

Salmonellosis

(nontyphoidal *Salmonella*)

1. DISEASE REPORTING

A. Purpose of Reporting and Surveillance

1. To identify outbreaks and potential sources of ongoing transmission.
2. To prevent further transmission from such sources.
3. To educate people about how to reduce their risk of infection.

B. Legal Reporting Requirements

1. Health care providers: notifiable to local health jurisdiction within 24 hours
2. Health care facilities: notifiable to local health jurisdiction within 24 hours
3. Laboratories: *Salmonella* species notifiable to local health jurisdiction within 24 hours; specimen submission required – culture (2 business days)
4. Local health jurisdiction: notifiable to the Washington State Department of Health (DOH) Communicable Disease Epidemiology (CDE) within 7 days of case investigation completion or summary information required within 21 days

C. Local Health Jurisdiction Investigation Responsibilities

1. Begin investigation within one business day.
2. Administer appropriate infection control recommendations (see Section 6A).
3. Ensure that labs forward the first isolate from each patient to the Public Health Laboratories (PHL) for serotyping.
4. Report all confirmed and probable cases to CDE. Isolation of *Salmonella* from any site (including urine) meets the case definition. Complete the salmonellosis case report form (<http://www.doh.wa.gov/notify/forms/salm.pdf>) and enter the data into the Public Health Issues Management System (PHIMS). Note: *S. Typhi* is reported through PHIMS as Typhoid Fever and *S. Paratyphi* is reported through PHIMS as Salmonellosis.

2. THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Salmonella organisms are gram-negative bacilli. Current taxonomy puts organisms causing human infection into the species *Salmonella enterica*. The species *S. enterica* can be classified serologically into several subspecies designated by Roman numerals (I–VI), and sub-classified into serogroups designated by number (1–67) or formerly by letter (A–Z). Further sub-classification into more than 2000 serotypes (serovars) is done at state public health laboratories.

Subspecies I serotypes are given names (e.g., Enteritidis) while subspecies II–VI

serotypes are designated by antigenic formulae (e.g., *S.* IV 48:g,z₅₁). To emphasize that they are not separate species, the serotype names are not italicized and the first letter is capitalized. You will often see these serotypes referred to casually as *S.* Enteritidis, *S.* Panama, *S.* Oranienburg, etc., but their proper designation would be, for example, *S. enterica* serotype Enteritidis. While a few serotypes are relatively host or place specific, giving clues as to origin, most are very widely distributed in nature and therefore do not give indication as to their epidemiological origin.

B. Description of Illness

Nontyphoidal 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.

Note that typhoid infections (caused by *S. Typhi*) are covered in the Typhoid Fever Reporting and Surveillance Guidelines. *S. Paratyphi* (reported as Salmonellosis) can cause a milder systemic illness similar to typhoid fever including fever, anorexia, lethargy, malaise, headache, nonproductive cough, abdominal pain, and constipation or diarrhea.

C. Salmonellosis in Washington State

DOH receives approximately 650 to 850 reports of salmonellosis per year. Potential sources of infection frequently named by Washington case-patients include poultry products and contact with pets, particularly reptiles.

D. Reservoirs

Salmonella organisms are widely distributed in the animal kingdom, including livestock, pets, wild mammals, poultry and other birds, reptiles, and amphibians. Most infected animals are chronic carriers. In contrast, *S. Typhi* has only human reservoirs as does *S. Paratyphi* (with the exception of B variant L[+] tartrate+).

E. Modes of Transmission

Transmission is 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 exposure to animals or their waste. Intact (uncracked) chicken eggs can be infected transovarially. *S. Paratyphi* and other serogroups can occur in the urine as a rare route of transmission. A large dose of organisms is usually needed to cause infection, thus foods handled in ways that permit multiplication of organisms (e.g., inadequate refrigeration and/or inadequate 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 regular use of antacids and related medications.

Commonly 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, tomatoes);

4. Unpasteurized milk or milk products;
5. Contact with the feces of pets and other infected animals;
6. Contaminated and inadequately treated drinking water.

Person-to-person spread is not common but can occur when an infected person fails to wash hands thoroughly after defecation. It is more likely to occur when the infected person has diarrhea, rather than during the carrier state. Person-to-person spread is most commonly seen among preschool children in child care facilities or amongst playmates. It may also occur in medical care settings where immunocompromised patients are at increased risk.

F. Incubation Period

From 6 hours to 5 days, usually 1–3 days. Longer incubations, up to 16 days, have been documented. For *S. Paratyphi* usually 1–10 days, but may be as long as 2–3 weeks.

G. Period of Communicability

Patients are communicable as long as organisms are excreted in the feces, ranging from days to months. Rarely, the carrier state may exceed a year.

H. Treatment

Fluid and electrolyte replacement (oral or IV) is the mainstay of treatment for persons with salmonellosis. Antibiotic treatment is usually not indicated. Antibiotic therapy may prolong carriage and encourage the appearance of resistant strains; it does not shorten the course or ameliorate the symptoms of non-invasive gastrointestinal infections. Treatment should be reserved for those with invasive disease or those at elevated risk of developing invasive disease (e.g., infants, the elderly, or those with impaired immune functions). If treatment is indicated, antibiotic sensitivities should be determined.

3. CASE DEFINITIONS

A. Clinical Criteria for Diagnosis

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

B. Laboratory Criteria for Diagnosis

Isolation of *Salmonella* from a clinical specimen

C. Case Definition

1. *Probable*: a clinically compatible case that is epidemiologically linked to a confirmed case.
2. *Confirmed*: a case that meets the laboratory criteria for diagnosis.

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

4. DIAGNOSIS AND LABORATORY SERVICES

A. Diagnosis

The diagnosis is made by identification of *Salmonella* in a clinical specimen, such as stool, blood or urine. Serologic tests are not recommended.

B. Tests Available at Washington State Public Health Laboratories (PHL)

Laboratories in Washington are required to submit *Salmonella* isolates to PHL. PHL perform serotyping and pulsed-field gel electrophoresis (PFGE) on all submitted isolates. Finding isolates with the same PFGE pattern may be consistent with but does not prove a common source, whereas isolates with unrelated PFGE patterns presumptively came from different sources.

In an outbreak or other special situation, PHL can culture stool for *Salmonella* species. Contact Communicable Disease Epidemiology for approval prior to submitting stool for culture and prior to collecting food specimens.

Note that PHL require all clinical specimens have two patient identifiers, a name **and** a second identifier (e.g., date of birth) both on the specimen label and on the submission form. Due to laboratory accreditation standards, specimens will be rejected for testing if not properly identified. Also include specimen source and collection date.

C. Specimen Collection

For stool culture, use a sterile applicator swab to collect stool, insert the swab into Cary-Blair transport medium, push the cap on tightly, label the tube with two identifiers (e.g., name and date of birth), and mail immediately.

Please enclose a completed PHL Microbiology form (available at: <http://www.doh.wa.gov/EHSPHL/PHL/Forms/Microbiology.pdf>) with all isolates and stool specimens.

Instructions for handling food specimens can be found in the PHL Directory of Services: <http://www.doh.wa.gov/EHSPHL/PHL/Forms/DirServ30.pdf>.

5. ROUTINE CASE INVESTIGATION

Interview the case and/or others who may be able to provide pertinent information.

A. Identify Potential Sources of Infection

Take a detailed 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 (1–10 days or longer for paratyphoid fever), including:

1. Any contacts or household members with a similar illness. Obtain the name, phone number or address and clinical information of the ill person. Anyone meeting the probable case definition should be reported and investigated in the same manner as a confirmed case.
2. Restaurant meals. Obtain the name of the restaurant, and date and location of the meal.
3. Public gathering where food was consumed. Obtain the date, location, and sponsor of the event.

4. Consumption of raw or undercooked meat, poultry, or eggs.
5. Consumption of raw milk or other unpasteurized dairy products.
6. Travel outside Washington or the United States, or contact with others who have traveled outside the United States. Determine dates of travel.
7. Contact with reptiles or amphibians (snakes, lizards, turtles, frogs, etc.).
8. Contact with pets, livestock, or other animals (including farms and petting zoos).
9. Attendance or employment at a child care facility by the case or a household member.

B. Identify Contacts who Work in Sensitive Occupations

Determine if any household member or close contact attends or works at a child care facility; or works as a food handler or health care worker. If so, see Sections 6 and 7.

C. Environmental Evaluation

A sanitary inspection is indicated if a commercial food service facility, child care center, or public drinking water supply is suspected as the source of infection.

6. CONTROLLING FURTHER SPREAD

A. Infection Control Recommendations

1. Hospitalized patients should be cared for using standard precautions. Contact precautions should be used for diapered or incontinent persons for the duration of the illness or to control institutional outbreaks.
2. The case should be educated regarding effective hand washing, particularly after using the toilet, changing diapers, and before preparing or eating food. The importance of proper hygiene must be stressed, as excretion of the organism may persist for several weeks.
3. School Restriction: Children should not attend school as long as they have diarrhea.
4. Work or Child Care Restriction: Persons should not work as food handlers, child care or health care workers, or attend child care as long as they have diarrhea.

Food handlers serving highly susceptible populations

Food workers in facilities serving highly susceptible populations (e.g. hospitals, child care center or nursing homes) should not return to work until two consecutive negative stool cultures for *Salmonella* are collected not less than 24 hours apart, and at least 48 hours after the last dose of antibiotics.

Food handlers in establishments serving the general population

Food handlers must not return to work until asymptomatic. The local public health authority may issue work restriction (or exclusion) orders and release individuals from restriction based on individual case investigation. For asymptomatic infected individuals, restriction is indicated for those with questionable hygienic habits, or where *Salmonella* transmission is suspected to have occurred in the workplace. Release by the local health authority from work restriction may be based either on 2 consecutive negative stool specimens taken at least 24 hours apart, or on assessment of the ability of the individual

to maintain adequate hygienic precautions.

Healthcare Workers

Nosocomial outbreaks due to asymptomatic infected healthcare workers are uncommon. Release by the local health authority from work restriction may be based either on 2 consecutive negative stool specimens taken at least 24 hours apart, or on assessment of the ability of the individual to maintain adequate hygienic precautions. Health care workers who prepare food should be managed as food handlers.

Child Care Workers and Attendees

Nontyphoidal *Salmonella* species are infrequently associated with outbreaks in child care settings. Child care workers and child care attendees can return to work when their diarrhea has resolved and they are otherwise feeling well. (Red Book 2009 pp.130-1, 584–8). Child care workers who prepare food should be managed as food handlers.

Infections with S. Paratyphi

Communicable Disease Epidemiology recommends that persons infected with *S. Paratyphi* who present with paratyphoid fever be excluded from sensitive occupations until 2 consecutive negative stool cultures taken at least 24 hours apart are obtained.

5. If a suspected source of infection is identified and has the potential for transmitting infection to others, advise those individuals on measures to avoid exposure (e.g., good hand washing after handling a pet reptile, keeping the pet reptile out of areas in the home where food is prepared).

B. Case Management

Stool cultures to document that fecal shedding of the organism has stopped are not routinely indicated, except for the purpose of lifting work restrictions (see above).

C. Contact Management

1. Symptomatic contacts: Symptomatic household members and other close contacts should seek medical attention from their regular providers as needed. Contacts with recent or current disease are probable cases, and should be managed and reported as such on separate forms. Cultures are indicated if the symptomatic contact appears to be part of a common source outbreak. Cultures may be indicated if a symptomatic contact is a food handler, healthcare worker, child care worker, or child care attendee.
2. Education: All contacts should be educated about transmission routes, symptoms, and effective hand washing, particularly after using the toilet, changing diapers, and before preparing or eating food.

D. Environmental Measures

See Section 7 for environmental measures in special situations.

7. MANAGING SPECIAL SITUATIONS

A. Possible Foodborne Outbreaks

Salmonella is a frequent cause of foodborne disease. Call Communicable Disease Epidemiology if you suspect a common-source outbreak.

B. Case Attends or Works at a Child Care Facility

1. Interview the operator and review attendance records to identify other possible cases among staff or attendees during the previous month. Note: WAC170-295-3030 specifies that the operator keep a log of illnesses.
2. Review food handling, hand washing, and diaper changing practices with the operator and staff.
3. Collect stool specimens for culture from all staff members and children who are currently symptomatic.
4. Exclude cases from child care facilities until they are no longer symptomatic.
5. If more than one case is suspected among attendees or workers at a child care facility, inspect the facility. The facility may have requirements for reporting outbreaks to Department of Early Learning.
6. Instruct the operator to notify you immediately if new cases of diarrhea occur.
7. Make follow-up contact with the child care center to assure that surveillance and appropriate preventive measures are being carried out. Manage newly symptomatic children as outlined above.

C. Case Resides at a Health Care or Residential Care Facility

Determine if there has been any unusual incidence of diarrheal illness within the past month. If so, investigate these reports to identify possible common-source outbreaks or any continuing sources of exposure. If indicated, conduct a sanitary inspection of the facility. The extent of further investigation depends on circumstances. A facility may have requirements for reporting outbreaks to their licensing agency.

8. ROUTINE PREVENTION**A. Vaccine Recommendations:** None**B. Prevention Recommendations**

1. Wash hands after handling pets, pet wastes, pet treats made from animal products, fowl, other animals, raw meat, raw poultry, and always before food preparation.
2. Wash hands after caring for diapered children, after using the toilet, and after handling soiled clothing or linens.
3. Do not eat raw eggs or foods containing raw eggs. Do not use dirty or cracked eggs.
4. Thoroughly cook eggs, poultry, and other foods of animal origin.
5. Avoid cross-contamination of ready to eat foods with raw foods of animal origin via cooking surfaces and utensils. Wash food preparation surfaces and utensils thoroughly after contact with raw meat or poultry.
6. Wash fruits and vegetables thoroughly before consumption. Peel when possible.
7. Avoid unpasteurized milk and other unpasteurized products including soft cheeses, juices, and cider.
8. Avoid drinking or swallowing untreated surface water. Untreated water should be boiled

or otherwise disinfected before consumption.

9. Protect foods from rodent and insect contamination.
10. Discourage the use of chicks, ducklings, turtles, reptiles, and rodents as pets for small children.
11. Avoid direct or indirect contact between reptiles and infants or immunocompromised persons.

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UPDATES

August 2008

Section 2: Information was added regarding *S. Paratyphi*.

Section 6A: Additional guidance was added regarding the management of persons infected with *S. Paratyphi* who present with paratyphoid fever.

January 2011:

The Legal Reporting Requirements section has been revised to reflect the 2011 Notifiable Conditions Rule revision.

December 2011:

Section 6A: Work restrictions for food workers section distinguish highly susceptible from general populations.