



Alberta Public Health Disease Management Guidelines

Salmonellosis



This publication is issued under the Open Government Licence – Alberta (<http://open.alberta.ca/licence>). Please note that the terms of this licence do not apply to any third-party materials included in this publication.

This publication is available online at <https://open.alberta.ca/publications/salmonellosis>

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without written permission of Alberta Health, Government of Alberta.

© Copyright of this document and its contents belongs to the Government of Alberta.

For further information on the use of this guideline contact:

Health.CD@gov.ab.ca

Health and Wellness Promotion Branch

Public Health and Compliance Branch

Alberta Health

Salmonellosis | Alberta Health, Government of Alberta

© 2021 Government of Alberta | November 2021



Contents

Case Definition	4
Confirmed Case	4
Probable Case	4
Reporting Requirements	5
Physicians, Health Practitioners and Others	5
Laboratories	5
Alberta Health Services and First Nations and Inuit Health Branch	5
Additional Reporting Requirements	5
Epidemiology	6
Etiology	6
Clinical Presentation.....	6
Diagnosis	6
Treatment.....	6
Reservoir	7
Transmission	7
Incubation Period	7
Period of Communicability.....	7
Host Susceptibility	7
Incidence.....	8
Public Health Management	9
Key Investigation.....	9
Management of a Case	10
Management of Contacts	10
Preventive Measures.....	11
Appendix 1: Revision History	12
References	13

Case Definition

Confirmed Case

Laboratory confirmation of infection with or without clinical illness:^(A)

- Isolation of a *Salmonella* sp. (excluding *S. Typhi/Paratyphi*) from an appropriate clinical specimen (e.g., stool, urine, blood, sterile site, deep tissue wound)^(B)

Probable Case

Clinical illness^(A) in a person who is epidemiologically linked to a confirmed case

NOTE:

1. *Salmonella Paratyphi B var java* is considered a case of *Salmonella* (i.e., non-typhoidal) and **should not be reported as Paratyphoid Fever**.
2. *Salmonella Typhi/Paratyphi* **should be reported as Typhoid/Paratyphoid Fever** by fastest means possible. Refer to the Disease Management Guidelines related to [Paratyphoid Fever](#) and [Typhoid Fever](#) for more information.

^(A) Clinical illness is characterized by headache, diarrhea, abdominal pain, nausea, fever and sometimes vomiting. Asymptomatic infections may occur, and the organism may cause extraintestinal infections.

^(B) Refer to the [Public Health Laboratory \(ProvLab\) Guide to Services](#) for current specimen collection and submission information.

Reporting Requirements

Physicians, Health Practitioners and Others

Physicians, health practitioners and others shall notify the Medical Officer of Health (MOH) (or designate) of the zone, of all confirmed and probable cases in the prescribed form by mail, fax or electronic transfer within 48 hours (two business days).

Laboratories

All laboratories shall report all positive laboratory results by mail, fax or electronic transfer within 48 hours (two business days) to the:

- Chief Medical Officer of Health (CMOH) (or designate), and
- MOH (or designate) of the zone.

Alberta Health Services and First Nations and Inuit Health Branch

- The MOH (or designate) of the zone where the case currently resides shall forward the initial Notifiable Disease Report (NDR) of all confirmed and probable cases to the CMOH (or designate) within two weeks of notification and the final NDR (amendment) within four weeks of notification.
- The MOH (or designate) shall report all outbreaks to CMOH (or designate) via the [Alberta Outbreak Report Form \(AORF\)](#) as soon as possible using existing processes (e.g., CDOM or fax).
- For out-of-province and out-of-country reports, the following information should be forwarded to the CMOH (or designate) by phone, fax or electronic transfer within 48 hours (two business days):
 - name,
 - date of birth,
 - out-of-province health care number,
 - out-of-province address and phone number,
 - positive laboratory report, and
 - other relevant clinical/epidemiological information.

Additional Reporting Requirements

Alberta Agriculture and Forestry

- The [Reportable and Notifiable Diseases Regulation](#), under the *Animal Health Act*, lists specific diseases that are classified as reportable or notifiable, and the requirement and process for reporting these diseases.
 - All confirmed, probable, and suspect animal cases of salmonellosis in pigs, poultry, and cows must be reported to **Alberta Agriculture and Forestry**.
 - Animal health issues associated with the source of human salmonellosis disease should be reported by the CMOH (or designate) to the Chief Provincial Veterinarian.

Epidemiology

Etiology

Salmonellosis is caused by gram negative non-spore forming bacilli belonging to the *Enterobacteriaceae* family. About 2500 serotypes of *Salmonella* have been identified.⁽¹⁾ The most common serotypes that cause human disease are divided among the O-antigen groups A through E.⁽²⁾ *Salmonella* Typhimurium (serotype B) and *Salmonella* Enteritidis (serotype D) are the most commonly reported serotypes in the majority of countries that maintain *Salmonella* surveillance.⁽¹⁾

Clinical Presentation

Salmonellosis is a bacterial infection causing acute enterocolitis with a sudden onset of headache, fever, abdominal pain, diarrhea, nausea and occasionally vomiting.⁽¹⁾ Diarrhea is usually self-limiting and can last three to seven days. Fever, if present, usually resolves in 48–72 hours.⁽³⁾ Dehydration may be a severe complication, especially in the very young and in the elderly.⁽¹⁾ Septicemia may develop as well as focal infections, including meningitis, brain abscess and osteomyelitis.^(1,2) Reactive arthritis, an autoimmune condition, has been associated with gastrointestinal infections such as *Salmonella*.⁽⁴⁾ Asymptomatic infections can occur. Deaths are uncommon except in the very young, very old or immunosuppressed individuals.⁽¹⁾

Diagnosis

Isolation of *Salmonella* organisms in cultures from an appropriate clinical specimen (e.g., stool, urine, blood, sterile site, deep tissue wound) are diagnostic. Specimens should be collected over several days as excretion of the bacteria may be intermittent. Serotyping is done at the ProvLab.

Treatment

- *Salmonella* gastroenteritis is usually a self-limiting disease, and therapy is usually directed to the replacement of fluids and electrolyte balance.⁽³⁾
- Antibiotics are generally not indicated for treatment of uncomplicated non-typhoidal *Salmonella* infections, as they do not shorten the duration of diarrheal illness and can prolong the duration of fecal excretion of the organism.⁽²⁾
- Antibiotics may not clear the carrier state and may lead to resistant strains or more severe infections.⁽¹⁾
- Antimicrobial therapy, however, should be considered for:
 - individuals with severe illness, such as those with severe diarrhea, continued/high fever, or manifestations of extra-intestinal infections,⁽¹⁾ and
 - individuals at risk for invasive disease such as:
 - the very young (under three months old),
 - the elderly,
 - debilitated persons,
 - those with hemoglobinopathies including Sickle Cell Disease,⁽¹⁾ and
 - individuals with chronic gastrointestinal tract disease, malignant neoplasms, HIV infection or other immunosuppressive illnesses or therapies.⁽²⁾
- Antimicrobial resistance is variable; therefore antibiotics, if indicated, should be prescribed based on sensitivity testing.^(1,2)
- Consultation with an infectious disease specialist may be warranted.

Reservoir

The reservoirs for non-typhoidal *Salmonella* organisms include a wide range of wild and domestic animals including birds, poultry, livestock, reptiles, amphibians and household pets (e.g., pet turtles, iguanas, lizards, snakes, frogs, toads, newts, salamanders, chicks and other baby poultry, dogs, cats, hamsters and hedgehogs).^(1,2)

In humans, convalescent carriers, mild or unrecognized cases may also serve as reservoirs.⁽¹⁾

Transmission

Transmission can occur via consumption of contaminated foods, through animal to human, or through person-to-person.

Food of animal origin is the predominant source of transmission to humans.⁽²⁾ Food sources include contaminated raw or undercooked egg/egg products, meat/meat products, unpasteurized milk/milk products, poultry/poultry products, and contaminated fruits and vegetables. Infection may occur from ingesting food contaminated by feces of an infected animal or person.⁽¹⁾ Cross contamination can occur from a contaminated source to other foods or objects (e.g., utensils, equipment, kitchen surfaces) in the environment.⁽⁴⁾ Outbreaks have been linked to consumption of fruits or vegetables contaminated in the kitchen or in their growing environment.⁽¹⁾ Drinking contaminated water is another vehicle of transmission.⁽²⁾

Contact with animals (e.g., infected reptiles, amphibians, rodents or other mammals) or their environments can lead to infection with *Salmonella*. The infection can be transmitted to farm animals through feeds and fertilizers made from contaminated meat scraps, tankage, fish meal and bones.⁽¹⁾

Person-to-person transmission through the fecal-oral route is also possible, especially when diarrhea is present.⁽¹⁾

Incubation Period

The incubation period is commonly 12–36 hours with a range of 6–72 hours.^(1,2) Longer incubation periods of up to 16 days have been documented and may be more common following low dose ingestion of the organism.⁽¹⁾

Period of Communicability

Period of communicability lasts throughout the course of infection, and can vary from several days to several weeks.⁽¹⁾

After symptoms resolve, the mean duration of carriage of non-typhoidal *Salmonella* in the stool is about four to five weeks but this can vary by serotype.⁽⁴⁾ With the most common non-typhoidal *Salmonella* organisms, approximately 45% of children less than five years of age will continue to excrete organisms 12 weeks after infection. Excretion drops to only 5% in older children and adults.⁽²⁾

Chronic carriers in humans are rare but common in animals, including birds.⁽¹⁾ About 1% of adults continue to excrete *Salmonella* organisms for more than one year.⁽²⁾

Host Susceptibility

Susceptibility is general and is usually increased by achlorhydria (a condition in which production of gastric acid in the stomach is absent or low), antacid therapy, gastrointestinal surgery, prior or current broad spectrum antibiotic therapy, neoplastic disease, immunosuppressive therapy and other debilitation conditions including malnutrition.⁽¹⁾ Severity of disease is related to serotype, number of organisms ingested and host factors.⁽¹⁾

Incidence

General

Worldwide occurrence. In many countries, the incidence of human *Salmonella* infections has increased although good population based surveillance data is lacking.⁽³⁾ It is believed that only a small proportion of cases are clinically recognized and in developed countries, only an estimated 1% of clinical cases are reported.⁽¹⁾ About 60–80% of cases occur sporadically; however, large outbreaks may occur in settings such as hospitals, long-term care, child care sites, restaurants and community as a result of food contamination at its source or less commonly through contact with an ill individual or carrier.⁽¹⁾

In the US, the incidence of non-typhoidal *Salmonella* infection has doubled in the last two decades. The incidence rate in 2007 was 14.9 cases per 100,000 population.⁽³⁾

The incidence of non-typhoidal *Salmonella* infections is highest during the rainy season in tropical climates and during the warmer months in temperate climates, which coincides with foodborne outbreaks.⁽³⁾

Canada

Salmonellosis is the second most frequently reported food-related illness in Canada. Many of these illnesses are sporadic cases, but some are part of outbreaks.⁽⁵⁾

Between 2000 and 2012, the number of cases of Salmonellosis reported annually ranged from 5065 (2003) to 6999 (2010) representing rates of 16.0–20.5 cases per 100,000 respectively.⁽⁶⁾

Salmonella continued to be the most common pathogen reported to the National Enteric Surveillance Program in 2011. The three most commonly reported *Salmonella* serovars remained unchanged from the previous seven years, with *S. enteritidis* being the most frequently reported, followed by *S. Typhimurium* and *S. heidelberg*.⁽⁷⁾

Alberta

Between 1998 and 2012, rates of salmonellosis ranged from 18.2–28.4 per 100,000. This represents approximately 650–850 cases reported per year, with the majority of cases in the adult population.⁽⁸⁾ The most commonly reported source of infection between 2008 and 2012 was food. A peak in cases reported occurred in 2010 and was the result of two large outbreaks caused by two different serotypes – a *S. enteritidis* outbreak that was associated with several permitted food establishments and resulted in 80 reported cases, and a *S. heidelberg* outbreak associated with one permitted food establishment that resulted in 50 reported cases.

Refer to the [Interactive Health Data Application \(IHDA\)](#) for more information.

Public Health Management

Key Investigation

- Confirm the case meets the case definition.
- Obtain a history of illness including the date of onset, signs and symptoms.
- Identify any underlying medical conditions that may increase [host susceptibility](#).
- Determine the occupation of the case and if in a **sensitive situation or occupation (SSO)** that poses a higher risk of transmission to others. See Table 1 for a definition of SSO.
- Determine the possible source of infection taking into account the incubation period^(C), reservoir and mode of transmission. Assessment may include determining, identifying or obtaining:
 - a detailed food history including recent consumption of undercooked meat or poultry or recent consumption of other potential sources (e.g., raw or undercooked eggs or egg products, unpasteurized milk/dairy products, sprouts or other potentially contaminated produce),
 - possible exposure to farm animals (including petting zoos) or pets (including reptiles and amphibians) that may harbour the disease,
 - occupational exposure (e.g., animal or meat handling),
 - exposure to pet treats or pet foods,
 - high-risk sexual practices, especially contact with feces,
 - recent travel or immigration, and/or
 - residing in areas with poor sanitation including improper water treatment and sewage disposal either in Canada, or abroad.
- Obtain implicated food samples, if possible.
- Suspected contaminated food may be held to prevent consumption or may be destroyed.
- Assess for history of similar symptoms in other members of the household.
- Identify contacts that may have had significant risk of direct or indirect exposure to the feces of the case, especially those in SSO (refer to Table 1). Contacts include:
 - persons living in the household,
 - children and child care workers at a child care facility (daycare, dayhome, or other child care site), and
 - individuals exposed to the same source (if identified).

Table 1: Sensitive Situations or Occupations (SSO)

SSO	Activities
Food handler	<ul style="list-style-type: none"> • Touches unwrapped food to be consumed, <u>and/or</u> • Handles equipment or utensils that touch unwrapped food to be consumed.*
Health care, child care or other staff	<ul style="list-style-type: none"> • Has contact through serving food to highly susceptible patients or persons in whom an intestinal infection would have particularly serious consequences. • Provides direct patient care and is involved in the care of young children, elderly or dependent persons.
Child attending a child care facility or similar facilities	<ul style="list-style-type: none"> • Is diapered or unable to implement good standards of personal hygiene.
Any individual (older child or adult)	<ul style="list-style-type: none"> • Is unable to implement good standards of personal hygiene (e.g., with disabilities/challenges that may impact ability to perform good hand hygiene and is involved in an activity that may promote disease transmission).

* NOTE: Generally, food handlers who do not touch food, equipment or utensils in this way are not considered to pose a transmission risk; however, circumstances for each case should be assessed on an individual basis.

^(C) The incubation period of salmonellosis is usually 12–36 hours; however, individual cases can vary requiring flexibility when determining where and how the disease was likely acquired.

Management of a Case

- All cases should be advised of the following:
 - how the disease is transmitted, appropriate personal hygiene, routine infection prevention and control practices, and contact precautions, and
 - to avoid food preparation until symptoms have resolved.
- Contact precautions should be used in health care settings where children or adults have poor hygiene or incontinence that cannot be contained.⁽⁹⁾ Consultation with the facility Infection Prevention and Control would be appropriate.
- Refer to Table 2 for case exclusion criteria. For a summary of all enteric exclusions refer to [Enteric Transmission Risk Assessment and Exclusion Table](#).

Table 2: Case Exclusion

Cases	Category	Exclusion Criteria
Symptomatic	SSO	<ul style="list-style-type: none"> • The MOH may by order exclude the case until 48 hours after appropriate antibiotic treatment has been completed and stools have returned to normal or the MOH is satisfied that the case is no longer infectious. <ul style="list-style-type: none"> – The case must be symptom free for 48 hours after stopping any antidiarrheal medication (if taken). – Lifting of exclusions is not conditional upon submission of stool specimens to demonstrate clearance of the organism, – Specimens may still be submitted on a case-by-case basis in consultation with the MOH. • If possible, consideration may be given to temporary redeployment away from activities that involve increased risk of transmission.
Asymptomatic	SSO	<ul style="list-style-type: none"> • Generally not required unless otherwise recommended by the MOH.
Symptomatic	Non-SSO	<ul style="list-style-type: none"> • No exclusion required; however, all cases of gastroenteritis or enteritis should be regarded as potentially infectious and should remain home from work, school or daycare until 48 hours after diarrhea has stopped.
Asymptomatic	Non-SSO	<ul style="list-style-type: none"> • No exclusion required.

Management of Contacts

- Contacts should be instructed about disease transmission, appropriate personal hygiene, routine practices, and contact precautions.
 - Stress the measures that need to be taken to minimize possible fecal-oral transmission including strict hand hygiene, especially after using the washroom, changing diapers, and before eating and preparing/handling foods.
- Symptomatic contacts should be assessed by a physician.
 - Contacts with positive stool specimens should be treated as cases.
- Refer to Table 3 for contact exclusion criteria.

Table 3: Contact Exclusion

Contacts	Category	Exclusion Criteria
Symptomatic	SSO	<ul style="list-style-type: none"> • The MOH may by order exclude (same as per case). • Ensure the contact is assessed by their physician.
Symptomatic	Non-SSO	<ul style="list-style-type: none"> • No exclusion required. • Refer to their physician for assessment and testing, if required.
Asymptomatic	All	<ul style="list-style-type: none"> • No exclusion – contacts should monitor themselves for gastrointestinal symptoms, maintain good hand hygiene and food handling practices and seek medical attention if symptoms develop.

Preventive Measures

Reference 2 applies to this section.

Educate the **public** about the following:

- personal hygiene, especially:
 - the sanitary disposal of items containing feces,
 - careful hand washing
 - after contact with farm animals, pets, animal feces, and animal environments, especially where the animals/pets are ill with diarrhea,
 - after handling pet foods/treats and after cleaning pet enclosures,
 - after defecation and sexual contact, and
 - before/after preparing or eating food;
- avoiding cross-contamination of food by:
 - keeping uncooked meats separate from produce, cooked foods, and ready-to-eat foods, and
 - thoroughly washing cutting boards, counters, knives, and other utensils after handling uncooked foods;
- the possible dangers of consuming raw or unpasteurized milk or other dairy products, as well as raw or undercooked eggs (e.g., eggs ‘over easy’ or ‘sunny side up’, eggnogs, homemade ice cream, foods with hidden raw egg such as hollandaise sauce) and using dirty or cracked eggs;
- thoroughly cooking eggs, poultry and other foods of animal origin;
- possible risks of salmonella infection from certain animals/pets including reptiles (e.g., turtles, snakes, and lizards), amphibians (e.g., frogs and toads), and poultry (e.g., chicks, chickens, ducks, ducklings, geese, turkeys); also, pocket pets (e.g., guinea pigs and rodents like hamsters), dogs, cats, birds, horses and other farm animals (e.g., goats, calves, sheep) can carry and pass *Salmonella* to people;⁽¹⁰⁾
- risks of infection associated with Salmonella pathogens that may be found in aquariums;⁽¹¹⁾ and
- methods of personal protective measures, in particular the correct and consistent use of condoms, and risk of sexual practices that permit fecal-oral contact.

Educate **food handlers** about:

- proper food and equipment handling, preparation, and hygiene, especially in avoiding cross-contamination from raw meat products; and
- thorough hand washing before and after meal preparation.

Appendix 1: Revision History

Revision Date	Document Section	Description of Revision
November 2021	General	<ul style="list-style-type: none"> • Updated Template • Etiology, Clinical Presentation, Diagnosis and Treatment sections moved to Epidemiology • Key Investigation section moved to Public Health Management (formerly called Control) • Updated web links
	Reporting	<ul style="list-style-type: none"> • Added bullet on outbreak reporting
	Management of Case and Contacts	<ul style="list-style-type: none"> • Specified where terminology is SSO and included information in tables • Updated Exclusions to align with decisions agreed to in Enteric Transmission Risk Assessment and Exclusion Table • Aligned wording with other enteric diseases
	Preventive Measures	<ul style="list-style-type: none"> • Reworded to align with other enteric diseases

References

- (1) Heymann DL editor. Control of Communicable Diseases Manual. 19th ed. Washington, D.C.: American Public Health Association; 2008.
- (2) Pickering LK editor. Red Book, Report of the Committee on Infectious Diseases . 29th ed.: American Academy of Pediatrics; 2012.
- (3) Pegues D, Miller S. Salmonella Species, including *Salmonella* Typhi. Mandell, Douglas and Bennett's Principles and Practice of Infectious Diseases. 7th ed. Philadelphia: Churchill Livingstone; 2010. p. 2887-2903.
- (4) U.S. Food and Drug Administration. Bad bug book: Foodborne pathogenic microorganisms and natural toxins handbook. : Center for Food Safety and Applied Nutrition, of the Food and Drug Administration (FDA), U.S. Department of Health and Human Services; 2012.
- (5) Public Health Agency of Canada. Salmonella Fact Sheet. 2013-05-09; Available at: <http://www.phac-aspc.gc.ca/fs-sa/fs-fi/salmonella-eng.php>, 2013.
- (6) Public Health Agency of Canada. Notifiable Disease On-Line: Salmonellosis. 2013; Available at: <http://dsol-smed.phac-aspc.gc.ca/dsol-smed/ndis/charts.php?c=yf>.
- (7) Public Health Agency of Canada. National Enteric Surveillance Program (NESP): Annual Summary 2011. 2012.
- (8) Alberta Health, Surveillance and Assessment. Communicable Disease Reporting System (CDRS).
- (9) Public Health Agency of Canada. Routine Practices and Additional Precautions for Preventing the Transmission of Infection in Healthcare Settings. 2012; Available at: http://www.ipac-canada.org/pdf/2013_PHAC_RPAP-EN.pdf.
- (10) Centers for Disease Control and Prevention (CDC). Healthy Pets Healthy People. Salmonella Infection (Salmonellosis) and Animals. 2011; Available at: <http://www.cdc.gov/healthypets/diseases/salmonellosis.htm>.
- (11) Public Health Agency of Canada. Outbreak of *Salmonella* Paratyphi B Linked to Aquariums in the Province of Quebec. Can Comm Dis Rep 2002;28(11).