Diphtheria

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The following chapter is adapted with permission for the Alberta Health. For additional guidance regarding the management of Diphtheria see: Alberta Public Health Disease Management Guidelines: Diphtheria.

1. CASE DEFINITION

Confirmed Case

- Respiratory Diphtheria-An upper respiratory tract illness with an adherent pseudo-membrane of the nose, pharynx, tonsils, or larynx and any of the following,
    - Isolation of toxin-producing *Corynebacterium diphtheriae* from the nose or throat
    - Epidemiologic linkage to a laboratory-confirmed case of diphtheria
- Cutaneous Diphtheria-An infection at a non-respiratory anatomical site (e.g. skin, wound, conjunctiva, ear, or genital mucosa) in the absence of a more likely etiology with
    - Isolation of toxin-producing *C. diphtheriae* from that site

Probable Case

- In the absence of a more likely diagnosis, an upper respiratory tract illness with each of the following
    - An adherent pseudo-membrane of the nose, pharynx, tonsils, or larynx, ***AND*** –
    - Absence of laboratory confirmation ***AND***
    - Lack of epidemiologic linkage to a laboratory-confirmed case of diphtheria. ***OR***
- Histopathologic diagnosis

2. DIAGNOSIS

- Diagnosis is usually based on history, clinical presentation, and laboratory testing.
- Diagnosis is confirmed by isolation of *C. diphtheriae:*

- Respiratory Diphtheria
  - Culture from throat specimens (including swab of membrane if present)
- Cutaneous Diphtheria
  - Skin lesion swabs

- For successful culturing of *C. diphtheria,* close coordination with laboratory staff is recommended prior to sampling of *C. diphtheriae*
  - *C. diphtheriae* can only grow if it is rapidly inoculated on a special media that must be made **prior** to the sample arriving at the lab
- Once the presence of *C. diphtheria* is confirmed, the presence of toxin should be evaluated.
- Specimens should be collected **before** starting treatment.
- With routine diphtheria immunization in Canada, the majority of cases are now mild infections.
  - Assessment of immunization status is key in diagnosis
- As classic respiratory diphtheria is increasingly rare in Canada, it becomes increasingly difficult for physicians to recognize and diagnose diphtheria on clinical grounds alone.
  - However, where history and clinical presentation suggest respiratory diphtheria, it is essential to begin therapy as soon as possible to avoid complications.
- For more information, refer to the Alberta Provincial Laboratory Guide to Services

3. REPORTING

Health Care Professionals

- Respiratory Diphtheria
  - Confirmed or probable cases are to be reported to the Office of the Chief Public Health Officer (OCPHO) by telephone (867) 920-8646, **immediately** after diagnosis is made or opinion is formed, ***AND***
  - Complete and fax (867) 873-0442 the Communicable Disease Report Form to the OCPHO within **24 hours**
- Cutaneous Diphtheria
  - Confirmed or probable cases are to be reported to the Office of the Chief Public Health Officer (OCPHO) by telephone (867) 920-8646, fax (867) 873-0442, or email within **24 hours** after diagnosis is made or opinion is formed, ***AND***
  - Complete and fax (867) 873-0442 the Communicable Disease Report Form to the OCPHO within **24 hours**
- **Immediately** report all outbreaks or suspect outbreaks by telephone (867)-920-8646 to the OCPHO

Laboratories

- Respiratory Diphtheria
  - Report all positive results to the OCPHO **immediately** by phone (867) 920-8646 ***AND***
  - Fax results (867) 873-0442 to the OCPHO within **24 hours.**

- Cutaneous Diphtheria
    - Report all positive results to the OCPHO by fax (867)-873-0442 within **24 hours.**

4. OVERVIEW

For more information about diphtheria:

- Heath Canada: https://www.canada.ca/en/public-health/services/immunization/vaccine-preventable-diseases/diphtheria/health-professionals.html
- Centers for Disease Control and Prevention: https://www.cdc.gov/diphtheria/clinicians.html

Causative Agent

- Diphtheria is caused by toxigenic strains of *Corynebacterium diphtheriae*.
- *C. diphtheriae* is a non-sporulating, gram positive, irregularly staining, non-motile, pleomorphic bacillus with four biotypes:
    - *gravis*, *mitis, intermedius*, and *belfanti*
    - All four biotypes can cause toxigenic or non-toxigenic disease.
- Rarely, other *Corynebacterium* species such as *C. ulcerans,* and *C. pseudotuberculosis* can produce the diphtheria toxin and cause disease.

Clinical Presentation and Major Complications

For information regarding Clinical Presentations and Complications see Alberta Health Disease Management Guidelines: Diphtheria.

Transmission

- Humans are the only known reservoir.
- The most common means of transmission are through respiratory droplets or direct contact with respiratory secretions or exudate from skin lesions.
- Communicability is variable, but usually 2-4 weeks without treatment
    - With appropriate antibiotic treatment, persons are infectious for less than 4 days
- Chronic carriers are usually asymptomatic and may shed the bacteria for up to 6 months: effective antibiotic therapy can end shedding earlier.

Incubation Period

- Usually, 2 to 5 days with a range of 1-10 days for respiratory diphtheria.
- Cutaneous diphtheria's incubation period is poorly defined but believed to be slightly longer.

Clinical Guidance

- For patient-specific clinical management consult your local healthcare professional, paediatrician, infectious disease specialist or NWT Clinical Practice Guidelines.

5. PUBLIC HEALTH MEASURES

Key Investigation

- The goals of investigation are
  - Prompt diagnosis, isolation, and management of the case
  - Rapid identification of close contacts
- Obtain history of disease (date of onset, signs, and symptoms).
- Notify Laboratory as soon as diagnosis is suspected to ensure appropriate clinical specimen(s) are collected and placed in appropriate media prior to commencing treatment.
- Confirm diagnosis as per case definition.
- Determine diphtheria specific immunization status (number of doses, date and location of administration, explanation for any gaps in immunization).
- Determine possible source of infection:
  - Identify recent contact with a known diphtheria case/carrier or person with diphtheria-like illness or articles soiled with the discharges from lesions of infected individuals.
  - Identify travel history within last two weeks to a region that is endemic or experiencing a diphtheria outbreak.
  - Determine recent immigration (within last 6 months) from an area with known endemic disease.
  - Assess if members in the household have similar symptoms.
- Identify any transmission settings (Childcare, homeless shelters, overcrowded housing etc.).
- **Close Contacts**
  - **Anyone who is had contact with the case in the last 10 days AND**
    - **Lives in the same household or sleeping space**
    - **Sexual contacts**
    - **Childcare or nursery contacts**
    - **Has had direct contact with nasal/oral secretions, nose, or mouth of the case (cigarette sharing, kissing, shared utensils)**
    - **Healthcare staff exposed to oropharyngeal secretions of the infected persons without appropriate infection prevention and control precautions**
    - **Regular visitors in the home**
- **Identify close contacts who**
  - **Have or interact with children**
  - **Care for and interact with the sick and dependent**
  - **Attend school**
  - **Handle food**

Management of Cases

- Respiratory Diphtheria
  - Hospital based
    - Isolate and place patient on routine and droplet precautions.

        - Precautions apply until 2 cultures taken 24 hours apart and 24 hours after antimicrobial therapy is finished.
        - Notify the Infection Prevention and Control Practitioner immediately (See the NWT Infection Prevention and Control Manual 2012 for more information).
    - Non-hospitalized based
        - Contact precautions should be followed
            - Precautions apply until 2 cultures taken 24 hours apart and 24 hours after antimicrobial therapy is finished.
        - Individuals with non-severe disease can be treated and followed by a community physician with support from public health professionals. Consultation with an infectious disease specialist may be required, to determine appropriate course of treatment and follow-up.
- Cutaneous Diphtheria
    - Hospital Based
        - Routine and contact precautions should be instated.
        - Precautions apply until 2 cultures taken 24 hours apart and 24 hours after antimicrobial therapy is finished.
    - Non-hospital
        - Individuals are usually treated and followed by a community physician with support from public health professionals.
        - Consultation with an infectious disease specialist may be required to determine appropriate course of treatment and follow-up.
        - Recommend minimal contact with others until two cultures from both nose, throat, and skin lesions, taken at least 24 hours apart and at least 24 hours after cessation of antimicrobial therapy, are negative.
        - Clean all articles in contact with infected individual and articles soiled by discharges of the case should be washed as per normal practices.
- Persons recovering from diphtheria should be vaccinated for diphtheria, as indicated by age, unless serological testing indicates protective levels of antitoxin.
- Provide information about disease transmission and measures to minimize transmission.
- The CPHO or designate shall exclude cases from workplace, school, or childcare settings until 14 days of antibiotic therapy is completed and two cultures from nose, throat and/or lesions collected at least 24 hours apart and at least 24 hours after cessation of antimicrobial therapy are negative.
    - If skin lesion/wound has healed, swab skin where lesion/wound located
- Instruct cases to pay strict attention to personal hygiene by:
    - Covering mouth and nose with tissue when coughing
    - Placing all contaminated tissues directly into the garbage
    - Washing hands with soap and water every time there is contact with respiratory secretions or infected wounds
    - Keeping all infected wounds covered

Management of Contacts

- Provide information about diphtheria disease including signs and symptoms.

- Determine the type of exposure, the setting, and the time since last exposure from the case.
- **Prior** to administration of prophylaxis collect a swab from the nose, throat, **and** skin lesion (if present) of all **close contacts** (see Key investigations).
- Provide antibiotic prophylaxis to all **close contacts**, regardless of immunization status.
- Until cultures are proven to be negative for *C. diphtheria,* all contacts should be excluded from the following activities:
    - Contact with children
    - Occupations involving the care of the sick and dependent
    - Occupations involving the handling of foods
    - School
- For the 7 days following the date of last contact with the case, or as feasible, all contacts should complete carful daily surveillance:
    - Assess for signs and symptoms of diphtheria
    - Inspect throat for presence of membrane
    - Temperature
    - Assessment of wounds
- Refer symptomatic contacts for assessment as appropriate.
- Any asymptomatic contact identified as having a positive swab for toxigenic diphtheria should be treated as a carrier.
- Advise asymptomatic contacts to monitor closely for symptoms for at least ten days after their last exposure with the infected person and to notify public health if they develop symptoms.
    - **A carrier is defined** as a person who harbors and may transmit *C. diphtheriae* but who has no symptoms.
    - Carriers can include those with otitis media or nasal infections and asymptomatic pharyngeal infections due to toxigenic *C. diphtheriae*.
    - Carriers are NOT reportable.
    - Until completion of antibiotic therapy and two cultures from nose, throat and/or lesions are collected at least 24 hours apart and at least 24 hours after cessation of antimicrobial therapy are negative, the CPHO or designate shall exclude carriers from the following,
        - Contact with children,
        - Occupations involving the care of the sick and dependent,
        - Occupations involving the handling of food
        - School.
    - If repeat cultures are positive, recommend an additional 10-day course of antibiotics and continue with exclusion.

- If cultures are positive after 10-day course of antibiotics, consult with an infectious disease specialist on further antibiotic treatment recommendations.
- Carriers should be instructed to pay strict attention to personal hygiene by:
  - Covering mouth and nose with tissue when coughing,
  - Placing all contaminated tissues directly into garbage,
  - Washing hands with soap and water every time there is contact with respiratory secretions or infected wounds,
  - Cleaning wounds and skin lesions vigorously with soap and water
  - Keeping all infected wounds covered.

- Assess prior immunization status and provide vaccination with a diphtheria containing vaccine according to the NWT Immunization Schedule.

Post-Exposure Immunization

Immunization Status	Post exposure management
Fully Immunized	Should receive a dose of diphtheria toxin if their last dose was **more** than 10 years ago
Partially Immunized	The diphtheria toxoid-containing vaccine series should be completed
Unimmunized	The diphtheria-toxoid containing vaccine series should be initiated and completed

- For more information regarding post exposure immunization see: Canadian Immunization guide: Diphtheria toxoid.
- For information regarding the regular diphtheria toxoid containing vaccine schedule in the NWT, see the NWT Immunization Guide.

Prevention

- Educate the public on the risks of diphtheria infection and the importance of immunization.
- Routine vaccination for diphtheria is publicly funded in the NWT and should be offered according to the NWT Immunization Schedule.
  - The diphtheria vaccine protects against the toxin's effect, but does not prevent infection by *C. diphtheriae.*
    - Vaccinated individuals who are infected with *C. diphtheriae* will have mild symptoms or be entirely asymptomatic and should be treated with antibiotics.
- For more information on diphtheria vaccination follow the Canadian Immunization Guide on Diphtheria Toxoid.
- Persons traveling to countries where diphtheria is endemic should ensure they are immunized.

6. PUBLIC & HEALTH PROFESSIONAL EDUCATION

For more information about Diphtheria:

- The Government of Canada: https://www.canada.ca/en/public-health/services/immunization/vaccine-preventable-diseases/diphtheria.html
- Centers for Disease Control and Prevention: https://www.cdc.gov/diphtheria/index.html

7. EPIDEMIOLOGY

- The highest recorded number of diphtheria cases in Canada was 9,000 in 1921.
- For more information on the epidemiology of Diphtheria in the Northwest Territories (NWT) see: Epidemiological Summary of Communicable Diseases HSS Professionals

8. REFERENCES

Information for this chapter was adapted with permission from Alberta Health's Public Health Disease Management Guidelines: Diphtheria.

Additional Resources for this chapter include:

1. Canadian Immunization Guide Diphtheria Toxoid: https://www.canada.ca/en/public-health/services/publications/healthy-living/canadian-immunization-guide-part-4-active-vaccines/page-4-diphtheria-toxoid.html