Typhoid and Paratyphoid Fevers
(Salmonella typhi, paratyphi A and paratyphi B)

Summary

Salmonella typhi, *Salmonella paratyphi* A, and *Salmonella paratyphi* B cause protracted bacteremic illnesses referred to collectively as enteric fevers or individually as typhoid fever or paratyphoid fever. Since humans are the only reservoir for these three species of *Salmonella,* infection is most often acquired through ingestion of food or water contaminated by feces and urine of infected persons and chronic carriers. Both typhoid and paratyphoid fever are 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 both typhoid fever and paratyphoid fever. Enteric 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 obtained at least 24 hours apart, at least 48 hours after completion of antibiotic therapy, and no earlier than one month after symptom onset.

Agent

These enteric fevers are caused by different serotypes of *Salmonella:* Typhi, Paratyphi A and Paratyphi B, which are gram-negative bacilli.

Transmission

Reservoir**:**

Humans are the primary reservoir for *S. typhi*, S. *paratyphi* A, and *S*. *paratyphi* B.

Mode of transmission:

- Infection is acquired through ingestion of food or water contaminated by feces and urine of infected persons and chronic carriers (most often due to chronic infection of gall bladder). 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 three 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:

S.typhi: Usually 7-14 days, with a range of 3-60 days. *S. paratyphi*: 1-10 days.

Illness:

Enteric fevers are 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

Since *S. typhi* may be absent from stool and urine, in addition to the stool and urine, culture specimens should be obtained from blood, bone marrow or bile (collected from a bile-stained duodenal string) for culture and identification. Serologic tests (e.g., Widal test) are not recommended.

Treatment

Antimicrobial therapy for 10-14 days is indicated for patients with typhoid or paratyphoid fever. Fluoroquinolones are the drug of choice for adults, but other appropriate antimicrobial therapy includes amoxicillin, chloramphenicol, trimethoprim-sulfamethoxazole (TMP-SMX), or azithromycin, depending on the susceptibility of the organism. Relapse is common after completion of therapy. Retreatment may be indicated. The chronic carrier state may be eliminated by 4 weeks of oral therapy with antimicrobial agents that are highly concentrated in the bile. Treatment decisions should be made in conjunction with the patient's health care provider.

Surveillance

Case Definition:

Laboratory criteria – Isolation of *S. typhi*, S. *paratyphi* A, or *S. paratyphi* B 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 any of the three typhoid fevers 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 87502-6110, or fax to 505-827-0013. Investigation information should also be entered into NM-EDSS per established procedures.

Control Measures

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:

- 3 months has passed since report of disease; or
- Diarrhea has resolved; **and**
- There are three consecutive negative stool or urine cultures taken at least 24 hours apart and at least 48 hours after completion of antibiotic therapy. The first culture should be taken no earlier than one month after symptom onset. If any culture is positive, repeat cultures at intervals of one month during the 12 months following onset until at least three consecutive negative cultures are obtained, or the patient has medical documentation from a health practitioner that states the food employee or care giver is free from *S. typhi.*

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 two negative stool or urine cultures, taken at least 24 hours apart, are obtained. Prophylaxis is not applicable in this case.

2.2. If the index case traveled oversees, all oversees travel companions of the index case should submit stools samples. Travel companions with positive stools should be treated with antibiotics such as ciprofloxacin and monitored for development of symptoms.

2.3. Asymptomatic contacts of domestic travel do not require stool or urine culture.

3. Prevention

3.1. With a known carrier, household members should, practice meticulous hand hygiene. (i.e., proper hand washing after using the toilet, changing diapers, and before and after handling food).

3.2. Exclude contacts that handle food from highly susceptible populations.

3.3. International travelers should avoid prolonged exposure to potentially contaminated food and water in endemic areas (e.g. Indian subcontinent, Asia, Latin America, Middle East and Africa).

3.4. 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 or paratyphoid carrier; c) laboratory workers with frequent contact with *S.* typhi; d) persons living in typhoid-endemic areas outside the U.S.

Managing Enteric (Typhoid and Paratyphoid) Fever in Childcare Centers

1. Management of isolated cases

1.1. When a case of enteric fever occurs among a childcare center attendee or staff member, call the Epidemiology and Response Division (ERD) for consultation. Stool specimens

from other attendees and staff members should be cultured. All infected persons should be excluded until there are three 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 one month after symptom onset. If any culture is positive, repeat cultures at intervals of one month during the 12 months following onset until at least three consecutive negative cultures are obtained. Antimicrobial treatment should be administered to infected persons.

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

1.2.a Standard precautions should be followed. Strict hand hygiene routines for staff and children, and routines for handling fecally contaminated materials.

1.2.b 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 one cup bleach in nine cups of water).

1.2.c Food-handling and diaper-changing areas should be physically separated and cleaned daily.

1.2.d 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.

1.2.e Ideally institute and maintain a system of stool monitoring (i.e., diaper logs) for all infants and children who are not toilet trained. Diaper logs are not required by regulation but are recommended whenever a day care attendee is diagnosed with an enteric pathogen. At a minimum, diaper logs should document the quality (e.g., formed, loose, watery, blood present, mucus present) and time of each diaper change. The log should be reviewed each day with the center director, or their designated personnel, and personnel from NMDOH who are being consulted and/or investigating individual cases, clusters, or outbreaks at the center. The purpose of the log is to assist in the identification of potential new cases, to prioritize testing recommendations, and assist in determining if exclusion of the infant or child is necessary until infection can be ruled out.

1.2.f Animals in the childcare 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 childcare centers are uncommon. If an outbreak of typhoid or paratyphoid fever (i.e., two or more cases) is suspected in a childcare facility, ERD should be notified immediately at 505-827-0006.

References

American Academy of Pediatrics. In: Kimberlin, DW, et al eds. Red Book: 2021-2022 Report of the Committee on Infectious Diseases. 32nd ed. Itasca, IL: American Academy of Pediatrics; 2021.

Heymann, DL, ed. Control of Communicable Diseases Manual. 21st edition. Washington, DC: American Public Health Association; 2022.

See Typhoid Fever Fact Sheets (English) (Spanish).