UTAH DEPARTMENT OF HEALTH

Salmonellosis

Disease Plan

Quick Links

Last updated: January 25, 2017, by Cindy Burnett

Questions about this disease plan?

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

✓ WHY IS SALMONELLOSIS IMPORTANT TO PUBLIC HEALTH?

Salmonella was discovered more than a century ago. Salmonellosis, the illness caused by *Salmonella*, when ingested primarily results in a mild to severe diarrheal illness, known as acute gastroenteritis. An estimated 1.2 million cases of Salmonella infection occur annually in the United States. About 450 people die each year from Salmonella, with infants, the elderly and the immune compromised being at greatest risk. Salmonella is a leading cause of foodborne disease with multiple outbreaks detected each year.

✓ DISEASE AND EPIDEMIOLOGY

Clinical Description

Gastroenteritis

Infection with non-typhoidal *Salmonella* usually results in gastroenteritis. The most common symptoms include diarrhea (sometimes bloody), stomach cramps, fever, nausea, and vomiting. Diarrhea is usually self-limiting, lasting about 3-7 days. Occasionally patients may require hospitalization due to severe dehydration, which is more common among infants and the elderly.

Enteric Fever

Enteric fever is the result of invasive disease and is characterized by fever and abdominal symptoms. Systemic illness more commonly results from infection with *S.* typhi, resulting in typhoid fever, however infection with *S.* paratyphi may also produce a similar but less severe syndrome.

Bacteremia and Vascular Infection

Any *Salmonella* serotype can cause bacteremia, however the syndrome is most common with *S.* cholerasuis and *S.* dublin infections.

Localized Infections

Approximately 5-10% of persons with *Salmonella* bacteremia develop localized infections which may present as septicemia, abscess, arthritis, or cholecystitis.

Causative Agent

Salmonellosis refers to disease caused by any serotype of bacteria in the genus *Salmonella*, other than *Salmonella typhi* (the *Salmonella* species that causes typhoid fever). The genus *Salmonella* consists of two species, *Salmonella enterica* and *Salmonella bongori*; the former is further divided into six different subspecies. Based upon high levels of DNA similarity, most clinically important salmonellae are formally classified within a single subspecies, *Salmonella enterica.* All human pathogens are regarded as serovars within the

Three-dimensional computer-generated image of *Salmonella* serotype Typhi bacteria (CDC Photo, 2014)

subspecies of *S. enterica*. For example, the proposed nomenclature would change *S. typhi* to *S. enterica* serovar Typhi, abbreviated *S.* Typhi, and *Salmonella enterica* serovar Enteritidis would be referred to as *S.* Enteritidis instead of *S. enteritidis*.

Differential Diagnosis

Shigella, E. coli O157:H7*, Campylobacter, Yersinia enterocolitca*, protozoa (i.e., cryptosporidium, giardia, cyclospora, entamoeba), viruses (i.e., norovirus, rotavirus, adenoviruses, astrovirus) and bacterial food poisoning may show similar signs and symptoms.

Laboratory Identification

Culture of stool or blood is the preferred method for Salmonella diagnosis. Laboratory isolation of salmonellae from stool usually requires a minimum of 48 hours; 72 hours is needed if overnight enrichment broth incubation is used in addition to primary plating of stool samples. Rapid tests using EIA, LA, DNA probes, and monoclonal antibodies have been developed, but their availability is limited. Serologic evaluation for *Salmonella* agglutinins is not recommended.
UPHL: Utah Public Health Laboratories: Public Health accepts stool specimens for isolation and serotyping. All isolates must be submitted to UPHL.

Treatment

Antibiotics are not generally recommended for patients with uncomplicated non-typhoidal salmonellosis because treatment does not shorten the duration of disease and may prolong the carrier state. However, treatment is recommended for:

- Patients with an increased risk of invasive disease
- Infants less than 3 months of age
- Adults over 65 years of age
- Patients with chronic gastrointestinal tract disease, malignant neoplasms, or hemoglobinopathies
- Patients with HIV or other immunosuppressive illness or therapy
- Patients with severe colitis

Ampicillin, amoxicillin, TMP-SMX, cefotaxime, or ceftiaxone are recommended for susceptible strains. Strains acquired in developing countries are often resistant to many antimicrobial agents, but are usually susceptible to ceftriaxone, cefotaxime, cefdinir, cefpodoxime and fluoroquinolines. Typhimurium and Newport are increasingly resistant in the United States, with about one-third of Typhimurium isolates resistant to ampicillin, chloramphenicol, streptomycin sulfate, sulfonamides, and tetracycline, and about 11% of Newport isolates resistant to ceftriaxone.

Case Fatality

The case fatality rate for non-typhoidal *Salmonella* infections is less than .5%. Elderly persons 65 years of age and older have the highest case fatality rate, with nearly two-thirds of all deaths due to *Salmonella* infections among the elderly.

Reservoir

Salmonella is widely distributed in animals, including livestock, pets, poultry, other birds, reptiles, and amphibians. Most infected animals are chronic carriers. Humans can also be a source of infection.

Transmission

Salmonella are transmitted via the fecal-oral route. The most common mode of transmission is ingestion of food or water that has been contaminated with human or animal feces. This includes raw or undercooked poultry, eggs, and egg products; undercooked meats; and raw milk or milk products. However, any food contaminated with the bacteria can be a source of infection. In most circumstances, contaminated food must be subject to time and temperature conditions that allow reproduction of the bacteria to numbers that can cause disease in those ingesting the contaminated food. In addition, reptiles such as iguanas and lizards as well as live poultry such as chickens are chronic carriers of these bacteria and can be sources of infection especially to children under 5 years old and immunocompromised adults. Person-to-person spread can also occur, especially among household contacts, preschool children in childcare, and the elderly and developmentally disabled living in residential facilities. Transmission can also occur from person to person through certain types of sexual contact (i.e., oral-anal contact).

Susceptibility

Susceptibility is general and usually increased by achlorhydria, antacid treatment, gastrointestinal surgery, prior or current broad-spectrum antibiotic treatment, nepoplastic disease, immunosuppressive treatment, corticosteroid use and other debilitating conditions like malnutrition. A large dose of organisms (≥100,000) is usually needed to cause infection, but the infectious dose may be lower for certain serovars and for certain susceptible individuals such as children, the elderly, and the immunocompromised.

Incubation Period

The incubation period for salmonellosis is 6 to 72 hours following exposure, usually ingestion of contaminated food or water. However, longer incubation periods, up to 3 days, have been reported in some outbreaks, potentially as a result of exposure to a lower bacterial dose.

Period of Communicability

The disease is communicable for as long as the infected person excretes *Salmonella* bacteria in their stool. The median duration of excretion following infection is approximately 5 weeks, however, excretion can last from days to months, depending on the serovar, but rarely lasts more than one year. Treatment with antibiotics can prolong carriage by suppressing competing bacteria in the gastrointestinal tract.

Epidemiology

Salmonellosis has a worldwide distribution, with approximately 1.4 million cases occurring annually in the United States, resulting in roughly 15,000 hospitalizations and approximately 400 deaths. About 60-80% of cases are sporadic, but large outbreaks have occurred in institutional settings and from common food sources. The largest common-vehicle outbreak of salmonellosis ever recognized in the US was caused by ice cream made by a national producer from premix

that had been transported in contaminated tanker trucks. In Utah, 50% of *Salmonella* infections are caused by 3 *Salmonella* serovars. *S.* typhimurium and *S.* enteritidis each cause roughly 20% of serotyped infections, with *S.* Newport causing roughly 10%.

✓ PUBLIC HEALTH CONTROL MEASURES

Public Health Responsibility

- Investigate all suspect cases of disease and fill out and submit appropriate disease investigation forms.
- Provide education to the general public, clinicians, and first responders regarding disease transmission and prevention
- Identify clusters or outbreaks of this disease and determine the source.
- Identify cases and sources 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 (except 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. However, in certain circumstances, a single, confirmed case with leftover food that had been consumed within the incubation period may be considered for testing.

Personal Preventive Measures/Education

To avoid exposure to *Salmonella,* 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 (especially reptiles and live poultry).
- Wash the child'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. Hands should be scrubbed for at least 15-20 seconds after cleaning the bathroom; after using the toilet or helping someone use the toilet; after changing diapers; before handling food; and before eating.
- Keep food that will be eaten raw, such as vegetables, from becoming contaminated by animal-derived food products.
- Avoid letting infants or young children touch reptiles, such as turtles or iguanas, or their cages.
- Avoid letting infants or young children touch live poultry, such as chickens or ducks.
- If elderly or immunocompromised, avoid reptiles when choosing pets.

- In a childcare or school, do not use reptiles or live poultry as classroom pets.
- Make sure to thoroughly cook all food products from animals, especially poultry and eggs, and avoid consuming raw or cracked eggs, unpasteurized milk, or other unpasteurized dairy products.

Discuss transmission risks that may result from oral-anal sexual contact. Latex barrier protection (i.e., dental dam) may prevent the spread of *Salmonella* to a case's sexual partners and may prevent exposure to and transmission of other fecal-oral pathogens.

Chemoprophylaxis

None.

Vaccine

None.

Isolation and Quarantine Requirements

Isolation: Food handlers with salmonellosis must be excluded from work until diarrhea has resolved.

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

Hospital: Enteric precautions.

Quarantine: Contacts with diarrhea who are food handlers should be considered the same as a case and shall be handled in the same fashion. Otherwise, there are no restrictions.

NOTE: In certain circumstances, cases, ill contacts, and/or asymptomatic contacts who are food handlers may be required to have negative stool samples prior to returning to work. The local health department will decide which cases and/or contacts will need negative stool samples prior to returning to work and whether 1 or 2 negative samples is necessary. If a case or contact has been treated with an antimicrobial agent, the stool specimen should not be collected until at least 48 hours after cessation of therapy. If 2 negative stool samples are determined to be necessary they should be taken at least 24 hours apart.

✓ CASE INVESTIGATION

Reporting

Reporting refers to the process of healthcare providers or institutions (i.e., clinicians, clinical laboratories, hospitals) submitting basic information to governmental public health agencies about cases of illness that meet certain reporting requirements or criteria. Cases of illness may also be ascertained by the secondary analysis of administrative health data or clinical data. The purpose of this section is to provide those criteria to determine whether a specific illness should be reported.

Report any illness to public health authorities that meets any of the following criteria:

1. Any person with *Salmonella sp*. isolated from a clinical specimen.
2. Any person with *Salmonella sp*. detected using non-culture based methods.
3. Any person with diarrhea who is a contact of a confirmed case of *Salmonella* infection or a member of a risk group defined by the public health authorities during an outbreak.
4. A person whose healthcare record contains a diagnosis of Salmonellosis.
5. A person whose death certificate lists Salmonellosis as a cause of death or a significant condition contributing to death.

Other recommended reporting procedures:

- All cases of Salmonellosis should be reported.
- Reporting should be on-going and routine.
- Frequency of reporting should follow the state health department's routine schedule (in Utah, within 3 working days of identification).

Reporting Table

Table of criteria to determine whether a case should be reported to public health authorities. Requirements for reporting are established under State and Territorial laws and/or regulations and may differ from jurisdiction to jurisdiction. These criteria are suggested as a standard approach to identifying cases of this condition for purposes or reporting, but reporting should follow State and Territorial law/regulation if any conflicts occur between these criteria and those laws/regulations.

Table of criteria to determine whether a case should be reported to public health authorities

Criterion	Reporting	
Clinical Evidence		
Clinically compatible illness		N
Healthcare record contains diagnosis of *Salmonellosis*	S	
Death certificate contains salmonellosis as a contributing or underlying cause of death	S	
Laboratory Evidence		
Isolation of *Salmonella sp*. from a clinical specimen	S	

Detection of *Salmonella sp*. in a clinical specimen using CIDT	S	
Epidemiological Risk Factors		
Epidemiologically linked to a salmonellosis case		O
Member of a risk group as defined by public health authorities during an outbreak investigation		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 (i.e., clinical evidence and laboratory evidence) in the same column—in conjunction with all "N" criteria in the same column—is required to report a case. * A requisition or order for any of the "S" laboratory tests is sufficient to meet the reporting criteria.
Disease-specific data elements to be included in the initial report are listed below.

Clinical Information

- Reported symptoms and signs of illness
- Hospitalized

Epidemiologic Risk Factors:

- International travel in past 7 days
- Occupation/Industry/Place of Business, to include but not limited to
    - Food handler
    - Childcare center worker
    - Long-term care facility worker
- Childcare center attendee
- Nursing home resident
- Contact of a confirmed case of *Salmonella* infection

Laboratory Information

- Method(s) of laboratory testing (i.e., culture or culture-independent diagnostic testing (CIDT) [FDA-approved or not FDA-approved PCR or antigen-based test])
- Name of test and manufacturer, as available

Case Definition
Salmonellosis (2017)

Clinical Criteria

An illness of variable severity commonly manifested by diarrhea, abdominal pain, nausea, and sometimes vomiting. Asymptomatic infections may occur, and the organism may cause extra-intestinal infections.

Laboratory Criteria

Supportive laboratory evidence: Detection of *Salmonella* spp. in a clinical specimen using CIDT.
Confirmatory laboratory evidence: Isolation of *Salmonella* spp. from a clinical specimen.

Case Classification

Confirmed: A case that meets the confirmed laboratory criteria for diagnosis. When available, serotype characterization should be reported.
Probable:

- A case that meets the supportive laboratory criteria for diagnosis, OR
- A clinically compatible case that is epidemiologically linked to a case that meets the supportive or confirmatory laboratory criteria for diagnosis.

SUSPECT REMOVED FROM CLASS CLASSIFICATIONS

NOTE: The use of CIDTs as stand-alone tests for the direct detection of *Salmonella* in stool is increasing. Specific performance characteristics such as sensitivity, specificity, and positive predictive value of these assays likely depend on the manufacturer and are currently unknown. It is, therefore, useful to collect information on the type(s) of testing performed for reported salmonellosis cases. When a specimen is positive using a CIDT it is also helpful to collect information on all culture results for the specimen, even if those results are negative. Culture confirmation of CIDT-positive specimens is ideal, although it might not be practical in all instances.

State and local public health agencies should make efforts to encourage reflexive culturing by clinical laboratories that adopt culture-independent methods, should facilitate submission of isolates/clinical material to state public health laboratories, and should be prepared to perform reflexive culture when not performed at the clinical laboratory as isolates are currently necessary for molecular typing (PFGE and whole genome sequencing) that are essential for outbreak detection.

Position statement classifies cases as confirmed (a case that meets the confirmed laboratory criteria) **AND** probable (a case that meets the supportive laboratory criteria for diagnosis **OR** a clinically compatible case that is epidemiologically linked to a case that meets the supportive or confirmatory laboratory criteria for diagnosis). "Suspected" has been removed.

Classification Table

Criteria for defining a case of salmonellosis.

Criterion	Confirmed	Probable	Suspect
Clinical Evidence			
Clinically compatible illness	N		
Laboratory Evidence			
Detection of *Salmonella spp.* in a clinical specimen using a CIDT.		N	
Isolation of *Salmonella spp.* from a clinical specimen.			N
Epidemiologic Evidence			
Epidemiologically linked to a confirmed or probable case of salmonellosis with laboratory evidence	O		

Member of a risk group as defined by public health authorities during an outbreak investigation		O	
Criteria to distinguish a new case			
Not counted as a new case if occurred within 365 days of a previously reported salmonellosis infection in same individual, (unless separate serotype as described below)		N	N
Report separate serotypes as distinct cases.			N

Notes:
N = All “N” criteria in the same column are Necessary to classify a case. A number following an “N” indicates that this criterion is only required for a specific disease/condition subtype (see below). If the absence of a criterion (i.e., criterion NOT present) is required for the case to meet the classification criteria, list the Absence of criterion as a Necessary component.
O = At least one of these “O” (One or more) criteria in each category (i.e., clinical evidence and laboratory evidence) in the same column—in conjunction with all “N” criteria in the same column—is required to classify a case. (These “O” criteria are alternative, which means that a single column will have either no O criteria or multiple O criteria; no column should have only one O.) A number following an “O” indicates that this criterion is only required for a specific disease/condition subtype.

Case Investigation Process

- Food handlers should be excluded from work until diarrhea has resolved. Negative stool specimens may also be required.
- Assure isolate submission to UPHL.

Outbreaks

CDC defines a food-borne 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 salmonellosis, the same *Salmonella* species must be isolated from clinical specimens from at least 2 ill persons or the species must be isolated from an epidemiologically implicated food. The source of the infection should be identified and measures to identify additional ill persons and/or to remove the source from consumers should be taken. Control of person-to-person transmission requires special emphasis on personal cleanliness and sanitary disposal of feces.

Identify Case Contacts

Contacts of salmonellosis cases may include household contacts, childcare and school attendees and workers, food handlers, developmentally disabled living in residential facilities as well as sexual partners through certain types of sexual contact (i.e., oral-anal contact). These contacts may be identified through interview of the case-patient or physician notes. More information about management of case contacts are listed in the "Case Contact Management" section below.

Case Contact Management

Childcare

Since salmonellosis may be transmitted from person to person through fecal-oral transmission, it is important to follow-up on cases in childcare settings. General recommendations include:

- Children with *Salmonella* infection who have diarrhea should be excluded until their diarrhea is resolved.
- Children with *Salmonella* infection who have no diarrhea and are not otherwise ill may be excluded or may remain in the program if special precautions are taken.
- Most staff in childcare programs are considered food handlers. Those with *Salmonella* in their stool (symptomatic or not) can remain on site but must not prepare food or feed children until their diarrhea has resolved. Negative stool specimens may be required.

School

Since salmonellosis may be transmitted from person to person through fecal-oral transmission, it is important to follow up on cases in school settings. General recommendations include:

- Students or staff with *Salmonella* infection who have diarrhea should be excluded until their diarrhea is resolved.
- Students or staff with *Salmonella* who do not handle food, have no diarrhea or have mild diarrhea, and are not otherwise sick may remain in school if special precautions are taken.
- Students or staff who handle food and have *Salmonella* infection (symptomatic or not) must not prepare food until their diarrhea has resolved. Negative stool specimens may be required.

Community Residential Programs

Actions taken in response to a case of salmonellosis in a community residential program will depend on the type of program and the level of functioning of the residents.

In long-term care facilities, residents with salmonellosis should be placed on standard (including enteric) precautions until their symptoms subside. Staff members who give direct patient care (i.e., feed patients, give mouth or denture care, or give medications) are considered food handlers and should be treated as such. In addition, staff members with *Salmonella* infection who are not food handlers should not work until their diarrhea is resolved.

In residential facilities for the developmentally disabled, staff and clients with salmonellosis must refrain from handling or preparing food for other residents until their diarrhea has subsided. Negative stool specimens may be required. In addition, staff members with *Salmonella* infection who are not food handlers should not work until their diarrhea is resolved.

✓ ACKNOWLEDGEMENTS

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✓ REFERENCES

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✓ VERSION CONTROL

Updated Jan 2017 – "Why is Salmonellosis Important to Public Health", “Identify Case Contacts”, “Contact Management”, “Acknowledgments”, and “Version Control” sections added. More information added to "Differential Diagnosis" and ‘Environmental Measures” sections. "Laboratory Identification,” "Treatment", "Transmission," "Susceptibility”, “Period of Communicability”, “Epidemiology”, “Personal Preventative Measures/Education”, “Reporting” and “Case Definitions” sections updated.

✓ UT-NEDSS/EpiTrax Minimum/Required Fields by Tab

Demographic
- Last Name
- First Name
- State
- County
- Date of Birth
- Area Code
- Phone Number
- Birth Gender
- Ethnicity
- Race

Clinical
- Disease
- Onset Date
- Date Diagnosed
- Died
- Date of Death
- Symptoms:

Laboratory
- Test Type
- Test Result
- Accession Number
- PFGE (1st enzyme) (completed by UDOH)
- PFGE (2nd enzyme) (completed by UDOH)

Contacts
- Does case's infection appear secondary to another person's infection? If YES, please fill out the contact information below.

Epidemiological
- Food Handler
  - (if yes) What is the name of the facility where the patient handled food?
  - (if yes) Location:
  - (if yes) Supervisor name:
  - (if yes) Supervisor phone number:
  - (if yes) Did the patient work while ill?
    - (if yes) Important information including dates:

Epidemiological Continued
- Healthcare worker
  - (if yes) What is the name of the healthcare facility?
- Group Living
  - (if yes) What is the name of the facility?
  - (if yes) Location:
  - (if yes) Supervisor name:
  - (if yes) Phone number:
  - (if yes) Did the patient work while ill?
    - (if yes) Important information including dates:
- Childcare Association
  - (if yes) What is the name of the childcare?
  - (if yes) Location:
  - (if yes) Supervisor name:
  - (if yes) Supervisor phone number:
  - (if yes) Did the patient attend while ill?
    - (if yes) Important information including dates:
- Attends School?
  - (if yes) Did the patient attend while ill?
    - (if yes) Important information including dates:
- Occupation
- Check all that apply:
- Did the patient eat at any restaurants (fast food/chain/sit-down/cart/kiosk/etc.) in the 7 days before illness?
- Did the patient eat food from any grocery stores in the 7 days before illness (including farmers' markets, produce or fruit stands, etc.)? If patient can't remember, ask where s/he usually purchases groceries
- Did the patient attend/visit any events during the 7 days before illness?
  - (if yes) Party

- Imported From
- Risk Factors
- Risk Factor Notes

Reporting

- Date first reported to public health

Investigation

- Date 7 days before disease onset:
- Date 1 day before disease onset:
- Did the patient travel outside the USA during the exposure period?
  - (if yes) Describe the travel (location, dates, mode, if others were ill, etc.):
- Did the patient travel outside Utah, but inside USA during the exposure period?
  - (if yes) Describe travel (location, dates, mode, if others were ill, etc.):
- Milk
  - (if yes) Details and source
- Blue cheeses
- Queso fresco/queso blanco
- Other cheese
  - (if yes) Details: variety/brand, how prepared, where bought/eaten (store/restaurant)
- Shell eggs
- Anything uncooked and made w/ raw eggs
- Chicken
  - (if yes) Whole
- Hamburger/other ground beef
- Pork
- Deli meat/cold cuts
- Fish (not canned tuna/salmon)
- Did you handle any other raw meat at home/anywhere else?

Investigation Continued

- Tomatoes
- Bell peppers
- Watermelon
- Mango
- Apple juice/cider
  - (if yes) Unpasteurized?
- Peanuts
- Peanut butter
- Did the patient have contact with animal waste/manure during the exposure period?
- Did patient have contact with ANY animals (including farm animals, pets) during the exposure period?
  - (if yes) What animals did the patient have contact with?
- Did the patient drink or have exposure to any of the following during exposure period?
- Interview date:
- Person interviewed:
  - (If Unable to Interview) Specify reason for unable to interview (i.e., LTF, refused, etc.)

Administrative

- State Case Status (completed by UDOH)
- Outbreak-associated
- Outbreak Name