Salmonellosis

Revision Dates

Case Definition	August 2011
Note added re: Typhoid/Paratyphoid Fever	February 2019
Reporting Requirements	May 2018
Remainder of the Guideline (i.e., Etiology to References sections inclusive)	August 2014

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.

Comment: *Salmonella Paratyphi B var java* is considered a case of *Salmonella* (i.e., non-typhoidal) and should not be reported as Paratyphoid Fever.

NOTE: *S. Typhi* / *Paratyphi* should be reported as Typhoid / Paratyphoid Fever (fastest means possible). Refer to the Alberta Public Health Disease Management Guideline 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 extra-intestinal infections.
[B] Refer to the Provincial Laboratory for Public Health (ProvLab) Guide to Services for current specimen collection and submission information.

Reporting Requirements

1. **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).

2. **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.

3. **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.
   - 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.

4. **Additional Reporting Requirements**
   - Agriculture and Forestry (AF): Under the *Animal Health Act – Reportable and Notifiable Diseases Regulation* all confirmed, probable, and suspect animal cases of salmonellosis in pigs, poultry, and cows must be reported to AF. Animal health issues associated with the source of human salmonellosis disease should be reported by the CMOH (or designate) to the Chief Provincial Veterinarian.

Etiology

Salmonellosis is caused by gram negative non-spore forming bacilli belonging to the *Enterobactericeae* 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 3–7 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.

Epidemiology

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 human to human.

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 4–5 weeks but this can vary by serotype.[4] With the most common non-typhoidal *Salmonella* organisms, approximately 45% of children less than 5 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 >1 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]

Occurrence

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, childcare 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]

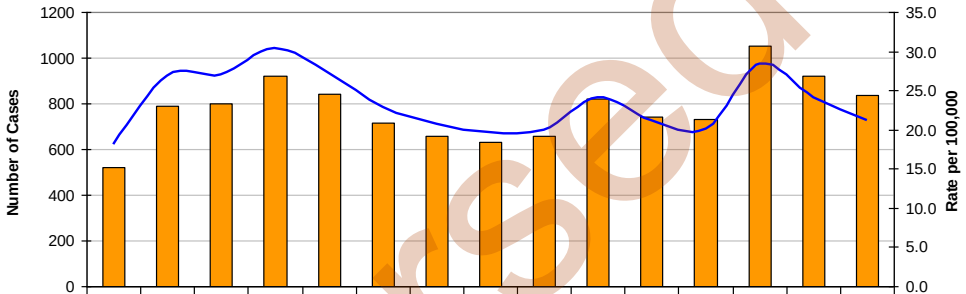
Between 2000 and 2012, the number of cases of Salmonellosis reported annually ranged from 5065 (2003) to 6999 (2010) representing rates of 16.0–20.5 cases per 100,000 respectively.[6]

Salmonella continued to be the most common pathogen reported to National Enteric Surveillance Program (NESP) 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. This peak 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.

Case count/Rate of Salmonellosis in Alberta, 1998-2012



	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
CASES	519	787	800	920	840	717	659	633	657	819	741	729	1054	920	836
RATE	18.2	26.9	27.0	30.4	27.2	22.9	20.7	19.6	19.9	24.0	21.2	20.2	28.4	24.1	21.2

Source: Alberta Health Communicable Disease Reporting System (CDRS) [8] *Accessed June 2013*

Key Investigation

Single Case/Household Cluster

- Confirm the diagnosis.
- 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 (e.g., food handler, childcare facility worker, healthcare worker) and identify specific duties at work.
- If the case is a child, determine attendance at a childcare facility (e.g., daycare, day home) or other childcare site.
- Determine if the case had any other type of institutional contact (e.g., long-term care)
- Determine the possible source of infection taking into account the incubation period, reservoir and mode of transmission. Assessment may include:
  - 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, etc.),
  - identifying history of high-risk sexual practices, especially contact with feces,
  - determining history of exposure to farm animals (including petting zoos) or pets (including reptiles and amphibians) that may harbour the disease,
  - determining exposure to pet treats or pet foods,

  - determining history of travel
  - determining history of residing in areas with poor sanitation including improper water treatment and sewage disposal either in Canada or abroad,
  - identifying others who may have been exposed to the same source and
  - assessing for history of similar symptoms in other members of the household.
- Suspected contaminated food may be held to prevent consumption or may be destroyed.
- Identify contacts including:
  - persons living in the household,
  - children and childcare workers at a childcare facility (e.g., daycare, day home) and
  - individuals exposed to the same source, where the source is identified.
- Identify contacts involved in sensitive occupations or situations (i.e., those who pose a higher risk of transmission to others). They would generally include:
  - food handlers whose work involves:
    - touching unwrapped food to be consumed raw or without further cooking and/or
    - handling equipment or utensils that touch unwrapped food to be consumed raw or without further cooking. **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,
  - healthcare, childcare or other staff who have contact through serving food to highly susceptible patients or persons,
  - healthcare workers providing direct patient care and persons involved in the care of young children, elderly or dependent individuals,
  - children attending a childcare facility or similar facilities who are diapered or unable to implement good standards of personal hygiene or
  - any individual (child or adult) who is unable to implement good standards of personal hygiene (e.g., those with disabilities/challenges that may impact ability to perform good hand hygiene).

Control

Management of a Case

- Provide information about disease transmission and the appropriate infection prevention and control measures to be implemented to minimize the possibility of transmission including strict hand hygiene especially after using the washroom, changing diapers and before preparing/handling and serving food.
- Routine practices should be adhered to for hospitalized patients. For hospitalized children or adults unable to maintain appropriate hygiene habits or who have incontinence that cannot be contained, additional precautions (i.e., contact precautions) should be implemented.[9] Consultation with the facility Infection Prevention and Control would be appropriate.
- Advise the case about proper food handling practices and to refrain from preparing food for others for the duration of the period of communicability.
- Exclude symptomatic cases (confirmed and probable) who are involved in sensitive occupations or situations.
  - Exclusion would apply until 48 hours after stools return to normal. **NOTE:** 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 for clearance of the organism unless deemed otherwise necessary by the Medical Officer of Health (MOH) on a case-by-case basis.
- Exclusion of asymptomatic cases involved in sensitive occupations or situations is generally NOT required unless otherwise recommended on a case by case basis by the MOH (e.g., case is unable to follow appropriate hand hygiene practices).

- Advise all other cases (i.e., those not involved in sensitive occupations or situations) to remain off work until 48 hours after they have recovered clinically and their stools have returned to normal.
  - These individuals should refrain from participating in other sensitive activities/settings outside their primary occupation (e.g., volunteering to prepare or serve food at functions) while they are symptomatic.
  - If they must return to work sooner than recommended, review the importance of strict hand hygiene, proper food handling practices and advise them not to prepare food for others.

Treatment of a Case

- *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 (< 3 months), 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.

Management of Contacts

- Provide information about disease transmission and appropriate infection prevention and control measures. 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.
- Refer symptomatic contacts to their physician for assessment, as indicated.
- Manage symptomatic contacts as cases.
- Exclude symptomatic contacts who are involved in sensitive occupations or situations.
- Exclusion would apply until 48 hours after stools return to normal. **NOTE:** 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 for clearance of the organism unless deemed otherwise necessary by the MOH on a case-by-case basis.
- Asymptomatic contacts are generally not excluded, however they should monitor themselves for gastrointestinal symptoms, maintain good hand hygiene and food handling practices, seek medical attention if symptoms develop. If symptoms develop, exclusions would apply as for a case.

Preventive Measures[2]

Educate the public including food handlers about:

- Thoroughly cooking eggs, poultry and other foods of animal origin.

- The possible dangers of consuming 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.
- Measures to reduce fecal-oral transmission such as strict hand hygiene practices, the sanitary disposal of feces and careful hand washing after caring for diapered children, after using the washroom and before handling, preparing or eating food.
- The risks of sexual practices that permit fecal-oral contact.
- Encouraging good hand washing after handling animals or pet foods/treats and after cleaning pet enclosures.
- The 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]
- Educate about the risks of infection associated with Salmonella pathogens that may be found in aquariums.[11]
- Avoiding raw or unpasteurized milk or other dairy products.
- Proper food handling practices, equipment handling and strict personal hygiene.
- Avoiding cross-contamination of food. Keeping uncooked meats separate from produce, cooked foods, and ready-to-eat foods. Thoroughly wash hands, cutting boards, counters, knives, and other utensils after handling uncooked foods.

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