PUBLIC HEALTH REFERENCE SHEET
Typhoid fever

Name	*Salmonella enterica* serotype Typhi *(S. Typhi)* EXCLUDES: All other *Salmonellas* including *Salmonella Typhimurium* See Salmonella reference sheet
Reservoir & Transmission	Humans Transmitted through ingestion of food and water contaminated by feces or urine of patients and carriers
Incubation Period	6–30 days
Common Symptoms	Insidious onset of sustained fever, headache, malaise, anorexia, slow heart rate, constipation or diarrhea, and nonproductive cough However, many mild and atypical infections occur. Carriage of *S. Typhi* may be prolonged.
Gold Standard Diagnostic Test	Blood culture
Risk Groups	Risk is very low in the United States, higher among international travelers, and highest among people living in places with poor sanitation and hygiene.
Geographic Significance	Africa, Latin America, and Asia Most typhoid fever patients in the United States report international travel in the 30 days before their illness; most of these patients traveled to South Asia (e.g., India, Bangladesh, Pakistan).

What is typhoid fever?
Typhoid fever is a systemic bacterial disease caused by the bacterium *Salmonella enterica* serotypes Typhi (*S. Typhi*).

What is the occurrence of typhoid fever?
An estimated 11 to 21 million cases of typhoid fever occur worldwide each year, causing an estimated 135,000–230,000 deaths. An estimated 5,700 infections of *S. Typhi* occur among people in the United States each year; an estimated 620 of these people are hospitalized. Approximately 85% of typhoid fever cases in the United States occur among international travelers; most cases are in travelers returning from South Asia, primarily Bangladesh, India, and Pakistan. Other high-risk regions for infection include Africa, Latin America, and Southeast Asia; lower-risk regions include East Asia and the Caribbean.

How is typhoid fever transmitted?
Humans are the only source of the bacteria that cause typhoid fever; no animal or environmental reservoirs have been identified. Typhoid is acquired through consumption of water or food contaminated by feces of an acutely infected or convalescent person, or a person with chronic, asymptomatic carriage. Sexual contact, particularly among men who have sex with men, has been documented as a rare route of transmission.

Who is at risk for typhoid fever?
Risk for infection is high in low- and middle-income countries with endemic disease, poor access to safe food and water, and poor sanitation. Travelers visiting friends and relatives in endemic regions are at increased risk because they might be less careful with food and water while abroad than other travelers, and they might not seek pretravel health consultation or typhoid vaccination. Although the risk of acquiring illness increases with the duration of stay,

travelers have acquired typhoid fever even during visits of <1 week to countries where the disease is highly endemic (e.g., Bangladesh, India, Pakistan).

What are the signs and symptoms of typhoid fever?

The incubation period of typhoid infections is typically 6–30 days but may range more widely depending on exposure and/or individual factors. The onset of illness is insidious, with gradually increasing fatigue and a fever that increases daily from low-grade to 102°F–104°F (38°C–40°C) by the third or fourth day of illness. Fever is commonly lowest in the morning, peaking in the late afternoon or evening. Anorexia, headache, and malaise are nearly universal, and abdominal pain, constipation, or diarrhea are common. Diarrhea and vomiting are more common in children than in adults. People also can have dry cough, fatigue, myalgias, and sore throat. Hepatosplenomegaly often can be detected. A transient, maculopapular rash of rose-colored spots can occasionally be seen on the trunk.

The clinical presentation is often confused with malaria. Typhoid fever is suspected in a person with a history of travel to an endemic area who is not responding to antimalarial medication. Untreated, the disease can last for a month, and reported case-fatality ratios are 10%–30%. By comparison, the case-fatality ratio in patients treated early is usually <1%. Serious complications of typhoid fever occur in 10%–15% of hospitalized patients, generally after 2–3 weeks of illness, and include life-threatening gastrointestinal hemorrhage, intestinal perforation, and encephalopathy.

How is typhoid fever diagnosed?

Poor sensitivity and specificity of rapid antibody tests and the time it takes to obtain a positive culture suggest that the initial diagnosis must often be made clinically. The combination of risk factors for infection and gradual onset of fever that increases in severity over several days should raise suspicion of typhoid fever.

Patients with typhoid fever typically have bacteremia; therefore, blood culture is the preferred method of diagnosis. Bone marrow cultures have sensitivity of 80% in some studies and can remain positive despite antibiotic therapy. Multiple cultures are usually needed to identify the pathogen. Stool culture is not usually positive during the first week of illness and has less diagnostic sensitivity than blood culture. Urine culture has a lower diagnostic yield than stool culture. Rapid diagnostics tests, such as the Widal test, are not recommended because of the high rate of false positives; however, it is widely used in developing countries because of its low cost.

How is typhoid fever treated?

- Typhoid fever is treated with antibiotics. Antibiotic therapy shortens the clinical course of typhoid fever and reduces the risk for death.
- Reduced susceptibility to fluoroquinolones (e.g., ciprofloxacin) and the emergence of multidrug resistance has complicated treatment of infections, especially those acquired in South Asia.
- If fever in a person with typhoid infection does not subside within 5 days of initiating antibiotic therapy, consider treatment with alternative antibiotics or begin looking for a persistent focus of infection (e.g., an abscess, bone, joint, or other extraintestinal site).
- Relapse, reinfection, and chronic carriage also can occur. Relapse occurs in ≤10% of patients 1–3 weeks after clinical recovery, requiring further antibiotic treatment. An estimated 1%–4% of treated patients become asymptomatic chronic carriers (defined as

people who excrete the organism in stool for ≥12 months); a prolonged antibiotic course is usually required to eradicate the organism.

How can typhoid fever be prevented?

- Safe food and water precautions and frequent handwashing, especially before meals, are important in preventing typhoid fever, regardless of typhoid vaccination status. Deployed Service members should eat food and consume water from approved sources only. See CDC's recommendations on food and water precautions for travelers at https://wwwnc.cdc.gov/travel/yellowbook/2024/preparing/food-and-water-precautions.
- Two typhoid vaccines are licensed for use in the United States: Vi capsular polysaccharide vaccine (ViCPS) (Typhim Vi, manufactured by Sanofi Pasteur) for intramuscular use; and live attenuated vaccine (Vivotif, manufactured from the Ty21a strain of serotype Typhi by PaxVax) for oral use. Both vaccines are unconjugated, which means the polysaccharide antigens are not paired with a protein to elicit a strong response from the immune system. Because these vaccines protect 50%–80% of recipients, remind travelers that typhoid immunization is not 100% effective, and take the opportunity to reinforce safe food and water precautions. The oral typhoid vaccine (live, attenuated) is licensed for persons 6 years of age and older as a four-dose course, and should be completed at 1 week before travel/deployment to typhoid endemic area. Revaccination is recommended every 5 years for persons who remain at risk for exposure to typhoid. The oral typhoid vaccine should be given to pregnant women only, if clearly needed. The oral typhoid vaccine should not be given to immunocompromised travelers, including those infected with HIV. The injectable typhoid vaccine (inactivated) is licensed for persons 2 years of age and older and should be completed 2 weeks before travel/deployment. Revaccination is recommended every 2 years for persons who remain at risk for exposure to typhoid.
- Recovery from typhoid fever does not provide reliable immunity from future infections.

What are some Public Health considerations?

- Typhoid fever is a communicable disease that must be reported through military and civilian public health channels, such as the supporting county and/or State health department and reported through Disease Reporting System internet (DRSi).
- When reporting cases of typhoid fever in the DRSi, document relevant travel and deployment history occurring within the incubation period and note the patient's typhoid immunization history.
- Epidemic measures: Search intensively for the case/carrier who is the source of infection, and for the vehicle (water or food) through which infection was transmitted. Selectively eliminate suspected contaminated food. Pasteurize or boil milk or exclude milk supplies and other foods suspected on epidemiological evidence until safety is ensured. Chlorinate suspected water supplies adequately under competent supervision or avoid use. All drinking water must be chlorinated, treated with iodine, or boiled before use. Preemptive vaccination before seasonal outbreaks or in areas at risk of an outbreak may be considered.
- Disaster implications: With disruption of usual water supply and sewage disposal and of controls on food and water, transmission and large-scale outbreaks of typhoid fever may occur if there are active cases or carriers in a displaced population. Efforts should be made to restore safe drinking-water supplies and excreta disposal facilities. Selective immunization of stabilized groups, such as schoolchildren, prisoners, and utility, municipal, or hospital personnel, may be helpful.

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