

INFORMATION PAPER

DHA-IHB

5 October 2015

SUBJECT: Typhoid Fever and Typhoid Vaccines

1. Purpose. To describe typhoid fever and the vaccines to prevent it

2. Facts.

a. Background. Typhoid fever is caused by *Salmonella enterica* serotype Typhi (*S. typhi*). These highly infectious bacteria rapidly and effectively pass through the intestinal tract of the human host, and can be transmitted to other people through the fecal-oral route. Infection may result in bacteremia and acute febrile illness. In cases where the bacteria invade the gall bladder, a patient can become a chronic carrier of typhoid bacteria. Vaccination is indicated for international travelers who may visit regions with higher risk for typhoid transmission.

b. Disease. Incubation is 6-30 days. Infection may result in a wide range of symptoms with varying clinical severity. Symptoms include a high fever, myalgia, anorexia, abdominal discomfort, loss of appetite, diarrhea or constipation, and headaches. The fever gradually rises over a period of days and then generally remains at 102° to 104°F. A flat, skin rash described as “rose spots” may appear in some cases. Severe complications of typhoid fever may include intestinal perforation, hemorrhage, and even death.

c. Epidemiology. Humans are the sole reservoir for *S. typhi*. People with typhoid fever carry the bacteria in their bloodstreams and intestinal tracts. The infection is spread when people ingest food or water that has been contaminated with fecal matter. It can also spread via contaminated sewage that enters water sources used for drinking or washing food. Typhoid fever is still endemic in many developing countries with inadequate sanitation and drinking water quality, where it is mainly a disease of school-age children. About 2% to 4% of acute typhoid cases result in the chronic-carrier state. Symptomless carriers are the natural reservoir for *S. typhi*. There are approximately 400 cases of typhoid fever reported annually in the United States, most acquired during foreign travel.

d. Vaccines.

1) Typhim Vi® (ViCPS) is an inactivated polysaccharide vaccine produced by Sanofi Pasteur. The vaccine is a sterile solution containing the cell surface Vi polysaccharide extracted from the *S. typhi* Ty2 strain. Phenol, 0.25%, is added as a preservative.

2) Vivotif® (Ty21a) is a live attenuated oral vaccine produced by Crucell Switzerland LTD. The vaccine strain is lyophilized and filled into gelatin capsules which are coated to render them resistant to dissolution in stomach acid. This vaccine contains no preservatives; each capsule contains sucrose, ascorbic acid, amino acid mixture, lactose, and magnesium stearate.

e. Precautions. People with a history of serious allergic reaction to typhoid vaccine, or who have any hypersensitivity to any component of the vaccine, should not receive vaccine. No information is available on the safety of typhoid vaccine in pregnancy; it is prudent on theoretical grounds to avoid vaccinating pregnant women. Live attenuated Ty21a vaccine should not be given to immunocompromised travelers, including those infected with HIV; the inactivated injectable vaccine presents a theoretically safer alternative for this group. When administering the oral vaccine, individuals with an acute fever or gastrointestinal illness, or those currently receiving antibiotics should be temporarily exempted until symptoms resolve and >72 hours have elapsed since the last dose of antibiotics.

f. Immunization.

1) Typhim Vi (ViCPS) vaccine is licensed for persons 2 years of age and older. It is administered as a single 0.5 mL intramuscular injection. Revaccination is recommended every two years for persons who have prolonged exposure to potentially contaminated food and water.

2) Vivotif (Ty21a) vaccine is licensed for persons 6 years of age and older. The vaccine consists of four (4) enteric-coated capsules supplied in a foil blister package. One (1) capsule is taken every other day on days 1, 3, 5, and 7. The capsules should be taken on an empty stomach, at least one hour before and two hours after a meal, with a cold or lukewarm drink. Care should be taken not to chew or break open the vaccine capsule. Revaccination is recommended every five years for persons who have prolonged exposure to potentially contaminated food and water.

g. Adverse Events. The most common adverse reactions to injectable typhoid vaccination are redness, swelling, and discomfort at the injection site. Nausea, skin rash, headaches, or a mild fever may occur. Potential adverse reactions to oral typhoid vaccination include abdominal discomfort, nausea, vomiting, diarrhea, fever, rash or headache.

h. DoD Policy. Vaccination is required for personnel who will deploy to typhoid-endemic areas and other areas with poor water sanitation. Typhoid immunization is generally required for members of units designated to be ready to deploy outside of the U.S. within 10 days of notification.

i. Special Considerations. The typhoid vaccines do not protect against *S. paratyphi* infection. Both typhoid vaccines protect 50%–80% of recipients; travelers should be

reminded that typhoid immunization is not 100% effective, and typhoid fever could still occur after ingestion of contaminated food or water. Vaccinated individuals should continue to take personal precautions against exposure to typhoid organisms and should be cautioned that vaccination is not a substitute for careful selection of food and drink.

3. References.

a. Centers for Disease Control and Prevention. Updated recommendations for the use of typhoid vaccine – Advisory Committee on Immunization Practices (ACIP), United States, 2015. MMWR 2015;64(11):305-8.

b. Centers for Disease Control and Prevention. CDC Health Information for International Travel 2014. New York: Oxford University Press; 2014.
<http://wwwnc.cdc.gov/travel/page/yellowbook-home>

c. Multiple resources (including product insert, Vaccine Information Statements) assembled by the Defense Health Agency Immunization Healthcare Branch:
www.health.mil/typhoid

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