

Appendix A: Disease-Specific Chapters

Chapter: *Haemophilus influenzae* disease, all types,
invasive

Effective: February 2019

***Haemophilus influenzae*, all types, invasive**

Communicable

Virulent

**Health Protection and Promotion Act:
O. Reg. 135/18 (Designation of Diseases)**

1.0 Aetiologic Agent

Haemophilus influenzae (*H. influenzae*) is a gram-negative coccobacilli bacterium that can cause invasive disease and illness. *H. influenzae* strains are either encapsulated (typeable) or non-encapsulated (non-typeable). Encapsulated strains (classified as serotypes a to f), are more likely to cause invasive disease than non-encapsulated strains.¹

All strains resulting in invasive disease are reportable.

2.0 Case Definition

2.1 Surveillance Case Definition

Refer to [Appendix B](#) for Case Definitions.

2.2 Outbreak Case Definition

Not applicable

3.0 Identification

3.1 Clinical Presentation

H. influenzae disease in humans ranges from non-invasive infections such as acute otitis media to severe invasive infections such as meningitis and epiglottitis.²

Haemophilus influenzae serotype b (Hib) is the most pathogenic strain, causing 95% of invasive disease prior to the introduction of vaccine programs.¹ In the pre-vaccine era, the most common presentation of invasive Hib disease was meningitis (50%-65% of cases).³ Other common types of invasive disease include epiglottitis, pneumonia, arthritis and cellulitis.³ Non-type b encapsulated strains (a, c-f) can also cause invasive disease similar to type b infections.³

Non-typeable strains may cause invasive disease but are generally less virulent than encapsulated strains.³ Non-typeable strains more commonly cause infections such as conjunctivitis, otitis media, sinusitis, and pneumonia.²

3.2 Diagnosis

See [Appendix B](#) for diagnostic criteria relevant to the Case Definitions.

For further information about human diagnostic testing, contact the Public Health Ontario Laboratories or refer to the Public Health Ontario Laboratory Services webpage: <http://www.publichealthontario.ca/en/ServicesAndTools/LaboratoryServices/Pages/default.aspx>

4.0 Epidemiology

4.1 Occurrence

Hib disease occurs worldwide, but its incidence has decreased by 94% with the introduction of Hib vaccine in an increasing number of countries.¹ In Canada, Hib was the most common cause of bacterial meningitis and a leading cause of other serious invasive infections in young children before the introduction of Hib vaccines in 1988.¹

Non-b *H. influenzae* now accounts for the majority of invasive *H. influenzae* disease in Canada.¹ The annual rate of invasive *H. influenzae* non-b disease among reporting Canadian jurisdictions has increased from 0.83 to 1.57 cases per 100,000 between 2007 and 2015, whereas the rate of invasive *H. influenzae* b disease has remained between 0.05 and 0.14 cases per 100,000 over the same period.⁴

In the post-vaccination era in Ontario, non-typeable *H. influenzae* caused the majority of invasive *H. influenzae* disease in all age groups between 2004 and 2013.⁵ The incidence of invasive non-b *H. influenzae* disease increased from 0.67 to 1.60 cases per 100,000 over this time period, with the highest rates observed among infants, young children and older adults.⁵

Please refer to Public Health Ontario's (PHO) Reportable Disease Trends in Ontario reporting tool and other reports for the most up-to-date information on infectious disease trends in Ontario. Please note that case count information for non-b strains will only be available following its designation as a disease of public health significance in May 2018.

<http://www.publichealthontario.ca/en/DataAndAnalytics/Pages/DataReports.aspx>

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

4.2 Reservoir

Humans (asymptomatic carriers).³

4.3 Modes of Transmission

Transmission is person-to-person, most commonly by inhalation of respiratory tract droplets or by direct contact with respiratory tract secretions from an infected person during the infectious period or from an asymptomatic carrier.²

Asymptomatic colonization of *H. influenzae* is common, especially with non-typeable and non-type b capsular type strains. In neonates, infection can be acquired intrapartum by aspiration of amniotic fluid or by contact with genital tract secretions containing the organism.²

4.4 Incubation Period

Unknown; probably short, two to four days.⁶

4.5 Period of Communicability

The exact period of communicability of Hib is unknown. However, the risk of infection persists for as long as organisms are present whether or not there is nasal discharge.⁶ Hib disease is considered non-communicable within 24-48 hours after starting effective antibiotic therapy.⁶ The period of communicability for non-b strains is unknown.

4.6 Host Susceptibility and Resistance

Most of what is understood regarding susceptibility and resistance is in relation to Hib. Invasive Hib disease is less common after five years of age even in the absence of immunization. This age-dependent susceptibility is likely attributed to acquisition of Hib immunity through asymptomatic Hib infection, the likelihood of which increases with age.³ Risk factors for disease include host factors (e.g., chronic disease) and exposure factors (e.g., large household size/crowding, child care attendance, low socioeconomic status, and school-aged siblings) that increase the likelihood of exposure to Hib.³

5.0 Reporting Requirements

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:

- *Ontario Regulation 569* (Reports) under the *Health Protection and Promotion Act* (HPPA);⁷
- The iPHIS User Guides published by PHO; and
- Bulletins and directives issued by PHO.

6.0 Prevention and Control Measures

In the event that publicly funded vaccine doses are needed for case and contact management for Hib, the board of health should contact the Ministry of Health and Long-Term Care’s immunization program at vaccine.program@ontario.ca as soon as possible.

6.1 Personal Prevention Measures

Currently, only Hib is vaccine-preventable. Routine childhood immunization is the most important preventive measure against invasive Hib disease, with clinical efficacy

estimated at 95% to 100% with a completed series.¹ Immunize as per the current Publicly Funded Immunization Schedules for Ontario (2016, or as current).⁸

In Ontario, the *Child Care and Early Years Act, 2014* (CCEYA) is the legislation that governs licensed child care settings. Pursuant to *Ontario Regulation 137/15* under the CCEYA, children who are not in school and who are attending licensed child care settings must be immunized as recommended by the local medical officer of health prior to being admitted. Under the CCEYA parents can provide a medical reason as to why the child should not be immunized or object to immunization on religious/conscience grounds.⁹

Hib vaccination is recommended for certain individuals over five years of age at high-risk for Hib disease, including those who are immunocompromised or have certain chronic diseases.^{1,3}

6.2 Infection Prevention and Control Strategies

Droplet precautions are recommended for 24 hours after initiation of antimicrobial therapy for hospitalized cases of Hib.²

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

6.3 Management of Cases

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 Section 5: Reporting Requirements above for relevant data to be collected during case investigation.

The board of health should obtain the following disease specific information during case management:¹⁰

All invasive Hi cases:

- Clinical: symptoms and date of symptom onset;
- Laboratory: specimen type, specimen source, serotype.

Invasive Hib cases only:

- Immunization status specifically pertaining to Hib-containing vaccines (agent and administration dates);
- Epidemiologic: history of exposure (i.e. contact history), child care attendance (see below).

Antimicrobial therapy should be initiated immediately for invasive Hib disease to eliminate Hib colonization. Cases who are less than two years of age or who are a member of a household with a susceptible contact should additionally receive rifampin chemoprophylaxis prior to hospital discharge if cefotaxime or ceftriaxone were not used for treatment.²

Information about the illness and immunization should be provided. Families should be informed that children who develop invasive disease when younger than 24 months of age are at risk of developing a second episode of disease and should be immunized according to the age-appropriate schedule for unimmunized children as if no Hib vaccine doses were previously received.² Please refer to the Publicly Funded Immunization Schedules for Ontario (2016, or as current).⁸

6.4 Management of Contacts

Secondary cases caused by non-type b or non-typeable *H. influenzae* strains are rare and chemoprophylaxis is not recommended for contacts of invasive non-b *H. influenzae* disease.² Therefore this section only applies to contacts of a case of invasive Hib disease.

A contact is defined as a person living with or who has spent four or more hours per day with the case, for at least five of the seven days preceding the day of hospital admission of the case.²

Chemoprophylaxis is recommended to eliminate nasopharyngeal carriage of Hib bacteria and prevent secondary transmission. To effectively prevent secondary spread, rifampin chemoprophylaxis is recommended for household and child care contacts in the following circumstances:²

- All members in households:
 - With at least one contact under four years of age who is unimmunized or incompletely immunized;
 - With a child less than 12 months of age who has not received the primary series; and
 - With an immunocompromised child, regardless of that child's Hib immunization status.
- Child care settings:
 - If one case of invasive Hib disease has occurred, chemoprophylaxis should be provided to incompletely or unimmunized children younger than four years of age; and
 - If two or more cases of invasive Hib disease have occurred within 60 days and unimmunized or incompletely immunized children attend the facility, chemoprophylaxis for all attendees and childcare providers should be considered.

If chemoprophylaxis is indicated, rifampin should be administered as soon as possible as most secondary cases in households occur during the first week after hospitalization of the index case. However initiation of prophylaxis more than 7 days after hospitalization may still be beneficial, as some secondary cases may occur later.²

Careful observation of exposed unimmunized or incompletely immunized household, non-household, and childcare contacts is vital. Exposed children who develop a febrile illness should promptly see their health care provider for evaluation.²

In addition to chemoprophylaxis, all contacts who are young children and who have not been completely immunized against Hib or are not immunized at the recommended age-appropriate intervals should receive required immunizations.² Vaccine series completion and administration at the recommended intervals is essential to achieve optimal protection against invasive Hib disease.

6.5 Management of Outbreaks

Not applicable.

7.0 References

1. National Advisory Committee on Immunization, Public Health Agency of Canada. Part 4- Active Vaccines: Haemophilus Influenzae Type B Vaccine. 2015 [cited March 6, 2018]. In: Canadian Immunization Guide [Internet]. Ottawa, ON: Her Majesty the Queen in Right of Canada. Evergreen. [cited March 6, 2018]. Available from: <https://www.canada.ca/en/public-health/services/publications/healthy-living/canadian-immunization-guide-part-4-active-vaccines.html?page=7>.
2. Committee on Infectious Diseases, American Academy of Pediatrics. Section 3: Summaries of Infectious Diseases: Haemophilus influenzae infections. In: Kimberlin DW, Brady MT, Jackson MA, Long SS, editors. Red Book: 2015 Report of the Committee on Infectious Diseases. 30 ed. Elk Grove Village, IL: American Academy of Pediatrics; 2015.
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5. Desai S, Jamieson FB, Patel SN, Seo CY, Dang V, Fediurek J, et al. The epidemiology of invasive *Haemophilus influenzae* non-serotype B disease in Ontario, Canada from 2004 to 2013. PloS one. 2015;10(11):e0142179.
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7. Health Protection and Promotion Act, R.S.O. 1990, Reg. 569, Reports, (2018).
8. Ontario, Ministry of Health and Long-Term Care. Publicly Funded Immunization Schedules for Ontario: December 2016. Toronto, ON: Queen's Printer for Ontario; 2016.
9. Child Care and Early Years Act, 2014, S.O. 2014, c. 11, Sched. 1, (2018).

10. Briere EC. Haemophilus influenzae invasive disease. 2017. In: Manual for the Surveillance of Vaccine-Preventable Diseases [Internet]. Atlanta, GA: Centers for Disease Control and Prevention. 6. Available from: <https://www.cdc.gov/vaccines/pubs/surv-manual/index.html>.

8.0 Document History

Table 1: History of Revisions

Revision Date	Document Section	Description of Revisions
January 2014	General	New template. Title of Section 4.6 changed from “Susceptibility and Resistance” to “Host Susceptibility and Resistance” Title of Section 5.2 changed from “To Public Health Division (PHD)” to “To the Ministry of Health and Long-Term Care (the ministry) or Public Health Ontario (PHO), as specified by the ministry” Section 9.0 Document History added.
January 2014	1.0 Aetiologic Agent	The second part of the first sentence, “...there are numerous serotypes and non-typable strains”, was deleted and replaced with the following: “H. influenzae strains are either encapsulated (typeable) or non-encapsulated (nontypeable). Encapsulated strains (classified a-f) are more likely to cause invasive disease than non-encapsulated strains, which cause mild infection. ¹ Only type b strains are reportable.”
January 2014	2.2 Outbreak Case Definition	Content deleted and now identified as “Not applicable”.
January 2014	3.1 Clinical Presentation	Entire section revised.
January 2014	3.2 Diagnosis	Addition of direction to contact Public Health Ontario Laboratories or PHO website for additional information on human diagnostic testing.
January 2014	4.1 Occurrence	Entire section revised.
January 2014	4.2 Reservoir	Change from “Humans” To “Humans (asymptomatic carriers)”.

Revision Date	Document Section	Description of Revisions
January 2014	4.3 Modes of Transmission	Entire section revised.
January 2014	4.5 Period of Communicability	Entire section revised.
January 2014	4.6 Host Susceptibility and Resistance	Final sentence, "In Ontario, Hib is most common among the immunocompromised infants who have not completed the primary series and unimmunized individuals" and replaced with "Invasive Hib disease is rare after five years of age. This age-dependent susceptibility is likely attributed to acquisition of Hib immunity through asymptomatic infection by Hib bacteria, the likelihood of which increases with age."
January 2014	6.1 Personal Prevention Measures	Entire section revised.
January 2014	6.2 Infection Prevention and Control Strategies	Addition of reference to PIDAC IPAC best practices documents.
January 2014	6.3 Management of Cases	Entire section revised.
January 2014	6.4 Management of Contacts	Majority of section revised. Rifampin dosages for treatments of contacts removed.
January 2014	6.5 Management of Outbreaks	Content deleted and now identified as "Not applicable".
January 2014	7.0 References	Updated.
January 2014	8.0 Additional Resources	Updated.
May 2018	General	<p>New template.</p> <p>Revisions were made to support the regulation change to Diseases of Public Health Significance – all serotypes of <i>H. influenza</i> are now reportable. Changes were made to all sections to reflect this change.</p> <p>Section 5.1 Reporting Requirements to Local Boards of Health and Section 8.0 Additional Resources, were removed.</p>

Revision Date	Document Section	Description of Revisions
February 2019	General	Common text included in all Disease Specific chapters: Surveillance Case Definition, Diagnosis, Reporting Requirements and Management of Cases. (Note: Outbreak Case Definition and Management of Outbreaks are not applicable)
February 2019	6.0 Prevention and Control Measures	Updates regarding the ordering of publicly funded vaccines for case and contact management.
February 2019	6.1 Personal Prevention Measures	Updates to information on Immunization of School Pupils Act and Child Care and Early Years Act.

