Paratyphoid Fever

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Case Definition

**Confirmed Case**
Laboratory confirmation of infection with or without clinical illness[1]:
- Isolation of *Salmonella paratyphi* A, B, or C from an appropriate clinical specimen (e.g., sterile site, deep tissue wounds, stool, vomit or urine).[2]

**Probable Case**
Clinical illness[1] in a person who is epidemiologically linked to a confirmed case.

**Carrier**
Individuals who continue to shed *Salmonella paratyphi* for one year or greater are considered to be carriers.[3]

[1] 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.


[3] Alberta Health maintains a Typhoid/Paratyphoid Registry for purposes of monitoring carriers as they potentially pose a long term health risk for transmission of disease.

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

1. Physicians, Health Practitioners and others
   Physicians, health practitioners, and others listed in Sections 22(1) or 22(2) of the Public Health Act shall notify the Medical Officer of Health (MOH) (or designate) of all confirmed and probable cases by the Fastest Means Possible (FMP) i.e., direct voice communication.

2. Laboratories
   All laboratories, including regional laboratories and the ProvLab shall in accordance with Section 23 of the Public Health Act, report all positive laboratory results by FMP to the:
   • Chief Medical Officer of Health (CMOH) (or designate),
   • MOH (or designate) and
   • Attending/ordering physician.

3. Alberta Health Services and First Nations and Inuit Health Branch (FNIHB)
   • The MOH (or designate) shall notify the CMOH (or designate) of all confirmed and probable cases by FMP.
   • The MOH (or designate) of the zone where the case currently resides shall forward the preliminary Notifiable Disease Report (NDR) of all confirmed and probable cases to the CMOH (or designate) within seven days (one week) of notification and the final NDR (amendments) within two weeks of notification.
   • For out-of-zone reports, the MOH (or designate) first notified shall notify the MOH (or designate) of the zone where the client currently resides by FMP and immediately fax a copy of the positive laboratory report.
   • For out-of-province and out-of-country reports, the following information should be forwarded to the CMOH (or designate) by FMP, including:
     - name,
     - date of birth,
     - out-of-province health care number,
     - out-of-province address and phone number,
     - attending physician (locally and out-of-province) and
     - positive laboratory report (faxed).
Etiology
Paratyphoid fever is caused by Salmonella enterica subsp. enterica serotype S. paratyphi A, S. paratyphi B (S. schottmuelleri) and S. paratyphi C (S. hirschfeldii). (1)

Clinical Presentation
Paratyphoid is a systemic bacterial disease that presents with clinical symptoms similar to typhoid but generally less severe and shorter in duration. Symptoms include an insidious onset of fever, headache, malaise, anorexia, a non-productive cough in the early stages of the illness, a relative bradycardia and splenomegaly. (1) A transient, macular rash of rose-colored spots can occasionally be seen on the trunk. (2) In adults, constipation is more often seen than diarrhea. Relapses can occur in approximately 3–4% of cases.

A carrier state may follow acute or mild illness and even subclinical infections. Persons with S. Paratyphi infections tend to become carriers less frequently than persons infected with S. typhi. (1)

Diagnosis
The causative organisms can be isolated from the blood early in the disease, and from urine and feces after the first week. Bone marrow culture provides a greater sensitivity for bacteriological confirmation even in persons who have already received antibiotics. (1)

Epidemiology
Reservoir
The reservoir for paratyphoid fever is humans and, rarely, domestic animals. Family contacts may be transient or permanent carriers and inadvertently spread infection. (1)

Transmission
Paratyphoid is transmitted through ingestion of food and/or water contaminated by urine or feces from infected cases or carriers. The infection is rarely spread by casual contact. Shellfish (particularly oysters) taken from sewage-contaminated beds; fruits and/or vegetables fertilized by night soil (human excrement) eaten raw; and contaminated milk/milk products (usually contaminated by hands of carriers) are important sources of infection to consider. Flies may also infect foods in which the organism can multiply to achieve an infective dose. (1)

Incubation Period
The incubation period ranges from 1–10 days depending on the size of infecting dose and host factors. (1)

Period of Communicability
The period of communicability lasts as long as the bacilli are present in the excreta. This usually begins from the first week after onset of illness and continues through convalescence and for a variable period thereafter (commonly 1–2 weeks for paratyphoid). Fewer people infected with paratyphoid fever become permanent carriers compared to those with typhoid fever. (1)

Host Susceptibility
Susceptibility is general and is increased in persons with achlorhydria (a condition in which production of gastric acid in the stomach is absent or low, or more commonly treatment with acid suppression agents) (S. Houston, 2013, Personal Communication, January 28). Relative specific immunity follows recovery from clinical illness or inapparent infection. (1)
Occurrence

General
Worldwide occurrence. An estimated 6 million cases of paratyphoid fever occur worldwide annually and approximately 150 cases of paratyphoid fever are reported each year in the United States, most of which are in recent travellers. The risk of paratyphoid fever is increasing among travellers to southern and Southeast Asia. (2) Paratyphoid fever occurs sporadically or in limited outbreaks but is most likely under reported. (1) The ratio of disease caused by S. typhi compared to that of S. paratyphi A and B is estimated to be about 4:1. (1) Parts of China and Pakistan are reporting more cases caused by S. paratyphi than S. typhi. (1)

Canada
The incidence of paratyphoid remains very low in Canada. In 1999, S. paratyphi infection was removed from the nationally notifiable disease list as a separate entity and was included under Salmonella infections. Laboratory confirmed isolations of enteric pathogens in Canada, including bacterial, viral and parasitic pathogens are reported on a weekly basis through the National Enteric Surveillance Program (NESP). Between 2006 and 2011 there was an average of 102 S. paratyphi isolates reported to the NESP per year. The majority of isolates were identified as S. paratyphi A. (3)

Alberta
The greatest risk of paratyphoid infection for Albertans appears to be travel to countries where sanitation is likely to be poor or sewage systems inadequate. Between 2000 and 2012, the number of cases of paratyphoid reported annually varied from two (2003) to 13 (2011) representing rates of 0.06 cases per 100,000 to 0.34 cases per 100,000 respectively. During this same period of time, 93/104 cases reported travel outside Canada (e.g., travelled to South Asia), an additional 6/104 cases reported recent immigration and for 5/104 cases there was no information available.

Key Investigation

Single Case/Household Cluster
- Confirm the diagnosis.
- Obtain a history of illness including the date of onset and signs and symptoms.
- Identify any underlying medical conditions (e.g., decreased gastric acidity).
- 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, dayhome) or other childcare site.
• Determine whether 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 should include:
  o Determining history of travel. **NOTE:** Additional specimens (e.g., urine for S. typhi/S. paratyphi +/- serology for schistosomiasis) may be indicated in special circumstances. Refer to Management of a Case.
  o Determining history of residing in areas with poor sanitation including improper water treatment and sewage disposal (including recent immigration).
  o Obtaining a detailed food history (including consumption of shellfish).
  o Identifying any risk behaviours including lifestyle risks for infection (e.g., high risk sexual practices especially contact with feces).
  o Determining any exposure (either household or non-household) to a confirmed case of paratyphoid.
  o Identifying symptomatic household or other close contacts (e.g., co-travellers or others) that had recently travelled to a developing country.
• Identify contacts that may have had exposure during the period that the case was infectious. Consider the following individuals when identifying contacts:
  o household contacts;
  o recent co-travellers (includes anyone who travelled with the case and is likely to have been exposed to the same source of infection as the case rather than someone who only travelled on the same plane/bus as the case); or
  o other close, non-household contacts (e.g., sexual contacts, childcare site contacts).
• From the contacts identified above, identify individuals involved in sensitive occupations or situations (i.e., those who pose a higher risk of transmission to others). They would generally include:
  o 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.
  o Healthcare workers providing direct patient care and persons involved in the care of young children, elderly, highly susceptible or dependent individuals.
  o Children attending a childcare facility who are diapered or unable to implement good standards of personal hygiene.
  o 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 with poor hygiene habits or who have incontinence that cannot be contained, additional precautions (i.e., contact precautions) should be implemented. [5]
• Advise the case to refrain from preparing food for others for the duration of the period of communicability.
• Exclude symptomatic and asymptomatic cases who are involved in sensitive occupations or situations as outlined above.
• See Annex 1 for information on stool collection to demonstrate microbiological clearance for cases involved in sensitive occupations or situations.
• If the case is involved in sensitive occupations or situations AND has EVER travelled to or lived in a schistosomiasis endemic area and may have been exposed to schistosomiasis; urine for *S. typhi/S. paratyphi* +/- serology for schistosomiasis (depending on whether there is a recurrence of Salmonella bacteremia or bacteriuria) will need to be collected in addition to stools to demonstrate microbiological clearance. See Annex 1.
  o If required, serology for schistosomiasis should be collected according to recommendations outlined in Annex 1. Specimens collected before the recommended time frames, may yield false negative results (Kowaleska-Grochowska, K., 2012, Personal Communication, Nov 19).
• Exclusion would apply until:
  o Two consecutive stool specimens collected from a confirmed case are reported as negative AND one urine culture for *S. paratyphi* is reported negative from a case who has EVER travelled to or lived in a schistosomiasis endemic country and may have been exposed to schistosomiasis.
    ▪ Stool specimens should be collected when stools have returned to normal and at least 21 days following completion of antibiotic and not less than 24 hours apart
    ▪ If one or both stool samples are positive for *S. paratyphi*, continue submitting samples for testing at the specified intervals as outlined in Annex 1.
    ▪ If urine sample is positive for *S. paratyphi*, collect serology for schistosomiasis 8 weeks post exposure in areas where risk exists for infection with *Schistosoma japonicum*, *S. mansoni*, *S. mekongi* and *S. intercalatum* or 12 weeks post exposure in areas where risk exists for infection with *S. haematobium*. Specimens collected before this time, may yield false negative results (Kowaleska-Grochowska, K., 2012, Personal Communication, Nov 19). See Annex 1.
    ▪ If urine sample is positive for *S. paratyphi* and serology is positive for schistosomiasis, refer the case back to physician and advise physician to treat case concurrently for both infections, even if this means repeating antibiotic treatment. Refer to Annex 1.
    ▪ Persons co-infected with schistosomiasis should be treated with parziquantel to eliminate possible carriage of salmonella bacteria (including *S. typhi* and *S. paratyphi*) by the schistosomes.
• If possible, consideration may be given to temporary redeployment away from activities that involve increased risk of transmission.
• Advise all other cases (i.e., those not involved in sensitive occupations or situations) to remain off work until they are free from diarrhea and other gastrointestinal symptoms and for 48 hours following resumption of normal stool. Continued public health surveillance is not required for these cases, however, follow-up with the personal physician for clearance of the organism is recommended. Persons not involved in sensitive occupations or situations present a minimal risk of spreading gastrointestinal pathogens if they are healthy and have normal, well formed stools.
Treatment
Generally fluoroquinolones are effective for treatment in adults, however, antibiotic resistance has become a public health problem in many areas (especially Asia) and therefore, clinicians should consider local resistance patterns when choosing appropriate antimicrobials for treatment. (1,7,8) Consulting with an infectious diseases specialist may be appropriate.

Management of Contacts
• “Warn and inform” contacts by providing 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 all symptomatic contacts to their physician for assessment.
• Exclude symptomatic contacts involved in sensitive occupations or situations until:
  o Two consecutive stool specimens are taken not less than 24 hours apart and are reported as negative prior to returning to work or back to their childcare facility.
    ▪ If any stool sample is positive, manage as a confirmed case.
    ▪ If stool sample is negative, advise contact to remain home while symptomatic and until 48 hours after last symptoms before returning to work or childcare facility. Continue to self-monitor for symptoms within 20 days after initial negative stools and seek prompt medical attention and inform public health if symptoms develop.
• Screen asymptomatic co-travellers who are involved in sensitive occupations or situations:
  o Collect one stool specimen and question about symptoms both while away travelling and since returning.
  o No exclusion is necessary for asymptomatic co-travellers while waiting for results of screening stool specimen. If stool result is positive then they would be treated and managed as a confirmed case.
• Refer asymptomatic co-travellers who are not involved in sensitive occupations or situations to their own health care provider for screening and follow-up.
• Collect ONE screening stool for asymptomatic household or other close, non-household contacts (e.g., sexual contacts) involved in sensitive occupations or situations and asymptomatic childcare site contacts (e.g., staff and children in the same room). Exclusions are not necessary while waiting for results of screening UNLESS:
  o the individual is unable/unwilling to comply with good hand hygiene OR unwilling to provide a screening stool sample. In that event, exclusion would apply until one stool specimen is submitted and reported as negative prior to returning to work or back to their childcare facility;
  o consultation with the MOH is appropriate;
  o contacts should be advised to self-monitor and seek prompt medical attention AND contact public health if they develop symptoms within 20 days of the initial negative stool result.
• See Annex 2 for information on stool collection for contacts involved in sensitive occupations or situations.
• Public health follow-up is generally not required for contacts of a case who do not pose a higher risk of transmission to others, (i.e., not involved in sensitive occupations or situations), however, the circumstances should be considered individually. Follow-up with their health care provider is appropriate.
• Additional contact follow-up and assessment of a source of infection may be necessary if cases are identified with no recent travel history and/or for whom travel is an unlikely source of infection. Stool samples may be requested on identified contacts to determine the source of the infection in the case.
Management of Chronic Carriers and their Contacts

- Individuals who continue to shed *S. paratyphi* for one year or greater are considered carriers.
- Monitoring of carriers is maintained through the Alberta Health Typhoid/Paratyphoid Registry.
- Refer to Annex 1 for details on continued stool testing for carriers.
- Medical intervention may be indicated for individuals who become carriers and consultation with an infectious disease specialist should be considered.
- Exclude chronic carriers from activities that are involved in sensitive occupations or situations and continue submitting stool specimens as outlined in Annex 1.
- If possible, consideration may be given to temporary redeployment of the carrier away from activities that involve increased risk of transmission.
- Contacts of carriers should be advised to seek prompt medical assessment and screening and notify public health if they become symptomatic.
- Exclude asymptomatic contacts of carriers who are involved in sensitive occupations or situations until:
  - Two consecutive stool specimens taken not less than 24 hours apart are reported as negative prior to returning to work or back to their childcare facility.
- Asymptomatic contacts of carriers are not excluded and no stool specimens are required.
- Public health follow-up is generally not required for contacts of a carrier who do not pose a higher risk of transmission to others (i.e., those not involved in sensitive occupations or situations), however, stool samples may be requested to determine the source of the infection in the case.

Preventive Measures

- Educate the public regarding the need for:
  - Thorough hand washing especially after using the washroom, changing diapers, and before eating and preparing/handling foods;
  - Sanitary disposal of feces; and
  - Hygienic food preparation and food and equipment handling practices.
- Encourage travelers to seek travel advice before visiting areas of high prevalence of disease and emphasize the importance of good sanitation, proper arrangements for safe water supplies and scrupulous personal hygiene while travelling.
- Reinforce information about boiling or steaming shellfish for at least 10 minutes before serving.
- There is currently no vaccine to protect against paratyphoid fever.
Paratyphoid Fever

Paratyphoid Stool Collection Algorithm to demonstrate Microbiological Clearance for CASES involved in SENSITIVE OCCUPATIONS OR SITUATIONS [1]

Submit TWO stool samples collected ≥24 hours apart beginning:
- 21 days after completion of antibiotics AND
- when stools have returned to normal

ONE or BOTH stool specimens are POSITIVE

TWO consecutive stool samples are NEGATIVE

Continue collecting a stool specimen at least one week apart for up to 8 specimens (2 months) until TWO consecutive weekly stool specimens are NEGATIVE

ONE stool specimen is POSITIVE

TWO consecutive stool samples (submitted at weekly intervals) are NEGATIVE

STOP

After 2 months, if weekly stool specimens continue to be reported as POSITIVE.

Continue submitting ONE stool specimen at least one month apart for nine continuous months (up to 9 specimens total) until TWO consecutive monthly stool specimens are NEGATIVE

ONE stool specimen is POSITIVE

TWO consecutive stool specimens (submitted at monthly intervals) reported NEGATIVE

STOP

After 9 months, if monthly stool specimens continue to be reported as positive the case is considered a CHRONIC CARRIER [4]

For individuals who have EVER travelled to or lived in a schistosomiasis endemic area and may have been exposed to schistosomiasis collect ONE urine specimen for culture for S.Paratyphi.

Urine NEGATIVE for S.Paratyphi

Urine POSITIVE for S.Paratyphi

Collect serology for schistosomiasis, at the appropriate times in individuals who have recurrence of Salmonella bacteremia or bacteriuria after treatment and have EVER travelled to or lived in a schistosomiasis endemic area and may have been exposed to schistosomiasis.

Serology POSITIVE for Schistosomiasis

Serology NEGATIVE for Schistosomiasis

Case should be referred back to physician and be re-treated for S.Paratyphi and simultaneously treated for schistosomiasis and then recollect stool specimens as indicated.

NOTE:
- 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
- healthcare workers providing direct patient care and persons involved in the care of young children, elderly or dependent individuals children attending a childcare facility who are diarheic or unable to implement good standards of personal hygiene
- any individual (child or adult) who is unable to implement good standards of personal hygiene (e.g. mentally or physically challenged)

[1] Sensitive Occupations or Situations are those that pose a higher risk of transmission to others. The circumstances for each case, contact or carrier in these groups should be assessed on an individual basis taking into account the type of employment, work duties, provision of sanitary facilities at work, school or institutions and standards of personal hygiene. Sensitive Occupations or Situations 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
- healthcare workers providing direct patient care and persons involved in the care of young children, elderly or dependent individuals
- children attending a childcare facility who are diarheic or unable to implement good standards of personal hygiene
- any individual (child or adult) who is unable to implement good standards of personal hygiene (e.g. mentally or physically challenged)

[2] For persons who continue to shed the bacteria, the majority of cases are positive on the first sample, however since there is risk of intermittent shedding, a second sample is required.

[3] For individuals who have EVER travelled to or lived in a schistosomiasis endemic area and may have been exposed to schistosomiasis collect ONE urine specimen for culture for S.Paratyphi.

[4] Collect serology for schistosomiasis 8 weeks post exposure to areas where risk exists for infection with S. japonicum and S. mekongi or 12 weeks post exposure to areas where risk exists for infection with S. haematobium. Specimens collected before this time, may yield false negative results. Serology may need to be repeated if done too early or if the risk for infection is considered to be high. O&P in stool & urine may be appropriate in certain circumstances. ID consult should be considered.

[5] "Chronic Carriers" are defined as those individuals who continue to shed S.Paratyphi for ≥ one year. Medical intervention may be indicated and consult with Infectious Diseases should be considered.
**ANNEX 2**

**PARATYPHOID Stool Collection Algorithm for CONTACTS [1] who are involved in SENSITIVE OCCUPATIONS or SITUATIONS [2]**

- **Symptomatic contacts [1]** (including co-travellers [3]) involved in sensitive occupations or situations.
  - Refer to physician for assessment AND EXCLUDE until TWO consecutive stools collected not less than 24 hours apart are tested.
  - **Positive Stool Result:** Manage as a CASE
  - **Negative Stool Result:** Contact should remain home while symptomatic and until 48 hours after last symptoms before returning to work

- **Asymptomatic contacts [1]** (including co-travellers [3]) involved in sensitive occupations or situations.
  - ‘WARN and INFORM’
  - Asymptomatic contacts should be informed 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.
  - Collect ONE stool specimen and submit for testing. **NO EXCLUSION** required UNLESS the contact is unwilling/unable to comply with good hand hygiene OR is unwilling to provide a stool specimen.
  - In that event, EXCLUSION would apply until ONE stool specimen is submitted and reported as negative prior to returning to work or back to their childcare facility.
  - **Positive Stool Result:** Manage as a CASE
  - **Negative Stool Result:** Asymptomatic contacts should be advised to seek prompt medical attention AND contact Public Health if they develop symptoms within 20 days of the initial negative stool results

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[1] Contacts include: household contacts, co-travellers, other close non-household contacts (e.g. sexual contacts, children and childcare workers in a childcare facility)

[2] Sensitive Occupations or Situations are those that pose a higher risk of transmission to others. The circumstances for each case, contact or carrier in these groups should be assessed on an individual basis taking into account the type of employment, work duties, provision of sanitary facilities at work, school or institutions and standards of personal hygiene. Sensitive Occupations or Situations 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 should be assessed on an individual basis.
- healthcare, childcare staff or other staff who have direct contact or contact through serving food with 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 who are diapered or unable to implement good standards of personal hygiene
- any individual (child or adult) who is unable to implement good standards of personal hygiene (e.g. mentally or physically challenged)

[3] Co-travellers, (i.e. those who are likely to have been exposed to the same source of infection as the case and would not include those who only travelled on the same plane/bus etc as the case) should be assessed and screened as appropriate because these individuals would be at a greater risk of acquiring disease. NOTE: Co-travellers, not involved in sensitive occupations or situations, would be assessed and followed up by their own health care provider.
References


