria, so family, friends and coworkers are at risk.

c. Tuberculosis Screening Tests. There are two tests available to help detect if an individual has been infected with TB. The first screening test is the Mantoux tuberculin skin test. This test is performed by injecting a small amount of TB protein under the skin and observing for a skin reaction. The most recent test available is QuantiFERON®-TB Gold test. This is a blood test that measures how the individual's immune system reacts to the bacteria that causes TB. A positive skin test or QuantiFERON®-TB Gold test only tells if the individual has been exposed to TB bacteria, not whether the individual has TB disease.

d. Tuberculin skin testing. The Mantoux tuberculin skin test involves an injection of 0.1-mL of the purified protein derivative (PPD) of tuberculin (*Tubersol*, Aventis Pasteur) just under the skin (intradermally). PPD is a sterile solution of TB protein. A positive test 48 to 72 hours after injection helps to diagnose infection with *Mycobacterium tuberculosis*. PPD is not a vaccine; it is a skin-test reagent used to screen for people infected with TB bacteria. The size of the PPD skin test reaction indicates whether the person is infected. The reaction size that is defined as positive varies, depending on the patient's risk factors for TB infection. People who develop a positive PPD test generally should not receive PPD again, but should receive thorough testing for tuberculosis infection (e.g., chest x-rays). Adults previously vaccinated with an old TB vaccine product, called BCG, can be given a PPD skin test, but BCG vaccination may cause a falsely positive skin reaction to PPD. Test people who are HIV-infected for TB infection as recommended by the Advisory Council for the Elimination of Tuberculosis.

e. Cautions. Do not inject PPD subcutaneously or intramuscularly, because no local reaction would develop and the result could be falsely negative. Another potential cause of false-negative tuberculin tests occurs when cell-mediated immunity (CMI) is reduced by immune

suppression (e.g., AIDS), severe protein malnutrition, lymphoma, leukemia, or sarcoidosis. Prolonged use of corticosteroids and other immune-suppressant drugs or recent receipt of live virus vaccinations may also affect TST interpretation.

f. Adverse Events after Tuberculin Testing. Injection-site adverse reactions to PPD are rare. Blistering, ulceration, or necrosis may develop at the test site in highly sensitive people. To provide relief, apply cold packs and topical steroid preparations. Strongly positive reactions may leave a scar at the test site. Systemic reactions occur extremely rarely. These manifest as skin rashes or a generalized rash within 24 hours.

g. QuantiFERON®-TB Gold test. The QuantiFERON®-TB Gold test (Cellestis Ltd.) is a blood test used to aid in screening for latent TB infection. The test measures the level of an immune system protein (interferon-gamma) produced in response to infection by TB bacteria. The advantages of this test include: 1) single patient visit with results within 24 hours 2) is not subject to reader error 3) is not affected by previous BCG vaccination. The QuantiFERON®-TB Gold test is not recommended for use in individuals younger than 17 years of age, individuals suspected of recent exposure to TB and in immunocompromised individuals. Tuberculin skin testing remains the preferred test in these situations, as TST is less likely to give false negative results.

h. Tuberculosis Vaccine. Bacille Calmette-Guerin (BCG), a live bacterial vaccine (*Tice BCG*, Organon Teknika) made from a weakened strain of *Mycobacterium bovis*, is used in many developing countries, where TB is very common, to reduce severe complications of TB in infants and children. The effectiveness of the vaccine varies in adults and it is not normally recommended for use in the United States.

i. Immunization. BCG vaccination to prevent TB is reserved for people who meet specific criteria. BCG vaccination considered for a child continuously exposed to an ineffectively treated patient infected with *M. tuberculosis*. BCG vaccination is not recommended for children infected with HIV. Consider BCG vaccination of healthcare workers who care for TB patients infected with *M. tuberculosis* strains resistant to isoniazid and rifampin and where transmission to the healthcare workers is likely. Also, consider vaccination of healthcare workers where comprehensive TB infection-control precautions have been implemented but have not proven successful. BCG vaccination is not recommended for healthcare workers who are infected with HIV or who are otherwise immune compromised.

j. DoD Policy. See service-specific policies and directives.

k. Special Considerations. People who travel and come in contact on a regular basis with those in hospitals, prisons, or homeless shelters should have a TST before leaving the United States and upon return. Immune-compromised people (e.g., those with AIDS) may have a reduced response to PPD; therefore, immune-compromised travelers should advise their physicians of their health status.

3. References.

a. CDC. Progressing toward tuberculosis elimination in low-incidence areas of the United States: Recommendations of the Advisory Council for the Elimination of Tuberculosis. *MMWR* 2002;51(RR-5):1-14. www.cdc.gov/mmwr/PDF/RR/RR5105.pdf

b. Advisory Committee on Immunization Practices, Advisory Council for the Elimination of Tuberculosis. The role of BCG vaccine in the prevention and control of tuberculosis in the United States. *MMWR* 1996;45(RR-4):1-18. http://ftp.cdc.gov/pub/Publications/mmwr/rr/rr4504.pdf

c. CDC disease information. www.cdc.gov/nchstp/tb/faqs/qa.htm

d. American Thoracic Society, CDC, Infectious Diseases Society of America. Treatment of tuberculosis. *MMWR* 2003; 52(Jun 20) (RR-11). www.cdc.gov/mmwr/PDF/RR/RR5211.pdf

e. Deployment Health Clinical Center, TB resources. www.deploymenthealth.mil/tuberculosis.asp

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

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