

Typhoid Fever (*Salmonella Typhi* infection)

Summary

Salmonella Typhi causes a protracted bacteremic illness referred to as typhoid fever. Since humans are the only reservoir for *S. Typhi*, infection is most often acquired through ingestion of food or water contaminated by feces and urine of infected persons and chronic carriers. Typhoid fever is characterized by the gradual onset of fever, headache, malaise, anorexia, abdominal pain, hepatosplenomegaly, rose spots, and changes in mental status. Laboratory diagnosis can be made by culture of stool, urine, or blood. Antimicrobial therapy is indicated for patients with typhoid fever. Typhoid fever cases should be excluded from food handling, and from direct care of infants, elderly, immunocompromised, and hospitalized or institutionalized patients. An individual may return to normal duties after 3 consecutive negative stool or urine cultures taken at least one month apart, and at least 48 hours after completion of antibiotic therapy.

Agent

- Typhoid fever is caused by *Salmonella Typhi*, a gram-negative bacillus.

Transmission

- **Reservoir:** Humans are the primary reservoir for *S. Typhi*.
- **Mode of Transmission:** Infection is acquired through ingestion of food or water contaminated by feces and urine of infected persons and chronic carriers. In some circumstances, other vehicles of transmission include ingestion of shellfish taken from sewage contaminated beds, unwashed raw fruits or vegetables fertilized by night soil, or milk contaminated by carriers. Most U.S. cases are infected during international travel.
- **Period of Communicability:** The period of communicability is as long as the organism appears in excreta (i.e., stool or urine), ranging from the first week of illness throughout convalescence. About 10% of untreated patients will excrete the organism for 3 months after the onset of signs and symptoms, and 2% to 5% become permanent gallbladder carriers. A chronic carrier state is most common in persons infected during middle age or in persons with underlying biliary tract abnormalities such as gallstones.

Clinical Disease

- **Incubation period:** Usually 7 to 14 days, with a range of 3 to 60 days.
- **Illness:** Typhoid fever is characterized by the gradual onset of fever, headache, malaise, anorexia, abdominal pain, and changes in mental status. Constipation

may be an early feature. Physical exam may show hepatosplenomegaly or rose spots on the trunk. Sustained or intermittent bacteremia can occur.

Laboratory Diagnosis

- The organism can be isolated in blood culture early in the disease, and from urine and feces after the first week of illness. Stool samples should be submitted in enteric pathogen transport media. Fresh stool specimens are preferred over rectal swabs.
- Serologic tests (e.g., Widal test) are not recommended.

Treatment

- Antimicrobial therapy is indicated for patients with typhoid fever. Appropriate antimicrobial therapy includes ampicillin, cefotaxime, chloramphenicol, Trimethoprim-Sulfamethoxazole (TMP-SMX), or a fluoroquinolone, depending on the susceptibility of the organism. Relapse is common after completion of therapy; retreatment is indicated.
- Treatment decisions should be made in conjunction with the patient's health care provider.

Surveillance

- **Case Definition:**
Laboratory criteria – Isolation of *S. Typhi* from a clinical specimen.
Confirmed – A clinically compatible case that is laboratory confirmed.
Probable – A clinically compatible case that is epidemiologically linked to a confirmed case in an outbreak.
- **Reporting:** **Report all suspected or confirmed cases of *S. Typhi* infection immediately to the Epidemiology and Response Division (ERD) at 505-827-0006.** Information needed includes: patient's name, age, sex, race, ethnicity, home address, home phone number, occupation and health care provider.
- **Case Investigation:** Complete the Foodborne Surveillance Investigation Form and the CDC Typhoid Fever Investigation Form. Send the later to Epidemiology and Response Division, P.O. Box 26110, Santa Fe, New Mexico 87501-6110, or fax to 505-827-0013. Investigation information should also be entered into NM-EDSS per established procedures.

Control Measures

For a summary of work and daycare exclusion criteria for all enteric pathogens see Appendix 1.

1. **Case management**

- 1.1. Isolation: Exclude symptomatic persons AND asymptomatic chronic carriers from food handling, and from direct care of infants, elderly, immunocompromised, and hospitalized or institutionalized patients. The person may be allowed to resume his/her usual duties when:
 - Diarrhea has resolved; AND
 - There are 3 consecutive negative stool or urine cultures taken at least one month apart, and at least 48 hours after completion of antibiotic therapy. The first culture should be taken no earlier than 1 month after symptom onset. If any culture is positive, repeat cultures at intervals of 1 month during the 12 months following onset until at least 3 consecutive negative cultures are obtained.
 - 1.1.a For hospitalized patients, contact precautions should be used.
- 1.2. Prophylaxis: Not applicable.
2. Contact management
 - 2.1. Isolation: Household or close contacts who are involved in food handling or direct care of infants, elderly, immunocompromised, and hospitalized or institutionalized patients should be excluded from their duties until at least 2 negative stool or urine cultures, taken at least 24 hours apart, are obtained.
 - 2.2. Prophylaxis: Not applicable.
3. Prevention
 - 3.1. Emphasize good hand hygiene practices (i.e., proper handwashing after using the toilet, changing diapers, and before and after handling food).
 - 3.2. General guidelines for preventing foodborne illness include:
 - Thoroughly cook raw food from animal sources.
 - Wash raw vegetables.
 - Avoid unpasteurized dairy products.
 - Wash hands, knives, and cutting boards after handling uncooked foods.
 - 3.3. Immunization: Vaccination against typhoid is available, but recommended only for a) travelers to typhoid-endemic areas such as Latin America, Asia and Africa; b) persons with prolonged intimate exposure to a typhoid carrier; c) laboratory workers with frequent contact with *S. Typhi*; d) persons living in typhoid-endemic areas outside the U.S.

Managing Typhoid Fever in Child Care Centers

1. Management of isolated cases
 - 1.1. When a case of typhoid fever occurs among a child care center attendee or staff member, stool specimens from other attendees and staff members should be cultured. All infected persons should be excluded until there are 3 consecutive negative stool cultures taken at least one month apart, and at least 48 hours after completion of antibiotic therapy. The first culture should be taken no earlier than 1 month after symptom onset. If any culture is positive, repeat cultures at intervals of 1 month during the 12 months following onset until at least 3 consecutive negative cultures are obtained. Antimicrobial treatment should be administered to infected persons.

1.2. The child care center should review its infection control protocols with staff, and emphasize the following:

- Standard precautions should be followed. Strict handwashing routines for staff and children, and routines for handling fecally contaminated materials.
- Frequently mouthed objects should be cleaned and sanitized daily. Items should be washed with dishwashing detergent and water, then rinsed in freshly prepared (daily) household bleach solution (dilute 1 cup bleach in 9 cups of water).
- Food-handling and diaper changing areas should be physically separated and cleaned daily.
- Diaper changing surfaces should be nonporous and cleaned with a freshly prepared (daily) household bleach solution (dilute 1 cup bleach in 9 cups of water). Cleaning of diaper changing surfaces after each use is required; diapers should be disposed of properly. If available, nonporous gloves should be worn when changing diapers.
- Animals in the child care center with diarrhea should be isolated from children and taken to a veterinarian for diagnosis and treatment.

2. Outbreak

2.1. Outbreaks of *S. Typhi* infection in child care centers are uncommon. If an outbreak of typhoid fever (i.e., 2 or more cases) is suspected in a child care facility, the Epidemiology and Response Division should be notified immediately at 505-827-0006.

References

American Academy of Pediatrics. Pickering LK, ed. 2006 Red Book: Report of the Committee on Infectious Diseases. 27th ed. Elk Grove Village, IL: American Academy of Pediatrics; 2006.

Heymann, DL, ed. Control of Communicable Diseases Manual. 18th edition. Washington, DC: American Public Health Association; 2004.

For a summary of the clinical characteristics of common enteric pathogens, see Appendix 1.