

Salmonellosis (Non-Paratyphi/Non-Typhi)

BASIC EPIDEMIOLOGY

Infectious Agent

Salmonella species, a Gram-negative bacilli. There are two species of *Salmonella* (*Salmonella enterica* and *Salmonella bongori*), with the most common cause of human illness being *S. enterica*. The two species are further separated into subspecies and then serotypes based on defining antigens. Due to most human illness being attributed to the same species and subspecies, they are commonly referred to and distinguished by their defined serotype, such as *S. Heidelberg* (*Salmonella enterica* subsp. *enterica* subtype Heidelberg).

Transmission

Transmission occurs via the fecal-oral route and can occur through the ingestion of food or water contaminated with feces, or improperly cooked or prepared food. Transmission may also occur via direct contact with an infected person, fomite, animal or an animal's environment.

Incubation Period

Usually 12-36 hours (ranges 6 to 72 hours). Longer incubations, up to 16 days, have been documented.

Communicability

People are infectious as long as bacteria are shed in their stool. On average bacteria can be shed in stool through the course of infection, usually several days to several weeks, with a small percentage of cases excreting the organism for many months. Antibiotic use during the acute illness can prolong the carrier state.

Clinical Illness

Non-typhoidal salmonellosis is characterized by diarrhea, nausea, headache, and sometimes vomiting. Fever is almost always present. Bloody diarrhea and invasive disease may occur, particularly with certain serotypes. Invasive infection may present as urinary tract infection, septicemia, abscess, arthritis, cholecystitis and rarely as endocarditis, pericarditis, meningitis, or pneumonia. A carrier state may develop.

DEFINITIONS

Clinical Case Definition

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

Laboratory Confirmation

- Isolation of *Salmonella* (except *S. Typhi* and *S. Paratyphi* [A, B (tartrate negative) and C])^{*} from a clinical specimen.

Notes:

- *S. Typhi* is reportable as *Salmonella Typhi*.
- *S. Paratyphi* is reportable as *Salmonella Paratyphi*.

Case Classifications

- **Confirmed:** A case that meets the laboratory criteria for diagnosis. When available, *Salmonella* serotype characterization should be reported.
- **Probable:**
 - A case with *Salmonella* sp. (excluding *S. Typhi* and *S. Paratyphi* [A, B (tartrate negative), and C]) detected, in a clinical specimen, by use of culture independent

- laboratory methods (non- culture based), **OR**
- A clinically compatible case that is epidemiologically linked to a case that meets the probable or confirmed laboratory criteria for diagnosis

Note: A case with isolation of *S. Paratyphi B* (tartrate positive) from a clinical specimen should be reported as a salmonellosis, non-Paratyphi/non-Typhi case.

Both asymptomatic infections and infections at sites other than the gastrointestinal tract, if laboratory confirmed, are considered confirmed cases that should be reported.

A case should not be counted as a new case if laboratory results were reported within 365 days of a previously reported infection in the same individual, unless additional information is available indicating a separate infection, e.g., different serotype.

SURVEILLANCE AND CASE INVESTIGATION

Case Investigation

It is recommended that local and regional health departments investigate all reported cases of salmonellosis to identify potential sources of infection. Sporadic cases of salmonellosis do not require an investigation form be sent to DSHS EAIDU.

Case Investigation Checklist

- Confirm laboratory results meet the case definition.
- If an isolate has not been sent to the DSHS laboratory, request the laboratory to forward the isolate to the DSHS laboratory for serotyping and whole genome sequencing (WGS).
- Review medical records or speak to an infection preventionist or healthcare provider to verify case definition, identify possible risk factors and describe course of illness.
- **Salmonellosis cluster or outbreak cases:** Use the TXDSHS/CDC Hypothesis Generating Questionnaire or an outbreak specific form provided by DSHS EAIDU to interview salmonellosis cluster cases. See Managing Special Situations.
- **Salmonellosis cases:** If time and resources allow, interview the case to identify potential sources of infection. Take a food history. Note brand and purchase or source information for high risk foods. Ask about potential exposures during at least the 5 days before onset including:
 - Any contacts or household members with a similar illness. Obtain the name, phone number or address and clinical information of the ill person.
 - Restaurant meals. Obtain the name of the restaurant, date and location of the meal, and food/drinks consumed.
 - Public gathering where food was consumed. Obtain the date, location, sponsor of the event, and food/drinks consumed.
 - Consumption of raw or undercooked meat, poultry, or eggs.
 - Consumption of raw milk or other unpasteurized dairy products.
 - Travel within and outside Texas or outside the United States or contact with others who have traveled outside the United States. Determine dates of travel.
 - Contact with reptiles or amphibians (snakes, lizards, turtles, frogs, etc.).
 - Contact with pets, livestock, or other animals (including farms and petting zoos).
 - Note: If the case is not available or is a child, conduct the interview with a surrogate who would have the most reliable information on the case, such as a parent or guardian.
- Provide education to the case or his/her surrogate about effective hand washing, food safety practices, and animal contact/handling precautions. See Prevention and Control

Measures.

- Identify whether there is a public health concern: persons should not work as food handlers, child-care or health care workers, or attend child-care if they have diarrhea. See Exclusions.
- Fax completed forms for cluster related cases to DSHS EAIDU at **512-776-7616** or email securely to an EAIDU foodborne epidemiologist.
- For lost to follow-up (LTF) cases, please complete as much information obtained from medical/laboratory records (e.g., demographics, symptomology, onset date, etc.) on investigation form and fax/email securely to DSHS EAIDU noting case is LTF.
- If case is part of an outbreak or cluster, see Managing Special Situations section.
- All confirmed, probable, and suspect case investigations must be entered and submitted for notification in the NEDSS Base System (NBS). Please refer to the *NBS Data Entry Guidelines* for disease specific entry rules.

Prevention and Control Measures

- Routine hand washing with soap and warm water, especially:
 - Before preparing, handling or eating any food.
 - After going to the bathroom.
 - After changing a diaper.
 - After caring for someone with diarrhea.
 - After handling raw food, especially poultry and other raw meat products.
 - After any contact with an animal, their living area, or their food.
- Avoid consuming raw milk, unpasteurized dairy products, and undercooked eggs.
- Follow food safety principles in the kitchen, especially:
 - Cook meat thoroughly. Poultry should be cooked to an internal temperature of 165°F.
 - Prevent cross-contamination in food preparation areas by thoroughly washing hands, counters, cutting boards, and utensils after they touch raw meat.
 - Separate uncooked meats, hot dogs and other meat packaging from vegetables, uncooked food and ready to eat foods.
 - Keep the refrigerator at 40°F or lower and the freezer at 0°F or lower.
 - Clean up all spills in your refrigerator right away—especially juices from raw meat, raw poultry, and hot dog and lunch meat packages.

Exclusions

School/child-care: No exclusion specified for salmonellosis but the standard exclusion for diarrhea or fever applies:

- Children with diarrhea should be excluded from school/child-care until they are free from diarrhea for 24 hours without the use of diarrhea suppressing medications.
- Children with a fever from any infection should be excluded from school/child-care for at least 24 hours after fever has subsided without the use of fever suppressing medications.

Food Employees: Symptomatic food employees infected with non-typhoidal *Salmonella* are to be excluded from work. Asymptomatic food employees diagnosed with an infection from non-typhoidal *Salmonella* are to be restricted from work.

Food employees can be reinstated with approval from the Regulatory Authority and if one of the following conditions is met:

- Medical documentation stating that the food employee is free of infection from non-typhoidal *Salmonella* based on test results showing two consecutive, negative stool specimen cultures. The stool specimens should be collected at least 24 hours apart

- and not sooner than 48 hours after the last dose of antibiotics, if antibiotics were given.
- More than 30 days have passed since the food employee became asymptomatic (without the use of diarrhea suppressing medications) **or**
- The food employee did not develop symptoms and more than 30 days have passed since being diagnosed.

Please see Guide to Excluding and Restricting Food Employees in Appendix A.

MANAGING SPECIAL SITUATIONS

Outbreaks

If an outbreak is suspected, notify the appropriate regional DSHS office or DSHS EAIDU at **(512) 776-7676**.

The local/regional health department should:

- Interview all cases suspected as being part of the outbreak or cluster.
- Request medical records for any case in your jurisdiction that died, was too ill to be interviewed, or for whom there are no appropriate surrogates to interview.
- Prepare a line list of cases in your jurisdiction. Minimal information needed for the line list might include patient name or other identifier, DSHS or laboratory specimen identification number, specimen source, date of specimen collection, date of birth, county of residence, date of onset (if known), symptoms, underlying conditions, treatments and outcome of case, and risky foods eaten, foods eaten leading up to illness, or other risky exposures, such as animal contact and travel, reported by the case or surrogate.

Line list example:

ID	Name	Age	Sex	Ethnicity	Onset	Symptoms	Food	Animal	Notes
1	NT	34	F	W/N	2/4/16	Bl. D, F	Chicken, eggs	Dog	Dog food
2	PR	2	M	U/U	1/30/16	V,D,F	Chicken, spinach	None	Brother ill

- If the outbreak was reported in association with an apparent common local event (e.g., party, conference, rodeo), a restaurant/caterer/home, or other possible local exposure (e.g., pet store, camp), contact hospitals in your jurisdiction to alert them to the possibility of additional salmonellosis cases.
- If isolates have not already been submitted to the DSHS laboratory for serotyping and whole genome sequencing (WGS), request hospital/clinical labs submit isolates for serotyping and WGS testing.
See Laboratory Procedures.
- Work with any implicated facilities to ensure staff, students, residents, and volunteers receive hand hygiene education, and review hygiene and sanitary practices currently in place including:
 - Policies on, and adherence to, hand hygiene
 - Storage and preparation of food
 - Procedures for changing diapers and toilet training
 - Procedures for environmental cleaning
- Recommend that anyone displaying symptoms seeks medical attention from a healthcare provider.

- Restrict individuals from handling food, engaging in child-care, healthcare work, or attending child-care, as long as they are symptomatic. See Exclusions in Case Investigation section.
- Enter outbreak into NORS at the conclusion of the outbreak investigation. See Reporting and Data Entry Requirements section.

Whole Genome Sequencing (WGS) clusters:

- For clusters of cases with indistinguishable WGS patterns detected by CDC/PulseNet and/or the DSHS laboratory, a member of the DSHS EAIDU foodborne team will notify appropriate DSHS regional epidemiologists, usually by email, who will then notify appropriate local health departments of cases within their jurisdiction.
- Local/regional health departments with cases in their jurisdiction should:
 - Interview the case patient, even if they have already been interviewed as part of a routine disease investigation, using the cluster specific questionnaire attached in the email notification.
 - Fax the completed questionnaire promptly within timeframe designated in the cluster notification to DSHS EAIDU at **512-776-7616** or e-mail securely to an EAIDU foodborne epidemiologist.
 - If the health department having jurisdiction of a case is unable to reach a case-patient after 3 attempts during normal working hours, and they are not able to call after hours, please call the DSHS regional office or DSHS EAIDU to discuss further.
 - If an interview is unattainable or the case is lost to follow-up, fax the completed cover sheet and any case information to DSHS EAIDU.
- Local/regional health department with cases will be notified by the EAIDU foodborne team of any CDC or DSHS conference calls and may participate, if able.

Note:

- If a food item or food establishment is implicated, the lead epidemiologist for foodborne diseases will notify the DSHS Division of Regulatory Services about the outbreak and the possibility of a common contaminated food source for the cases.
- Decisions about testing implicated food items can be made after consultation with an EAIDU foodborne epidemiologist and the DSHS Laboratory. The general policy is to test only food samples implicated in suspected outbreaks, not in single cases.

REPORTING AND DATA ENTRY REQUIREMENTS

Provider, School, Child-Care Facility, and General Public Reporting Requirements

Confirmed and probable cases are required to be reported **within 1 week** to the local or regional health department or the DSHS EAIDU at **(512) 776-7676**.

Local and Regional Reporting and Follow-up Responsibilities

Local and regional health departments should:

- Enter the case into NBS and submit an NBS notification on all **confirmed** and **probable** cases.
 - Please refer to the *NBS Data Entry Guidelines* for disease-specific entry rules.
 - A case should not be counted as a new case if laboratory results were reported within 365 days of a previously reported infection in the same individual, unless additional information is available indicating a separate infection, e.g., different serotype. A notification can be sent as soon as the case criteria have been met. Additional information from the investigation may be entered upon completing the investigation.
- If investigation forms are requested, they may be faxed to 512-776-7616 or emailed securely to an EAIDU foodborne epidemiologist at FoodborneTexas@dshs.texas.gov.

When an outbreak is being investigated, local and regional health departments should:

- Report outbreaks within 24 hours of identification to the regional DSHS office or to EAIDU at **512- 776-7676**.
- Enter outbreak information into the **National Outbreak Reporting System (NORS)** at the conclusion of the outbreak investigation.
 - For NORS reporting, the definition of an outbreak is two or more cases of similar illness associated with a common exposure.
 - The following should be reported to NORS:
 - Foodborne disease, waterborne disease, and enteric illness outbreaks with person-to-person, animal contact, environmental contact, or an indeterminate route of transmission.
 - Enter outbreaks into NORS online reporting system at <https://wwwn.cdc.gov/nors/login.aspx>
 - Forms, training materials, and other resources are available at <http://www.cdc.gov/nors/>
- To request a NORS account, please email FoodborneTexas@dshs.texas.gov
 - Please put in Subject Line: NORS User Account Request
 - Information needed from requestor: name, email address, and agency name
 - After an account has been created a reply email will be sent with a username, password, and instructions for logging in.

LABORATORY PROCEDURES

CLINICAL SPECIMENS:

Salmonella isolates are required to be submitted to the DSHS Laboratory for typing and molecular analysis.

Please refer to the [TAC](#) Title 25, Ch 97, Subchapter A, Rule §97.3 “What Condition to Report and What Isolates to Report or Submit”.

In an outbreak or other special situation, the DSHS Laboratory can culture raw stool or stool in transport medium (e.g., Cary-Blair media) for *Salmonella* species. Contact an EAIDU foodborne epidemiologist prior to submitting raw stool or stool in transport medium for culture.

Specimen Collection

- Submit pure cultures on an agar slant at ambient temperature or 2-8°C (*ice pack*) as soon as possible to ensure viability.
- For raw stool or stool in transport medium, please refer to table below:

Specimen type	Transport time to lab from time of collection	Transport temperature
Raw stool	≤24 hours	4°C (ice pack)
Raw stool	>24 hours	Freeze immediately at ≤-70°C. Ship on dry ice.
Stool in transport solution/medium	Time of collection to ≤3 days	Room temp or 4°C (ice pack)
Stool in transport solution/medium	>3 days	Freeze immediately at ≤-70°C. Ship on dry ice.
All	*The above transport times are optimal for recovery of pathogenic organisms. In the interest of public health, specimens will be accepted	*The above transport temperatures are optimal for the recovery of pathogenic

	up to 30 days from date of collection.	organisms. In the interest of public health, specimens will be accepted at non-optimal temperature transport.
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* Note: Pathogen recovery rates decrease over time. For best results, submit ASAP.

Submission Form

- Use DSHS Laboratory G-2B form for specimen submission.
- Make sure the patient's name, date of birth and/or other identifier match exactly what is written on the transport tubes and on the G-2B form.
- Fill in the date of collection and select the appropriate test.
- If submitting as part of an outbreak investigation, check "Outbreak association" and write in name of outbreak.
- Payor source:
 - Check "IDEAS" to avoid bill for submitter

Specimen Shipping

- Ship specimens via overnight delivery.
- DO NOT mail on Friday, or state holiday, unless special arrangements have been pre-arranged with an EAIDU foodborne epidemiologist or DSHS Laboratory.
- Ship specimens to:

Laboratory Services Section, MC-1947
Texas Department of State Health Services
Attn. Walter Douglass (512) 776-7569 1100
West 49th Street
Austin, TX 78756-3199

Causes for Rejection:

- Missing or discrepant information on form/specimen.
- Transport media was expired.
- Specimen not in correct transport medium

FOOD SAMPLES AND ENVIRONMENTAL SWABS:

Testing of food and environmental swabs for *Salmonella* spp. is available at the DSHS laboratory. Decisions about testing implicated food items can be made after consultation with an EAIDU foodborne epidemiologist and the DSHS Laboratory.

General policy

- The DSHS lab will only test food samples or environmental swabs from facilities implicated in a suspected outbreak (not associated with single cases).
- In outbreaks, the DSHS lab will not test food samples or environmental swabs unless a pathogen has been identified in a clinical specimen.
- Food samples or environmental swabs must be **collected by a registered sanitarian**. For further questions, please contact an EAIDU foodborne epidemiologist to discuss further.

Salmonellosis, TABLE 1:

Guide to Salmonellosis, Paratyphoid Fever, Typhoid Fever Reporting and Surveillance Forms

<i>Salmonella</i> serotype	Reported in NEDSS as	Surveillance Form
<i>Salmonella</i> Typhi	Typhoid Fever	CDC Typhoid and Paratyphoid Fever Surveillance Report requested
<i>Salmonella</i> Paratyphi A, B*, or C	Salmonellosis	CDC Typhoid and Paratyphoid Fever Surveillance Report requested
all other <i>Salmonella</i> serotypes	Salmonellosis	no CDC or DSHS form requested unless part of outbreak investigation

**Salmonella* Paratyphi B var L(+) tartrate + (formerly var. Java) is associated with routine GI illness and is reported as Salmonellosis and no CDC or DSHS form is requested unless part of an outbreak investigation.

A case with isolation of *S. Paratyphi* B (tartrate positive) from a clinical specimen should be reported as a salmonellosis, non-Paratyphi/non-Typhi case. Salmonellosis Paratyphi A, B (tartrate negative), and C is reported as a separate condition

REVISION HISTORY

March 2021

- Updated case definition to match the Epi Case Criteria Guide for 2019