UTAH DEPARTMENT OF HEALTH

Report Immediately

Typhoid Fever/Paratyphoid Fever (Enteric Fever)

Disease Plan

Quick Links

Last updated: April 7, 2022 by Delaney Moore

Questions about this disease plan?

Contact the Utah Department of Health Bureau of Epidemiology: 801-538-6191.

✓ CRITICAL CLINICIAN INFORMATION

Clinical Evidence
Signs/Symptoms • Most common symptoms include fever, abdominal pain, anorexia, lethargy, malaise, headache, and cough. • Neurologic symptoms include acute psychosis, myelitis, meningitis, and encephalitis. • Paratyphoid has a similar clinical presentation but may be less severe.
Period of Communicability • Typhoid and paratyphoid fever are communicable for as long as the infected person excretes *S.* Typhi or *S.* Paratyphi in the feces or urine. • Persons who excrete *S.* Typhi or *S.* Paratyphi for more than three months are considered chronic carriers and can potentially excrete bacteria permanently.
Incubation Period • Typhoid Fever: usually 8-14 days (range of three days to 2 months). • Paratyphoid Fever: 1-10 days.
Mode of Transmission • Typically fecal-oral route, but sexual transmission and laboratory-acquired infections have been reported.
Laboratory Testing
Type of Lab Test/Timing of Specimen Collection • Culture is the preferred method for Typhoid/Paratyphoid fever diagnosis. • Vi antibody testing may be useful for identifying chronic carriers.
Type of Specimens • Stool, blood, and urine are all acceptable specimens. • *S.* Typhi can be cultured from bone marrow.
Treatment Recommendations
Type of Treatment • Antibiotics therapy is essential. Ampicillin, amoxicillin, cefotaxime, ceftriaxone, chloramphenicol, TMP-SMX, and fluoroquinolones are all appropriate treatments. • In patients with shock or severe neurologic symptoms, IV dexamethasone may reduce mortality.
Time Period to Treat • Relapse is common and retreatment is indicated in these cases.
Prophylaxis • Vaccination of household contacts of chronic typhoid carriers is beneficial and should be considered. • Vaccination of household contacts of non-chronic typhoid cases is of limited value. • Vaccines are available for travelers but have limited efficacy (50% to 80%).
Contact Management
Isolation of Case • Food handlers, childcare workers, and healthcare workers with typhoid must be excluded from work. After diarrhea has resolved, excluded workers may only return to work after producing three consecutive negative stool specimens, taken no less than 24 hours apart each.
Quarantine of Contacts • All food handling, childcare, and healthcare facility workers, symptomatic or asymptomatic, who are contacts of a typhoid case should be considered the same as a case and handled in the same fashion at the discretion of the Local Health Officer.
Infection Control Procedures
• Enteric Precautions

✓ WHY IS TYPHOID FEVER/PARATYPHOID FEVER IMPORTANT TO PUBLIC HEALTH?

Typhoid fever and paratyphoid fever are bacterial illnesses usually transmitted via contaminated food or water. Although typhoid and paratyphoid fever are no longer endemic in the United States, approximately 200 to 300 cases are reported each year, mainly in travelers returning from developing countries, or persons exposed to chronic carriers. Typhoid and paratyphoid fever often cause severe, systemic illness, and hospitalization of cases is common. Appropriate antibiotic treatment is critical in preventing complications; untreated cases have a high fatality rate. Infected persons can easily spread the bacteria to others and chronic carriers who are unidentified can continue to spread the disease for many years. When cases are reported to public health, intervention is essential to ensure appropriate treatment, prevent secondary transmission of disease, and identify the source of infection, including identification and management of chronic typhoid carriers.

✓ DISEASE AND EPIDEMIOLOGY

Clinical Description

Typhoid fever is a systemic bacterial disease. Initial symptoms typically include sustained fever, abdominal pain, anorexia, lethargy, malaise, dull continuous headache, and a nonproductive cough. Constipation is reported more frequently than diarrhea in adults. Nausea and vomiting may also occur. Diarrhea is most common in children, especially infants under one year of age. During the second week of illness, there is often a protracted fever and mental dullness. After the first week or so, some cases develop a macular rash on the trunk and upper abdomen (“rose spots”). Other symptoms may include intestinal bleeding, slight deafness, and parotitis. Neurologic symptoms including acute psychosis, myelitis, meningitis, and encephalitis; focal central nervous infections occur rarely. Mild and atypical infections are common and relapses occur in up to 15-20% of patients. Without treatment, symptoms may last for 3-4 weeks.

Paratyphoid fever has a similar presentation as typhoid fever; however, symptoms tend to be less severe.

Causative Agent

Typhoid fever is caused by *Salmonella enterica* serovar Typhi.

Paratyphoid fever is caused by *Salmonella enterica* serovar Paratyphi A, B, or C. Paratyphi A and B are the most common serotypes. Infections with S. Paratyphi B variant L[+] tartrate + (previously known as *S*. Java) cause gastroenteritis rather than paratyphoid fever.

Differential Diagnosis

The differential diagnosis for typhoid and paratyphoid fever includes parenteric fever, dengue fever, brucellosis, malaria, subacute bacterial endocarditis, kala azar, liver amebiasis, and typhus.

Laboratory Identification

Isolation of *S.* Typhi or *S*. Paratyphi from clinical specimens is the preferred method for laboratory diagnosis. Blood cultures may be more sensitive than stool or urine cultures in the first week of disease. *S.* Typhi can be also cultured from bone marrow; in fact, this is the most sensitive method of isolating of *S.* Typhi. Serologic tests based on agglutinating antibodies (Widal test) are generally of little diagnostic value. Newer, rapid serodiagnostic tests using enzyme-linked immunosorbent assay (ELISA) and dipstick techniques have better sensitivity and specificity than the Widal test and may be useful in outbreak settings. However, they are not useful for individual patient diagnosis. Culture-independent diagnostic tests (CIDTs) have also become more widely-used but results should be verified by culture.

An ELISA for antibodies to the capsular polysaccharide Vi antigen may be useful in diagnosing chronic carriers of *S.* Typhi.

> **UPHL:** The Utah Public Health Laboratory (UPHL) accepts stool, urine, and blood specimens for isolation, serotyping, and Whole Genome Sequencing (WGS). All isolates from clinical laboratories should be submitted to UPHL.
>
> **CDC:** The Centers for Disease Control and Prevention (CDC) may be able to provide Vi antibody testing to identify chronic carriers. Contact the Utah Department of Health (UDOH) for more information.

Treatment

Early diagnosis and prompt treatment with appropriate antibiotic therapy are essential in order to treat the disease with minimal complications. This is especially true for children. While most cases can be managed with oral antibiotics and regular follow-up at home, patients with more severe illness require hospitalization and parenteral antibiotic treatment.

Ampicillin, amoxicillin, cefotaxime, ceftriaxone, chloramphenicol, TMP-SMX, and fluoroquinolones are all appropriate treatments. The drug of choice, route of administration, and duration of therapy are based on the site of infection, host, and clinical response. Due to increasing antibiotic resistance among *Salmonella* Typhi isolates, antimicrobial susceptibility testing is strongly recommended in order to select the most appropriate treatment. A person will usually recover in 2-3 days with prompt antibiotic treatment. Relapse is common after therapy, and retreatment is indicated in these cases.

In patients presenting with shock or severe neurologic symptoms, intravenous dexamethasone (under strictly controlled conditions and supervision) may reduce mortality.

Case Fatality

The case fatality rate for untreated typhoid fever ranges from 10% to 20%. With prompt, appropriate antibiotic treatment, however, this drops to less than 1%.

Reservoir

Humans are the only reservoir for *S.* Typhi and *S.* Paratyphi A. Humans are also the most important reservoir for *S*. Paratyphi B and *S.* Paratyphi C, but domestic animals may also transmit disease.

Chronic carriers are the most important source of *S.* Typhi. About 2-5% of cases become chronic carriers, some after asymptomatic or mild infection. The chronic carrier state is most common when infection occurs during middle age, and women are more likely to have chronic infection than men. Infection with *S.* Paratyphi is less likely to lead to the carrier state.

Transmission

S. Typhi is generally transmitted via food or water contaminated with feces or urine from a case or carrier. Direct person-to-person spread can also occur. Shellfish harvested from sewage-contaminated water are potential vehicles, as are fruits and vegetables grown in soil fertilized with human waste in developing countries. Sexual transmission from an asymptomatic carrier has been documented. Laboratory-acquired infections also have been reported, including in lab workers who do not directly handle *Salmonella* specimens.

Susceptibility

Anyone can get typhoid fever if exposed to the bacteria. Relative specific immunity follows infection or immunization. Travelers visiting developing countries are at greatest risk for getting typhoid fever. In developing countries, most cases occur in children.

Incubation Period

The incubation period for typhoid fever is usually 8-14 days, with a range of three days to two months. The incubation period for paratyphoid fever is 1-10 days.

Period of Communicability

Typhoid and paratyphoid fever are communicable for as long as the infected person excretes *S.* Typhi in the feces or urine. This usually begins about a week after onset of illness, continues through convalescence, and occurs for a variable period thereafter. Cases of paratyphoid fever are usually infectious for 1-2 weeks. About 10% of cases of *S.* Typhi excrete the organism for three months after onset. Both treated and untreated cases can become carriers. *S.* Paratyphi infection is less likely to result in chronic carriage.

Chronic Carriers

Persons who excrete *S.* Typhi or *S.* Paratyphi for more than three months are considered chronic carriers. Patients who are chronically colonized may excrete large numbers of organisms in spite of having a high level of immunity and no clinical symptoms. Chronic carriers

often will have high antibody titers to the Vi antigen, a clinically useful test for rapid identification of carriers (see Laboratory Identification section). Carriers can excrete bacteria permanently.

Epidemiology

Typhoid fever is most prevalent in impoverished countries, and it is estimated that worldwide, over 22 million cases occur each year, resulting in 200,000 deaths. While approximately 5,700 cases are estimated to occur in the United States each year, only 300-500 of these are reported. On average, 2-3 cases of typhoid fever are reported in Utah each year.

The incidence of paratyphoid fever is less well documented, but is believed to be much less than the incidence of typhoid (by a ratio of 10 to 1).

Most cases of typhoid fever in the United States (up to 75%) are acquired while traveling internationally. Over the past ten years, travelers to Asia, Africa, the Middle East, and Latin America have been especially at risk.

Antimicrobial-resistant strains are becoming increasingly prevalent.

Outbreaks have occurred in the United States from food brought in from other countries. Despite suggestions to the contrary, outbreaks do not occur as a result of floods or other disasters in developed countries such as the United States where typhoid fever is not endemic.

✓ PUBLIC HEALTH CONTROL MEASURES

Public Health Responsibility

- Identify all suspect cases and carriers of disease and ensure appropriate treatment and education are provided.
- Investigate all cases, complete and submit appropriate disease investigation forms.
- Identify contacts to cases and carriers and ensure they receive appropriate education, testing, vaccination and/or treatment, if necessary.
- Provide education to the general public, clinicians, and first responders regarding disease transmission and prevention.
- Identify clusters or outbreaks and determine the source.
- Attempt to identify the source of all cases to prevent further transmission.

Prevention

Environmental Measures

Implicated food items must be removed from consumption. A decision about testing implicated food items can be made in consultation with the enteric epidemiologist at UDOH, and UPHL.

The general policy of UPHL is to test only food samples implicated in suspected outbreaks, not in single cases. The exception to this is when botulism is suspected. If holders of food implicated in single case incidents would like their food tested, they may be referred to a private

laboratory that will test food or store the food in their freezer for a period of time in case additional reports are received.

Personal Preventive Measures/Education

To avoid exposure to *S.* Typhi or *S.* Paratyphi, persons should:

- Always wash their hands thoroughly with soap and water before eating or preparing food, after using the toilet, after changing diapers, and after touching pets or other animals.
- Wash children's hands as well as their own hands after changing diapers, and dispose of diapers in a closed-lid garbage can.
- Wash hands thoroughly and frequently when ill with diarrhea or when caring for someone with diarrhea.
- Scrub hands for at least 15-20 seconds after cleaning the bathroom; after using the toilet, or helping someone else use the toilet; after changing diapers; before handling food; and before eating.

International Travel

Persons traveling to areas endemic for typhoid and paratyphoid fever should:

- Consider vaccination against typhoid fever. Travelers should check with their healthcare provider or a travel clinic for vaccine options. Vaccination must be completed 1-2 weeks before travel to be effective.
- "Boil it, cook it, peel it, or forget it."
- Avoid foods and beverages from street vendors.
- Drink only bottled or boiled water. Bottled, carbonated water is safer than non-carbonated 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 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 thoroughly wash.

Chemoprophylaxis

Vaccination of household contacts of active cases of typhoid fever is of limited value. However, vaccination of household contacts of chronic typhoid carriers is beneficial and should be considered.

Vaccine

Two vaccines for typhoid fever are currently licensed in the United States. Vaccine efficacy ranges from 50% to 80%, so travelers must still exercise caution when consuming local foods and beverages. Typhoid vaccines lose effectiveness after several years, so booster doses are necessary. Vaccination should be completed 1-2 weeks before travel to be effective.

Typhoid Vaccines Available in the United States

Vaccine Name	How Given	Number of Doses Necessary	Time Between Doses	Time immunization should be completed by (before possible exposure)	Minimum Age For Vaccination	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

Note: As of December 2020, the maker of the oral typhoid fever vaccine (Ty21a) will temporarily stop making and selling it. This vaccine may be in limited supply or unavailable.

Source: https://www.cdc.gov/typhoid-fever/typhoid-vaccination.html

No vaccine for paratyphoid fever is available. Typhoid vaccine does not offer protection against *S.* Paratyphi infection.

Isolation and Quarantine Requirements

Isolation: Food handlers, childcare workers, and healthcare workers with typhoid must be excluded from work. After diarrhea has resolved, excluded workers should only return to work after producing three consecutive negative stool specimens, taken no less than 24 hours apart each. If the case has been treated with an antimicrobial, the first stool specimen should not be collected until at least 48 hours after cessation of therapy.

Utah Food Code requires that food handlers are restricted from work until the following two criteria are met:

1. The person in charge obtains approval from the regulatory authority, and
2. The food employee provides to the person in charge written medical documentation from a health practitioner that states the food employee is free from *S.* Typhi infection.

   NOTE: A food handler is any person directly preparing or handling food. This can include a patient or childcare provider.

Hospital: Enteric precautions.

Quarantine: All food handling, childcare, and healthcare facility workers, symptomatic or asymptomatic, who are contacts of a typhoid case should be considered the same as a case and handled in the same fashion at the discretion of the Local Health Officer.

✓ CASE INVESTIGATION

Reporting

All cases of typhoid and paratyphoid should be reported immediately to public health, including:

<u>*S.* Typhi Infection</u>

- A person with *S.* Typhi isolated from a clinical specimen
- A person with *S.* Typhi detected in a clinical specimen using a culture-independent diagnostic test (CIDT)
- A person with antibodies to *S.* Typhi detected in a clinical specimen
- A person with fever, diarrhea, abdominal cramps, constipation, anorexia, or relative bradycardia who is a contact of a confirmed or probable case of *S.* Typhi infection with laboratory evidence or a member of a risk group defined by public health authorities during an outbreak.
- A person whose healthcare record contains a recent diagnosis of *S.* Typhi infection.
- A person whose death certificate lists *S.* Typhi infection as a cause of death or a significant condition contributing to death.

<u>*S.* Paratyphi Infection</u>

- A person with *S.* Paratyphi A, B, or C isolated from a clinical specimen.
- A person with *S.* Paratyphi A, B, or C detected in a clinical specimen using a CIDT.
- A person with antibodies to *S.* Paratyphi A, B, or C detected in a clinical specimen.
- A person with fever, diarrhea, abdominal cramps, constipation, anorexia, or relative bradycardia who is a contact of a confirmed or probable case of *S.* Paratyphi infection with laboratory evidence or a member of a risk group defined by public health authorities during an outbreak.
- A person whose healthcare record contains a recent diagnosis of *S.* Paratyphi infection.
- A person whose death certificate lists *S.* Paratyphi infection as a cause of death or a significant condition contributing to death.

Other recommended reporting procedures

- All cases of typhoid/paratyphoid fever should be reported according to state regulations.
- Reporting should be ongoing and routine.
- Frequency of reporting should follow the state health department's routine schedule.

Table 1: Criteria to determine whether a case should be reported

Criterion	***Salmonella enterica* serotype Typhi (*S.* Typhi) Infection**		***Salmonella enterica* serotypes Paratyphi A, B (tartrate negative), and C (*S.* Paratyphi) infection**	
Clinical evidence				
Fever		O		O
Diarrhea		O		O
Abdominal cramps		O		O
Constipation		O		O

Anorexia		O		O
Relative bradycardia		O		O
Healthcare record contains a recent diagnosis of *S.* Typhi infection	S			
Death certificate lists *S.* Typhi infection as a cause of death or a significant condition contributing to death	S			
Healthcare record contains a recent diagnosis of *S.* Paratyphi A, B, or C infection			S	
Death certificate lists *S.* Paratyphi A, B, or C infection as a cause of death or a significant condition contributing to death			S	
Laboratory evidence				
Isolation of *S*. Typhi from a clinical specimen	S			
Detection of *S*. Typhi in a clinical specimen using a CIDT	S			
Detection of antibodies to *S*. Typhi in a clinical specimen	S			
Isolation of *S.* Paratyphi A, B, or C from a clinical specimen			S	
Detection of *S.* Paratyphi A, B, or C in a clinical specimen using a CIDT			S	
Detection of antibodies to *S.* Paratyphi A, B, or C in a clinical specimen			S	
Epidemiological evidence				
Epidemiologically linked to a confirmed *S.* Typhi Infection case		O		
Epidemiologically linked to a probable *S.* Typhi Infection case with laboratory evidence		O		
Epidemiologically linked to a confirmed *S.* Paratyphi Infection case				O
Epidemiologically linked to a probable *S.* Paratyphi Infection case with laboratory evidence				O
Member of a risk group as defined by public health authorities during an outbreak		O		O

Notes:

S = This criterion alone is SUFFICIENT to report a case

N = All “N” criteria in the same column are NECESSARY to report a case

O = At least one of these “O” (ONE OR MORE) criteria in **each category** (categories=clinical evidence, laboratory evidence, and epidemiological evidence) **in the same column**—in conjunction with all other “N” criteria in the same column—is required to report a case.

CSTE Case Definition
Typhoid and Paratyphoid Fever, 2018

Clinical Criteria

One or more of the following

- Fever
- Diarrhea
- Abdominal cramps
- Constipation
- Anorexia
- Relative bradycardia

Laboratory Criteria

S. Typhi Infection

Confirmatory laboratory evidence:

- Isolation of *S.* Typhi from a clinical specimen.

Presumptive laboratory evidence:

- Detection of *S.* Typhi in a clinical specimen using a culture-independent diagnostic test (CIDT).

S. Paratyphi Infection

Confirmatory laboratory evidence:

- Isolation of *S.* Paratyphi A, B (tartrate negative), or C from a clinical specimen.

Presumptive laboratory evidence:

- Detection of *S.* Paratyphi A, B (tartrate negative), or C in a clinical specimen using a CIDT.

*Serologic testing (i.e. detection of antibodies to *S.* Typhi or *S.* Paratyphi A, B, or C) should not be utilized for case classification.

Epidemiologic Linkage

S. Typhi Infection

- Epidemiological linkage to a confirmed *S.* Typhi Infection case, or
- Epidemiological linkage to a probable *S.* Typhi Infection case with laboratory evidence, or
- Member of a risk group as defined by public health authorities during an outbreak.

S. Paratyphi Infection

- Epidemiological linkage to a confirmed *S.* Paratyphi Infection case, or
- Epidemiological linkage to a probable *S.* Paratyphi Infection case with laboratory evidence, or
- Member of a risk group as defined by public health authorities during an outbreak.

Case Classifications

S. Typhi Infection

Confirmed:

- A person with confirmatory laboratory evidence.

Probable:

- A clinically compatible illness in a person with presumptive laboratory evidence.
- A clinically compatible illness in a person with an epidemiological linkage.

S. Paratyphi Infection

Confirmed:

- A person with confirmatory laboratory evidence.

Probable:

- A clinically compatible illness in a person with presumptive laboratory evidence.
- A clinically compatible illness in a person with an epidemiological linkage.

Criteria to distinguish a new case

S. Typhi Infection

A new case should be created when a positive laboratory result is received more than 365 days after the most recent positive laboratory result associated with a previously reported case in the same person.

S. Paratyphi Infection

A new case should be created when either:

- A positive laboratory result is received more than 365 days after the most recent positive laboratory result associated with a previously reported case in the same person, or
- Two or more different serotypes are identified in one or more specimens from the same person.

Table 2: Criteria for defining a case of Typhoid/Paratyphoid Fever

Criterion	***S.* Typhi Infection**			***S.* Paratyphi Infection**		
	Probable		Confirmed	Probable		Confirmed
Clinical evidence						
Fever	O	O		O	O	
Diarrhea	O	O		O	O	
Abdominal cramps	O	O		O	O	
Constipation	O	O		O	O	
Anorexia	O	O		O	O	
Relative bradycardia	O	O		O	O	
Laboratory evidence						
Isolation of *S*. Typhi from a clinical specimen			N			
Detection of *S*. Typhi in a clinical specimen using a CIDT		N				
Isolation of *S.* Paratyphi A, B, or C from a						N

clinical specimen						
Detection of *S.* Paratyphi A, B, or C in a clinical specimen using a CIDT					N	
Epidemiological evidence						
Epidemiologically linked to a confirmed *S.* Typhi Infection case	O					
Epidemiologically linked to a probable *S.* Typhi Infection case with laboratory evidence	O					
Epidemiologically linked to a confirmed *S.* Paratyphi Infection case				O		
Epidemiologically linked to a probable *S.* Paratyphi Infection case with laboratory evidence				O		
Member of a risk group as defined by public health authorities during an outbreak	O			O		
Criteria to distinguish a new case						
A positive laboratory result reported more than 365 days after the most recent positive laboratory result associated with a previously reported case in the same person		N	N		O	O
Two or more different serotypes identified in one ore more specimens from the same person					O	O

Notes:
S = This criterion alone is SUFFICIENT to classify a case
N = All "N" criteria in the same column are NECESSARY to classify a case.
O = At least one of these "O" (ONE OR MORE) criteria in **each category** (categories=clinical evidence, laboratory evidence, and epidemiological evidence) **in the same column**—in conjunction with all other "N" criteria in the same column—is required to report a case.

Case Investigation Process

- Obtain patient medical records, if available, to ensure that the patient has received appropriate antibiotic therapy.
- Assure isolate submission to UPHL.
- Interview the patient to ascertain:
    - That the patient has completed antibiotic therapy.
    - Whether the patient works in a high-risk setting (e.g., food service, childcare, healthcare).
    - Likely source of infection (e.g., international travel, exposure to a chronic carrier).
- Provide education to the patient and contacts about disease transmission and prevention.

- Exclude food handlers, childcare workers, and healthcare workers from work until their symptoms are resolved and they can produce three consecutive negative stool specimens.
- Investigate cases and contacts for carriage.
- Enter case information into UT-NEDSS/EpiTrax.
- Complete and submit CDC's "Typhoid and Paratyphoid Fever Surveillance Report" form.

Cases That Have Not Traveled Outside the United States

Efforts should be made to identify the source of infection for all cases that did not travel outside the United States in the 60 days before disease onset. The most likely sources of infection for non-travel related cases are undiagnosed chronic carriers and contaminated imported food.

Typhoid Carriers

A typhoid fever chronic carrier is defined as a person who excretes *S.* Typhi in the stool at 12 months following acute illness, or who has a known, asymptomatic infection.

A typhoid fever convalescent carrier is defined as a person who excretes typhoid bacilli for at least three, but less than 12, months after onset.

Treatment of Carriers

Carriers can be treated with ciprofloxacin or norfloxacin. These treatments are 80% successful in the treatment of carriers. Follow-up cultures are needed to confirm cure of carrier status as described below.

Public Health Responsibility for Carriers

All carriers and any household, sexual, and other close contacts should be under public health supervision.

A carrier:

- May not attend a childcare facility or participate in occupations involving food handling, patient care, or care for young children or elderly persons until:
    - There is evidence that the person is no longer a carrier, or
    - Approval is granted by the Local Health Officer.
- May be released from supervision:
    - After three consecutive stool specimens are negative. These specimens should be taken one month apart and at least 48 hours after antibiotic treatment is completed, or
    - When approval is granted by the Local Health Officer.

Contacts of Carriers

- Household and close contacts of typhoid carriers should be assessed for symptoms. Any symptomatic contacts should be tested and treated if positive.
- Immunization is recommended for household and close contacts of typhoid fever carriers.

- Contacts of a carrier may not attend a childcare facility or participate in occupations involving food handling, patient care, or care for young children or elderly persons until:
    - Two consecutive negative stool specimens, taken at least 24 hours apart, are obtained, or
    - When approval is granted by the Local Health Officer.

Outbreaks

CDC defines a foodborne outbreak as "an incident in which two or more persons experience a similar illness resulting from the ingestion of a common food." In order to confirm an outbreak of typhoid or paratyphoid fever, the organism must be isolated from clinical specimens from at least two ill persons, or from an epidemiologically implicated food. Confirmed or suspected outbreaks of typhoid or paratyphoid fever should be investigated promptly and aggressively to identify the source and prevent additional cases. Control of person-to-person transmission requires special emphasis on personal cleanliness and sanitary disposal of feces.

Management of Cases and Carriers in High-Risk Settings

Since typhoid and paratyphoid fever may be easily transmitted from person-to-person and can cause severe illness, it is important to aggressively manage cases in high-risk settings.

General recommendations for persons in high risk settings who have positive cultures for *S.* Typhi or *S.* Paratyphi A, B (tartrate -) or C are outlined below.

Childcare Centers

- Cases should be excluded until three consecutive stool cultures taken 24 hours apart (and no sooner than 48 hours after the cessation of antibiotic therapy) are negative.
- Staff and attendees may be required to submit stool specimens for testing and may be subject to exclusion.

Schools

- Cases that are experiencing symptoms, such as diarrhea, fever, and abdominal pain, should be excluded until symptoms have resolved.
- Cases that do not handle food, have no symptoms, and are not otherwise ill may remain in school if special precautions are taken.
- When cases occur in a preschool, kindergarten, or first grade class (where hygiene may not be optimal), more stringent control measures may be indicated at the discretion of local health authorities.
- Students or staff who handle food and have a *S.* Typhi infection (symptomatic or not), or paratyphoid fever, must not prepare or handle food for others until they have three negative stool specimens taken 24 hours apart (and no sooner than 48 hours after the cessation of antibiotic therapy).

Community Residential Programs

Actions taken in response to a case or carrier of *S*. Typhi or *S.* Paratyphi in community residential programs will depend on the type of program and the level of functioning of the residents.

In residential facilities for the developmentally disabled:

- Staff and clients with *S.* Typhi or *S.* Paratyphi must refrain from handling or preparing food for other residents until their symptoms have subsided and until they produce three negative stool specimens, taken 24 hours apart and no sooner than 48 hours after the cessation of antibiotic therapy.
- Other close contacts in the facility should be tested, and if positive, should be subject to the same restrictions.

Long-Term Care Facilities

- Residents with *S*. Typhi or *S.* Paratyphi should be placed on standard (including enteric) precautions until symptoms subside and they test negative with three consecutive stool specimens taken 24 hours apart (and no sooner than 48 hours after the cessation of antibiotic therapy).
- Close contacts in the long-term care facility, including staff and roommates, should also be tested.
- Contacts who test positive should be placed on enteric precautions until they test negative with three stool cultures.
- Staff members who test positive for *S.* Typhi or *S.* Paratyphi and who give direct patient care (e.g., feed patients, provide mouth or denture care, administer medications), are considered food handlers and must be excluded until they produce three negative stool specimens taken 24 hours apart (and no sooner than 48 hours after the cessation of antibiotic therapy).

✓ ACKNOWLEDGMENTS

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✓ REFERENCES

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✓ VERSION CONTROL

V.11.14: Added CSTE reporting criteria, case definition swim lanes and case classification swim lanes.

V.03.15: New format adopted. All sections updated. Added language to clarify that recommendations apply to paratyphoid fever cases and typhoid fever cases.

V.12.21: Added Critical Clinician Information and Electronic Laboratory Reporting Processing Rules sections. Updated CSTE Case Classification. All other sections updated.

✓ UT-NEDSS Minimum/Required Fields by Tab

Demographic

- First Name
- Last Name
- Street Number
- Street Name
- City
- State
- County
- Zip Code
- Date of Birth
- Area Code
- Phone Number
- Birth Gender
- Ethnicity
- Race
- Is the patient a recent refugee or immigrant?

Clinical

- Disease
- Onset Date
- Have the patient's symptoms resolved?
- Date Diagnosed
- Diagnostic Facility
- Visit Type
  - (if inpatient) Did Typhoid/Paratyphoid cause hospitalization?
- Died
  - (if yes) Date of Death
  - (if yes) Did Typhoid/Paratyphoid cause death?
- Symptoms
- Was patient vaccinated within 5 years before onset?
  - (if yes) Was oral Ty21a or Vivotif 4-pill series used?
  - (if yes) Was ViCPS or Typhim Vi shot used?

Laboratory

- Lab Name
- Lab Test Date
- Collection Date
- Specimen Source
- Test Type
- Organism
- Test Result
- Accession Number
- Antibiotic sensitivity performed?
  - (if yes) Resistant to Ampicillin?
  - (if yes) Resistant to TMP-sulfa?
  - (if yes) Resistant to Chloramphenicol?
  - (if yes) Resistant to Fluoroquinolones?

Epidemiological

- Food Handler
  - Name of facility where patient handled food
  - Location
  - Did the patient work while ill?
  - Important information including dates
- Healthcare Worker
  - Name of healthcare facility
  - Location
  - Did the patient work while ill?
  - Important information including dates
- Group Living
  - Name of the facility
  - Did the patient work/attend while ill?
  - Important information including dates
- Childcare Association
  - Name of the daycare
  - Location
  - Did the patient work/attend while ill?
  - Important information including dates
- Occupation
- Imported From
- Risk Factors
- Risk Factor Notes

Investigation

- Date 30 days before disease onset
- Date 1 day before disease onset
- Did the patient travel outside the USA during the exposure period?
  - (if yes) Purpose of international travel:
  - (if yes) Describe travel (location, dates, mode, if others were ill, etc):
- Did the patient travel outside Utah, but inside the U.S. during the exposure period?
  - (if yes) Describe travel (location, dates, mode, if others were ill, etc):

- Did the patient travel outside the county, but inside Utah during the exposure period?
    - (if yes) Describe travel (location, dates, mode, if others were ill, etc):
- Did the patient have any visitors from out of the state or outside the U.S. during the exposure period?
    - (if yes) Did visitors bring food to share?
    - (if yes) Details:
- Did the patient drink or have exposure to any of the following during the exposure period?
    - (if yes) Specify details (dates, locations, etc.):
- Did the patient drink or have exposure to any other water sources not listed during the exposure period?
    - (if yes) Specify details (dates, locations, etc.):
- Date Epidemiology was notified of any high-risk occupations/settings and/or exposures likely to cause additional illness:
- Date all contacts of case identified:
- Date UDOH was notified of suspect case or carrier from which patient may have acquired infection and/or contacts identified outside jurisdiction.

Contacts

- Was the case traced to a typhoid or a paratyphoid carrier?
    - (if yes) Was the carrier previously known to the health department?

Reporting

- Date first reported to public health

Administrative

- State Case Status
- Outbreak Associated
- Outbreak Name

CONTACT EVENT

Clinical

- Onset date
- Was contact previously vaccinated?
    - (if yes) Which type?
    - (if yes) Completed?

Epidemiological

- Does contact work in a high-risk occupation?
    - (if yes) What type?

✓ ELECTRONIC LABORATORY REPORTING PROCESSING RULES

Typhoid/Paratyphoid Rules for Entering Laboratory Test Results

The following rules describe how laboratory results reported to public health should be added to new or existing events in UT-NEDSS. These rules have been developed for the automated processing of electronic laboratory reports, although they apply to manual data entry, as well.

Test-Specific Rules

Test specific rules describe what test type and test result combinations are allowed to create new morbidity events in UT-NEDSS, and what test type and test result combinations are allowed to update existing events (morbidity or contact) in UT-NEDSS.

Test Type	Test Result	Create a New Event	Update an Existing Event
Culture	Positive	Yes	Yes
	Negative	No	Yes
	Equivocal	No	Yes
	Other	No	Yes
PCR/amplification	Positive	Yes	Yes
	Negative	No	Yes
	Equivocal	No	Yes
	Other	No	Yes
Total Antibody (by EIA, IFA, TRF, etc.)	Positive	No	Yes
	Negative	No	Yes
	Equivocal	No	Yes
	Other	No	Yes

Whitelist Rules

Whitelist rules describe how long an existing event can have new laboratory data appended to it. If a laboratory result falls outside the whitelist rules for an existing event, it should not be added to that event, and should be evaluated to determine if a new event (CMR) should be created.

Typhoid/Paratyphoid Morbidity Whitelist Rule: If the specimen collection date of the laboratory result is 1 year or less after the specimen collection date of the morbidity event, the laboratory result should be added to the morbidity event.

Typhoid/Paratyphoid Contact Whitelist Rule: If the specimen collection date of the laboratory result is 30 days or less after the event date of the contact event, the laboratory result should be added to the contact event.

Graylist Rule

We often receive laboratory results through ELR that cannot create cases, but can be useful if a case is created in the future. These laboratory results go to the graylist. The graylist rule describes how long an existing event can have an old laboratory result appended to it.

Typhoid/Paratyphoid Graylist Rule: If the specimen collection date of the laboratory result is 30 days before to 7 days after the event date of the morbidity event, the laboratory result should be added to the morbidity event.

Other Electronic Laboratory Processing Rules

- If an existing event has a state case status of “not a case,” ELR will never add additional test results to that case. New labs will be evaluated to determine if a new CMR should be created.