**Typhoid Fever**

**Traveler Summary**

**Key Points**
- Typhoid fever and paratyphoid fever are bacterial infections acquired from ingesting food or liquids contaminated by the feces of an infected person.
- Risk is related to overall food hygiene and is highest in travelers visiting friends and relatives and those going to remote areas of Asia, especially India, Nepal, Pakistan, and Bangladesh.
- Symptoms include prolonged, steady high fever, fatigue, headache, muscle aches, and loss of appetite, which may be preceded by diarrhea.
- Consequences of untreated infection include gastrointestinal bleeding or intestinal perforation.
- Prevention includes observing standard food and beverage precautions.
- Injectable typhoid vaccine requires a single dose. Oral typhoid vaccine is given in 4 doses (1 dose every other day).
- Injectable vaccine side effects are redness and tenderness at injection site. Oral vaccine side effects are nausea, abdominal pain and cramps, vomiting, fever, headache, and rash or hives.
- Duration of vaccine protection is 2 to 3 years for the injectable vaccine and 5 years for the oral vaccine. Revaccination is recommended at 2 to 3 years and 5 years, respectively.

**Introduction**

Typhoid fever and paratyphoid fever are infections known as enteric fevers caused by bacteria. Typhoid fever and paratyphoid fever occur worldwide, mainly in countries with a poor standard of hygiene. Paratyphoid fever is clinically indistinguishable from typhoid fever. The bacteria that cause paratyphoid fever are responsible for a growing proportion of enteric fever cases in many countries, accounting for as many as half of the cases in travelers. Fatality rates in persons with untreated typhoid fever can be as high as 20%. The overall case fatality rate with early and appropriate antibiotic treatment is typically less than 1%.

**Risk Areas**

Prevalence is highest in countries with warm climates and less-developed sanitary facilities for sewage disposal and water treatment. Risk is highest in travelers going to southern Asia (India, Pakistan, Bangladesh, and Nepal), where rates may reach 24 per 100,000 travelers, especially for those visiting friends and relatives and those going to remote areas of these countries. Other risk areas include East and Southeast Asia, sub-Saharan Africa, Caribbean, Central and South America, and Middle East.

In the U.S., an average of about 300 confirmed cases of typhoid fever and 100 cases of paratyphoid fever are reported annually. Approximately 90% of U.S. cases occur among persons returning from foreign travel; of these, more than 75% had traveled in India, Bangladesh, or Pakistan.

**Transmission**

Transmission is predominantly via the fecal-oral route. Typhoid bacteria are excreted in feces and urine. Infection is most commonly acquired from ingesting liquids or food contaminated by the feces of an infected person. Persons with acute typhoid fever are infectious, but the main sources of infection in the community are convalescent patients and carriers with chronic asymptomatic infection of the gallbladder, who are infectious for weeks or years, respectively. Typhoid and paratyphoid bacteria only colonize in humans.

**Risk Factors**

Current risk in travelers is estimated to be intermediate (1-10 per 100,000 travelers per month of travel). Eating or drinking contaminated food or water is the main risk factor for infection. Risk is related to overall food hygiene anywhere in the developing world. In any endemic country, even the most hygienic restaurant could be risky because of a healthy, silent
typhoid carrier.
The risk of acquiring clinical disease following infection varies with the number of organisms ingested and the state of appropriate gastric acid secretion. Stomach acid is the body’s first line of defense against the bacteria, and reduced stomach acid from taking medicines (such as antacids) increases the risk of infection.

**Symptoms**
Symptoms appear about 21 days following exposure and include prolonged, steady high fever, fatigue, headache, muscle aches, loss of appetite, and a rash appearing on the trunk, which may be preceded by diarrhea. Typhoid fever and paratyphoid fever have the same symptoms, but typhoid fever may be more dangerous.

Symptoms of typhoid fever can be confused with malaria.

**Consequences of Infection**
Consequences of untreated infection include gastrointestinal bleeding or intestinal perforation.

**Need for Medical Assistance**
Any traveler who develops fever upon return from the tropics should seek medical assistance. Gradual onset of prolonged fever with malaise and abdominal symptoms is suggestive of enteric fever.

**Prevention**

**Non-vaccine:** Food and beverage precautions should be observed regardless of vaccination status. See Food and Beverage Precautions.

**Vaccine:** Two moderately effective vaccines (60%–70% protection) are available for typhoid fever but not for paratyphoid fever. Neither of the 2 typhoid vaccines (injectable or oral) that are available in the U.S. are approved for the prevention of paratyphoid fever, but the oral typhoid vaccine might offer some protection against 1 strain of paratyphoid bacteria. Protection may last longer with the oral vaccine.

Persons with underlying medical conditions or who have concerns about the vaccine should speak to their health care provider before vaccine administration.

*Side Effects:*

**Injectable vaccine:** The most common side effects are redness and tenderness at the injection site. Occasionally, fever, headache, influenza-like episodes, abdominal pain, vomiting, and diarrhea occur.

**Oral vaccine:** Side effects include nausea, abdominal pain and cramps, vomiting, fever, headache, and rash or hives.

**Timing:**
Vaccination should be completed at least 2 weeks before arriving at a high-risk area.

**Oral vaccine**
Persons aged ≥ 6 years: 4 oral doses; 1 capsule taken by mouth every other day (days 0, 2, 4, and 6). Each dose should be taken 1 hour before or 2 hours after a meal with cool or lukewarm water (no warmer than body temperature) and should not be taken with milk or alcohol. Capsules must be kept refrigerated. Revaccination is recommended in 5 years if exposure is repeated or continuous.

Oral typhoid vaccine can be given at the same time as chloroquine, mefloquine, Malarone (atovaquone-proguanil), or pyrimethamine/sulfadoxine, when the antimalarial is given at doses used for prophylaxis. A 24-hour interval between receiving oral typhoid and beginning doxycycline is advised.

Oral typhoid vaccine should not be administered to persons receiving antibiotics until 72 hours after the last dose of antibiotic. If feasible, to avoid a possible reduction in vaccine effectiveness, antibiotic drugs should not be started or resumed until 1 week after the last dose of oral typhoid vaccine.

**Injectable vaccine**
Persons aged ≥ 2 years: A single intramuscular injection. Revaccination is recommended in 2 to 3 years if exposure is