

TYPHOID FEVER

Potential Bioterrorism Agent: Category B

Responsibilities:

Hospital: Report by IDSS, facsimile, mail or phone

Lab: Report by IDSS, facsimile mail or phone

Physician: Report by IDSS, facsimile, mail or phone

Local Public Health Agency (LPHA): Follow-up required

Iowa Department of Public Health

Disease Reporting Hotline: (800) 362-2736

Secure Fax: (515) 281-5698

1) THE DISEASE AND ITS EPIDEMIOLOGY

A. Agent

Typhoid fever is caused by the bacillus *Salmonella enterica* subspecies *enterica* serovar Typhi (commonly *S. Typhi*).

B. Clinical Description

Symptoms: Typhoid fever causes fever, headache, malaise, anorexia, bradycardia, splenomegaly, and constipation more often than diarrhea in adults. Rose colored spots occur on the trunk in 25% of light-skinned patients and a nonproductive cough often occurs in the early stage of illness.

Onset: Illness is usually not abrupt and varies from mild illness with low-grade fever to severe clinical disease with abdominal discomfort and multiple complications. Inapparent or mild illnesses occur, especially in endemic areas.

Complications include intestinal perforation and hemorrhage, kidney failure, and peritonitis. The case-fatality rate of 10-20% observed in the pre-antibiotic era falls below 1% with prompt antibiotic therapy. Relapses may occur in 15-20% of patients with typhoid fever.

A major concern with typhoid fever is that a carrier state may follow illness. Typhoid fever can be present in both feces and urine chronically after acute infection. The chronic carrier state is most common (2-5%) among persons infected during middle age. Carriers frequently have biliary tract abnormalities including gallstones. The chronic urinary carrier state may occur with schistosome infections.

C. Reservoirs

Common reservoirs: Humans may become transient or permanent carriers.

D. Modes of Transmission

Spread: Via ingestion of food and water contaminated by feces and urine of patients and carriers. Important vehicles for transmission include shellfish (particularly oysters) from sewage contaminated beds, raw fruit, vegetables fertilized by human feces, contaminated milk/milk products and unidentified cases. Flies may contaminate foods, allowing the organism to multiply to infectious doses. Epidemiological data suggest that waterborne transmission may involve less contamination than foodborne transmission.

Person-to-person: Rare

E. Incubation period

Depending on the inoculum size and host factors, the incubation period may range from 3 to over 60 days. The usual range is 8-14 days.

F. Period of Communicability or Infectious Period

The disease is communicable for as long as infected persons excrete the bacilli in their stool or urine, usually from the first week throughout convalescence; variable thereafter. Approximately 10% of untreated typhoid patients discharge bacilli for 3 months after symptom onset; 2-5% become carriers.

G. Epidemiology

Typhoid fever has a worldwide distribution, with approximately 5700 cases per year in the United States, with approximately 75% of these cases occurring among travelers to other countries. An estimated 27 million cases of typhoid fever and 210,000 deaths occur worldwide.

H. Bioterrorism Potential

Category B Agent: As with other Salmonella organisms, *S. Typhi* has potential to be used as a bioweapon similar to other fecal-oral transmission agents.

2) DISEASE REPORTING AND CASE INVESTIGATION

A. Purpose of Surveillance and Reporting

- To identify whether the case may be a high risk for spread to others (*e.g.*, a diapered child, child care attendee, healthcare provider, or food handler) and, if so, to prevent further transmission.
- To identify transmission sources of public health concern (*e.g.* a restaurant or a commercially distributed food product) and to stop transmission from such sources.

B. Laboratory and Healthcare Provider Reporting Requirements

Iowa Administrative Code 641-1.3(139) stipulates that the laboratory and the healthcare provider must report. The preferred method of reporting is by utilizing the Iowa Disease Surveillance System (IDSS). However, if IDSS is not available to your facility the reporting number for IDPH Center for Acute Disease Epidemiology (CADE) is (800) 362-2736; fax number (515) 281-5698, mailing address:

IDPH, CADE
Lucas State Office Building, 5th Floor
321 E. 12th Street
Des Moines, IA 50319-0075

Postage-paid disease reporting forms are available free of charge from the IDPH clearinghouse. Call (319) 398-5133 or visit the website: healthclearhouse.drugfreeinfo.org/cart.php?target=category&category_id=295 to request a supply.

C. Local Public Health Agency (LPHA) Follow-up Responsibilities

Case Investigation

- a. It is the LPHA responsibility to complete an investigation by interviewing the case or legal guardian of the case and others who may be able to provide pertinent information. Using IDSS is the preferred method of conducting the investigation. Much of the information can be obtained from the case's healthcare provider or the medical record.
- b. Use the following guidelines in completing the investigation:
 1. Record demographic information, date of symptom onset, symptoms, and medical information.

2. When asking about exposure history (food, travel, activities, etc.), use the usual incubation-range for typhoid fever (8 – 14 days).
3. If possible, record any restaurants at which the case ate, including food items(s) and date consumed.
4. Ask questions about travel history and outdoor activities to help identify where the case became infected.
5. Ask questions about water supply because typhoid fever may be acquired through water consumption.
6. Household/close contact, school, work, travel, and food handler questions are designed to examine the case's risk of having acquired the illness from, or potential for transmitting it to, these contacts.
7. Ask if the patient knows others who had a similar illness about the same time.
8. If several attempts have been made to obtain case information, but have been unsuccessful (*e.g.*, the case or healthcare provider does not return your calls or respond to a letter, or the case refuses to divulge information or is too ill to be interviewed), please request help from CADE epidemiologists (800) 362-2736.

After completing the investigation and gathering the information, enter the information into IDSS, or FAX the report form with supporting laboratory documentation to (515) 281-5698 or mail (in an envelope marked "Confidential") to the IDPH/CADE mailing address.

3) CONTROLLING FURTHER SPREAD

Fluoroquinolones appear to be the drug of choice in adults. However, the recent emergence of resistance to fluoroquinolones prevents its indiscriminate use in primary care facilities. If a typhoid isolate is known to be sensitive to traditional first-line antibiotics, oral chloramphenicol, amoxicillin or trimethoprim-sulfoxazole (particularly in children) should be used in accordance with local antimicrobial sensitivity patterns. Short-term, high dose corticosteroid treatment, combined with specific antibiotics and supportive care, reduces mortality in critically ill patients.

A. Isolation and Quarantine Requirements

Hospital care is desirable during acute typhoid illness. All hospitalized patients should be on Standard Precautions. Use Contact Precautions for diapered or incontinent persons for duration of illness or to control institutional outbreaks.

Quarantine is not applicable.

B. Protection of Contacts of a Case

Administration of typhoid vaccine is of limited value for family, household and nursing contacts who have been or will be exposed to active cases. Vaccine should be considered for those exposed to carriers of typhoid.

C. Managing Special Situations

Contact the Center for Acute Disease Epidemiology (CADE), (800) 362-2736, for consultation for persons identified as chronic carriers or who continue to have positive stool cultures after acute disease.

In the case of situations that are not covered below contact CADE, (800) 362-2736, for consultation.

Food handlers

Note: Meat plant workers are considered food handlers.

Return to work should be after 3 consecutive negative stool cultures (and urine in patients with schistosomiasis) at least 24 hours apart and at least 48 hours after completion of antimicrobials.

Household members of people with a Typhoid Fever diagnosis must also have 3 consecutive negative stool cultures, as above, before a food handler is allowed to return to food handling duties.

Hand hygiene education must occur before return to work. Good hand hygiene must be practiced at all times.

Child care/School

Since typhoid fever can be transmitted person-to-person through fecal-oral transmission, it is important to carefully follow up on cases in a child care setting. General recommendations for typhoid fever include:

- For staff or children 5 years of age and older who are fecally continent, 24 hours without a diarrheal stool is required before returning.
- For children younger than 5 years of age or individuals who are diapered or fecally incontinent, 3 consecutive negative stool cultures (and urine in patients with schistosomiasis) at least 24 hours apart and at least 48 hours after completion of antimicrobials are required before returning.
- Good hand hygiene must be practiced at all times.

Business

Since typhoid fever can be transmitted person-to-person through fecal-oral transmission, it is important to follow up carefully on each case. General recommendations include:

- For staff (exception for food handlers), 24 hours without a diarrheal stool is recommended before returning to a business setting.
- Staff with *S. typhi* in their stool who do not have diarrhea or vomiting and do not handle food may remain if proper hygienic practices are maintained.
- Good hand hygiene must be practiced at all times.

Health Care Provider

Return to work should be after 3 consecutive negative stool cultures (and urine in patients with schistosomiasis) at least 24 hours apart and at least 48 hours after completion of antimicrobials. Good hand hygiene must be practiced at all times.

Reported Incidence Is Higher than Usual/Outbreak Suspected

Any case of typhoid fever is unusual in the U.S, so it is important to determine the source of infection and mode of transmission. Careful follow-up of cases to ensure proper isolation and identify "chronic carrier" status is important. Control of person-to-person transmission requires special emphasis on personal cleanliness and sanitary disposal of feces. Consult with the regional epidemiologist or CADE if assistance is needed. CADE can help determine a course of action to prevent further cases and can perform surveillance for cases that may cross jurisdictional lines.

D. Preventive Measures

Environmental Measures

Proper sanitation of public and private facilities is critical to prevent typhoid fever. Routine sanitation measures should include:

- Education of the public regarding proper handwashing, which includes providing suitable handwashing facilities in public places, especially in food service, child care, or health care settings.
- Proper disposal and treatment of human sewage. Latrines should be fly-proof and properly designed and situated.

- Public and private water supplies should be protected, purified, and chlorinated (as needed). Backflow prevention devices should be installed between potable water and non-potable water systems.
- Scrupulous cleanliness in food preparation and handling are important. Proper temperature maintenance of raw and cooked foods is critical, as well as avoiding cross contamination of raw meats and items already prepared to eat.
- All milk and milk products should be pasteurized before consumption.
- Limit the collection and marketing of shellfish to supplies from approved sources.

Education

To avoid possible exposures, recommend that people:

- Always wash their hands thoroughly with soap and water before eating or preparing food, after using the toilet, and after changing diapers. This is important for the entire household of a case as household members can become transient or long term carriers.
- Dispose of feces in a sanitary manner in all settings.
- Keep food that will be eaten raw, such as vegetables, from becoming contaminated by animal-derived food products. Wash all foods that will be eaten raw before eating.
- Receive typhoid vaccination when traveling to endemic high-risk areas. Visit www.cdc.gov/travel/ for current information on endemic high-risk areas. The World Health Organization (WHO) also recommends that school-age children who live in such areas receive vaccination. An oral, live vaccine is available and usually consists of 3-4 doses.
- In non-endemic areas there is no recommendation for vaccine except for those who are subject to unusual occupational exposures (e.g. clinical microbial technicians or household members of known carriers).

4) ADDITIONAL INFORMATION

The Council of State and Territorial Epidemiologists (CSTE) surveillance case definitions for Typhoid Fever can be found at: www.cdc.gov/osels/ph_surveillance/nndss/phs/infdis.htm#top

CSTE case definitions should not affect the investigation or reporting of a case that fulfills the criteria in this chapter. (CSTE case definitions are used by the state health department and the CDC to maintain uniform standards for national reporting.)

References

CDC web site, Typhoid Fever. www.cdc.gov/nczved/divisions/dfbmd/diseases/typhoid_fever/
Heymann, D.L., ed. *Control of Communicable Diseases Manual, 20th Edition*. Washington, DC, American Public Health Association, 2015.

Additional Resources

IDPH web site: www.idph.state.ia.us/adper/
World Health Organization site: www.who.int/topics/typhoid_fever/en/