

TYPHOID FEVER

REPORTING INFORMATION

- **Class B:** Report by the end of the next business day after the case or suspected case presents and/or a positive laboratory result to the local public health department where the patient resides. If patient residence is unknown, report to the local public health department in which the reporting health care provider or laboratory is located.
- Reporting Form(s) and/or Mechanism:
 - The Ohio Disease Reporting System (ODRS) should be used to report lab findings to the Ohio Department of Health (ODH). For healthcare providers without access to ODRS, you may use the [Ohio Confidential Reportable Disease form](#) (HEA 3334).
 - [CDC Typhoid and Paratyphoid Fever Surveillance Report form](#) (CDC 52.5) is available for use to assist in local health department disease investigation. Information collected from the form should be entered into ODRS and the form should be faxed to ODH, Bureau of Infectious Diseases at (614) 564-2456.
 - The [Ohio Enteric Case Investigation Form](#) may be useful in local health department follow-up of cases who do not report a history of travel to countries where typhoid fever is endemic. Do not send this report to ODH; it is for local health department use only.
- Key fields for ODRS reporting include: import status (whether the infection was travel-associated or Ohio-acquired), date of illness onset and travel details entered into the Travel History module.

AGENT

Salmonella enterica serotype Typhi is the agent of typhoid fever. (Note: this organism is different from *Salmonella enterica* serotype Typhimurium).

Infectious dose: A low infectious dose ($<10^3$ organisms) can cause disease.

CASE DEFINITION

Clinical Description

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

Laboratory Criteria for Diagnosis

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

Case Classification

Probable: A clinically compatible case that is epidemiologically linked to a confirmed case in an outbreak.

Confirmed: A clinically compatible case that is laboratory confirmed.

Comment

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.

All laboratory-confirmed cases must be reported to the local health department and ODH, regardless of symptoms.

SIGNS AND SYMPTOMS

A febrile illness with headache, malaise, anorexia, weakness, stomach pain, headache and non-productive cough. Rose spots on the trunk appear in 25% of cases. Constipation is more common than diarrhea in adults. Many mild and atypical infections occur. Approximately 2%-5% of typhoid fever patients become carriers.

DIAGNOSIS

Typhoid fever is diagnosed by isolating the organism from blood, stool, bone marrow, bile or other body fluid. Serology tests are not useful for diagnosis. Some hospital laboratories have the ability to identify *Salmonella* serotype Typhi. ODH Laboratory performs testing for *Salmonella*. In some circumstances, testing of cases and contacts can be done at the ODH Laboratory without charge. To obtain the fee exemption and to arrange for receipt of the stool transport kit, contact the ODH BID's Outbreak Response and Bioterrorism Investigation Team (ORBIT) at (614) 995-5599. Clinical laboratories are asked to send all *Salmonella* serotype Typhi isolates and specimens that test positive for *Salmonella* via culture independent diagnostic testing (CIDT) to ODH Laboratory for serotyping and pulsed-field gel electrophoresis typing. If testing is to be performed at ODH Laboratory, use Cary Blair transport medium.

EPIDEMIOLOGY

Source

Humans are the reservoir of *Salmonella* serotype Typhi.

Occurrence

Typhoid fever occurs worldwide, but most of the disease burden occurs in developing countries. Ohio reports approximately 10 cases annually, most of whom have a recent history of foreign travel.

Mode of Transmission

Ingestion of food or water contaminated with feces or urine from patients with typhoid fever or carriers of *Salmonella* serotype Typhi. Flies might help carry the bacteria from filth to food. Direct person-to-person transmission by the fecal-oral route may also occur. Sexual transmission from an asymptomatic carrier of typhoid fever has been documented.

Period of Communicability

The organism is shed in the stool during the acute illness and throughout convalescence. About 10% of untreated typhoid fever patients shed the bacteria for 3 months after symptom onset. Approximately 2%-5% of typhoid fever patients, whether treated or untreated, become chronic carriers.

Incubation Period

3 days to over 60 days, usually 7-14 days.

PUBLIC HEALTH MANAGEMENT

Case

Investigation

Local health departments are asked to contact ODH ORBIT at (614) 995-5599 upon learning of a new case of typhoid fever to expedite the investigation and follow-up. Ensure that the *Salmonella* serotype Typhi isolate (bacterial culture) is sent to ODH Laboratory. All cases should be contacted to obtain demographic and epidemiologic data. All cases, regardless of their occupation, should have 3 stool specimens tested for *Salmonella* serotype Typhi. Three consecutive negative specimens are generally sufficient to rule out carriage. See [Isolation](#) and [Follow-Up Specimens](#), below, for

additional information.

Treatment

Antibiotic treatment is usually indicated. Treatment should be based on the antibiotic susceptibility of the patient's culture. Fluoroquinolones appear to be the drug of choice for adults, but resistance is developing in some regions. The following may be used if the strain is sensitive: oral chloramphenicol, amoxicillin, trimethoprim-sulfamethoxazole, expanded-spectrum cephalosporins or azithromycin. Relapses occur in 3%-4% of cases.

The chronic carrier state may be eradicated with 4 weeks of oral therapy with ciprofloxacin or norfloxacin, antimicrobial agents that are highly concentrated in bile. High-dose parenteral ampicillin can also be used if 4 weeks of oral fluoroquinolone therapy is not well tolerated. Cholecystectomy may be indicated in some adults if antimicrobial therapy alone fails.

Isolation and Follow-Up Specimens

Ohio Administrative Code (OAC) 3701-3-13 (BB) states:

"Typhoid fever: a person with typhoid fever who attends a child care center or works in a sensitive occupation shall be excluded from the child care center or work in the sensitive occupation and may return after the person is asymptomatic and after three consecutive follow-up stool specimens are negative for *Salmonella* Typhi."

Obtain the first stool specimen at least 48 hours after completion of antibiotic therapy. Obtain the remaining specimens at least 24 hours apart. If one or more of the first three follow-up specimens are positive, space subsequent specimens at one week intervals until a maximum of eight weeks after onset of illness. After eight weeks, obtain follow-up specimens at one month intervals for up to one year.

The initial isolate identifying the case as typhoid fever is often from a blood culture. Regardless of the source of the initial isolate, follow-up cultures should always be from stool.

ODH has developed an [instructional video for patients submitting stool specimens](#) that may be helpful to ensure specimens are collected appropriately and safely.

Contacts

All household members should be tested for *Salmonella* serotype Typhi, regardless of their symptoms or occupation.

Prevention and Control

Sanitary disposal of human waste, hand washing, fly control and provision of safe food and drinking water are important in the prevention and control of typhoid fever.

Food Handlers

Symptomatic persons shall be excluded from work. As detailed in Isolation above, food handlers may only return to work when asymptomatic and with three consecutive follow-up stool specimens negative for *Salmonella* serotype Typhi.

The Food Service Operation rules also pertain. Typhoid fever is a disease which can be transmitted through food. Persons infected with a disease that is communicable by food are not permitted to work as a food handler. For additional information, refer to Ohio Administrative (OAC) Chapter 3717-1 (Ohio Uniform Food Safety Code) Section 02.1, Management and Personnel Employee Health.

Healthcare Workers, Child Care Workers and Children who Attend Child Care Centers

Symptomatic persons shall be excluded from work. As detailed in Isolation above, children who attend child care centers and persons who work in sensitive occupations may return when asymptomatic and when three consecutive follow-up stool specimens are negative for *Salmonella* serotype Typhi.

Child Care Center Outbreak Control

Whenever a case of typhoid fever has been identified in a child care center attendee or worker, **all** staff and children in the same classroom as the case should be cultured for *Salmonella* serotype Typhi. Arrangements to have this testing done at ODH Laboratory may be made by contacting ODH ORBIT at (614) 995-5599.

Vaccine

Routine typhoid vaccination is not recommended in the U.S. Vaccination is indicated for the following:

- Travelers to areas with recognized risk (e.g. Asia, Africa, Latin America),
- Close contacts to a typhoid carrier,
- Microbiologists who work with *Salmonella* serotype Typhi and
- People living outside the U.S. in areas with endemic typhoid infection.

Routine vaccination is not warranted for sewage workers in the U.S., summer camp attendees or persons affected by floods or other natural disasters in the U.S.

Two different typhoid vaccines are available in the U.S.; one is injectable and one is oral. Contact a travel clinic, local health department or the ODH Immunization Program (614) 466-4643 for additional information. Also refer to CDC Advisory Committee on Immunization Practices (ACIP) recommendations at:

<http://www.cdc.gov/mmwr/preview/mmwrhtml/00035643.htm>.

Special Information

Travel to Asia, Africa and Latin America is especially risky for acquiring typhoid fever.

The risk of acquiring typhoid fever while traveling overseas can be reduced by:

- Getting vaccinated against typhoid fever.
- Avoiding risky food and drink.

Typhoid vaccines are not 100% effective. If you acquire a drug-resistant strain of typhoid and are not treated with effective antibiotics, a serious and prolonged illness can result. For these reasons, avoid risky food and drink. Bottled or boiled water is safe, as are hot, cooked foods. Avoid ice and raw fruits and vegetables that cannot be peeled. The adage "Boil it, cook it, peel it or forget it" applies! These precautions will also help the traveler avoid other diseases, such as dysentery and travelers' diarrhea.

What is typhoid fever?

Typhoid fever is a life-threatening illness caused by the bacterium *Salmonella* Typhi. In the United States, it is estimated that 5,700 cases occur annually. Most cases (up to 75%) are acquired while traveling internationally. Typhoid fever is still common in the developing world, where it affects about 21.5 million persons each year.

Typhoid fever can be prevented and can usually be treated with antibiotics. If you are planning to travel outside the United States, you should know about typhoid fever and what steps you can take to protect yourself.

How is typhoid fever spread?

Salmonella Typhi lives only in humans. Persons with typhoid fever carry the bacteria in their bloodstream and intestinal tract. In addition, a small number of persons, called carriers, recover from typhoid fever but continue to carry the bacteria. Both ill persons and carriers shed *Salmonella* Typhi in their feces (stool).

You can get typhoid fever if you eat food or drink beverages that have been handled by a person who is shedding *Salmonella* Typhi or if sewage contaminated with *Salmonella* Typhi bacteria gets into the water you use for drinking or washing food. Therefore, typhoid fever is more common in areas of the world where hand washing is less frequent and where water is likely to be contaminated with sewage.

Once *Salmonella* Typhi bacteria are eaten or drunk, they multiply and spread into the bloodstream. The body reacts with fever and other signs and symptoms.

Where in the world do you get 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, if you are traveling to the developing world, you should consider taking precautions. Other areas at risk include East and Southeast Asia, Africa, the Caribbean and Central and South America.

How can you avoid typhoid fever?

Two basic actions can protect you from typhoid fever:

- Avoid risky foods and drinks.
- Get vaccinated against typhoid fever.

It may surprise you, but watching what you eat and drink when you travel is as important as being vaccinated. This is because the vaccines are not completely effective. Avoiding risky foods will also help protect you from other illnesses, including travelers' diarrhea, cholera, dysentery and hepatitis A.

"Boil it, cook it, peel it or forget it."

- If you drink water, buy it bottled or bring it to a rolling boil for one minute before you drink it. Bottled carbonated water is safer than uncarbonated 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.
- When you eat raw fruit or vegetables that can be peeled, peel them yourself. Wash your 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.

Getting vaccinated.

If you are traveling to a country where typhoid is common, you should consider being vaccinated against typhoid. Visit a doctor or travel clinic to discuss your vaccination options. Travelers should be reminded that typhoid immunization is not 100% effective and typhoid fever could still occur. Both vaccines protect 50%-80% of recipients.

Remember that you will need to complete your vaccination at least 1-2 weeks before you travel, so that the vaccine has time to take effect. Typhoid vaccines lose effectiveness after several years; if you were vaccinated in the past, check with your doctor to see if it is time for a booster vaccination. Taking antibiotics will not prevent typhoid fever; they only help treat it.

The chart below provides basic information on typhoid vaccines that are available in the United States.

Typhoid Fever Vaccines Available in the United States

Vaccine Name	How Given	Number of Doses Necessary	Time Between Doses	Time Completed before Exposure	Minimum Age	Booster Needed Every
Ty21a (Vivotif Berna, Swiss Serum and Vaccine Institute)	1 capsule by mouth	4	2 days	1 week	6 years	5 years
ViCPS (Typhim Vi, Pasteur Merieux)	Injection	1	N/A	2 weeks	2 years	2 years

The parenteral heat-phenol-inactivated vaccine (manufactured by Wyeth-Ayerst) has been discontinued.

What are the signs and symptoms of typhoid fever?

Persons with typhoid fever usually have a sustained fever as high as 103°F-104°F (39°C-40°C). They may also feel weak or have stomach pains, headache or loss of appetite. In some cases, patients have a rash of flat, rose-colored spots. The only way to know for sure if an illness is typhoid fever is to have samples of stool or blood tested for the presence of *Salmonella* Typhi.

What do you do if you think you have typhoid fever?

If you have a high fever and feel very ill, see a doctor immediately. If you are traveling in a foreign country, call the U.S. consulate for a list of recommended doctors.

Typhoid fever is treated with antibiotics. Resistance to multiple antibiotics is increasing among *Salmonella* that cause typhoid fever. Reduced susceptibility to fluoroquinolones (e.g., ciprofloxacin) and the emergence of multidrug-resistance has complicated treatment of infections, especially those acquired in South Asia. Antibiotic susceptibility testing may help guide appropriate therapy. Choices for antibiotic therapy include fluoroquinolones (for susceptible infections), ceftriaxone and azithromycin. Persons who do not get treatment may continue to have fever for weeks or months, and as many as 20% may die from complications of the infection.

Typhoid fever's danger does not end when symptoms disappear.

Even if your symptoms seem to go away, you may still be carrying *Salmonella* Typhi. If so, the illness could return or you could pass the disease to other people. In fact, if you work at a job where you handle food or care for small children, you may be barred legally from going back to work until a doctor has determined that you no longer carry any typhoid bacteria.

If you are being treated for typhoid fever, it is important to do the following:

- Keep taking the prescribed antibiotics for as long as the doctor has asked you to take them.
- Wash your hands carefully with soap and water after using the bathroom and do not prepare or serve food for other people. This will lower the chance that you will pass the infection on to someone else.
- Have your doctor perform a series of stool cultures to ensure that no *Salmonella* Typhi bacteria remain in your body.

Additional information:

Additional information on typhoid fever may be obtained from your local health department, ODH, a travel clinic or your doctor.

- CDC Travelers' Health Typhoid and Paratyphoid Fever: <http://wwwnc.cdc.gov/travel/yellowbook/2016/infectious-diseases-related-to-travel/typhoid-paratyphoid-fever>
- CDC Typhoid Fever Vaccine: <http://www.cdc.gov/vaccines/vpd-vac/typhoid/default.htm>