

## Typhoid and Paratyphoid Fevers (*Salmonella* Typhi, Paratyphi A B, and C)

### Summary

*Salmonella* Typhi, *S. Paratyphi* A, *S. Paratyphi* B, and *S. Paratyphi* C cause protracted bacteremic illnesses referred to collectively as enteric fevers or individually as typhoid 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/or urine of infected persons and chronic carriers. Although cases are rare in the US, infections are endemic in resource-limited countries.

Both typhoid and paratyphoid fever are characterized by the gradual onset of fever, headache, malaise, anorexia, lethargy, cough, abdominal pain, hepatosplenomegaly, “rose spot” rash (visible in approximately 30% of patients), dactylitis, and changes in mental status. Laboratory diagnosis can be made by culture of stool, urine, blood, or other foci of infection. Since many enteric fever patients are bacteremic, blood is the most common specimen source, but may require multiple cultures. 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

Enteric fevers are caused by different serotypes of *Salmonella*: Typhi, Paratyphi A Paratyphi B, and Paratyphi C, all of which are gram-negative bacilli in the order *Enterobacterales*.

### Transmission

#### Reservoir:

Humans are the primary reservoir for *S. Typhi* and *S. Paratyphi* A, B, and C. Most US cases are associated with international travel to endemic areas.

#### Mode of Transmission:

Infection is acquired through ingestion of food or water contaminated by feces and/or 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 feces, or milk contaminated by carriers. Person-to-person transmission can also occur through certain types of sexual contact (e.g., oral-anal contact). 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 with underlying biliary tract abnormalities such as gallstones. Chronic carriage in children is less common.

### 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, lethargy, anorexia, abdominal pain, cough, and changes in mental status. Either constipation or diarrhea may be an early feature. Physical exam may show hepatosplenomegaly, dactylitis, or a “rose spot” rash on the trunk. Sustained or intermittent bacteremia can occur.

Severe cases may have complications including encephalopathy, shock, gastrointestinal bleeding, or intestinal perforation.

### Laboratory Diagnosis

*Salmonella Typhi* or *Paratyphi* can be isolated from blood (positive in approximately 60% of cases), stool (positive in approximately 30% of cases), urine, or other foci of infection. Since *S. Typhi* can be absent from stool and urine, culture specimens may be obtained from blood, bone marrow or bile (collected from a bile-stained duodenal string) for culture and identification, depending on the patient’s clinical course. Multiple cultures may be needed to isolate the pathogen.

Serologic tests (e.g., Widal test) are not recommended to diagnose acute typhoid fevers. Isolation of the bacterium is important for determining appropriate antimicrobial therapy, as drug nonsusceptibility is increasingly common among *S. Typhi* cases.

Treatment: Antimicrobial therapy is indicated for patients with typhoid or paratyphoid fever. Drug choice, route of administration, and duration of therapy should be based on organism susceptibility, severity and site of infection, and clinical response. Fluoroquinolone nonsusceptibility is common in *S. Typhi* infections, therefore, clinicians should consider empiric treatment with other drugs until susceptibility results are available.

#### Extensively Drug-Resistant Infections (XDR)

Since 2016, Pakistan been experiencing an ongoing outbreak of extensively drug-resistant (XDR) *S. Typhi* infections; these isolates are only susceptible to azithromycin and carbapenems. Clinicians should consider travel history and regional antibiotic resistance patterns when prescribing empiric therapy.

#### Multidrug-Resistant Infections (MDR)

*S. Typhi* infections that are known to be multi-drug resistant but not XDR may be treated with a parenteral third-generation cephalosporin or azithromycin. Azithromycin or a carbapenem antibiotic should be considered if the travel history includes travel to Iraq or Pakistan due to ceftriaxone resistance in those areas.

Treatment for 7-10 days is usually recommended, although optimal duration of therapy depends on the antimicrobial choice.

If the isolate is susceptible to fluoroquinolones, amoxicillin, or TMP-SMX, a 10-14 course of therapy should be considered.

Relapse is common (17% of cases) after completion of therapy, and immunocompromised patients are at higher risk. 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.

Infectious disease consultation is recommended for management of severe and/or complicated cases.

## Surveillance

Case Definition:

*Laboratory criteria* – Isolation of *S. Typhi*, *S. Paratyphi A*, *S. Paratyphi B*, or *S. Paratyphi C* 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 New Mexico Department of Health's (NMDOH) Infectious Disease Epidemiology Bureau (IDEB) at 1-833-SWNURSE (1-833-796-8773). 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 IDEB, 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 have 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. All overseas travel companions of the index case should submit stool samples. Travel companions with positive stools should be treated with antibiotics 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). Vaccination may be warranted.
  - 3.2. 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).
  - 3.3. Immunization: Vaccination against typhoid fever is available and is recommended 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 Child Care Centers

1. Management of isolated cases
  - 1.1. When a case of enteric fever occurs among a child care center attendee or staff member, call the IDEB 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 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 enteric fevers 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, IDEB should be notified immediately at 1-833-SWNURSE (1-833-796-8773).

## References

American Academy of Pediatrics. In: Kimberlin, DW, et al eds. Red Book: 2024-2027 Report of the Committee on Infectious Diseases. 33rdnd ed. Itasca, IL: American Academy of Pediatrics; 2024.

Halsey, Eric (ed.), *CDC Yellow Book 2026: Health Information for International Travel* (New York, 2025; online edn, Oxford Academic, 19 June 2025), <https://doi.org/10.1093/oso/9780197788547.001.0001>.

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

See Typhoid Fever Fact Sheets ([English](#)) ([Spanish](#)).