

# 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 infected person transmitting infection to others, and to prevent such transmission.
3. To identify other undiagnosed cases.

### B. Legal Reporting Requirements

1. Health care providers: notifiable to local health jurisdiction within 24 hours
2. Health care facilities: notifiable to local health jurisdiction within 24 hours
3. Laboratories: *Salmonella* species notifiable to local health jurisdiction within 24 hours; specimen submission required – culture (2 business days)
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 upon receipt of notification.
2. Administer appropriate infection control recommendations (see Section 6A).
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 <http://www.doh.wa.gov/notify/forms/typhoid.pdf> 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 (full official designation is *S. enterica* subsp. *enterica* serovar Typhi). It is a group D *Salmonella*, which is a *Salmonella* serogroup that also contains serotypes (serovars) 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, 4–15 cases were reported annually to DOH with most cases reporting recent travel to typhoid endemic countries. Some case investigations have revealed previously undetected asymptomatic household carriers as sources of infection.

## 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 acute 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 8–14 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 (permanently, if a carrier state

develops). As many as 10% of untreated cases 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 *S. 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

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 Washington State Public Health Laboratories (PHL)

Laboratories in Washington are required to submit all *Salmonella* isolates to PHL. PHL provide isolate confirmation, serotyping, and pulsed-field gel electrophoresis (PFGE) on all submitted isolates.

Stool and blood culturing for *S. Typhi* and follow-up cultures to establish (or rule out) the carrier state can also be done at PHL if these services are not available locally. Contact CDES for approval prior to submitting stool for culture.

Note that PHL require all clinical specimens have two patient identifiers, a name **and** a second identifier (e.g., date of birth) both on the specimen label and on the submission form. Due to laboratory accreditation standards, specimens will be rejected for testing if not properly identified. Also include specimen source and collection date.

### 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 with two identifiers (e.g., name and date of birth), and mail immediately.

Please enclose a completed PHL microbiology form (available at: <http://www.doh.wa.gov/EHSPHL/PHL/Forms/Microbiology.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 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 five years of age or older 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 facilities 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 to detect chronic carriage are indicated for all persons diagnosed with typhoid fever, regardless of the need for work restrictions.

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.
3. Persons who excrete the organism for a prolonged period can consider antibiotic treatment in an 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 through medical providers or arranged by local health jurisdictions.

2. Regardless of symptoms, household and other intimate 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 discontinued.
3. Vaccination for household contacts of chronic carriers should be considered.
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

**Investigate as below if the patient did not travel to a typhoid endemic area during the incubation period or if the patient attended the facility after onset of symptoms.**

1. Interview the operator and inspect the facility including the written attendance records to identify other possible cases among staff or attendees during the previous two months.  
Note: WAC170-295-3030 specifies that the operator keep a log of illnesses.
2. Review food handling, hand washing techniques, and diaper changing practices with the operator and staff.
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 a potential exists for typhoid exposure within the child care facility, parents of children in the same child care group as a typhoid case should be notified. Day care operators are required to notify these parents that their child was exposed to a communicable disease through a letter or posted notification (WAC 170-295-3030). The local health jurisdiction may use this notification as an opportunity to ask parents about symptoms in their child and add the following elements to the notification:
  - Children should be monitored carefully for a syndrome of sustained fever, headache,

- malaise, anorexia, constipation or diarrhea, and nonproductive cough.
- Medical care should be sought if a child becomes ill with these symptoms and the provider informed that a case of typhoid fever occurred among the child's contacts.
  - The daycare operator or local health jurisdiction should be notified should symptoms occur.
  - A symptomatic child should not be brought to the daycare facility or placed in any other group of children.
  - Information on the illness and how transmission can be prevented.
6. Instruct the operator to notify the local health jurisdiction immediately if new cases suggestive of typhoid fever occur.
  7. Follow-up with the child care center to ensure that surveillance and appropriate prevention measures are being carried out. Manage newly symptomatic children as outlined above.

#### **B. Case is a Food Handler or a Commercial Food Source is Suspected**

1. Conduct an environmental evaluation of the facility. Determine whether any of the facility employees have had any illness suggestive of typhoid within the past two months by interviewing the operator, reviewing worker attendance records, and interviewing workers as indicated. Ask about any complaints of illness from patrons during the past two months.
2. Collect a stool specimen for culture from any facility employee with a suspicious illness within the past two months. 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 Suspected**

1. Determine if anyone who prepared food for the gathering had any symptoms suggestive of typhoid within the previous two months. Find out if any other food preparers or attendees became ill after the gathering.
2. Collect a stool specimen for culture from any food handlers with suggestive histories.
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 further to identify 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.

## 8. ROUTINE PREVENTION

### A. Vaccine Recommendations

Two vaccines are currently licensed in the United States for the prevention of typhoid fever: an oral live vaccine (Vivotif) and an injectable polysaccharide vaccine (TyphimVi). 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/nczved/divisions/dfbmd/diseases/typhoid\\_fever/](http://www.cdc.gov/nczved/divisions/dfbmd/diseases/typhoid_fever/)

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 one 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 immediately before eating. (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**

January 2011:

The Legal Reporting Requirements section has been revised to reflect the 2011 Notifiable Conditions Rule revision.