Salmonellosis (non-typhoidal)

Investigative Guidelines

October 2022

1. DISEASE REPORTING

1.1 Purpose of Reporting and Surveillance

1. To identify outbreaks and potential sources or sites of ongoing transmission.
2. To determine if there is a source of infection of public health concern (e.g., food handler or commercially distributed food product) and to stop transmission from such a source.
3. To assess the risk of the case transmitting infection to others, and to provide education to prevent such transmission.
4. To identify other cases.
5. To educate people on common sources of infection and how to reduce risk of infection.
6. To better characterize the epidemiology of this infection.

1.2 Laboratory and Physician Reporting Requirements

Laboratories and physicians are required to report infections to the local health department (LHD) within one working day of identification or diagnosis. Laboratories must submit isolates to the Oregon State Public Health Laboratory (OSPHL) according to Oregon Administrative Rule (333- 018-0018). Laboratories are encouraged to perform reflex culture for specimens positive by culture-independent diagnostic tests (CIDTs), such as polymerase chain reaction (PCR), and to submit actively growing isolates. If reflex culture cannot be done, submit the stool specimen to OSPHL as soon as possible. Reports to LHD should not be delayed for serotyping or final laboratory confirmation.

1.3 Local Health Department Reporting and Follow-Up Responsibilities

1. Report all confirmed and presumptive cases by creating a case in Orpheus within one working day of initial physician or laboratory report. Note that detection of *Salmonella* in any clinical specimen (including blood, urine, abscess, etc.) is reportable.
2. Begin follow-up investigation of confirmed and presumptive cases within one working day. Interview the case or a proxy who can provide pertinent information. If unable to interview the case or a proxy, review the medical record to obtain clinical data (e.g., onset date, symptoms, whether hospitalized overnight, and any available risk data).

3. Enter data directly into Orpheus or use the Salmonellosis case report form to collect data before entering it into Orpheus: https://www.oregon.gov/oha/PH/DISEASESCONDITIONS/COMMUNICABLEDISEASE/REPORTINGCOMMUNICABLEDISEASE/REPORTINGFORMS/Documents/salmonel.pdf

   All data are automatically submitted to Oregon Health Authority (OHA) Acute and Communicable Disease Prevention Section (ACDP) electronically via the Orpheus application. Enter date in "LHD Completion Date" box in Orpheus (bottom left of home page) when investigation is complete.
4. For outbreaks, consult with the OHA ACDP on-call epidemiologist to create an outbreak record and request any needed assistance. The assigned OHA ACDP epidemiologist will typically coordinate closely with the LHD on salmonellosis outbreak investigations and documenting findings in the Outbreaks database.

2. THE DISEASE AND ITS EPIDEMIOLOGY

2.1 Etiologic Agent

Salmonella spp. — Gram-negative bacteria. The way salmonellae are classified has changed a lot since 1990. There are only two species of *Salmonella* (*S. enterica and S. bongori*), of which *S. enterica* accounts for almost all isolates from ill people. There are more than 2,500 *Salmonella* serotypes, but less than 100 cause most cases of salmonellosis in people. These serotypes are often referred to casually as *S.* Enteritidis, *S.* Panama, *S.* Oranienburg, etc., but their proper designation would be, for example, *S. enterica* serotype Heidelberg. While a few serotypes are relatively host or place specific (which can provide important clues as to origin), most are very widely distributed in nature and there is no clue a priori to their epidemiological origin. *S.* Enteritidis and *S.* Typhimurium are among the most reported serotypes in Oregon and nationally, accounting for approximately half of all identified human infections.

2.2 Description of Illness

Nontyphoidal salmonellosis is typically characterized by diarrhea (sometimes bloody), fever, and abdominal cramping; some people may also have nausea, headache, or vomiting. Invasive disease may occur, particularly with certain serotypes (e.g., *S.* Dublin and *S.* Poona). Extraintestinal infection may present as septicemia, abscess, arthritis, cholecystitis and rarely as endocarditis, pericarditis, meningitis, pneumonia, or pyelonephritis.

Note that typhoidal *Salmonella* infections (caused by *S.* Typhi or, less commonly, *S.* Paratyphi A, *S.* Paratyphi B [tartrate negative], or *S.* Paratyphi C) are covered in Investigative Guidelines for Typhoid Fever and Paratyphoid Fevers.

2.3 Reservoirs

Salmonellae are widely distributed in domestic and wild animals, including livestock, pets (e.g., dogs, cats, guinea pigs, hedgehogs), poultry and other birds, amphibians, reptiles, and rodents (e.g., hamsters, mice, rats). Many animals can carry *Salmonella* in their intestines and show no signs of illness. In contrast, *S.* Typhi has only human reservoirs.

2.4 Sources and Routes of Transmission

Fecal-oral and vehicle-borne.

Infection may result from ingesting food or water that has been contaminated with human or animal feces, or from direct contact with infected animals or their environment. Intact chicken eggs can be infected transovarially. A large dose of organisms is usually needed to cause infection (estimated probability of infection is 10-20% with a dose of 100 organisms vs 60-80% with a dose of 10^6 organisms), although there have been documented outbreaks with low inocula. Thus, foods handled in ways that permit multiplication of organisms (e.g., due to inadequate refrigeration or cooking) are the most common vehicles. The infectious dose may be lower for children, the elderly, the immunocompromised, antibiotic users, and those with achlorhydria or who are regular users of antacids. It may also vary by serotype.

Some recognized vehicles or mechanisms of transmission include:

1. Inadequately cooked or raw meat, poultry, or eggs;
2. Other foods cross-contaminated with any of the above;
3. Contaminated produce (e.g., sprouts, cantaloupe, mangoes);
4. Unpasteurized milk or milk products;
5. Contact with the feces of pets or other infected animals;
6. Contaminated and inadequately treated drinking water;
7. Person-to-person spread, which can occur when an infected person fails to wash hands thoroughly after defecation (surprisingly uncommon, likely because of high infectious dose). It is more likely to occur when the infected person has diarrhea, rather than during the carrier state. Person-to-person spread is most common among children in day care facilities or among playmates. It may also occur in medical care settings where immunocompromised patients are at increased risk.

2.5 Incubation Period

The APHA *Control of Communicable Diseases Manual* reports the incubation period as “6 to 72 hours”; however, 1–5 days, or even 7 days, is a more realistic range in our experience. The majority will manifest within 1-4 days, but the median exceeds 3 or 4 days on occasion.

2.6 Period of Communicability

During excretion of organisms in the feces (days to months). Concentrations (and hence, infectivity) are typically highest during the time of overt symptoms. Rarely, the carrier state may exceed a year. *Antibiotic treatment often prolongs the period of bacterial excretion in the feces*.

2.7 Treatment

Antibiotic treatment of salmonellosis is usually inappropriate. Antibiotic treatment may prolong carriage and encourage development of resistant strains; it does not shorten the course of illness or ameliorate the symptoms of noninvasive (i.e.,

typical gastrointestinal) infections. Treatment should be reserved for those with invasive disease (e.g., sepsis) or at elevated risk of developing invasive disease (e.g., immunocompromised, infants, or the elderly). If treatment is indicated, antibiotic sensitivities should be ascertained first.

3. CASE DEFINITIONS, DIAGNOSIS AND LABORATORY SERVICES

3.1 Confirmed Case Definition

Persons from whom *Salmonella* spp. are cultured (again, from *any* site).

3.2 Presumptive Case

Anyone with *Salmonella* spp. detected in a clinical specimen by CIDT, and the reflex culture is negative, or not done.

OR

Compatible illness (e.g., acute diarrhea) in someone epidemiologically linked to a confirmed or presumptive (CIDT-positive) case.

3.3 Considerations when a person has multiple laboratory results available

1. A case should not be counted as a new case if laboratory results indicating infection with the same serotype are reported within 365 days of a previously reported infection in the same individual.
2. When two or more different serotypes are identified from one or more specimens from the same individual, each should be reported as a separate case.

3.4 Services Available at the Oregon State Public Health Laboratory

OSPHL provides isolate confirmation, identification, and serotyping for *Salmonella* spp. Whole genome sequencing of all *Salmonella* spp. isolates is performed for surveillance purposes (e.g., to identify disease clusters). For isolate identification, submit a pure isolate of the organism on an agar slant of media that will support the growth (e.g., nutrient or blood agar) or non-selective plate media. *Salmonella* spp. isolates that OSPHL is unable to serotype will be sent to the Centers for Disease Control and Prevention reference lab for serotyping.

Laboratories that do not perform reflex culture on CIDT-positive specimens should submit such specimens to OSPHL for *Salmonella* culture as soon as possible to improve pathogen recovery. For outbreak investigations, the BioFire Multiplex Gastrointestinal PCR Panel and stool culture are available on approval by an OHA ACDP epidemiologist. For culture or BioFire testing, submit fresh stool in enteric pathogen transport media (e.g., Cary-Blair).

Package all isolates and specimens to maintain room temperature during transport. All submissions must be properly packaged in double packaging with absorbent material around them. See the OSPHL Test Menu for complete submission criteria (www.healthoregon.org/labtests).

Samples for *Salmonella* identification or *Salmonella* culture must be accompanied by a completed OSPHL General Microbiology Test Request Form. Samples for BioFire testing must be accompanied by a completed OSPHL Virology/Immunology Test Request Form. Both forms are available at www.bitly.com/phl-forms.

N.B.– Stool specimens for culture must be obtained before initiation of antibiotic treatment.

4. ROUTINE CASE INVESTIGATION

Interview the case or a proxy who may be able to provide pertinent information. Enter date of first contact attempt. If interviewed, enter interview date, interviewer's name, and who was interviewed. If unable to interview the case or a proxy, obtain clinical data (e.g., onset date, symptoms, whether hospitalized overnight, and other available information) from the medical record. Enter a reason if no interview is conducted (e.g., unable to reach).

4.1 Case Interview

For the 7 days before onset, determine:

1. Name, diagnosis, telephone number, and address of any acquaintance or household member with a similar illness. Identified individuals that meets the presumptive case definition should be reported and investigated in the same manner as a confirmed case;
2. Name, date, and location of any restaurant meals;
3. Date, location, and sponsor of any public gathering where food was consumed;
4. Consumption of raw or undercooked meat, poultry, or eggs;
5. Consumption of raw milk or other unpasteurized dairy products;
6. Travel history (within Oregon, within the U.S., or international); complete travel module, including travel dates;
7. Contact with reptiles or amphibians (snakes, lizards, turtles, frogs, etc.);
8. Contact with pets, livestock, poultry, or other animals (including farms, petting zoos);
9. Attendance or employment at a day care facility by the case or a household member.

4.2 Identify Potentially Exposed Persons

Identify whether the case had contact with people with potential exposure to infection (e.g., household members, coworkers). If the case or a symptomatic household member attends or works at a day care, health care, or residential care facility, or is food handler, refer to §6.

4.3 Environmental Evaluation

If the source of infection appears to be associated with a day care facility, restaurant, dairy, or public drinking water supply; or, if the case attends, or works at, a day care facility or works as a food handler, health care provider, or residential care provider, see §6

5. CONTROLLING FURTHER SPREAD

5.1 Education

As indicated, provide basic instruction to cases and potentially exposed contacts about hand washing after defecation, diaper changing and before food preparation; about the importance of proper food handling and adequate cooking for meat, poultry, and eggs. Provide general pointers about minimizing fecal consumption in daily life

5.2 Isolation of Cases

Standard precautions are sufficient to prevent transmission.

5.3 School, Day Care, or Occupational Restrictions

As of March 2002, restrictions are no longer imposed routinely on asymptomatic cases of nontyphoidal salmonellosis, nor are there requirements for follow-up stool testing. Cases with diarrhea are restricted from school and day care attendance, food handling, and patient care. Instruct cases and their surrogates on the art of handwashing as necessary.

5.4 Protection of Contacts

None needed, except emphasis on hand washing after defecation, diaper changing and before food preparation.

5.5 Environmental Measures

As indicated (see below).

6. MANAGING SPECIAL SITUATIONS

6.1 Case Attends or Works at a Day Care Facility

1. Interview the operator and check attendance records for the previous 30 days to identify other possible cases that that may suggest an outbreak.
2. Instruct the operator and other staff in proper methods for food handling and hand washing, especially after changing diapers.
3. If other confirmed, presumptive, or clinically compatible cases have occurred, collect stool specimens for testing from all staff members and children who are symptomatic or who have had diarrhea during the previous 2 weeks.
4. If other possible cases are identified, do an environmental evaluation and consult with OHA ACDP epidemiologists (971-673-1111). We will discuss the advisability and feasibility of special control measures (e.g., cohorting, exclusions).
5. Instruct the operator to notify the LHD immediately if new cases of diarrhea occur. Call or visit once each week for 2 weeks after onset of the last case to verify that surveillance and appropriate preventive measures are being carried out. Manage newly symptomatic staff and children as outlined in §5.3 and §6.1.3.

6.2 Case is a Food Handler

Absent particularly suspicious circumstances, no special follow-up is warranted. Consult with OHA ACDP epidemiologists (971-673-1111) if you have concerns.

6.3 Food Served at a Public Gathering Implicated

Determine if anyone who prepared food for the gathering had diarrhea at any time during the 2 weeks before the gathering; if so, collect stool specimens for culture. The extent of further investigation depends on circumstances. Consult with OHA ACDP epidemiologists.

6.4 Case Works at Health Care or Residential Care Facility

Determine if there has been any increase in incidence of diarrheal illness within the past month. If so, investigate these reports with an eye towards identifying possible common-source outbreaks or any continuing sources of exposure. If indicated, conduct an environmental evaluation of the facility. The extent of further investigation depends on circumstances. Consult with OHA ACDP epidemiologists.

6.5 Public Water Supply Implicated

Consult with OHA ACDP epidemiologists.

UPDATE LOG

October 2022. Updated case definitions to align with 2016 CSTE position statement; laboratory portions updated by OSPHL; various other edits. (E. DeBess, J Hatch, K Morey, R Trevejo)