

Appendix A: Disease-Specific Chapters

Chapter: Pertussis (Whooping Cough)

Effective: February 2019

Pertussis (Whooping Cough)

Communicable

Virulent

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

1.0 Aetiologic Agent

Pertussis is caused by, a gram-negative, bacillus, *Bordetella pertussis*, (*B. pertussis*).^{1,2}

2.0 Case Definition

2.1 Surveillance Case Definition

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

2.2 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).

3.0 Identification

3.1 Clinical Presentation

The clinical course of pertussis is divided into three stages:

1. Catarrhal Stage is characterized by mild upper respiratory tract symptoms with a mild occasional cough that lasts approximately 1-2 weeks and then progresses to the next stage.
2. Paroxysmal Stage presents with an increase in the severity and frequency of the cough which can last 1 to 2 months and sometimes longer; paroxysms are characterized by repeated violent coughs and this is where the high pitched inspiratory whoop may occur, commonly followed by vomiting; fever is absent or minimal.

3. Convalescent Stage is the gradual recovery period where the cough becomes less paroxysmal and disappears. This may take weeks to months.²

The clinical course varies with age. In young infants, who are at the highest risk, clinical symptoms are frequently atypical and it is this group that has the most serious complications.² Pertussis presentation may be atypical in adults or among persons previously immunized.

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

Pertussis outbreaks tend to be cyclical in nature with increased disease activity approximately every 4 - 6 years.³ Protection against pertussis is not lifelong and wanes after 7-20 years of natural infection and approximately 4-12 years after immunization with either whole cell or acellular pertussis vaccine (varies with age).⁴ Pertussis tends to be under-diagnosed, particularly among adolescents and adults. Young infants (< 6 months of age) have the highest risk of death; before they are eligible to receive the vaccine and before completion of their primary vaccine series.

Between 2013 and 2017, an average of 366 cases of pertussis was reported per year in Ontario.*

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.

<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 are the only known reservoir; siblings and parents are an important source of pertussis transmission to young infants.²

* Data included in the epidemiological summary are from January 1, 2013 to December 31, 2017. Data were extracted from Query on February 7, 2018 and therefore are considered preliminary.

4.3 Modes of Transmission

Transmission occurs by direct contact with respiratory secretions of infected persons via droplets.¹

4.4 Incubation Period

Usually 9-10 days, can range from 6-20 days.^{1,2}

4.5 Period of Communicability

Highly communicable in the early catarrhal stage and beginning of the paroxysmal stage (first 2 weeks) and then communicability gradually decreases and becomes negligible in about 3 weeks.¹

No longer communicable after 5 days of effective treatment.¹

4.6 Host Susceptibility and Resistance

Non-immunized or partially immunized individuals are susceptible to pertussis. Previously immunized adolescents and adults (due to waning immunity) may also be susceptible.

Infection does not induce long term immunity. Secondary attack rates of up to 90% can occur in non-immune household contacts.¹

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);
- The iPHIS User Guides published by PHO; and
- Bulletins and directives issued by PHO.⁵

6.0 Prevention and Control Measures

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

6.1 Personal Prevention Measures

Immunize as per the current *Publicly Funded Immunization Schedules for Ontario*.⁶

In Ontario, the *Immunization of School Pupils Act* (ISPA) is the legislation that governs the immunization of school pupils for the designated diseases that are included in the

Act. All students without a valid exemption must have documented receipt of pertussis containing vaccine according to the specified schedule.⁷

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.⁸

The current schedule for acellular pertussis vaccine is 2, 4, 6, and 18 months, and booster doses at 4-6 years, and 14-16 years. The on time administration of the 2, 4 & 6 month doses of acellular pertussis vaccine are most critical in reducing infant mortality and hospitalization rates from pertussis.^{1,2} Refer to the current Publicly Funded Immunization Schedules for Ontario for more information on adult immunization with the tetanus-diphtheria-acellular pertussis (Tdap) vaccine.⁶ Tdap can be safely administered regardless of the interval from the last tetanus-diphtheria booster.²

Provide education to the public about the risk of pertussis infection especially to infants and educate the public about respiratory etiquette; coughing into tissues and sleeves and about proper hand hygiene.

6.2 Infection Prevention and Control Strategies

At present, the most effective control of transmission of pertussis in hospital settings includes isolation using droplet precautions.

Evaluation of all symptomatic health care workers (HCW) for pertussis and provision of appropriate therapy and exclusion during the first 5 days of their therapy is recommended. In addition, HCW should ensure they are up to date with pertussis vaccinations.⁹

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

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.

Investigate risk factors for disease transmission including:

- work with vulnerable populations;
- child care attendees or workers;
- health care providers; and

- those who have direct contact with infants less than one year of age and pregnant women in their third trimester.

Provide education about transmission of infection and proper respiratory etiquette. Advise cases to avoid contact with young children, infants, and women in their third trimester of pregnancy, until the completion of 5 days of appropriate antibiotic therapy or 21 days post cough onset. Advise symptomatic individuals to remain at home until they are well.

Refer to the Pertussis Surveillance Protocol for Ontario Hospitals when dealing with cases that work in health care settings.⁹

Exclusion is not a proven effective strategy; however, in high-risk situations (where there are vulnerable persons) exclusion until five days after the start of antibiotic therapy, or if no treatment is given, until after 21 days with negative results from culture or PCR, should be at the discretion of the medical officer of health.³

6.4 Management of Contacts

There is no evidence that antibiotic chemoprophylaxis of contacts changes the epidemic course of pertussis in the community, therefore, it is only recommended for the following contacts of confirmed pertussis cases:

- household contacts (including attendees at home child care settings) where there is a vulnerable person defined as an infant < 1 year of age [immunized or not] or a pregnant woman in the third trimester; and
- for out of household exposures, vulnerable persons, defined as infants less than one year of age regardless of immunization status and pregnant women in their third trimester who have had face-to-face exposure and/or have shared confined air for > 1 hour.³

Chemoprophylaxis:

Macrolide antibiotics such as azithromycin and erythromycin may prevent or moderate clinical pertussis when given during the incubation period or in the early catarrhal stage. During the paroxysmal phase of the disease, antibiotics may not shorten the clinical course but may reduce the possibility of complications. Antibiotics eliminate the organism after a few days of use and thus reduce transmission.

Chemoprophylaxis is only recommended in the above identified contacts, even in communities that refuse immunization. It should be implemented as soon as possible after exposure as efficacy is related to early implementation. It is not likely to be beneficial after 21 days since the first contact.³

There is little or no protection 24-48 hours after the last dose of chemoprophylaxis. In particular situations, if a high-risk contact refuses immunization and a further exposure occurs after the cessation of prophylaxis, re-offering chemoprophylaxis based on the nature of their exposure and risk of infection may be considered, based on expert opinion.

Laboratory diagnostic testing of contacts should not be done to guide decisions around who should receive chemoprophylaxis.

The following antimicrobials are indicated for chemoprophylaxis among people without contraindications.^{3,10}

Table 1: Antimicrobials indicated for chemoprophylaxis among people without contraindications

Age	Drug	Dosage
Infants (< 1 month)	Azithromycin	10 mg/kg once daily in a single dose for 5 days
	Erythromycin	Not preferred
	Clarithromycin	Not recommended
Infants (1 – 5 months)	Azithromycin	As per < 1 month
	Erythromycin	40 mg/kg po (maximum 1 gm) in 3 doses for 7 days
	Clarithromycin	15 mg/kg/day po (maximum 1 gm/day) in 2 divided doses for 7 days
Infants (≥ 6 months and children)	Azithromycin	10 mg/kg po (maximum 500 mg) once for 1 day, then 5 mg/kg po (maximum 250 mg) once daily for 4 days
	Erythromycin	As per 1 – 5 months
	Clarithromycin	As per 1 – 5 months
Adults	Azithromycin	500 mg po once for 1 day then 250 mg po once for 4 days
	Erythromycin	As per 1 – 5 months
	Clarithromycin	1 gm/day in 2 divided doses for 7 days (Not recommended in pregnancy)

Azithromycin is the preferred antimicrobial for infants < 1 month of age. Clarithromycin is not recommended during pregnancy as it is classified as a Category C drug. Pregnancy is not a contraindication to azithromycin or erythromycin; both are classified as Category B drugs.¹¹

6.5 Management of Outbreaks

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.

Outbreaks provide the opportunity to update the immunization status of contacts if required and to recommend immunization to all those who are not up to date in their pertussis immunization.^{2,3}

7.0 References

1. Heymann DL, editor. Control of Communicable Diseases Manual. 20 ed. Washington, D.C: American Public Health Association; 2015.
2. National Advisory Committee on Immunization, Public Health Agency of Canada. Part 4- Active Vaccines: Pertussis Vaccine. 2017. In: Canadian Immunization Guide [Internet]. Evergreen ed. Ottawa, ON: Her Majesty the Queen in Right of Canada, [cited March 7, 2018]. Available from: <https://www.canada.ca/en/public-health/services/publications/healthy-living/canadian-immunization-guide-part-4-active-vaccines.html?page=7>
3. Health Canada. National consensus conference on pertussis, Toronto, May 25-28, 2002. Canada Communicable Disease Report. 2003;29(Suppl 3):1-33.
4. Wendelboe AM, Van Rie A, Salmaso S, Englund JA. Duration of immunity against pertussis after natural infection or vaccination. The Pediatric Infectious Disease Journal. 2005;24(5):S58-S61.
5. Health Protection and Promotion Act, R.S.O. 1990, Reg. 569, Reports, (2018). Available from: <https://www.ontario.ca/laws/regulation/900569>
6. Ontario, Ministry of Health and Long-Term Care. Publicly Funded Immunization Schedules for Ontario: December 2016. Toronto, ON: Queen's Printer for Ontario; 2016. Available from: <http://www.health.gov.on.ca/en/pro/programs/immunization/schedule.aspx>
7. Immunization of School Pupils Act, R.S.O. 1990, c.I.1, (2018). Available from: <https://www.ontario.ca/laws/statute/90i01>
8. Child Care and Early Years Act, 2014, S.O. 2014, c. 11, Sched. 1, (2018). Available from: <https://www.ontario.ca/laws/statute/14c11>
9. Ontario Hospital Association, Ontario Medical Association. Pertussis Surveillance Protocol for Ontario Hospitals. Toronto, ON: Ontario Hospital Association; 2017. Available from: <https://www.oha.com/labour-relations-and-human-resources/health-and-safety/communicable-diseases-surveillance-protocols>
10. Tiwari T, Murphy TV, Moran J. Recommended antimicrobial agents for the treatment and postexposure prophylaxis of pertussis: 2005 CDC Guidelines. Morbidity and Mortality Weekly Report: Recommendations and Reports. 2005;54(RR-14):1-16.
11. Murphy TV, Slade BA, Broder KR, Kretsinger K, Tiwari T, Joyce MP, et al. Prevention of Pertussis, Tetanus, and Diphtheria Among Pregnant and Postpartum Women and Their Infants: Recommendations of the Advisory Committee on Immunization Practices (ACIP). Morbidity and Mortality Weekly Report: Recommendations and Reports. 2008;57(RR-4):1-51.

8.0 Document History

Table 2: History of Revisions

Revision Date	Document Section	Description of Revisions
December 2014	General	<p>New template.</p> <p>Title of Section 4.6 changed from “Susceptibility and Resistance” to “Host Susceptibility and Resistance”.</p> <p>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”.</p> <p>Section 9.0 Document History added.</p>
December 2014	1.0 Aetiologic Agent	Removal of “pleomorphic” as characteristic of the bacillus.
December 2014	2.2 Outbreak Case Definition	Entire section revised.
December 2014	3.1 Clinical Presentation	<p>First paragraph: Changed from “This acute bacterial infection attacks the tracheobronchial tree of the respiratory tract. It is...” to “The clinical course of pertussis is...”</p> <p>Second bullet: length of cough “and can last 1 to 2 months” moved from end of bullet to beginning “which can last 1 to 2 months and sometimes longer”.</p> <p>Paragraph removed “Complications among adolescents and adults include...” and replace with new paragraph “The clinical course varies with age. In young infants...”</p>
December 2014	3.2 Diagnosis	<p>Addition of “for diagnostic criteria relevant to the case definition.”</p> <p>Addition of direction to contact Public Health Ontario Laboratories or PHO website for additional information on human diagnostic testing.</p>
December 2014	4.1 Occurrence	Entire section revised.

Revision Date	Document Section	Description of Revisions
December 2014	4.2 Reservoir	Change from "...considered to play a major role in the transmission of infection to infants and children" to "often the source for infants".
December 2014	4.4 Incubation Period	Changed from "Usually 7-10 days, can range from 5-21 days" to "Usually 9-10 days, can range from 6-20 days".
December 2014	4.6 Host Susceptibility and Resistance	Deletion of sentence: "These individuals often are a source of infection for young children".
December 2014	5.1 To Local Board of Health	The following was deleted: <p>"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".</p> <p>And replaced with: <p>"Individuals who have or may have pertussis shall be reported as soon as possible 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 (HPPA)".</p></p>
December 2014	5.2 To the Ministry of Health and Long-Term Care (the ministry) or Public Health Ontario (PHO), as specified by the ministry	Deletion of "to PHD" from the end of the first sentence. <p>Under the third paragraph the end of the second and third bullets changed from: "...by the ministry" to "...by PHO".</p>
December 2014	6.1 Personal Prevention Measures	Entire section revised.
December 2014	6.2 Infection Prevention and Control Strategies	Entire section revised.

Revision Date	Document Section	Description of Revisions
December 2014	6.3 Management of Cases	<p>“ON Regulation 569” changed to “<i>Regulation 569</i>”.</p> <p>“...and ensure to include the following” changed to “...including the following”.</p> <p>New bullet added: “Clinical: symptoms and date of symptom onset, complications, outcome.”</p> <p>Addition to end of bullet regarding immunization history: “Specifically dates of vaccination with pertussis-containing vaccines.”</p> <p>New bullet added: “Laboratory: specimen type and result”.</p> <p>Two bullets regarding source of infection and vulnerable contacts merged into one new bullet: “Epidemiologic...”</p> <p>Paragraph deleted: “Apply case definition to confirm the report”.</p> <p>Second paragraph; fourth (last) bullet changed: “Those who have direct contact with immunocompromised patients and (deleted) infants less than one year of age and pregnant women in their third trimester (added)”.</p> <p>Deletion of paragraph: “Treatment with antibiotics and follow up is under the direction of the attending health care provider...”</p> <p>Deletion: “Advise cases to avoid contact with young children, infants and women in their 3rd trimester of pregnancy, especially those who have not been immunized (deleted), until...”</p>
December 2014	6.4 Management of Contacts	<p>“Prophylaxis” changed to “Chemoprophylaxis”.</p> <p>Entire section revised and provides more details on chemoprophylaxis and updates the antimicrobials to align with current guidelines and include infants.</p>

Revision Date	Document Section	Description of Revisions
December 2014	6.5 Management of Outbreaks	The following was deleted: “Vaccination is not recommended for outbreak management, but the opportunity should be taken to update the immunization status of contacts if required. As well, recommend immunization to all those who are not up to date in their pertussis immunization.” And replaced with: “Outbreaks provide the opportunity to update the immunization status of contacts if required and to recommend immunization to all those who are not up to date in their pertussis immunization.” Addition to end of bullet on the development of an outbreak definition: “These definitions should be reviewed during the course of the outbreak, and modified if necessary, to ensure that the majority of cases are captured by the definitions”.
December 2014	7.0 References	Updated.
December 2014	8.0 Additional Resources	Updated.
February 2019	General	Minor revisions were made to support the regulation change to Diseases of Public Health Significance. Common text included in all Disease Specific chapters: Surveillance Case Definition, Outbreak Case Definition, Diagnosis, Reporting Requirements, Management of Cases, and Management of Outbreaks. The epidemiology section and references were updated and Section 8.0 Additional Resources was deleted.
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.

