

Salmonellosis

(nontyphoidal *Salmonella*)

1. DISEASE REPORTING

A. Purpose of Reporting and Surveillance

1. To determine if there is a source of infection of public health concern (e.g., a food handler or commercially distributed food product) and to stop transmission from such a source.
2. When the source of infection appears to pose a risk to only a few individuals (e.g., a reptile in the home), to inform those individuals how they can reduce their risk of exposure.
3. To assess the risk of the case transmitting infection to others, and to prevent such transmission.
4. To identify outbreaks and other undiagnosed cases.

B. Legal Reporting Requirements

1. Health care providers: **immediately notifiable to local health jurisdiction**
2. Hospitals: **immediately notifiable to local health jurisdiction**
3. Laboratories: notifiable to local health jurisdiction within 2 work days; specimen submission required
4. Local health jurisdiction: notifiable to the Washington State Department of Health (DOH) Communicable Disease Epidemiology Section (CDES) 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 work 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 CDES. Isolation of *Salmonella* from any site (including urine) meets the case definition. Complete the salmonellosis case report form (www.doh.wa.gov/notify/forms/salm.doc) 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*. *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 direction 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.

Note that typhoid infections (caused by *S.* Typhi) are covered in the Typhoid Fever Reporting and Surveillance Guidelines. *S.* Paratyphi 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 800 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, although there have been documented outbreaks with much lower inocula. 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 antacid use.

Commonly recognized vehicles or mechanisms of transmission include:

1. Inadequately cooked or raw meat, poultry, or eggs;
2. Others foods cross-contaminated with any of the above;
3. Contaminated produce (e.g., sprouts, cantaloupe, mangos);
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 home and neighborhood playmates. It may also occur in medical care settings where immunocompromised patients are at increased risk.

F. Incubation Period

Usually 1–3 days, occasionally as short as 6 hours or as long as 5 days. 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 GI 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 ascertained.

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 (2005)

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 that 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. Isolates with the same PFGE pattern may be consistent with but do not prove a common source, whereas isolates with different PFGE patterns presumptively came from different sources.

In an outbreak or other special situation, PHL can culture stool for *Salmonella* species. Contact CDES for approval prior to submitting stool for culture.

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, and mail immediately.

Please enclose a completed PHL Enteric Bacteriology form (available at: <http://www.doh.wa.gov/EHSPHL/PHL/Forms/EntericBacteriology.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/directory_of_services.pdf.

5. ROUTINE CASE INVESTIGATION

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

A. Identify Source of Infection

Take a detailed 5-day food history. Ask about potential exposures during 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 Restrictions: Children should not attend school as long as they have diarrhea.
4. Work or Child Care Restrictions: Persons should not work as food handlers, child care or health care workers, or attend child care as long as they have diarrhea. The following section addresses when food handlers, healthcare workers, child care workers and child care attendees can return to work or child care.

Food Handlers

The Washington State Retail Food Code requires food employees to report *Salmonella* infections to their employer and requires food establishments to restrict from areas where unwrapped food or beverages are prepared and sold (if serving general populations) or exclude from the establishment (if serving highly susceptible populations) employees known to be infected with *Salmonella* until approved to be released by the local health authority (WAC 246-215-251) (5).

The local health authority may issue restriction or exclusion orders and release individuals from work restriction or exclusion based on the findings of an investigation related to a food employee. Restriction or exclusion of asymptomatic infected individuals is indicated for those with questionable hygienic habits. Release by the local health authority from work restrictions 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 (WAC 246-215-251)(8). CDES recommends restricting persons from preparing food for high risk populations (i.e., nursing home residents, hospitalized patients) until 2 consecutive negative stool specimens taken at least 24 hours apart are negative.

Healthcare Workers

Nosocomial outbreaks due to asymptomatic infected healthcare workers appear to be uncommon. Release by the local health authority from work restrictions 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 2006 pp.134,582–3) Restrictions can be waived or modified at the discretion of the local health jurisdiction.

Infections with S. Paratyphi

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

5. If a suspected source of infection is identified and has the potential for transmitting infection to a defined population, 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 CDES immediately if you suspect a common-source outbreak.

B. Case Attends or Works at a Child Care Facility

1. Interview the operator and inspect attendance records to identify other possible cases among staff or attendees during the previous month.
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 or suspected case is identified among attendees or workers at a child care facility, inspect the facility.
6. Instruct the operator to notify the LHM 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.

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, or use dirty or cracked eggs.
4. Thoroughly cook eggs 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 cheese, 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.

ACKNOWLEDGEMENTS

This document is a revision of the Washington State Guidelines for Notifiable Condition Reporting and Surveillance published in 2002 which were originally based on the Control of Communicable Diseases Manual (CCDM), 17th Edition; James Chin, Ed. APHA 2000. We would like to acknowledge the Oregon Department of Human Services for developing the format and select content of this document.

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.