Appendix A: Disease-Specific Chapters

Chapter: Diphtheria

Revised December 2014
Diphtheria

☐ 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

1.0 Aetiologic Agent

Diphtheria is caused by *Corynebacterium diphtheria*, an aerobic Gram-positive bacillus with four biotypes: gravis, mitis, belfanti and intermedius.\(^1,\,2\) Strains may be toxigenic or nontoxigenic. Only the toxigenic strains produce exotoxin and can cause serious diseases.\(^1,\,3\) The nontoxigenic strains produce a milder symptomatic clinical illness and have been associated with infective endocarditis.\(^1\)

2.0 Case Definition

2.1 Surveillance Case Definition

See Appendix B

3.0 Identification

3.1 Clinical Presentation

Diphtheria is an acute bacterial disease primarily involving the upper respiratory tract, cutaneous, or other mucous membranes (e.g. conjunctivae, vagina).

Respiratory diphtheria can be classified based on clinical manifestation. Anterior nasal diphtheria may appear as mild or chronic unilateral mucopurulent to serosanguinous nasal discharge and excoriations.\(^1,\,2\) Onset of symptoms often cannot be distinguished from those of a common cold.\(^2\)

Pharyngeal and tonsillar diphtheria initially presents with low-grade fever, sore throat, difficulty swallowing, malaise and anorexia.\(^2,\,3\) The characteristic lesion is an asymmetrical adherent greyish white membrane with surrounding inflammation visible on the tonsils and oropharynx within two to three days of illness.\(^1,\,3\) Neck swelling and enlarged cervical lymph nodes may give the appearance of a “bull neck”.\(^1\) Pharyngeal membranes may extend into the trachea resulting in upper airway obstruction and subsequent acute respiratory distress; asphyxia can occur in young children.\(^1,\,3\) Systemic complications from dissemination of diphtheria toxin can result in myocarditis and central nervous system effects.\(^3\)

Laryngeal diphtheria can be confined to this site or an extension of pharyngeal diphtheria, characterized by fever, hoarseness, stridor and a barking cough that can progress to airway obstruction, coma and death.\(^2\) Case-fatality ratio for respiratory diphtheria is 5% to 10%.\(^2\)
Cutaneous diphtheria is localized to the area of infection and rarely associated with systemic complications.\(^3\) Disease is often associated with homeless persons and is presumed to be responsible for high levels of natural immunity in this population.\(^2\) Lesions may vary from scaly rash to ulcers with demarcated edges.\(^2\)

### 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

http://www.publichealthontario.ca/en/ServicesAndTools/LaboratoryServices/Pages/Index.aspx

### 4.0 Epidemiology

#### 4.1 Occurrence

Diphtheria is a rare disease in Ontario; no cases have been reported since 1995.

Please refer to the Public Health Ontario Monthly Infectious Diseases Surveillance Reports and other infectious diseases reports for more information on disease trends in Ontario.\(^4,5\)

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

Diphtheria occurs worldwide and is endemic in many developing countries.\(^3\) Epidemics can occur in susceptible populations that are unimmunized or incompletely immunized.\(^1\)

Routine infant and childhood diphtheria immunization has resulted in a dramatic decline in reported cases of diphtheria.\(^3\)

#### 4.2 Reservoir

Humans\(^1\)

#### 4.3 Modes of Transmission

Transmission is most often person-to-person spread from the respiratory tract. Both cases and carriers can be a source of infection. Rarely, transmission may occur from skin lesions or articles soiled with discharges from lesions of infected persons (fomites).\(^1,2\)

#### 4.4 Incubation Period

Usually two to five days, occasionally longer; range from one to 10 days.\(^1,2\)

#### 4.5 Period of Communicability

Variable; until virulent bacilli have disappeared from discharges and lesions, usually two weeks or less and seldom more than four weeks for respiratory diphtheria. Chronic carriers may shed organisms for six months or more. Effective antibiotic therapy promptly terminates shedding.\(^1\)
4.6 Host Susceptibility and Resistance
Lifelong immunity is generally, but not always, acquired following disease or inapparent infection.\(^1\) Infants born to immune mothers have passive protective immunity that typically lasts less than six months. Immunization with diphtheria toxoid produces prolonged but not lifelong immunity and hence the need for booster doses throughout life. Waning immunity has been found in adults in several countries including Canada.\(^1\)

5.0 Reporting Requirements

5.1 To local Board of Health
Individuals who have or may have diphtheria shall be reported immediately to the medical officer of health (MOH) by persons required to do so under the *Health Protection and Promotion Act*, R.S.O. 1990 (HPPA).\(^6\)

**Note:** Laboratory confirmed cases are to be reported by phone to the local MOH as soon as identified.

5.2 To the Ministry of Health and Long-Term Care (the ministry) or Public Health Ontario (PHO), as specified by the ministry
Cases shall be reported using the integrated Public Health Information System (iPHIS), or any other method specified by the ministry within one business day of receipt of initial notification as per iPHIS Bulletin #17: Timely Entry of Cases and Outbreaks.\(^7\) In addition, 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),\(^8,\)\(^6\)
- The disease-specific User Guide published by PHO; and
- Bulletins and directives issued by PHO.

Report confirmed cases (see Appendix B) **immediately** to:

- PHO at ivpd@oahpp.ca during business hours
- Spills Action Centre at (416) 325-3000 / 1-800-268-6060 during after hours and weekends

6.0 Prevention and Control Measures

6.1 Personal Prevention Measures
Immunize as per the current *Publicly Funded Immunization Schedules for Ontario*.\(^9\) Under the Immunization of School Pupils Act, all students must have documented receipt of diphtheria toxoid-containing vaccine.\(^10\) Children attending Day Nurseries should, at a minimum be immunized according to the current *Publicly Funded Immunization Schedules for Ontario*.\(^9\)

Diphtheria toxoid-containing vaccines are only available as combination vaccines.
Completion of the primary series (three doses recommended at two, four and six months of age) induces more than 97% protective antibody levels against diphtheria. The primary series is followed by three booster doses during childhood (at 18 months of age, between four to six years of age, and between 14 and 16 years of age). Adults should receive booster doses with a diphtheria toxoid-containing vaccine every ten years.

6.2 Infection Prevention and Control Strategies

Hospitalized confirmed or suspect cases and carriers, in addition to routine practices:

- Pharyngeal diphtheria: strict droplet isolation until two cultures from both the nose and throat collected at least 24 hours apart and at least 24 hours after completing antimicrobial treatment are negative for *C. diphtheria*.1, 11
- Cutaneous diphtheria: strict contact isolation until two cultures of skin lesions collected at least 24 hours apart and at least 24 hours after completing antimicrobial treatment are negative for *C. diphtheria*.1, 11

Non-hospitalized carriers:12

- Exclusion from the workplace or school until two negative cultures are obtained after completion of antibiotics.
- Minimize contact with other persons in the household and practice routine and droplet precautions.
- Refer to Public Health Ontario’s website at www.publichealthontario.ca to search for the most up-to-date Provincial Infectious Diseases Advisory Committee (PIDAC) best practices on Infection Prevention and Control (IPAC). PIDAC best practice documents can be found at: [http://www.publichealthontario.ca/en/BrowseByTopic/InfectiousDiseases/PIDAC/Pages/PIDAC_Documents.aspx](http://www.publichealthontario.ca/en/BrowseByTopic/InfectiousDiseases/PIDAC/Pages/PIDAC_Documents.aspx).

6.3 Management of Cases

Cases should be investigated to determine the source of infection. Refer to Section 5: Reporting Requirements above for relevant data to be collected during case investigation. The following disease specific information should also be obtained during case management:12

- Hospitalization: facility name, date of admission and discharge;
- Clinical: symptoms and date of symptom onset, antibiotic therapy and starting date, antitoxin treatment given and administration date;
- Laboratory: specimen type, specimen source, toxigenicity;11
- Immunization status, specifically dates of vaccination with diphtheria-toxoid containing vaccines (agent and administration dates); and
- Exposure history (i.e. travel history, close contacts [within 6 months] to an endemic region or during an outbreak period).
Respiratory isolation until two cultures (nasal and pharyngeal) taken 24 hours apart and at least 24 hours after completion of appropriate antibiotics (see below), are negative.

**Treatment:**
Immediate medical treatment is required; do not await laboratory confirmation. Diphtheria antitoxin can be accessed through the Public Health Division - Ministry of Health and Long-Term Care (MOHLTC).

Refer to the most current version of the MOHLTC document *Diphtheria – Guide for Healthcare Professionals, 2010* (or as current).

### 6.4 Management of Contacts
Risk of infection is directly related to duration of contact, the type of contact and intensity of exposure.\(^{12}\) Contacts are defined as household members, persons who have had close face-to-face contact to a case such as intimate contact, sharing same room at home, school or work and health care workers exposed to oropharyngeal secretions from the case.\(^{12}\) Contacts of cases infected with non-toxigenic *C. diphtheriae* (or toxigenic and non-toxigenic *C. ulcerans*) are not considered to be at risk.\(^{12}\)

Close contacts, especially household contacts:
- Keep under surveillance for seven days from the date of last contact with the case, regardless of immunization status.\(^{12}\)
- Collect laboratory specimens.
- All identified contacts should be alerted to signs and symptoms of diphtheria and advised to seek medical attention immediately should they develop any other clinical manifestations of diphtheria.
- Antimicrobial chemoprophylaxis should be given to all contacts regardless of immunization status after laboratory specimens have been collected.\(^{12}\)
- Recommended chemoprophylaxis is benzathine penicillin G (600,000 units for persons younger than 6 years old and 1,200,000 units for those 6 years old and older) or a 7- to 10-day course of oral erythromycin (40 mg/kg/day for children and 1 g/day for adults).\(^{1,2}\)
  For compliance reasons, if surveillance of contacts cannot be maintained, they should receive benzathine penicillin G.
- Close contacts should receive a dose of a diphtheria toxoid-containing vaccine as appropriate for age unless the contact is known to have been fully immunized and the last dose of diphtheria toxoid-containing vaccine was given within ten years.
- Unimmunized or incompletely immunized contacts should complete their diphtheria toxoid-containing vaccine series.

Exclusion of contacts who attend school or whose occupations involve food handling, close contact with children under 7 years of age or known unimmunized persons, and care of the sick until treatment is complete and cultures from the nose and throat or lesions are negative.
7.0 References


8.0 Additional Resources


9.0 Document History

Table 1: History of Revisions

<table>
<thead>
<tr>
<th>Revision Date</th>
<th>Document Section</th>
<th>Description of Revisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 2014</td>
<td>General</td>
<td>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.</td>
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<td>December 2014</td>
<td>1.0 Aetiologic Agent</td>
<td>“Diphtheria is caused by Corynebacterium diphtheria (C. diphtheriae), a gram-positive bacillus with four biotypes of C. diphtheriae (gravis, mitis, belfanti and intermedius)” changed to “Diphtheria is caused by Corynebacterium diphtheria, an aerobic Gram-positive bacillus with four biotypes: gravis, mitis, belfanti and intermedius.”</td>
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<td>December 2014</td>
<td>2.2 Outbreak Case Definition</td>
<td>Entire section removed.</td>
</tr>
<tr>
<td>December 2014</td>
<td>3.1 Clinical</td>
<td>Entire section revised.</td>
</tr>
<tr>
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<td>Document Section</td>
<td>Description of Revisions</td>
</tr>
<tr>
<td>---------------</td>
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</tr>
<tr>
<td>December 2014</td>
<td>Presentation</td>
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</tr>
<tr>
<td>December 2014</td>
<td>3.2 Diagnosis</td>
<td>Entire section revised.</td>
</tr>
<tr>
<td>December 2014</td>
<td>4.1 Occurrence</td>
<td>Entire section revised.</td>
</tr>
<tr>
<td>December 2014</td>
<td>4.3 Modes of Transmission</td>
<td>“Transmission is most common from close intimate contact with a case or carrier by respiratory droplet…” changed to “Transmission is most often person-to-person spread from the respiratory tract…”</td>
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<td>December 2014</td>
<td>4.5 Period of Communicability</td>
<td>Addition of “for respiratory diphtheria. Chronic carriers may shed organisms for six months or more.” Removal of “The rare chronic carrier may shed organisms for 6 months or more.”</td>
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<tr>
<td>December 2014</td>
<td>4.6 Host Susceptibility and Resistance</td>
<td>Removal of “Routine vaccination is recommended as per the Publicly Funded Immunization Schedules…” Addition of “Infants born to immune mothers have passive protective immunity…”</td>
</tr>
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<tr>
<td>December 2014</td>
<td>6.2 Infection Prevention and Control Strategies</td>
<td>Entire section revised.</td>
</tr>
<tr>
<td>December 2014</td>
<td>6.3 Management of Cases</td>
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</tr>
<tr>
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</tr>
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<tr>
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<td>8.0 Additional Resources</td>
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