

Typhoid (“Enteric”) Fever

1. DISEASE REPORTING

A. Purpose of Reporting and Surveillance

1. To determine if there is a source of infection of public health concern (e.g., a food handler or commercially distributed food product) and to stop transmission from such a source.
2. To assess the risk of the case transmitting infection to others, and to prevent such transmission.
3. To identify other undiagnosed cases.

B. Legal Reporting Requirements

1. Health care providers: **immediately notifiable to local health jurisdiction**
2. Hospitals: **immediately notifiable to local health jurisdiction**
3. Laboratories: notifiable to local health jurisdiction within 2 work days; specimen submission required
4. Local health jurisdiction: notifiable to the Washington State Department of Health (DOH) Communicable Disease Epidemiology Section (CDES) within 7 days of case investigation completion or summary information required within 21 days

C. Local Health Jurisdiction Investigation Responsibilities

1. Begin investigation on the same day as notification.
2. Administer appropriate infection control recommendations (see Section 6).
3. Ensure that labs forward the first isolate from each patient to the Public Health Laboratories (PHL).
4. Report all confirmed and probable cases to CDES. Complete the typhoid fever case report form (www.doh.wa.gov/notify/forms/typhoid.doc) and enter the data into the Public Health Issues Management System (PHIMS). **Note: *S. Typhi* is reported through PHIMS as Typhoid Fever and *S. Paratyphi* is reported through PHIMS as Salmonellosis.**

2. THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agents

Typhoid fever is caused by *Salmonella* Typhi (properly speaking, *S. enterica* subsp. *enterica* serovar Typhi) — a gram-negative bacillus. It is a group D *Salmonella*, as are many of those that cause non-typhoidal salmonellosis.

Paratyphoid fever, a milder form of typhoid-like illness, can be caused by *S. Paratyphi* (*S. enterica* subsp. *enterica* serovar Paratyphi) serotypes A, B, and C. *S. Paratyphi* B is the most common serotype. *S. Paratyphi* A is less frequent and *S. Paratyphi* C is rare. Many isolates of *S. Paratyphi* B, particularly B variant L[+] tartrate + (previously known

at *S. Java*) cause gastroenteritis rather than paratyphoid fever.

B. Description of Illness

Typhoid ("enteric") fever has a very different presentation than the more common kinds of salmonellosis. Vomiting and diarrhea are typically absent; indeed, constipation is frequently reported. As typhoid is a systemic illness, blood cultures are at least as likely to be positive as stool, particularly early in the course of the infection; bone marrow cultures may be most sensitive.

Initial symptoms typically include fever, anorexia, lethargy, malaise, headache, non-productive cough, abdominal pain, and constipation. As the illness progresses, there is protracted fever and mental dullness (stupor). Diarrhea may develop, particularly in children less than one year old. Many patients develop hepatosplenomegaly. After the first week, ~30% of cases develop a salmon-colored maculopapular rash ("rose spots") on the trunk. Mild infections are common, particularly in endemic areas. As many as 10–20% of untreated infections may be fatal, and relapses are not uncommon.

Paratyphoid fever is a similar but usually milder illness and is reported as Salmonellosis.

C. Typhoid Fever in Washington State

Typhoid fever is not endemic in Washington. In recent years, 4–11 cases were reported annually to DOH with most cases reporting recent travel to typhoid endemic countries.

D. Reservoirs and Chronic Carriage

Unlike other salmonellae, *S. Typhi* infect only humans. Chronic carriers are important reservoirs for *S. Typhi*. About 2–5% of cases become chronic carriers, some after asymptomatic infection, but the risk is highest for persons infected in middle age, particularly women with gall bladder abnormalities. Chronic carriage is customarily defined as carriage extending beyond one year. Improvements in sanitation over the past 50 years have greatly reduced the prevalence of chronic carriage in the United States; most carriers in this country are now elderly or immigrants.

E. Modes of Transmission

Typhoid fever is acquired by ingestion of food or water contaminated with the stool or urine of a person infected with *S. Typhi*. Despite frequent suggestions to the contrary, typhoid outbreaks are not precipitated by floods or other disasters in non-endemic countries, such as the United States.

F. Incubation Period

Typhoid: typically 7–14 days, with a range of 3–60 days.

G. Period of Communicability

Persons are communicable as long as organisms are excreted in the feces or urine, typically beginning during the first week *after* onset and continuing through convalescence and for a variable period thereafter (lifelong, if a carrier state develops). As many as 10% of untreated cases may excrete the organisms for 3 months after onset.

H. Treatment

Antibiotic therapy is useful in resolving signs and symptoms, and can be considered in an attempt to eliminate the carrier state. The choice of antibiotics is dependent on the susceptibility of the organism. Multidrug-resistant isolates of *S. Typhi* are common.

3. CASE DEFINITIONS

A. Clinical Description

An illness caused by *Salmonella Typhi* that is often characterized by insidious onset of sustained fever, headache, malaise, anorexia, constipation or diarrhea, and nonproductive cough. However, many mild and atypical infections occur. Carriage of *S. Typhi* may be prolonged.

B. Laboratory Criteria for Diagnosis

Isolation of *S. Typhi* from blood, stool, or other clinical specimen

C. Case Definition (1997)

1. **Probable:** a clinically compatible case that is epidemiologically linked to a confirmed case in an outbreak
2. **Confirmed:** a clinically compatible case that is laboratory confirmed

Note: Isolation of the organism is required for confirmation. Serologic evidence alone is not sufficient for diagnosis. Asymptomatic carriage should not be reported as typhoid fever.

4. DIAGNOSIS AND LABORATORY SERVICES

A. Laboratory Diagnosis

Typhoid fever is diagnosed by isolation of *S. Typhi* from blood, stool, urine or other clinical specimens including bone marrow.

Serologic tests such as the Widal test are of low sensitivity and specificity and generally provide little diagnostic value.

B. Tests Available at DOH Public Health Laboratories (PHL)

Laboratories in Washington are required to submit all *Salmonella* isolates to PHL. PHL provide isolate confirmation/identification, serotyping, and stool and blood culturing for *S. Typhi*. Follow-up cultures to establish (or rule out) the carrier state can also be done if these services are not available locally. Contact CDES for approval prior to submitting stool for culture.

C. Specimen Collection

For stool culture, use a sterile applicator swab to collect stool, insert the swab into Cary-Blair transport medium, push the cap on tightly, label the tube, and mail immediately.

Please enclose a completed PHL Enteric Bacteriology form (available at: <http://www.doh.wa.gov/EHSPHL/PHL/Forms/EntericBacteriology.pdf>) with all isolates and stool specimens.

5. ROUTINE CASE INVESTIGATION

Interview the case and others who may be able to provide pertinent information.

A. Identify Potential Sources of Infection

Ask about potential exposures during the 3–60 days before onset, including:

1. Any contacts or household members with a similar illness. Obtain the name, phone number or address and clinical information of the ill person. Anyone meeting the probable case definition should be reported and investigated in the same manner as a confirmed case.
2. Travel outside Washington or the United States, or contact with others who have traveled outside the United States. Determine dates of travel.
3. Source(s) of drinking water at home, work, during trips, and in any vocational or recreational pursuit, including water from streams, rivers or lakes (obtain travel locations and dates).
4. Restaurant meals. Obtain the name of the restaurant, and date and location of the meal.
5. Public gathering where food was consumed. Obtain the date, location, and sponsor of the event.
6. Attendance or employment at a child care facility by the case or a household member.

If the patient did not travel to a typhoid endemic area during the incubation period, consider culturing contacts who may be carriers in attempt to determine the source of infection.

B. Identify Contacts Who Work in Sensitive Occupations

Determine if any household member or close contact attends or works at a child care facility; or works as a food handler or health care worker. If so, see Sections 6 and 7.

C. Environmental Evaluation

If the source of infection appears to be associated with a child care facility, restaurant, dairy, or public drinking water supply; or, if the case attends, or works at a child care facility or works as a food handler, health care provider, or residential care provider, see Section 7.

6. CONTROLLING FURTHER SPREAD

NOTE: The following guidelines apply only to *S. Typhi* infections. Please see the salmonellosis guideline for follow-up regarding persons infected with *S. Paratyphi* (<http://www.doh.wa.gov/notify/guidelines/pdf/salmonellosis.pdf>).

A. Infection Control Recommendations

1. Hospitalized patients should be cared for using standard precautions. Contact precautions should be used for diapered or incontinent persons for the duration of the illness or to control institutional outbreaks.
2. The case should be educated regarding effective hand washing, particularly after using the toilet, changing diapers, and before preparing or eating food. The importance of

proper hygiene must be stressed, as excretion of the organism may persist for several weeks or longer.

3. School Restrictions: Children (≥ 5 years old) with *S. Typhi* infections may return to school and other group settings 24 hours after cessation of diarrhea (Red Book 2006 p. 582).
4. Work or Child Care Restrictions: Persons infected with *S. Typhi* may not work as food handlers, work as child care, residential care, or health care workers, or attend child care until they have 3 consecutive negative stool cultures (and urine cultures in persons with schistosomiasis) beginning at least one month after illness onset. Specimens should be collected at least 24 hours apart and at least 48 hours after completion of antibiotics.

B. Case Management

Routine follow-up cultures are indicated for all persons diagnosed with typhoid fever.

1. All persons infected with *S. Typhi* should be supervised by the local health jurisdiction until they have three consecutive negative stool cultures (and urine cultures in persons with schistosomiasis) beginning at least one month after illness onset. Specimens should be collected at least 24 hours apart and at least 48 hours after completion of antibiotics.
2. If *S. Typhi* is isolated from any of the three clearance stools, supervision by the local health jurisdiction should continue until the patient has three consecutive negative stool cultures collected at one month intervals following onset of symptoms.
3. Persons who excrete the organism for a prolonged period can consider antibiotic treatment in attempt to eliminate the carrier state.
4. While under local health department supervision, persons excreting *S. Typhi*:
 - should not work as food handlers, as child care, residential care, or health care workers, or attend child care;
 - should notify the local health department at once of any change in address or occupation;
 - should notify the local health department at once of any suggestive illness among household members or other personal contacts.

C. Contact Management

1. Symptomatic household members and other close contacts should be encouraged to seek medical attention from their regular providers. Stool cultures should be requested or arranged by local health jurisdictions.
2. Regardless of symptoms, household and other close contacts should not work as food handlers, child care, residential care, or health care workers or attend child care until they have at least 2 consecutive negative stool cultures taken at least 24 hours apart. Then, they can return to work or child care but should have stool cultures performed weekly until the case is no longer excreting *S. Typhi* or the contact with the case is broken.
3. Household contacts of chronic carriers should be vaccinated for typhoid fever.

4. **Education:** All contacts should be educated about transmission routes, symptoms, and effective hand washing, particularly after using the toilet, changing diapers, and before preparing or eating food.

D. Management of Other Persons Exposed

If the case acquired the infection while traveling, members of the travel groups should be followed for symptoms. Travel companions having symptoms consistent with typhoid fever should be referred to their provider. Local health jurisdictions can consider culturing the stool of asymptomatic travel companions.

E. Environmental Measures

See Section 7 for environmental measures in special situations.

7. MANAGING SPECIAL SITUATIONS

A. Case Attends or Works at a Child Care Facility

1. Interview the operator and check attendance records to identify suspect cases that occurred during the previous two months.
2. Instruct the operator and other staff in proper methods for food handling and hand washing, especially after changing diapers.
3. Collect stool specimens from all staff members and children who are currently symptomatic or who have had symptoms consistent with typhoid fever during the previous two months. Stool cultures may also be indicated for asymptomatic staff and attendees, depending on circumstances.
4. Exclude cases from child care facilities as in Section 6A(4).
5. If other possible cases are identified, conduct an environmental evaluation.
6. Instruct the operator to notify the local health jurisdiction immediately if new cases of illness suggestive of typhoid fever occur. Call or visit once each week for two weeks after onset of the last case to verify that surveillance and appropriate preventive measures are being carried out. Manage newly symptomatic children as outlined above.

B. Case is a Food Handler or a Commercial Food Source Implicated

1. Conduct an environmental evaluation of the facility and verify (by interviewing the operator and reviewing worker attendance records) if any of the facility employees have had any illness suggestive of typhoid within the past two months. Ask about any complaints of illness from patrons during the past two months.
2. Facility employees with a suspicious illness within the past two months must submit a single stool specimen for culture. (Symptomatic employees should be excluded until symptoms consistent with typhoid have resolved and a negative stool culture has been obtained.)
3. The extent of further investigation depends on circumstances.

C. Food Served at a Public Gathering Implicated

1. Determine if anyone who prepared food for the gathering had any symptoms suggestive of typhoid at any time during the previous month. Find out if any other food preparers

or attendees became ill after the gathering.

2. Collect stool specimens for culture from any food handlers with suggestive histories. (This is mandatory if the food handler works for a commercial food service facility.)
3. The extent of further investigation depends on circumstances.

D. Case Works at a Health Care or Residential Care Facility

1. Consult with the Infection Control Practitioner at the facility. Determine if there has been any unusual incidence of illness suggestive of typhoid within the past two months. If so, investigate these reports with an eye towards identifying possible common-source outbreaks or any continuing sources of exposure.
2. If indicated, conduct an environmental evaluation of the facility.
3. The extent of further investigation depends on circumstances.

E. Suspected Common-Source Outbreak

Report a suspected outbreak to Communicable Disease Epidemiology Section immediately.

8. ROUTINE PREVENTION

A. Vaccine Recommendations

Two vaccines are currently licensed in the United States for the prevention of typhoid fever: Typhoid vaccine live oral Ty21a (Vivotif) and Typhoid Vi polysaccharide vaccine (Typhim Vi). Typhoid vaccine is not routinely recommended in the United States. However, the vaccine is recommended for the following groups:

- Travelers to areas in which there is a recognized risk of exposure to *S. Typhi*;
- Persons with ongoing exposure (e.g., household contact) to a documented *S. Typhi* carrier;
- Microbiology laboratorians who work frequently with *S. Typhi*.

The efficacy of these two vaccines ranges from 50–80%. Therefore, vaccination should not be a substitute for careful selection of food and drink while traveling or proper handling of specimens and cultures in the laboratory. For additional information regarding typhoid fever vaccines, please see the most recent Red Book or the Immunization Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 1994;43 (No. RR-14).

B. Prevention Recommendations (Source:

http://www.cdc.gov/ncidod/dbmd/diseaseinfo/typhoidfever_g.htm)

Typhoid fever is common in most parts of the world except in industrialized regions such as the United States, Canada, western Europe, Australia, and Japan. Therefore, travelers to the developing world should consider taking precautions. Over the past 10 years, travelers from the United States to Asia, Africa, and Latin America have been especially at risk. While traveling in typhoid endemic areas, people should follow the general rule, "Boil it, cook it, peel it, or forget it" and:

- Drink bottled water or bring water to a rolling boil for 1 minute before drinking. Bottled carbonated water is safer than uncarbonated bottled water.
- Ask for drinks without ice unless the ice is made from bottled or boiled water. Avoid popsicles and flavored ices that may have been made with contaminated water.
- Eat foods that have been thoroughly cooked and that are still hot and steaming.
- Avoid raw vegetables and fruits that cannot be peeled. Vegetables like lettuce are easily contaminated and are very hard to wash well.
- Peel raw fruits or vegetables themselves. (Wash hands with soap first.) Do not eat the peelings.
- Avoid foods and beverages from street vendors. It is difficult for food to be kept clean on the street, and many travelers get sick from food bought from street vendors.

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UPDATES