

Typhoid (“Enteric”) Fever (and Paratyphoid)

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 cases.

B. Laboratory And Physician Reporting Requirements

Laboratories and physicians are required to report within one working day of identification/diagnosis. Reports should not be delayed for serotyping or final laboratory confirmation. Labs are required to either report the specific serotype or send the isolate to the CPHL for serotyping.

C. Local Health Department Reporting and Follow-Up Responsibilities

1. Report all confirmed and presumptive (but *not* suspect) cases to the OHD by the end of the calendar week of initial physician/lab report. Use the standard case report form (OHD 43-36; “Notice of a Disease or Condition”).
2. Begin follow-up investigation within one working day. Use the typhoid case investigation form (OHD 43-52). Send a copy of the completed form to the OHD within seven days of initial report.
3. Encourage labs to forward the first isolate from each patient to the CPHL (this is mandatory if the lab does not do serotyping).
4. As indicated, complete summary forms for waterborne or foodborne disease outbreaks (available from OHD) when investigation is complete.
5. For persons identified as typhoid carriers, (see definitions, §3A), complete a Typhoid Carrier Agreement and Permit (EP-41A, Rev. 1/70); send a copy to the OHD.

2. THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agents

1. Typhoid

Typhoid is caused by *Salmonella typhi* (properly speaking, *S. enterica* serotype Typhi) — a Gram-negative bacillus. It is a group D *Salmonella*, as are many of those that cause garden-variety salmonellosis. Under the right conditions, *S. typhi* can remain viable for weeks or even months in water, ice, or elsewhere in the environment. It is killed by exposure to direct sunlight, drying, and by contact with commonly used chemical disinfectants, including the chlorine concentrations used for water treatment.

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2. Paratyphoid

Paratyphoid fever, a milder form of typhoid-like illness, is caused by *S. enterica* serotypes Paratyphi A, B, and C (aka *S. paratyphi*). Fewer than one case of paratyphoid per year is reported in Oregon—typically in persons who have been travelling overseas.

B. Description of Illness

Typhoid ("enteric") fever has a totally 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, dull continuous headache, non-productive cough, vague abdominal pain, and constipation. Despite the often high fever, the pulse is often only slightly elevated. During the second week of the illness there is protracted fever and mental dullness (stupor). Diarrhea may develop, but usually does not. Many patients develop hepatosplenomegaly. After the first week or so, many cases develop a maculopapular rash on the upper abdomen. These lesions ("rose spots") are ~2 cm in diameter and blanch on pressure. They persist for 2-4 days, and may come and go. Mild and atypical infections are common. As many as 10% of untreated infections may be fatal, and relapses are not uncommon.

Paratyphoid fever is a similar but usually milder illness. As noted, it is extremely rare in Oregon.

C. Reservoirs and Chronic Carriage

Unlike other salmonellae, *S. typhi* (and generally, *S. paratyphi* serogroups A-C) only infect humans. Chronic carriers (e.g., "Typhoid Mary") are the most 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, and those with gall bladder abnormalities. Chronic carriers excrete large numbers of organisms in stool (as many as 10^{11} /g) and/or (less commonly) in urine, reflecting biliary tract (gall bladder) or intestinal colonization. Improvements in sanitation over the past 50 years have greatly reduced the prevalence of carriage in the United States; most carriers in this country are now elderly or immigrants.

D. Modes of Transmission

Person-to-person, usually via the fecal-oral route. Fecally contaminated drinking water is a commonly identified vehicle. *S. typhi* may also be found in urine and vomitus and, in some situations, these could contaminate food or water. Shellfish grown in sewage contaminated water are also potential vehicles, as are vegetables grown in night soil in developing countries. Flies can mechanically transfer the organism to food, where the organism could multiply to an infectious dose. Despite frequent suggestions to the contrary, typhoid outbreaks are not precipitated by floods or other disasters in non-endemic countries, such as the U.S.

E. Incubation Period

Typhoid: typically 1 to 3 weeks, varying with the infecting dose and other factors.

Paratyphoid: usually 1–10 days.

F. Period of Communicability

As long as organisms are excreted in the feces or urine, typically beginning about a 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 may excrete the organisms for 3 months after onset.

G. Treatment

Antibiotic therapy is useful in resolving signs and symptoms. Ampicillin, amoxicillin, trimethoprim-sulfamethoxazole, chloramphenicol, and cephalosporins. Resistance to many of these first-line drugs is widespread in some parts of the world; ciprofloxacin may be an effective alternative. Fifteen to 35% of treated cases will experience a relapse (especially with chloramphenicol), typically with milder symptoms. Second and even third relapses may occur.

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H. Immunization

Several vaccines, both oral and parenteral, are licensed for the prevention of typhoid fever; they are recommended for household contacts of carriers and for persons traveling overseas to areas where typhoid is endemic (e.g., most developing countries in Latin America, Africa, and Asia). The newer oral vaccines have fewer side effects. None of these vaccines are 100% effective, and they are no substitute for careful selection of food and drink. The ACIP recommendations for use were published in an MMWR supplement (CDC. Typhoid Immunization. MMWR 1994;43 [No. RR-14]), copies of which are available from the Immunization Program office.

3. CASE DEFINITIONS, DIAGNOSIS, AND LABORATORY SERVICES

A. Confirmed Case Definition

Persons from whom *S. typhi* (or *S. paratyphi*) is cultured. Cultures may come from blood, urine, stool, or directly from skin lesions.

A confirmed **chronic carrier** is someone who is culture-positive for *S. typhi* on 2 occasions at least one year apart. A **convalescent carrier** is someone who is culture-positive on 2 occasions at least four weeks and less than one year apart.

B. Presumptive Case Definition

Compatible illness in someone epidemiologically linked to a confirmed case.

C. Suspect Case (not reportable to OHD)

Anyone with an undiagnosed, compatible illness lasting at least 1 week.

D. Services Available at the Center for Public Health Laboratories

The CPHL provides isolate confirmation/identification, serotyping, and stool and blood culturing for *S. typhi* and *S. paratyphi*. Follow-up cultures to establish (or rule out) the carrier state can also be done if these services are not available locally.

For isolate identification, submit a pure isolate on an agar slant of media that will support growth (e.g., nutrient or blood agar). A swab with stool on it, completely submerged in a Cary-Blair tube, is required for stool culturing. Both specimens may be sent without a cold pack. All specimens must be properly packaged in double containers with absorbent material around them. Use the Bacteriology/Parasitology form (#75).

N.B.— Stool specimens will not be processed unless obtained before initiation of antimicrobials, or after 48 hours have passed since discontinuation of antimicrobials. Under special circumstances, isolates may be sent to CDC or other labs for subtyping. Serologic testing for antibodies (the Widal test) is also available, but because of a lack of specificity, such testing is rarely worthwhile.

4. 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 7-21 days before onset (1-10 days for paratyphoid), including:

1. name, diagnosis, and telephone number or address of any acquaintances or household members with similar illnesses (*N.B.*— anyone meeting the presumptive case definition should be reported and investigated in the same manner as a confirmed case);
2. name, date, and location of any restaurant meals;
3. date, location, and sponsor of any public gathering where food was consumed;
4. travel outside the U.S. or contact with others known to have traveled outside the U.S.;
5. source(s) of drinking water consumed at home, work, and in any avocational pursuit, including water from streams, rivers or lakes;
6. attendance or employment at a day care facility by the case or a household member.

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B. Identify Potentially Exposed Persons

If the case or a household member attends or works at a day care, health care, or residential care facility, or is food handler, refer to §6.

C. Environmental Evaluation

If the source of infection appears to be associated with a day care facility, restaurant, dairy, or public drinking water supply; or, if the case attends, or works at, a day care facility or works as a food handler, health care provider, or residential care provider, see §6.

5. CONTROLLING FURTHER SPREAD

NOTE: The following guidelines apply only to *S. typhi* infections. Distinct laws govern workplace and other restrictions on typhoid cases (see OAR 333-19-0046). Persons with paratyphoid fever are covered only by the general salmonellosis provisions; refer to the salmonellosis guidelines for follow-up directions for paratyphoid cases.

A. Patient/Household Education

1. As indicated, provide basic instruction to cases and potentially exposed contacts about hand washing after defecation and diaper changing and before food preparation or meals.
2. If applicable, discourage consumption of untreated surface water.

B. Isolation of Cases

Cases should be cared for in accordance with standard precautions. Contact precautions should be enforced for patients <6 years old if diapered or incontinent.

C. Children in Day Care

Children with *S. typhi* infections may not attend a school or day care facility unless special exemption is granted by the local health officer, or until they have 4 consecutive negative stool cultures as specified below (§5F). An exemption should be granted only if cohorting (separating ill children from well children) and special care with hand washing after diaper changing and before food handling can be implemented to prevent transmission. Cohorting is generally not feasible unless the facility is equipped with separate toilet facilities and entrances.

D. Occupational Restrictions

Persons with *S. typhi* infections may not work as food handlers, or in a school, day care, health care, or residential care facility until they have 4 consecutive negative stool cultures and one negative urine culture as specified below (§5F).

E. Restrictions on Household Contacts

None.

F. Follow Up of Reported Cases

Routine follow-up cultures are indicated for all persons diagnosed with typhoid. Other symptomatic household members should be encouraged to seek medical attention from their regular providers.

1. Acute Cases and Convalescent Carriers

Cases (and carriers) are excluded from work as defined in §5D or day care until they have 4 consecutive negative stool cultures and one negative urine culture, bearing in mind that:

1. no follow-up specimens should be collected until the person is asymptomatic;
2. no follow-up specimens should be collected until at least 48 hours after completion of antibiotic therapy (if any);
3. specimens must be collected at least 24 hours apart.

2. Chronic Carriers

Presumptive and confirmed carriers are subject to certain restrictions that are enforced by the local health officer, as outlined in OAR 333-19-0046, and itemized in the Typhoid Fever Carrier Agreement. This contract, which must be signed by carriers, provides that they:

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- will not to work as food handlers or provide personal care in day-care or residential care facilities;
- will notify the health officer at once of any change in address or occupation;
- will notify the health officer at once of any suggestive illness among household members or other personal contacts; and
- will provide specimens for culture as required by the health officer.

Chronic carriers can only be released from their agreement following 6 consecutive, negative stool cultures and one urine culture. Such specimens must be collected at least 72 hours apart.

G. Protection of Contacts

Generally, none, except that immunization is recommended for household contacts of chronic carriers.

H. Environmental Measures

As indicated (see below)

6. MANAGING SPECIAL SITUATIONS (Typhoid and Paratyphoid)

A. Case Attends or Works at a Day Care Facility

1. Interview the operator and check attendance records to identify suspect cases that occurred during the previous month.
2. Instruct the operator and other staff in proper methods for food handling and hand washing, especially after changing diapers.
3. If other cases (including suspected cases) have occurred, collect stool specimens from all staff members and children who are symptomatic or who have had diarrhea during the previous two months. Notify the Health Division immediately.
4. If other possible cases are identified, conduct an environmental evaluation.
5. Instruct the operator to notify the LHD immediately if new cases of illness suggestive of typhoid fever occur. Call or visit once each week for 2 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.
6. If more children or staff members are found to be infected than realistically can be excluded, work with the operator to develop a plan to physically separate (cohort) infected and uninfected children *and* staff. Such a program will have to be closely monitored, and should only be considered if there are separate toilet and hand washing facilities for each group.

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 employees have had any illness suggestive of typhoid within the past month. Ask about any complaints of illness from patrons during the past month.
2. Employees with a suspicious history within the past month must submit a single stool specimen for culture. (Symptomatic employees should obviously be excluded.)
3. The extent of further investigation depends on circumstances. Consult with the on-call epidemiologist at the OHD.

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 attend-

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ees became ill within 3 weeks after the gathering.

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

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

1. Consult with the Infection Control Practitioner. Determine if there has been any unusual incidence of typhoid-compatible illness within the past month. If so, investigate these reports to 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. Consult with the on-call epidemiologist at the OHD.

E. Suspected Common-Source Outbreak

Consult with the on-call epidemiologist at the OHD immediately →