

# Appendix A: Disease-Specific Chapters

Chapter: Typhoid Fever

## Typhoid Fever

- Communicable  
 Virulent

**Health Protection and Promotion Act:  
Ontario Regulation 558/91 – Specification of Communicable Diseases**

**Health Protection and Promotion Act:  
Ontario Regulation 559/91 – Specification of Reportable Diseases**

<b>1) Aetiologic Agent:</b>	Typhoid fever is caused by the Gram negative bacillus known as <i>Salmonella enterica subsp. Enterica</i> serovar Typhi A and B (commonly <i>S. Typhi</i> ) (1).
<b>2) Case Definition:</b>	
Surveillance Case Definition	<a href="#">See Appendix B</a>
Outbreak Case Definition	<p>The outbreak case definition varies with the outbreak under investigation. Consideration should be given to the following when establishing an outbreak case definition:</p> <ol style="list-style-type: none"><li>1. Clinical, laboratory and/or epidemiological criteria</li><li>2. The time frame for occurrence</li><li>3. The geographic location(s) or place(s) where cases live or became ill/exposed</li><li>4. Special attributes of cases (e.g. age, underlying conditions) and/or aetiologic agent</li></ol> <p>Cases may be classified by levels of probability (i.e. confirmed, probable and/or suspect).</p>
<b>3) Identification:</b>	
Clinical Presentation	<p>The clinical presentation of typhoid fever is highly variable, ranging from fever with little other morbidity to sepsis and complications involving many body systems. An average case of acute non-complicated typhoid fever is associated with prolonged low-grade fever, and may have any of the following: dull frontal headache, malaise, myalgia, a dry bronchitic cough, anorexia, nausea, and abdominal discomfort. Constipation is more common than diarrhea in adults but diarrhea is more common in children and those with HIV. In up to 25% of fair-skinned people small erythematous maculopapular lesions (rose spots) on the trunk are seen in the first week of fever. More severe symptoms include confusion and delirium (2, 3). Complications such as gastrointestinal bleeding, intestinal perforation, and encephalopathy occur in 10-15% of those who are ill (1).</p>

Diagnosis	<p><a href="#">See Appendix B</a></p> <p><i>S. Typhi</i> can be isolated from blood early in the disease and from urine and feces after the first week of illness (1).</p>
<b>4) Epidemiology:</b>	
Occurrence	Worldwide (1). Unlike other enteric diseases, typhoid fever does not demonstrate a seasonal pattern in Ontario because it is almost always associated with travel to endemic regions of the world. Over the last five years, the number of cases of typhoid fever has gradually increased, which may reflect the growing number of Ontarians travelling to endemic regions.
Reservoir	Humans; family contacts may be transient or permanent carriers. The chronic carrier state is most common among persons infected during middle age, especially women, and they frequently have biliary tract abnormalities including gallstones (1).
Modes of Transmission	Fecal-oral route. Common vehicles include contaminated water and beverages made with contaminated water, shellfish, particularly oysters, milk, ice-cream, raw fruit and vegetables grown in fields fertilized with sewage (1, 2). Other established risk factors include history of contact with other cases especially contact with feces and contact with urine of persons infected from schistosomiasis endemic areas. Also risk of transmission increases by not using soap for washing hands and poor sanitation (2).
Incubation Period	From 3 days to over 60 days; usual range is 8-14 days depending on inoculum size and on host factors (1).
Period of Communicability	Typhoid is communicable as long as <i>S. Typhi</i> is being excreted in stools or urine, usually from one week after symptom onset, through convalescence, and for a variable period thereafter (1). About ten percent of untreated typhoid fever cases have detectable bacteria in their stool for three months after onset of symptoms; two to five percent become chronic carriers (carriage for more than one year following illness). The frequency of long-term carriage is higher for women, those older than 50 years, and patients with cholelithiasis, carcinoma of the gall bladder, other gastrointestinal malignancies, persons with biliary abnormalities, or concurrent bladder infection with <i>Schistosoma haematobium</i> (2). In cases treated with appropriate antibiotics, fewer than 2% become carriers, or relapse (3).
Susceptibility and Resistance	Susceptibility is general and is increased in individuals with gastric achlorhydria and possibly in those who are HIV positive. Relative specific immunity follows recovery from clinical disease, inapparent infection and active immunization. In endemic area, typhoid fever is most common in preschool children and children 5-19 years of age (1).

## 5) Reporting Requirements:

To local Board of Health	Confirmed and suspected cases shall be reported to the medical officer of health by persons required to do so under the <i>Health Protection and Promotion Act</i> , R.S.O. 1990.
To Public Health Division (PHD)	<p>Report only case classifications specified in the case definition to PHD. Cases shall be reported using the integrated Public Health Information System (iPHIS), or any other method specified by the Ministry <b>within five (5) business days of receipt of initial notification</b> as per <i>iPHIS Bulletin</i> Number 17: Timely Entry of Cases (5).</p> <p>The minimum data elements to be reported for each case is specified in the following:</p> <ul style="list-style-type: none"><li>• <i>Ontario Regulation 569</i> (Reports) under the Health Protection and Promotion Act (HPPA);</li><li>• The disease-specific User Guides published by the Ministry, and</li><li>• Bulletins and directives issued by the Ministry.</li></ul>

## 6) Prevention and Control Measures:

Personal Prevention Measures	<p>Preventative measures:</p> <ul style="list-style-type: none"><li>• Education on proper hygiene, especially hand washing before food preparation and eating, and after using sanitary facilities</li><li>• Practice food and water precautions while travelling in endemic areas: avoid consumption of raw or undercooked shellfish, particularly shellfish harvested from water contaminated with human waste, wash fresh produce before cutting or consuming and thoroughly cook all food derived from animal sources. Shellfish should be boiled or steamed for at least 10 minutes before consumption. Refer travellers to travel clinics to assess their personal risk and appropriate preventive measures</li><li>• Vaccination should be considered for laboratory workers, household members of known carriers, and persons travelling to endemic high-risk areas</li></ul>
Infection Prevention and Control Strategies	<p>If hospitalized, contact precautions are recommended when symptomatic (1).</p> <p>Properly implemented exclusion requirements can contribute to the prevention and control of secondary cases. Exclusion criteria are detailed below.</p>
Management of Cases	Investigate cases of typhoid fever to determine the source of infection. Refer to Section 5: <i>Reporting Requirements</i> above for relevant data to be collected during case investigation. The following

	<p>disease-specific information pertaining to the 60 days prior to onset should also be obtained during case management:</p> <ul style="list-style-type: none"> <li>• Symptoms and date of symptom onset</li> <li>• History of out-of-province or international travel; include earliest and latest exposure dates</li> <li>• Typhoid fever immunization status (note vaccine information)</li> <li>• Known exposure to a carrier or unreported case including recent (last 60 days) contact with visitors from or travellers to endemic country</li> <li>• History of occupation involving vulnerable populations, food handling, childcare and healthcare</li> <li>• Food history, including consumption of common food vehicles as listed above during 14 days prior to symptom onset</li> <li>• Identify close contacts (see definition below)</li> <li>• Educate the case about transmission of infection and proper hand hygiene.</li> </ul> <ul style="list-style-type: none"> <li>• Treatment with antibiotics and follow up is under the direction of the attending health care provider. Note any treatment prescribed including name of medication, dose, and duration of treatment, start and finish dates.</li> </ul> <p><b>Exclusion Criteria:</b></p> <p>Exclude all cases of <i>S. Typhi</i> from food handling, healthcare and daycare activities until three consecutive stool specimens are negative. They are to be collected at least one week apart and at least 24 hours after cessation of symptoms. If treated then specimens must be collected at least two weeks after completion of antibiotic treatment.</p> <p>Treatment with antibiotics and follow up is under the direction of the attending physician. Details of medication name and dose and duration of treatment should be noted.</p> <p>Carriers: If after 6 samples, a case continues to test positive, then he or she could be considered a carrier. A carrier must be excluded from food-handling, health care and child care activities until the carrier state is eradicated. This requires three consecutive negative stool cultures, collected one month apart at least 48 hours after the cessation of antibiotic therapy. Also, three negative urine cultures are required for cases acquired in schistosomiasis endemic areas.</p>
<p>Management of Contacts</p>	<p>Close contacts include household members, any members of a travel party to endemic regions, and sexual partners.</p> <p>Investigate close contacts:</p> <ul style="list-style-type: none"> <li>• Note any symptoms, onset and severity.</li> <li>• Determine susceptibility of contact including immune status, medical status and other risk factors.</li> <li>• Identify those involved in high risk activities or settings.</li> </ul>

	<p>These contacts should be seen by their health care providers and screened for illness (that is, stool specimens taken for testing).</p> <p>Exclude symptomatic contacts from working in high risk (food handling, health care day care) settings until cleared with two consecutive negative stool specimens collected at least 24 hours apart.</p> <p>If contacts work in high risk settings and are asymptomatic, they should be screened, but not excluded.</p>
<p>Management of Outbreaks</p>	<p>Provide public health management of outbreaks or clusters in order to identify the source of illness, stop the outbreak and limit secondary spread.</p> <p><b>Two or more cases linked to the same source that are not travel related or are from the same household is suggestive of an outbreak of typhoid.</b></p> <p>As per this Protocol, outbreak management shall comprise of but not be limited to the following general steps:</p> <ul style="list-style-type: none"> <li>• Confirm diagnosis and verify the outbreak;</li> <li>• Establish an outbreak team;</li> <li>• Develop an outbreak case definition;</li> <li>• Implement prevention and control measures;</li> <li>• Implement and tailor communication and notification plans depending on the scope of the outbreak;</li> <li>• Conduct epidemiological analysis on data collected;</li> <li>• Conduct environmental inspections of implicated premise where applicable;</li> <li>• Coordinate and collect appropriate clinical specimens where applicable;</li> <li>• Prepare a written report, and</li> <li>• Declare the outbreak over in collaboration with the outbreak team.</li> </ul>
<p><b>7) References</b></p>	<p>(1) Heymann D, editor. Control of communicable diseases manual. 18th ed. Washington: American Public Health Association; 2004.</p> <p>(2) Bhan M, Bahl R, Bhatnagar S. Typhoid and paratyphoid fever. Lancet. 2005 ;366(9487): 749-62.</p> <p>(3) Parry CM, Hien TT, Dougan G, White NJ, Farrar JJ. Typhoid fever. N Engl J Med. 2002 ;347(22):1770-82.</p> <p>(4) Pegues D, Ohl M &amp; Miller S. Salmonella species including Salmonella typhi. In Mandell G, Bennett J &amp; Dolin R, editors. Mandell, Douglas, and Bennett's principles and practice of infectious disease. 6<sup>th</sup> ed. Philadelphia, PA: Elsevier; 2005, p. 2636-2654.</p> <p>(5) Ministry of Health and Long-Term Care. Timely entry of cases. <i>iPHIS Bulletin</i>. 2007 May 11;17.</p>

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## 8) Additional Resources

Ministry of Health and Long Term Care, Advisory Committee on Communicable Diseases, *Enteric Disease Screening Recommendations and Case Management Guidelines on Foodhandlers and Patient Care Workers*, 1990 (Currently being revised as “*Guidelines for the Management of Enteric Diseases in Healthcare Workers, Food Handlers and Day care Staff and Attendees*”)

Notifiable Diseases On-Line [Internet]. Ottawa: Public Health Agency of Canada; 2003. Typhoid; 2003 Dec 11 [cited 2009 Feb 12]. Available from [http://dsol-smed.hc-sc.gc.ca/dsol-smed/ndis/diseases/typh\\_e.html](http://dsol-smed.hc-sc.gc.ca/dsol-smed/ndis/diseases/typh_e.html).

Gregg MB, editor. *Field epidemiology*. 2<sup>nd</sup> ed. New York: Oxford University Press; 2002.

*Health Protection and Promotion Act*, R.S.O. 1990, c. H.7. Available from [http://www.e-laws.gov.on.ca/html/statutes/english/elaws\\_statutes\\_90h07\\_e.htm](http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90h07_e.htm).

Ministry of Health and Long-Term Care. *Infectious diseases protocol*. Toronto: Queen’s Printer for Ontario; 2009. Available from [http://www.health.gov.on.ca/english/providers/program/pubhealth/oph\\_standards/ophs/infdispro.html](http://www.health.gov.on.ca/english/providers/program/pubhealth/oph_standards/ophs/infdispro.html) (or as current)

Ministry of Health and Long-Term Care. *Food safety protocol*. Toronto: Queen’s Printer for Ontario; 2008. Available from [http://www.health.gov.on.ca/english/providers/program/pubhealth/oph\\_standards/ophs/progstds/protocols/food\\_safety.pdf](http://www.health.gov.on.ca/english/providers/program/pubhealth/oph_standards/ophs/progstds/protocols/food_safety.pdf). (or as current)

National Advisory Committee on Immunization. *Canadian immunization guide*. 7<sup>th</sup> ed. Ottawa: Public Health Agency of Canada; 2006. [cited 2008 June 24] Available from: <http://www.phac-aspc.gc.ca/publicat/cig-gci/index-eng.php>

Committee to Advise on Tropical Medicine and Travel (CATMAT). Statement on overseas travellers and typhoid. *Can Commun Dis Rep*. 1994 Apr 30;20(8):61-2. Available from <http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/94pdf/cdr2008.pdf>.

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