

# Typhoid Fever (*Salmonella typhi*) Investigation Guideline

## Contents

<b>CASE DEFINITION</b> .....	<b>1</b>
Additional Definitions for Case Management .....	1
<b>LABORATORY ANALYSIS</b> .....	<b>1</b>
<b>EPIDEMIOLOGY</b> .....	<b>2</b>
<b>DISEASE OVERVIEW</b> .....	<b>2</b>
<b>NOTIFICATION</b> .....	<b>3</b>
<b>INVESTIGATOR RESPONSIBILITIES</b> .....	<b>4</b>
<b>STANDARD CASE INVESTIGATION</b> .....	<b>4</b>
Case Investigation.....	5
Contact Investigation .....	6
Isolation, Work and Daycare Restrictions.....	7
Case Management.....	9
Contact Management .....	9
Environmental Measures.....	9
Education .....	9
<b>MANAGING SPECIAL SITUATIONS</b> .....	<b>10</b>
A. Outbreak Investigation.....	10
B. Chronic Carriers.....	10
C. Case Is a Food Handler or Restaurant Is Implicated.....	11
D. Case with Association to Childcare .....	11
E. Public Gathering Implicated .....	11
F. Intentional Contamination .....	12
<b>DATA MANAGEMENT AND REPORTING</b> .....	<b>13</b>
<b>ADDITIONAL INFORMATION</b> .....	<b>14</b>
<b>ATTACHMENTS</b> .....	<b>14</b>
• Fact Sheet (vs. 08/2014)	
• Sample Typhoid Carrier Agreement (vs. 08/2014)	

## Revision History:

Date	Replaced	Comments
08/2014	11/2009	Added notification section and table of contents. Added definition of Chronic Carrier. Edited data management section.

# Typhoid Fever

## Disease Management and Investigative Guidelines

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### CASE DEFINITION (CDC 2005)

#### Clinical Description for Public Health Surveillance:

- An illness caused by *Salmonella 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 *S. typhi* may be prolonged.

#### Laboratory Criteria for Case Classification:

- Isolation of *S. typhi* from blood, stool, or other clinical specimen. 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.

#### Case Classification:

- **Confirmed:** A clinically compatible case that is laboratory confirmed. Serologic evidence alone is not sufficient for confirmation.
- **Probable:** A clinically compatible case that is epidemiologically linked to a confirmed case in an outbreak.

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#### Additional Definitions for Case Management:

- **Chronic carrier:** individual who is asymptomatic and continues to have positive stool cultures for *S. typhi* a year following recovery from acute illness.

### LABORATORY ANALYSIS

There is no definitive test for typhoid fever. The initial diagnosis is made clinically; one should suspect typhoid or paratyphoid fever in a patient at a high risk for infection who presents with a gradual onset of fever that increases in severity over several days.

- Testing currently available commercially:
  - Blood culture: positive in only half the cases.
  - Stool or Urine culture: not usually positive during the early acute phase of the disease but is used to determine if a person is a typhoid carrier.
    - *Why urine cultures? Important for individuals with schistosomiasis and typhoid as they are at risk of developing a chronic urinary carrier state of S. typhi.*
  - Bone-marrow culture: increases the diagnostic yield to about 80%.
  - Culture of bile (collected from a bile-stained duodenal string): used with blood culture resulting in 90% diagnostic yield in children with enteric fever.
  - Widal test, a serology test for antibodies to O and H antigens of *Salmonella*; unreliable but is used in developing countries because of its low cost.
  - Newer serologic assays are more sensitive and specific than the Widal test but are not an adequate substitute for blood, stool, or bone marrow culture.
    - Vi antibody: found to be very high in chronic *S. typhi* carriers; has been used as a screening technique to identify carriers among food handlers, but stool cultures are necessary to remove food handling restrictions.

Services available from Kansas Health and Environmental Laboratories (KHEL):

- Storage and analysis of Salmonella isolates from outside laboratories. (The submission of Salmonella isolates to KHEL is required by law.)
- Culture of stool specimens from suspect cases during outbreak investigations. **Preapproval** is required through the KDHE Infectious Disease Response unit at 1-877-427-7317.
- Stool culturing for *S. Typhi* and follow-up cultures to establish (or rule out) the carrier state can also be done at KHEL if these services are not available locally. **Preapproval** is required through the KDHE Infectious Disease Response unit at 1-877-427-7317. Collection and shipment is arranged through the local health department.

Specimen collection criteria:

- Specimen type: Feces; marble size amount in Cary-Blair
- Collection materials: [Enteric kit](#) (bottle with Cary-Blair medium (0.16%))
- Timing of specimen collection:
  - To remove [restrictions](#) collect 2 specimens  $\geq$  24 hours apart.
  - Collect the first specimen >48 hours after the discontinuation of any antibiotics.

Shipment of *Salmonella* isolates to the KHEL as required by law:

- Isolate shipment: Use [infectious disease mailers](#) provided by KHEL.

For additional information concerning collection or transport to KHEL call (785) 296-1620 or refer to [www.kdheks.gov/labs/lab\\_ref\\_guide.htm](http://www.kdheks.gov/labs/lab_ref_guide.htm)

## EPIDEMIOLOGY

Worldwide, approximately 17 million cases and 600,000 deaths occur annually. In the U.S., less than 500 cases occur annually and 70% of these are acquired while traveling abroad; travelers to Asia, Africa and Latin America are at higher risk. Antimicrobial resistant strains are becoming more prevalent. Outbreaks have occurred in the United States from food imported from other countries. Outbreaks do not result from floods or other disasters in countries that are not endemic for typhoid. Typhoid fever is not endemic in Kansas or the United States. In recent years, 0-4 cases were reported annually to KDHE with cases reporting recent travel to typhoid endemic countries.

## DISEASE OVERVIEW

### A. Agent:

Typhoid fever is a bacterial disease caused by *Salmonella typhi*.

### B. Clinical Description:

Typhoid fever is a systemic infectious disease, symptoms include: sustained fever, headache, malaise and anorexia. Vomiting and diarrhea are typically absent, but constipation is frequently reported. Bradycardia, enlargement of the spleen and rose spots on trunk, may also occur. Ulceration of Peyer's patches in the ileum in late untreated disease causes bloody diarrhea. Mild and atypical infections are common. Relapses are common. The case-fatality rate is <1% with prompt antibiotic treatment.

**C. Reservoirs:**

*S. typhi* only infects humans; chronic carriers are important reservoirs.

**D. Mode(s) of Transmission:**

Person-to-person, usually via fecal-oral route. Fecally contaminated drinking water is a commonly identified vehicle. *S. typhi* may also be found in urine and vomitus which in some situations could contaminate food or water. Shellfish grown in sewage-contaminated water and vegetables from developing countries are potential vehicles. Flies can mechanically transfer the organism to food, where it then multiplies to achieve an infective dose.

**E. Incubation Period:**

Range 3 days to 1 month; average 8-14 days. Incubation period depends on the infective dose.

**F. Period of Communicability:**

The disease is communicable for as long as the infected person excretes *S. typhi* in their excreta, usually after the 1st week of illness through convalescence. Approximately 10% of untreated cases will excrete *S. typhi* for 3 months and between 2-5% of all cases become chronic carriers.

**G. Susceptibility and Resistance:**

Susceptibility is general. Specific immunity follows recovery from clinical disease and/or active immunization.

**H. Treatment:**

With resistant strain prevalence, antibiotic sensitivity tests must be obtained. Ciprofloxacin is considered the drug of choice with chloramphenicol, amoxicillin and TMP-SMX having high efficacy if the strain is shown to be sensitive. Relapse is common, retreat as necessary.

**I. Vaccine:**

Two typhoid vaccines are currently available in the U.S. CDC recommends typhoid vaccine for travelers to areas where there is a recognized increased risk of exposure to *S. Typhi*. Typhoid immunization is not 100% effective, and typhoid fever could still occur. See [Additional Information /Resources](#).

**NOTIFICATION TO PUBLIC HEALTH AUTHORITIES**

Typhoid fever infections shall be designated as infectious or contagious in their nature, and cases or suspect cases shall be reported within seven days:

1. Health care providers and hospitals: report to the local public health jurisdiction or KDHE-BEPHI (see below)
2. Local public health jurisdiction: report to KDHE-BEPHI (see below)
3. Laboratories: report to KDHE-BEPHI (see below)
4. KDHE-BEPHI will contact the local public health jurisdiction by phone within one hour of receiving any suspected typhoid fever report.

**Kansas Department of Health and Environment (KDHE)  
Bureau of Epidemiology and Public Health Informatics (BEPHI)  
Phone: 1-877-427-7317 Fax: 1-877-427-7318**

## **Further responsibilities of state and local health departments to the CDC:**

*As a nationally notifiable condition, confirmed and probable typhoid fever cases require a STANDARD report to the Center of Disease Control and Prevention (CDC).*

- **Local public health jurisdiction** will report information requested on the disease reporting forms as soon as possible, completing the forms within 7 days of receiving a notification of a report.
- KDHE-BEPHI will file an electronic case report the next regularly scheduled electronic transmission.  
(KDHE-BEPHI files electronic reports weekly with CDC.)

## **INVESTIGATOR RESPONSIBILITIES**

- 1) [Report](#) all confirmed, probable and suspect cases to the KDHE-BEPHI.
- 2) Contact medical provider to collect additional information and confirm diagnosis using current [case definition](#).
  - If *S. typhi* was isolated, ensure a [bacterial isolate](#) is sent to KHEL.
  - If an individual is self identifying as a [chronic carrier](#) but no medical record is available or only a Widal test was done in a developing country - a stool culture to confirm will be necessary.
  - Collect all information requested in [Step 1](#)) of case investigation.
  - Ensure that case is aware of his/her diagnosis.
- 3) Conduct [case investigation](#) to identify potential source of infection.
  - Complete an interview with the case to collect information requested on the [Typhoid Fever Investigation Form](#) located in EpiTrax.
- 4) Conduct [contact investigation](#) to identify additional cases
  - Create a contact listing and follow-up with contacts as necessary.
- 5) Identify whether the source of infection is major public health concern,
  - Chronic carrier
  - Unknown source when the case has had no association to an endemic area or exposure to a known chronic carrier
  - Involvement of a foodhandler, a daycare, or direct patient care provider.
  - Suspected outbreak.
- 6) Initiate control and prevention measures to prevent spread of disease.
  - Implement [Isolation, Work and Daycare Restrictions](#) as needed.
- 7) [Record](#) data, collected during the investigation, in the KS EpiTrax system under the data's associated [\[tab\]](#) in the case morbidity report (CMR).
- 8) As appropriate, use [Typhoid carrier agreements](#), and the disease [fact sheet](#) to notify the case, contacts and other individuals or groups as needed.

\* Please note the red [\[tab\]](#) names listed in this investigation guideline are notations on the location in EpiTrax where the collected data should be recorded.

Morbidity Event (Chickenpox) Route to Local Health Depts. Investigator: 1

Show | Print | Delete | Add Task | Add Attachment | Export to CSV | Create a new event from this one | Events

Disable Tabs]

Demographic | Clinical | Laboratory | Contacts | Epidemiological | Reporting | Investigation | Notes | Administrative

# STANDARD CASE INVESTIGATION AND CONTROL METHODS

## Case Investigation

Upon a notification of a suspected typhoid fever, the case is reported as “suspect” in EpiTrax, with the pending lab results noted. **Additional** case investigation will be required only for cases that are laboratory confirmed or are epidemiologically linked to a confirmed case.

**Note:** *If no laboratory results are received within 2 weeks of the initial report, the LHD with jurisdiction should follow-up with the physician to determine the results of testing, and any results (negative or positive) should then be forwarded to KDHE. Upon receipt of negative results, the case can be closed.*

Confirmed or probable cases are investigated as follows:

- 1) Contact the medical provider who ordered testing of the case and obtain the following information. (This includes medical records for hospitalized patients.)
  - Identify if the patient was ill with symptoms of typhoid fever.
    - If yes, record onset date of illness. [Clinical]
    - Record symptoms: fever, abdominal pain, headache, or other (specify). [Investigation-Symptoms]
  - Record the patients’ history of typhoid vaccine within the five years before illness onset; including the type of vaccine and year received. [Investigation-Vaccination History]
  - Examine laboratory testing, specifically culture results. [Laboratory]
    - If *S. Typhi* was isolated, ensure [bacterial isolate](#) was sent to KHEL and determine if the case is considered a [chronic carrier](#). In EpiTrax:
      - Examine field for “Specimen Sent to State Lab?”, and
      - Examine type of specimen and date first isolated fields to assist with determining if a case is a [chronic carrier](#).
  - Determine if further laboratory testing results are needed.
    - If not yet reported to KDHE, request antibiotic sensitivity testing results for: ampicillin, chloramphenicol, trimethoprim-sulfamethoxazole, or fluoroquinolones. [Laboratory]
    - Additional cultures may be needed for [case management](#).
  - Collect case’s demographics and contacting information ([address](#), [birth date](#), [gender](#), [race/ethnicity](#), [primary language](#), and [phone number\(s\)](#)) [Demographic]
  - Record reason for any hospitalizations, include location, admission and discharge dates [Clinical]
  - Record outcomes: recovered, or death and date of death [Clinical]
- 2) Interview the case to determine source, risk factors and transmission settings:
  - Collect epidemiological information that helps to establish risks of acquiring and transmitting infection: [Epidemiological]
    - Inquire about case’s occupation, with particular interest on any activities as a food handler, healthcare worker, and child or elder care worker.
    - Record any places of potential exposure (where they could have acquired or transmitted illness) this includes daycare or restaurants.

- 3) For the period 30 days prior to illness onset, interview the case or proxy to determine: [\[Investigation-Exposure\]](#)
  - U.S. or other country of citizenship
  - Identify if the case was possibly exposed to a typhoid carrier, and if the carrier was previously known to the health department.
  - Travel history:
    - Travel outside of county; list city, county visited; dates visited
    - Travel outside of KS; list states visited; dates visited
    - Travel outside of U.S.; list country; date of departure and return to U.S.
    - Record reason for travel: business, tourism, visiting family/friend, immigration, or other (specify)
  - If the case had no travel outside of the United States and was not exposed to a possible typhoid carrier, collect information on the case's food history focusing on a period of **2 weeks before** illness onset.
    - An abbreviated version of the [Salmonella Investigation Form](#) can be used; focusing the food history on 'Food Sources' (including restaurants) and the consumption of any 'Fish & Seafood', 'Fruits', and 'Vegetables'.
  - Collect information from case for the [Contact Investigation](#). (See below).
- 4) Investigate epi-links among cases (clusters, household, co-workers, etc).
  - If the case had contact with person(s) who have/had *S. typhi*, determine if the other "cases" have been reported to the state:
    - Search EpiTrax for the possible case.
    - If found, record the previously reported record number in the record of the case you are investigating [Notes]
  - Highly suspected cases, that have not previously been reported should be investigated as a suspect case and [reported](#) to KDHE-BEPI.
  - For suspected [outbreaks](#) refer to Managing Special Situations section.

### Contact Investigation

- 1) Review the case's occupation and activities that were collected during the case investigation and recorded on the [\[Epidemiological\]](#) tab, especially dates, activities and locations during the period of illness.
- 2) Consider the following contact types during a contact investigation:
  - General: Household, close contacts and sexual partners of a case.
  - Daycare: All employee direct caregivers and "room" mates of a case.
  - School: with evidence of transmission in the school setting, the close contacts of a case
  - Travel companions in a commercial travel group
  - Food Service Contacts:
    - Co-workers who work the same shift as the infected food handler.
    - Patrons of the establishment of an infected food handler if (1) the food handler worked while infectious, (2) had poor personal hygiene, and (3) had the opportunity to have bare-hand contact with ready-to-eat food.
  - High risk contacts: those at risk of developing illness based on exposure, or who may expose others at high risk for developing a severe infection.

- 3) Create a contact roster. Include visitors/contacts within incubation period (to identify source) and during communicable period (to examine transmission). Collect and report the following information for each high-risk contact or for each contact that may have been the source of infection. [\[Contact\]](#)
  - Name, address, relationship, occupation, dates of contact.
  - History of typhoid exposure or similar illness; if so, where and when.
  - Identify persons involved in special situations (foodhandler, daycare, etc.).
- 4) Follow-up with household and other contacts (especially high risk contacts) as recommended under [Contact Management](#).
- 5) Institute control measures for school or day-care contacts as indicated under [Isolation, Work and Daycare Restrictions](#).

### Isolation, Work and Daycare Restrictions

Most people may return to work or school when their stools become formed as long as they carefully wash their hands after using the toilet. The exceptions are food handlers, caretakers of patients, elderly, or young children.

#### K.A.R. 28-1-6 for Typhoid Fever

- Enteric precautions shall be followed for the duration of acute symptoms.
- Each infected person shall be restricted from food handling, patient care, and any occupation involving the care of young children and the elderly until three negative stool cultures, and three negative urine cultures in patients with schistosomiasis, have been obtained.
  - Both the second and the third specimens shall be collected at least 24 hours after the prior specimen.
  - The first specimen shall be collected no sooner than 48 hours following discontinuation of antibiotics, and not earlier than one month after onset.
  - If any one of these tests is positive, cultures shall be repeated monthly until three consecutive negative cultures are obtained.
- Workers in schools, residential programs, daycare and healthcare facilities, who feed, give mouth care or dispense medications to clients, are subject to restrictions listed in K.A.R. 28-1-6.
- See [Table 1](#) on page 6 for managing a food handler associated to *S.typhi* infections based on Kansas Food Code regulations.
- School attendees are excluded until diarrhea, vomiting and fever ceases.
- Daycare attendees should be excluded until three negative stool cultures have been obtained (Caring for Our Children: National Health and Safety Performance Standards, Third Edition, 2011; STANDARD 7.4.0.1) or after approval by the local regulatory authority (i.e. local health officer).
- Consult with BEPHI for admittance of carriers to daycare.
  - Consultation will focus on: the developmental and physical condition of carrier, precautions that must be taken to minimize transmission risk, and the susceptibility to typhoid fever of those who could be exposed.

**Table 1. Managing a Food Handler That is Associated to *S. typhi* per Kansas Food Code 2005.**

Acute GI*?	Stool culture positive for <i>S. Typhi</i> ?	Illness in last 3 month with <i>S. Typhi</i>	Exposed/ Associated † to <i>S. Typhi</i>	Restriction or Exclusion ‡	Reinstatement of Employee to Full Duties
	Yes			Exclude from all facilities.	With the approval from regulatory authority. §
No		Yes		Exclude from all facilities.	With the approval from regulatory authority. §
Yes	No	No	No	Exclude from facilities that serve highly susceptible populations <sup>¶</sup> . Restrict in other situations.	After asymptomatic for 24 hours or with written medical documentation that the symptom is noninfectious.
No	No	No	Yes	Restrict from facilities that serve highly susceptible populations <sup>¶</sup> .	14 days after employee was exposed / associated to illness or 14 days after household contact became asymptomatic.
<b>(Refer to the KDHE Foodborne Illness and Outbreak Investigation Manual for additional information)</b>					

\*Acute GI (gastroenteritis illness) is associated to diarrhea, fever, vomiting or jaundice.

† Exposure / association is defined as a food handler consuming or preparing food implicated in a foodborne outbreak of *S. typhi* or that was prepared by a person infected with *S. Typhi*; or a food handler who has a household contact diagnosed with *S. Typhi* or a household contact who attended or worked at a setting where a foodborne outbreak of *S. Typhi* or occurred.

‡ Exclusion is not allowing the employee to work at the food establishment. Restriction is not allowing the employee to work with food; to clean equipment, utensils or linens; or to un-wrap single-use articles in the food establishment.

¶ A highly susceptible population is more likely to experience foodborne disease because they are immunocompromised or older adults and in a facility that provides health care or assisted living services, such as a hospital or nursing home; or preschool age children in a facility that provides custodial care, such as a daycare center.

§ Approval by a regulatory authority (i.e. local health officer) requires written documentation of 3 consecutive negative stools taken 48 hours after discontinuance of antibiotics and 24 hours apart. (A case with schistosomiasis must also have three negative urine cultures collected at the same time as the stools.) If any one of the tests is positive, cultures shall be repeated monthly until three consecutive negative cultures are obtained.

## Case Management

- 1) Educate case and caregivers on blood/body fluids and enteric precautions to take until clinical recovery.
- 2) Arrange for case to follow-up with the health department until the case has had no fewer than three (3) consecutive negative cultures of stool (and urine in patients with schistosomiasis) taken at least 24 hours apart and at least 48 hours after any antimicrobials.
  - If any are positive, repeat the set of 3 cultures at one month intervals for a year until at least 3 consecutive negative cultures are obtained.
  - Case may work in non-sensitive occupations during the follow-up period.
  - For [chronic carriers](#), refer to [Managing Special Situations](#).
- 3) Assure compliance with control measures ([Isolation, Work and Daycare Restrictions](#)) for those who are involved in food handling, patient care, and any occupation involving the care of young children and the elderly.
- 4) Report on any changes in patient status (i.e. date recovered or released from hospitalization or date of death). [Clinical]

## Contact Management

- 1) Consult [Table 1](#) above if a contact of the *S. Typhi* case is a food-handler.
- 2) Follow-up with all contacts to assure compliance with any [control measures](#) and to determine if any have become infected.
- 3) Routine immunization with typhoid vaccine is of limited value for family, household and medical providers that have been in direct contact with a case, but the use of vaccine is indicated those who will have close contact (i.e. household contact) to a documented [S. typhi carrier](#).

## Environmental Measures

If a commercial food service facility, daycare center or public water supply is implicated in transmission. Activities should be coordinated through the proper regulatory agency, including:

- Inspection of the facility.
- Collection of food, drink or water samples and, if necessary, human stool specimens for testing.
- Possible detailed trace-back investigation of any suspect food products.

The agency involved in traceback and inspections will depend on the source of infection. Refer to the [KDHE Foodborne Illness and Outbreak Manual](#).

## Education

- 1) As needed, inform of communicability, incubation period and symptoms.
- 2) Provide basic instruction to cases and potentially exposed contacts about:
  - The importance of personal hygiene, emphasize hand washing and the proper cleaning fingernails;
  - The proper disposal of feces, urine, and fomites;
  - The importance of seeking medical care should contacts develop symptoms or if the case's symptoms worsen and/or return.
- 3) Use the [Public Health Fact Sheet on Typhoid Fever](#) to assist with education.

## MANAGING SPECIAL SITUATIONS

### A. Outbreak Investigation:

- A single case is actively pursued to identify any outbreaks with unidentified cases associated to the same source. The situation should be treated as a public health emergency until additional cases and the possibility of an unidentified contaminated source has been ruled out.
  - Foodborne disease outbreak is defined in the following ways:
    - Two or more individuals (from different households) who experience similar illness after eating a common food or in a common place.
    - An unexplained, unexpected increase of a similar illness and food is a likely source.
  - Waterborne disease outbreak is defined as an incident in which two or more persons experience a similar illness after consumption or use of water intended for drinking, and epidemiologic evidence implicates the water as the source of the illness.
  - Other outbreaks may be defined as unexplained, unexpected increase in cases that are clustered in person, place, or time.
- Notify KDHE immediately, 1-877-427-7317.
- Consult [KDHE Foodborne Illness and Outbreak Manual](#) for outbreaks involving food.
- Consult [KDHE Control of Enteric Outbreaks in Child-Care Facilities](#) for circumstances involving child-care.
- Active case finding will be an important part of any investigation.

### B. Chronic Carriers:

- Review the definition of a [chronic carrier](#).
- Presumptive and confirmed carriers are subject to certain restrictions that are enforced by the local health officer (or local board health). These restrictions are itemized in the [Typhoid Fever Carrier Agreement](#).
- This agreement, which is signed by carrier, provides that the carrier will:
  - Not work as a food handler or provide personal care in daycare or residential care facilities.
  - Notify the health officer at once of any change in address or occupation;
  - Notify the health officer at once of any suggestive illness among household members or other personal contacts.
  - Provide specimens for culture as required by the local health officer.
- Chronic carriers should be supervised by the local health department with contact made at intervals of no longer than a year to ensure that all instructions are being followed.
- Chronic carriers may be released from their agreement following three consecutive, negative cultures are obtained, as directed by [K.A.R 28-1-6](#).

### **C. Case Is a Food Handler or Restaurant Is Implicated:**

For outbreaks, refer to [KDHE Foodborne Illness and Outbreak Manual](#).

For one case, proceed with the following activities (coordinating with the local food inspector and regulatory agency, as necessary):

- Conduct an environmental evaluation of the facility, interview the operator and review worker attendance records to identify employees with any illness suggestive of typhoid within the past month.
- Employees with a suspicious history within the past month must submit a single stool specimen for culture; symptomatic employees should obviously be excluded until disease status is ascertained.
- Ask about any complaints of illness from patrons during the past month.
- Review previous facility inspection reports and consider the personal hygiene of infected workers to determine the risk of transmission to patrons.
- The extent of further investigation depends on circumstances. Consult with the on-call epidemiologist at 1-877-427-7317.

### **D. Case with Association to Childcare**

If an outbreak is suspected, refer to the [KDHE Control of Enteric Outbreaks in Child-Care Facilities](#) for recommendations and guidelines.

For one case, proceed with the following activities (coordinating with the local inspector and regulatory agency, as necessary):

- 1) Interview the operator and check attendance records to identify suspect cases that may have occurred during the previous month.
- 2) If other potential cases are identified, complete a sanitary inspection.
- 3) Instruct the operator and other staff in proper methods for food handling and hand washing, especially after changing diapers.
- 4) Instruct the operator to notify the health department immediately if new cases of illness similar to typhoid fever occur. (Symptoms of *S. typhi* infection may be mild to severe and can include fever, headache, loss of appetite, constipation or diarrhea, and nonproductive cough.)
- 5) Consult with the on-call epidemiologist at 1-877-427-7317 about the need to collect and test stool specimens from daycare attendees and workers.
- 6) Call or visit once each week for 4 weeks after onset of the last case to verify that surveillance and appropriate hygienic measures are being carried out.

### **E. 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.
- 2) Find out if any other food preparers or attendees became ill within 4 weeks of the gathering.
- 3) Enforce [restrictions](#) on attendees or their household contacts who handle food.
- 4) Collect stool specimens for culture from any food handlers with suggestive histories. (Mandatory for workers of a commercial food service facility.)
- 5) The extent of further investigation depends on circumstances. Consult with the on-call epidemiologist at 1-877-427-7317.
- 6) If a food establishment or distributor is implicated as the source of infection, or for any outbreak, refer to [KDHE Foodborne Illness and Outbreak Manual](#).

## F. Intentional Contamination

*S. typhi* is considered a Category B bioterrorism agent in that it is a food and water safety threat. If the natural etiology cannot be readily established by a prompt and vigorous investigation, the situation should be considered to be a bioterrorist act until proven otherwise.

If suspected:

- Notify local law enforcement and state public health officials.
- Implement “[Chain of Custody](#)” procedures for all samples collected, as they will be considered evidence in a criminal investigation.
- Work to define population at risk which is essential to guide response activities. Public health authorities will play the lead role in this effort, but must consult with law enforcement, emergency response and other professionals in the process. The definition may have to be re-evaluated and redefined at various steps in the investigation and response.
- Once the mechanism and scope of delivery has been defined, identify symptomatic and asymptomatic individuals among the exposed and recommend treatment and/or chemoprophylaxis.
- Establish and maintain a detailed line listing of cases, suspect cases, exposed, and potentially exposed individuals with accurate identifying and locating information as well as appropriate epidemiological information.

Safety Considerations:

- Food and water are the most likely mechanism of delivery.
- No isolation or quarantine measures are indicated beyond standard enteric precautions.

For [clinical information](#), [incubation period](#), [treatment](#), [vaccine](#) and [laboratory testing](#); refer to the previous sections.

## DATA MANAGEMENT AND REPORTING TO THE KDHE

- A. Accept the case assigned to the LHD and record the date the LHD investigation was started on the [\[Administrative\]](#) tab.
- B. Organize and collect data, using appropriate data collection tools, including:
- [Typhoid Fever Form](#) accessed electronically in EpiTrax; investigators can collect and enter all required information directly into EpiTrax [\[Investigation\]](#), [\[Clinical\]](#), [\[Demographics\]](#), and [\[Epidemiological\]](#) tabs.
  - As needed, use the [Salmonella Investigation Form](#) (paper version) to access sections related to foods of interest.
  - During outbreak investigations, refer to guidance from a KDHE epidemiologist for appropriate collection tools.
- C. Report data collected during the course of the investigation via EpiTrax.
- Verify that all data requested on the [Typhoid Fever Form](#) has been recorded on an appropriate EpiTrax [\[tab\]](#), or that actions are completed for a case lost to follow-up as outlined below.
  - Some data that cannot be reported on an EpiTrax [\[tab\]](#) may need to be recorded in [\[Notes\]](#) or scanned and attached to the record.
  - Paper report forms do not need to be sent to KDHE after the information is recorded in EpiTrax. The forms should be handled as directed by local administrative practices.
- D. If a case is lost to follow-up, after the appropriate attempts to contact the case have been made:
- Indicate 'lost to follow-up' on the [\[Investigation\]](#) tab with the number of attempts to contact the case recorded.
  - Record at least the information that was collected from the medical records.
  - Record a reason for 'lost to follow-up' in [\[Notes\]](#).
- E. Once the investigation is completed, the LHD investigator will enter the date the investigation was completed on the [\[Administration\]](#) tab and click the "Complete" button. This will trigger an alert to the LHD Administrator so they can review the case before sending to the state.
- The LHD Administrator will then "Approve" or "Reject" the CMR.
  - Once a case is "Approved" by the LHD Administrator, BEPHI staff will review the case to ensure completion before closing the case.  
(Review the [EpiTrax User Guide, Case Routing](#) for further guidance.)

## ADDITIONAL INFORMATION / REFERENCES

- A. **Treatment / Differential Diagnosis:** American Academy of Pediatrics. Red Book: Report of the Committee on Infectious Disease, 29th Edition. Illinois, Academy of Pediatrics, 2014.
- B. **Epidemiology, Investigation and Control:** Heymann. D., ed., Control of Communicable Diseases Manual, 19th Edition. Washington, DC, American Public Health Association, 2010.
- C. **Case Definitions:** CDC Division of Public Health Surveillance and Informatics, Available at: [www.cdc.gov/osels/ph\\_surveillance/nndss/casedef/case\\_definitions.htm](http://www.cdc.gov/osels/ph_surveillance/nndss/casedef/case_definitions.htm)
- D. **Quarantine and Isolation:** Kansas Community Containment Isolation/ Quarantine Toolbox Section III, Guidelines and Sample Legal Orders [www.kdheks.gov/cphp/operating\\_guides.htm#coc](http://www.kdheks.gov/cphp/operating_guides.htm#coc)
- E. **Caring for Our Children: National Health and Safety Performance Standards; Guidelines for Early Care and Education Programs:** <http://cfoc.nrckids.org/index.cfm>
- F. **Kansas Regulations/Statutes Related to Infectious Disease:** [www.kdheks.gov/epi/regulations.htm](http://www.kdheks.gov/epi/regulations.htm)
- G. **KDHE Foodborne Illness and Outbreak Investigation Manual:** [www.kdheks.gov/epi/download/kansas\\_foodborne\\_illness\\_manual.pdf](http://www.kdheks.gov/epi/download/kansas_foodborne_illness_manual.pdf)
- H. **KDHE Control of Enteric Disease Outbreaks in Childcare Facilities:** [www.kdheks.gov/epi/download/Enteric\\_Disease\\_in\\_Daycare\\_Centers.pdf](http://www.kdheks.gov/epi/download/Enteric_Disease_in_Daycare_Centers.pdf)
- I. **KDHE Foodborne Illness Resources:** [www.kdheks.gov/epi/foodborne.htm](http://www.kdheks.gov/epi/foodborne.htm)
- J. **Additional Information (CDC):** [www.cdc.gov/health/default.htm](http://www.cdc.gov/health/default.htm)
- K. **CDC's Travelers' Health - Yellow Book (Typhoid-paratyphoid fever):** [wwwnc.cdc.gov/travel/yellowbook/2011/chapter-H-infectious-diseases-related-to-travel/typhoid-paratyphoid-fever](http://wwwnc.cdc.gov/travel/yellowbook/2011/chapter-H-infectious-diseases-related-to-travel/typhoid-paratyphoid-fever)

## ATTACHMENTS

To view attachments in the electronic version:

1. Go to <View>; <Navigation Pane>; <Attachments> – OR – Click on the “Paper Clip”  icon at the left.
2. Double click on the document to open.