Ministry of Health

Ontario Public Health Standards:
Requirements for Programs, Services and Accountability

Infectious Disease Protocol

Appendix 1: Case Definitions and Disease-Specific Information

Disease: Typhoid Fever

Effective: May 2022

Ontario

Typhoid Fever

☒ Communicable
☐ Virulent

Health Protection and Promotion Act (HPPA)
Ontario Regulation (O. Reg.) 135/18 (Designation of Diseases)

Provincial Reporting Requirements

☒ Confirmed case
☒ Probable case

As per Requirement #3 of the "Reporting of Infectious Diseases" section of the *Infectious Diseases Protocol, 2018* (or as current), the minimum data elements to be reported for each case are specified in the following:

- O. Reg. 569 (Reports) under the HPPA;[4]
- The iPHIS User Guides published by Public Health Ontario (PHO); and
- Bulletins and directives issued by PHO.

Type of Surveillance

Case-by-case

Case Definition

Confirmed Case

Laboratory confirmation of infection with or without clinically compatible signs and symptoms:

- Isolation of *Salmonella* Typhi (*S.* Typhi) from an appropriate clinical specimen (e.g., sterile site, stool, urine, bone marrow)

Probable Case

- Clinically compatible signs and symptoms in a person with an epidemiologic link to a laboratory-confirmed case

Outbreak Case Definition

The outbreak case definition varies with the outbreak under investigation. Please refer to the *Infectious Diseases Protocol, 2018* (or as current) for guidance in developing an outbreak case definition as needed.

The outbreak case definitions are established to reflect the disease and circumstances of the outbreak under investigation. The outbreak case definitions should be developed for each individual outbreak based on its characteristics, reviewed during the course of the outbreak, and modified if necessary, to ensure that the majority of cases are captured by the definition. The case definitions should be created in consideration of the outbreak definitions.

Outbreak cases may be classified by levels of probability (*i.e.,* confirmed and/or probable).

Clinical Information

Clinical Evidence

Clinically compatible signs and symptoms are characterized by insidious onset of sustained fever, headache, malaise, anorexia, relative bradycardia, constipation, or diarrhea.

Clinical Presentation

The clinical presentation of typhoid fever is highly variable. Typically, symptoms include fever, headache, constipation or diarrhea, fatigue, abdominal pain or discomfort, and loss of appetite.[1-3] In more severe cases, symptoms may worsen and cause life threatening complications involving many body systems, such as enlargement of the liver and spleen or intestinal bleeding.[1-3] Constipation is more common than diarrhea in adults.[2] In up to 25% of light-skinned people small

erythematous maculopapular lesions (rose spots) on the trunk are seen in the first week of fever.[2] Severity is influenced by factors such as strain virulence, quantity of inoculum ingested, duration of illness before treatment, age, and previous exposure to typhoid vaccination.[2]

Laboratory Evidence

Laboratory Confirmation

The following will constitute a confirmed case of typhoid fever:

- Positive *S.* Typhi culture

Approved/Validated Tests

- Standard culture for *S.* Typhi
- Serotyping for O, H and Vi antigens

Indications and Limitations

Further strain typing (e.g., serotype, phage typing, pulsed-field gel electrophoresis) is conducted, as appropriate, and may be used to support linkage of cases.

Note: blood may be positive as early as the first week of illness; feces and urine after the first week.[2]

For further information about human diagnostic testing, contact the Public Health Ontario Laboratories.

Case Management

In addition to the requirements set out in the Requirement #2 of the "Management of Infectious Diseases – Sporadic Cases" and "Investigation and Management of Infectious Diseases Outbreaks" sections of the *Infectious Diseases Protocol, 2018* (or as current), the board of health shall investigate cases to determine the source of infection. Refer to Provincial Reporting Requirements above for relevant data to be collected during case investigation. The following disease-specific information

should also be obtained during the incubation period:

- History of out-of-province or international travel; include earliest and latest exposure dates;
- Typhoid fever immunization status (note vaccine information);
- Known exposure to a carrier or unreported case including recent (last 60 days) contact with visitors from or travelers to endemic country;
- History of occupation involving vulnerable populations, food handling, childcare and healthcare; and
- Food history, including consumption of common food vehicles as listed above during 14 days prior to symptom onset.

Identify close contacts (see definition below).

Educate the case about transmission of infection and proper hand hygiene.

Treatment with antibiotics and follow up is under the direction of the attending health care provider. Where possible, physicians should be encouraged to request antibiotic sensitivity testing due to resistant strains. Note any treatment prescribed including name of medication, dose, and duration of treatment, start and finish dates.

The following exclusion criteria were adopted from the British Columbia Centre for Disease Control (BC CDC).[5]

Exclusion Criteria:

Exclude all cases of *S*. Typhi from food handling, healthcare˙ and daycare activities until provision of:

˙ If the healthcare setting is a hospital, use the "Enteric Diseases Surveillance Protocol for Ontario Hospitals" (OHA and OMA Joint Communicable Diseases Surveillance Protocols Committee, 2017 or as current) for exclusion.

- 3 consecutive negative stool samples collected at least 48 hours apart; AND
- at least 48h after completion of antibiotic treatment (for ciprofloxacin); OR
- at least 2 weeks after completion of antibiotic treatment (for ceftriaxone and azithromycin).[5]

If the patient is treated with another antibiotic or the antibiotic is unknown, discuss with the attending clinician.[5]

If case was treated while traveling and the appropriate medication may not have been prescribed, the case should be referred to a physician for assessment. Sampling should only commence after the appropriate treatment is completed.

Collection of stool samples:

- Submit 3 stool samples at least 48 hours apart. If all 3 samples are negative, end exclusion.
- If any of the 3 samples are positive, continue sampling at least 48 hours apart for a maximum of 3 more samples. If 3 consecutive samples are negative, end exclusion.
- If 3 consecutive negative stool samples (after 6 samples collected) cannot be achieved, the confirmed case is classified as an excreter (see below).[5]

Excreter:

- A confirmed case who continues to excrete *S*. Typhi after 6 stool samples are collected, at least 48h apart, and at least 48h to 2 weeks (see above) after completion of antibiotic treatment to which the pathogen is known to be sensitive.
- If an excreter is identified, an assessment is required to determine the risk of transmitting the pathogen further.[5]

Cases not working in or attending high risk settings:

- *S*. Typhi infections can lead to a carrier state. While no exclusion is necessary, public health should educate *S*. Typhi cases and their physician about the availability of testing to ensure clearance of the organism. Personal hygiene

practices should be emphasized.[5]

Contact Management

Close contacts include any members of a travel party to endemic regions, household members, and sexual partners.

Investigate close contacts:

- Note any symptoms, onset and severity.
- Determine susceptibility of contact including immune status, medical status and other risk factors.
- Identify those involved in high-risk activities or settings.

These contacts should be seen by their health care providers and screened for illness.

Symptomatic Contact:

Exclude symptomatic contacts from food handling, healthcare* and daycare activities until provision of:

- 2 consecutive negative stool samples collected at least 48h apart
- If any sample is positive, exclude as per confirmed case.[5]

Asymptomatic Contact:

- Exclusion of an asymptomatic contact who traveled with a case from food handling, healthcare*, and daycare activities until 2 negative stool samples taken at least 48h apart.
- No exclusion required for asymptomatic contacts who did not travel with a case. (If the source of illness in the case is unclear, consider testing contacts to identify the source)[5]

Outbreak Management

Please see the *Infectious Diseases Protocol, 2018* (or as current) for the public health

management of outbreaks or clusters in order to identify the source of illness, manage the outbreak and limit secondary spread.

Two or more cases linked by time, common exposure, and/or place are suggestive of an outbreak.

For more information regarding specimen collection and testing, please see the Public Health Inspector's Guide to the Environmental Microbiology Laboratory Testing (2021, or as current).[6]

Refer to Ontario's Foodborne Illness Outbreak Response Protocol (ON-FIORP) 2020 (or as current) for multi-jurisdictional foodborne outbreaks which require the response of more than two Partners (as defined in ON-FIORP) to carry out an investigation.

Prevention and Control Measures

Personal Prevention Measures

Prevention measures:

- Education on proper hygiene, especially hand washing before food preparation and eating, and after using sanitary facilities;
- Practice food and water precautions while travelling in endemic areas: avoid consumption of unpasteurized milk and 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;
- Vaccination should be considered for laboratory workers, household members of known carriers, and persons travelling to endemic high-risk areas; and
- Travellers should be referred to travel clinics to assess their personal risk and appropriate preventive measures.[2]

For more food safety prevention measures, please see the Ministry of Health and Long-Term Care's food safety "Frequently Asked Questions".

Infection Prevention and Control Strategies

Contact precautions are recommended for symptomatic, hospitalized cases.[1,2]

Properly implemented exclusion requirements can contribute to the prevention and control of secondary cases. Exclusion criteria are detailed above.

Refer to PHO's website to search for the most up-to-date information on Infection Prevention and Control (IPAC).

Disease Characteristics

Aetiologic Agent - Typhoid fever is caused by the gram-negative bacillus known as *Salmonella enterica* serovar Typhi *(*commonly *S.* Typhi*)*.[1]

Modes of Transmission - Transmitted by the fecal-oral route mainly through the ingestion of food and water contaminated by feces and urine of patients and carriers. Common vehicles include contaminated water, beverages and ice made with contaminated water, shellfish (particularly oysters), contaminated milk and milk products, raw fruit and vegetables grown in fields fertilized with sewage.[2,3] Sexual transmission of typhoid fever from an asymptomatic carrier has been documented.[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. The risk of transmission increases with improper hand hygiene and poor sanitation.[3] Flies may act as vectors.[2]

Incubation Period – From 3 days to over 60 days; usual range is 8 to 14 days depending on inoculum and on host factors.[2]

Period of Communicability - Typhoid fever is communicable as long as *S.* Typhi is being excreted in stools or urine, usually from one week after symptom onset, through convalescence, and for a variable period thereafter.[2] About 10% of untreated typhoid fever cases have detectable bacteria in their stool for three months after onset of symptoms. Both treated and untreated patients can become

chronic carriers (carriage for more than one year following illness).[2]

Reservoir - Exclusively humans; family contacts may be transient or permanent carriers. A carrier state may follow acute illness, mild illness, or even sub-clinical infections. Short-term fecal carriers are more common than urinary 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. A chronic urinary carrier state may occur with schistosome infections or kidney stones.[2]

Host 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 areas, typhoid fever is most common in preschool children and children 5-19 years of age.[2]

Please refer to PHO's Reportable Disease Trends in Ontario reporting tool for the most up-to-date information on infectious disease trends in Ontario.

For additional national and international epidemiological information, please refer to the Public Health Agency of Canada and the World Health Organization.

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Document History

Revision Date	Document Section	Description of Revisions
April 2022	Entire Document	New template. Appendix A and B merged. No material content changes.
April 2022	Epidemiology: Occurrence section	Removed.
April 2022	ICD Codes	Removed.