# DIPHTHERIA

**Report Immediately by phone**

**Responsibilities:**
**Hospital:** Report immediately by phone
**Lab:** Report immediately by phone
**Physician:** Report immediately by phone
**Local Public Health Agency (LPHA): Follow-up required. Iowa Department of Public Health will lead the follow-up investigation.**

**Iowa Department of Public Health**
**Disease Reporting Hotline: (800) 362-2736**
**Secure fax: (515) 281-5698**

## 1) THE DISEASE AND ITS EPIDEMIOLOGY

### A. Agent

Diphtheria is caused by toxin-producing *Corynebacterium diphtheriae*, a gram-positive, irregularly-staining bacterium. Not all *Corynebacterium diphtheriae* produce toxin. The four strains or biotypes of *C. diphtheriae* in order of their likelihood to produce toxin are gravis, mitis, intermedius, and belfanti.

### B. Clinical Description

Symptoms: Diphtheria has two forms—respiratory and cutaneous. This chapter deals mainly with respiratory diphtheria. Respiratory (nasal, pharyngeal, tonsillar, and laryngeal) diphtheria is typically caused by toxin-producing (toxigenic) strains of *C. diphtheriae*. In the respiratory form of the disease a membrane, usually visible on the throat or tonsils, is formed. Respiratory diphtheria begins 2 - 5 days after infection. Initial symptoms include a sore throat and low-grade fever. Swelling of the neck ("bull-neck") can develop from inflammation, and is a sign of severe disease. Persons can die from asphyxiation if the membrane obstructs breathing. Remote effects of the diphtheria toxin can cause complications including myocarditis (inflammation of the heart muscle) and nerve paralysis. The respiratory form of diphtheria usually lasts several days, but complications can persist for months.

Membranous pharyngitis from nontoxigenic *C. diphtheriae* is also reportable, although disease is usually mild and does not cause systemic complications. The isolation of *C. diphtheriae* from the throat does not necessarily indicate a pathogenic role. Although the frequency with which this occurs is unknown, a small percentage of the population may carry nontoxigenic or toxigenic strains of *C. diphtheriae* without disease symptoms. Rarely, other *Corynebacterium* species (*C. ulcerans* or *pseudotuberculosis*) may produce diphtheria toxin and lead to classic respiratory diphtheria. *Note:* Other pathogens can cause a membrane of the throat and tonsils, including *Streptococcus* species, Epstein-Barr virus and cytomegalovirus, *Candida*, and anaerobic organisms (Vincent's angina).

Onset: The onset is indistinguishable from the common cold, usually characterized by a mucopurulent nasal discharge (containing both mucus and pus), which may become blood-tinged. A white to grayish membrane usually forms on the nasal septum and throat in respiratory disease.

Complications: The severity of the disease and complications are generally related to the extent of local disease. When absorbed, the toxin affects organs and tissues distant from the site of invasion. The most frequent complications of diphtheria are myocarditis and neuritis.

Myocarditis may present as abnormal cardiac rhythms, and can occur early in the course of the illness or weeks later, and lead to heart failure. If myocarditis occurs early, it is often fatal.
Neuritis most often affects motor nerves and usually resolves completely. Paralysis of the soft palate is most frequently seen during the third week of illness. Eye muscles, limbs, and diaphragm paralysis

can occur after the first week. Secondary pneumonia and respiratory failure may result from diaphragmatic paralysis.

Other complications include otitis media, and respiratory insufficiency due to airway obstruction, especially in infants.

The overall case-fatality rate for respiratory diphtheria is 5% - 10%, with higher death rates (up to 20%) in persons <5 and >40 years of age. The case-fatality rate for diphtheria has changed very little during the last 50 years, and is higher for those who have never received vaccine than for those who have been fully immunized.

## C. Reservoirs

Humans are the only known reservoir of *C. diphtheria*, which is present in discharges from the nose, throat, and eye and skin lesions for 2 - 6 weeks after infection.

## D. Modes of Transmission

Diphtheria is transmitted person-to-person by droplet or direct contact with an infected person's nasopharyngeal secretions. Contact with articles soiled with discharges from cutaneous lesions can be a source, but this has rarely been documented. Raw milk contaminated with *Corynebacterium diphtheriae* has served as a vehicle for transmission.

## E. Incubation period

The incubation period is usually 2 - 5 days but may occasionally be longer.

## F. Period of Communicability or Infectious Period

The infectious period is variable, typically lasting 2 weeks or less. Antibiotic treatment promptly terminates shedding, usually in less than 4 days; but chronic carriage may occur, even after antimicrobial therapy. Patients are considered infectious until two successive pairs of nose and throat cultures obtained not <24 hours after completion of antimicrobial therapy and $\geq$ 24 hours apart are negative. (See Section 3) B. 2. d [page 5] for more details.) Asymptomatic carriers are important in sustaining transmission. If cultures remain positive, contact IDPH, CADE at (800) 362-2736 for further guidance.

## G. Epidemiology

Infection can occur in immunized, partially immunized and unimmunized persons, but it is usually less severe in those who are partially or fully immunized. Diphtheria is endemic in many parts of the world, including countries of the Caribbean and Latin America. The incidence of respiratory diphtheria is greatest in the fall and winter. During the last few years, large epidemics of respiratory diphtheria, primarily in adolescents and adults, have occurred in the former Soviet Union, Algeria, and Ecuador. In the states of the former Soviet Union (including Russia, the Ukraine and Central Asian Republics), more than 150,000 cases and 5,000 deaths from diphtheria occurred between 1990 and 1997. In recent epidemics in the former Soviet Union, the case fatality rate has ranged from 3% to 23%. In 2011, 4,887 cases of diphtheria were reported worldwide to the World Health Organization (WHO), but many more cases likely go unreported.

The last reported case in Iowa occurred in 1967. It is estimated that more than 40% of US adults lack protective levels of circulating antitoxin.

## H. Bioterrorism Potential

None.

# 2) DISEASE REPORTING AND CASE INVESTIGATION

## A. Purpose of Surveillance and Reporting

- To identify and evaluate contacts and provide necessary antimicrobial prophylaxis to prevent further spread of the disease
- To alert public health authorities to the presence of cases of *C. diphtheriae* and the potential for increased cases development in the area, particularly given the large number of susceptible adults.
- To assure early and appropriate treatment with diphtheria antitoxin and antibiotics.
- To obtain necessary laboratory specimens before antibiotic or antitoxin treatment.

## B. Laboratory and Healthcare Provider Reporting Requirements

Iowa Administrative Code 641-1.3 stipulates that the laboratory and the healthcare provider must report any suspected or confirmed cases of diphtheria immediately by phone. The reporting number for IDPH Center for Acute Disease Epidemiology (CADE) is (800) 362-2736, if calling after business hours, call the Iowa State Patrol Office at (515) 323-4360. They will page a member of the on-call CADE staff.

### Laboratory Testing Services Available

After communicating with IDPH, contact the University of Iowa State Hygienic Laboratory (SHL) bacteriology department at (319) 335-4500 for further instructions.

## C. Local Public Health Agency Follow-up Responsibilities

Case Investigation

Diphtheria follow-up and case investigation is undertaken by the Local Public Health Agency (LPHA), and will be coordinated, if necessary, with the IDPH Bureau of Immunization and Center for Acute Disease Epidemiology (CADE).

A healthcare provider and a public, private, or hospital clinical laboratory will assist in a disease investigation conducted by the department, or local health department. A healthcare provider and a public, private, or hospital clinical laboratory will provide the department or local health department with all information necessary to conduct the investigation, including but not limited to medical records, exposure histories, medical histories, contact information, and positive, pending, and negative test results necessary to the investigation.

*Initial Questions to Ask Healthcare Providers and Patients*

To assess the likelihood that a suspect case is a true case prior to laboratory testing, LPHA or other public health staff should ask about: 1) symptoms, 2) diphtheria immunization history, 3) recent travel history (where and dates), 4) recent out-of-town visitors (from where and dates), and 5) recent contact with anyone with similar symptoms.

# 3) CONTROLLING FURTHER SPREAD

## A. Isolation and Quarantine Requirements

### Minimum Period of Isolation of Patient

Maintain Droplet Precautions for respiratory diphtheria in healthcare facility or home until two successive pairs of nose and throat cultures obtained not <24 hours after completion of antimicrobial therapy and $\geq$ 24 hours apart are negative. If cultures remain positive contact IDPH, CADE at (800) 362-2736 for further guidance. If there was no antimicrobial therapy, the two sequential pairs of cultures should be taken after symptoms resolve, and $\geq$ 2 weeks after onset. If cultures remain positive, contact IDPH, CADE at (800) 362-2736 for further guidance.

If an avirulent (nontoxigenic) strain is documented, isolation is not necessary.

### Minimum Period of Quarantine of Contacts

Contacts whose occupations involve handling food or working with unimmunized children must be excluded from work until two successive pairs of nose and throat cultures, obtained not <24 hours after completion of antimicrobial therapy and ≥ 24 hours apart, are negative. If cultures remain positive, contact IDPH, CADE at (800) 362-2736 for further guidance. These requirements may be extended to other contacts who work in high-risk settings, as determined by IDPH.

## B. Protection of Contacts of a Case

Close contacts are defined as those who sleep in the same house or who share food, drink, or eating/drinking utensils with the case, or otherwise share saliva with case such as child care contacts, and healthcare workers in contact with the case's oral or respiratory secretions. Those contacts that were in brief contact with the case, but do not meet the definition of a close contact, are not considered significant contacts.

Below, management of cases and contacts is divided into four categories: 1) cases, 2) cases and symptomatic close contacts, 3) asymptomatic close contacts, and 4) nonsignificant contacts. It is important to follow the sequence of actions, as administration of antibiotics, diphtheria antitoxin (DAT), and diphtheria toxoids will interfere with interpretation of diagnostic testing. Attachment C (at the end of this chapter) presents these recommendations in diagram form.

### 1. Case(s)

Place cases of respiratory diphtheria in Droplet Precautions until two cultures from both the nose and the throat are negative for toxigenic *C. diphtheriae*. Material for these cultures should be obtained not <24 hours after completion of antimicrobial therapy and ≥ 24 hours apart. If cultures remain positive, contact IDPH, CADE at (800) 362-2736 for further guidance. If there was no antimicrobial therapy, the cultures should be taken after symptoms resolve, ≥ 2 weeks after their onset, and ≥ 24 hours apart. Continue as described in Section 2 immediately below.

### 2. Cases and Symptomatic Close Contacts

a. Do not delay treatment to collect specimens.
b. Collect cultures as described in Attachment A (located at the end of this chapter). If antibiotics have been started, it is useful to collect specimens for PCR and serology, which are described in Attachment B (at the end of this chapter). If possible, serology specimens should be collected *before* administration of diphtheria antitoxin (DAT) or diphtheria toxoid.
c. Treat with appropriate antibiotic, and evaluate cases and symptomatic close contacts for initiation of therapy with DAT. DAT can be obtained from CDC through an Investigational New Drug (IND) protocol. Healthcare providers treating a case of suspected diphtheria can contact IDPH, CADE at (800) 362-2736 for assistance in obtaining DAT. Serology specimens should be collected *before* administration of DAT.
d. If cases or symptomatic close contacts are culture-positive, they will need two repeat pairs of nose and throat cultures obtained not <24 hours after completion of antimicrobial therapy and ≥ 24 hours apart. If cultures remain positive, contact IDPH, CADE at (800) 362-2736 for further guidance. If a case or symptomatic close contact has not received antibiotics, two successive pairs of nose and throat cultures taken after symptoms resolve, ≥ 2 weeks after the onset of symptoms, and ≥ 24 hours apart are needed. If cultures remain positive, contact IDPH, CADE at (800) 362-2736 for further guidance.
e. Cases and symptomatic close contacts that are not up to date should be immunized with a diphtheria toxoid-containing preparation appropriate for age during convalescence. (Refer to Section 3) D for recommendations on completing the schedule). Remember, serum should be collected before vaccinating.
f. Close contacts should be monitored for symptoms daily for at least 7 days after the last exposure. Active surveillance for suspect cases in affected settings should take place for at least two incubation periods (10 days).

3. **Asymptomatic Close Contacts**
   a. Where diphtheria is confirmed or highly suspected in the case, asymptomatic close contacts should be excluded from work if work involves food or unimmunized children.
   b. Where diphtheria is confirmed or highly suspected in the case, all asymptomatic close contacts should have cultures collected as described in Attachment A (at the end of this chapter).
   c. Assess and monitor for signs and symptoms of diphtheria for at least 7 days.
   d. Assess diphtheria toxoid vaccination status and vaccinate as outlined below:
      - If < 3 doses or unknown administer a dose of diphtheria toxoid (DTaP, DT, or Td as appropriate) and complete primary series according to schedule.
      - If ≥ 3 doses and last dose were >5 years ago, administer a booster dose of diphtheria toxoid.
      - If ≥ 3 doses and last dose was < 5 years ago, children needing their fourth primary dose or booster dose should be vaccinated; otherwise vaccination is not required.

   All close contacts (regardless of culture result or immunization status) should begin antibiotic prophylaxis with oral erythromycin (40-50 mg/kg/day for 7 days, maximum 2 g/day, for children; and 1/g/day for adults. A single IM dose of benzathine penicillin G (600,000 U for persons < 6 years of age and 1,200,000 U for persons ≥ 6 years of age) is an alternative. (The lower dose of penicillin is for patients weighing less than 30 kg.)

   e. All asymptomatic close contacts who were initially culture-positive will need two repeat pairs of nose and throat cultures taken not < 24 hours after antibiotics have been discontinued and ≥ 24 hours apart. If an asymptomatic contact has not received antibiotics, two successive pairs of nose and throat cultures taken ≥ 24 hours apart are needed. If any of the repeat cultures is positive, an additional 10-day course of oral erythromycin should be given and the cultures repeated as described above.
   f. Close contacts should be monitored for symptoms daily for at least 7 days after their last exposure. Active surveillance for suspect cases in affected settings should be conducted for at least two incubation periods (10 days).

4. **Non-Significant Contacts**
   Contacts who do not sleep in the same house as the case; do not share food, drink, or eating/drinking utensils with the case; and are not healthcare workers in contact with the case's oral or respiratory secretions should be immunized with the appropriate diphtheria toxoid-containing preparation as described in Section 3) D above. They do not need to be cultured or placed on antibiotic prophylaxis.

## C. Managing Special Situations

### Reported Incidence Is Higher than Usual/Outbreak Suspected

Immunize the largest possible proportion of the population group involved, emphasizing protection of infants and preschool children. In an epidemic involving adults, immunize groups that are most affected and at highest risk. Repeat immunization procedures one month later to provide a second dose.

## D. Preventive Measures

Vaccination, including routine childhood vaccination and Td boosters beginning at age 11–12 years and continuing every 10 years thereafter, is the best preventive measure against diphtheria. Tetanus toxoid-containing formulations should always be used. The Advisory Committee on Immunization Practices (ACIP) recommends that all children receive a routine series of five doses of diphtheria vaccine combined with other antigens (such as DTaP, Hib, IPV) at ages 2, 4, 6, 15–18 months, and 4–6 years. Booster doses of diphtheria and tetanus toxoids should be administered beginning at age 11–12 years (provided at least 5 years have passed since the last dose) and every 10 years thereafter. DTaP should be used in persons < 7 years of age, whereas Td is the preferred preparation for persons ≥ 7 years of age, although a one-time dose of Tdap is recommended at 11-

18 years of age. See the current CDC recommended immunization schedules for more information: www.cdc.gov/vaccines/

The Td schedule for those beginning immunization at ≥ 7 years of age consists of 3 doses. The second dose is usually given 1–2 months after the 1st dose and the 3rd dose 6 months after the 2nd dose.

Due to the presence of diphtheria worldwide, it is important for all international travelers to be up to date with DTaP/DT/Td/TdaP vaccination. Good personal hygiene (which consists of proper handwashing, disposal of used tissues, not sharing eating utensils) and avoiding sick people is important in prevention.

# 4) ADDITIONAL INFORMATION

The Council of State and Territorial Epidemiologists (CSTE) surveillance case definitions for Diphtheria can be found at: www.cdc.gov/osels/ph_surveillance/nndss/phs/infdis.htm#top

CSTE case definitions should not affect the investigation or reporting of a case that fulfills the criteria in this chapter. (CSTE case definitions are used by the state health department and the CDC to maintain uniform standards for national reporting.)

**Note on Cutaneous diphtheria**
Cutaneous diphtheria, caused by either toxigenic or nontoxigenic strains, is usually mild, typically consisting of nondistinctive sore or shallow ulcers, and only rarely involving toxic complications (1-2% of infections with toxigenic strains). Cutaneous diphtheria was removed from the nationally reportable disease list in 1980, but it remains reportable in Iowa.

Place the cutaneous case in contact precautions until two cultures of skin lesions are negative. Material for all these cultures should be taken not <24 hours after cessation of antimicrobial therapy and ≥ 24 hours apart. If cultures remain positive, contact IDPH, CADE at (800) 362-2736 for further guidance. If there was no antimicrobial therapy, the cultures should be taken after symptoms resolve, ≥ 2 weeks after their onset, and ≥ 24 hours apart.

Work restrictions are the same as for respiratory diphtheria.

# References

American Academy of Pediatrics. *Red Book 2003: Report of the Committee on Infectious Diseases, 26th Edition*. Illinois, Academy of Pediatrics, 2003.
CDC. *Epidemiology & Prevention of Vaccine-Preventable Diseases: The Pink Book, 12th Edition*. CDC, January, 2011.
CDC. *Vaccine-Preventable Disease Surveillance Manual, 4th Edition, 2008-09.* www.cdc.gov/vaccines/pubs/surv-manual/index.html
Heymann, D., ed. *Control of Communicable Diseases Manual, 20th Edition*. Washington, DC, American Public Health Association, 2015.
IDPH. *Public Health (641) Chapter 1, Notification and Surveillance of Reportable Communicable and Infectious Diseases, Poisonings and Conditions* (Printed April 2004).

# Additional Resources

Manual for the Surveillance of VPDs", Chapter 1: Diphtheria. Available at the following website: www.cdc.gov/vaccines/pubs/surv-manual/index.html

**ATTACHMENTS:**

**Attachment A:** Collection of Specimens for Isolation of *C. diphtheriae* (1 page)

**Attachment B:** Overview of Requirements for Laboratory Testing for Diphtheria (1 page)

**Attachment C:** Algorithm for Diagnosis, Treatment, and Follow-Up of Suspect Diphtheria Cases and Infected Contacts
(1 page)

**Attachment D:** Important Telephone Contacts for Diphtheria Control (1 page)

**Attachment A**

## COLLECTION OF SPECIMENS FOR ISOLATION OF *C. diphtheriae*

Clinical specimens for culture should be obtained as soon as possible when diphtheria of any type is suspected, even if treatment with antibiotics has already begun. Unless the index of suspicion is low, specimens should be collected from the nose and throat of all close contacts of suspected cases. (Culture of *C. diphtheriae* from close contacts may confirm the diagnosis of the case, even if the patient's culture is negative.) Use a dry, sterile swab.

Throat swabs

1. Pharynx should be clearly visible and well illuminated.
2. Depress tongue with an applicator and, Using a dry, sterile swab, swab the throat without touching the tongue or inside of the cheek.
3. Rub vigorously over any membrane, white spots, or inflamed areas; slight pressure with a rotating movement must be applied to the swab.
4. If membrane is present, lift the edge and swab beneath it to reach the organisms deeper in the throat. A portion of the membrane may also be submitted for testing.

Nasopharyngeal specimens

1. Insert the swab into the nose through one nostril beyond the anterior nares.
2. Gently introduce the swab along the floor of the nasal cavity, under the middle turbinate, until the pharyngeal wall is reached. Force must not be used to overcome any obstruction.

Skin diphtheria and other lesions

1. Lesions should be cleansed with sterile normal saline and crusted material removed.
2. Press the swab firmly into the lesion.

- **Place swabs in a transport system. If transport time is anticipated to be < 24 hours, Amies or Modified Stuart's medium is recommended. If transport time is to be ≥ 24 hours, silica gel is recommended. Send specimen overnight, with the attached submission form, to the State Hygienic Laboratory (SHL).**
- **Call the SHL Bacteriology Reference Laboratory at (319) 335-4500 to notify them that specimens for diphtheria culture are on the way, since isolation of *C. diphtheriae* requires special tellurite media.**
- **If *C. diphtheriae* is isolated, regardless of association with disease, SHL staff will arrange for shipment of isolates to the Diphtheria Laboratory, National Center for Infectious Diseases, CDC, as directed by CDC.**

## Attachment B

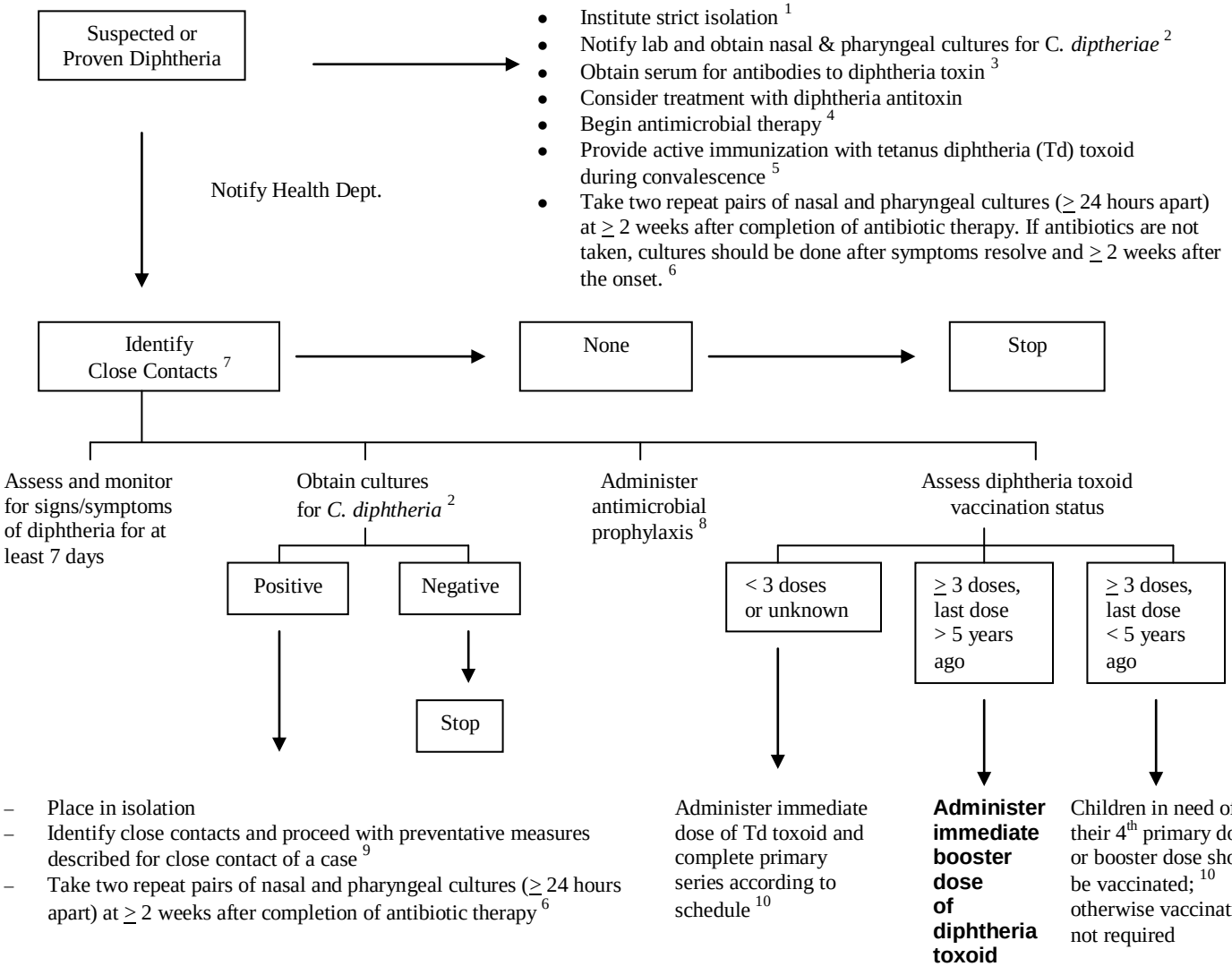
| A. Overview of Requirements for Laboratory Testing for Diphtheria | | | | | |
|---|---|---|---|---|---|
| **Test name** | **Specimens to take** | **Timing for specimen collection** | **Transport requirements** | **Collection & notification requirements** | **Notes** |
| Culture | • Swabs of nose, throat, and membrane (or other infected body site) of case<br>• Swabs of nose and throat of close contacts | As soon as possible, when diphtheria is suspected | < 24 hours: Amies or modified Stuart's medium<br><br>≥24 hours: silica gel sachets | Physicians or labs call UHL Bacteriology Lab (319) 335-4500 and IDPH Disease Reporting Hotline (800) 362-2736 regarding suspect case. IDPH may call CDC diphtheria lab at (404) 639-1730 or (404) 639-4057 | Available at SHL and elsewhere. Alert lab that diphtheria is suspected to ensure that tellurite medium is used. After isolation, biotype (strain) and toxigenicity can be determined. |
| PCR | Swabs (as above), or pieces of membrane or biopsy tissue of case | As soon as possible, when diphtheria is suspected | Silica gel sachet, or a sterile dry container at $4^0$ C | Contact as above | Available only at CDC. Alert lab that diphtheria is suspected so that specific PCR assay is used. Can detect non-viable organisms and toxin gene. Provides supportive evidence for, but not confirmation of, diagnosis. |
| Toxigenicity testing (Elek test) | Isolate from culture of case (above) | After *C. diphtheriae* has been isolated | Transport medium such as Amies medium or silica gel sachets | Contact as above | Available at SHL, CDC, and elsewhere. |
| Serology (antibodies to diphtheria toxin) | Serum of case | If possible before administration of antitoxin or vaccine, collect first of paired sera, taken 2-3 weeks apart | Frozen (-20 $^0$ C) | | Available only at CDC. If acute antibody levels are low, diphtheria can't be ruled out; if acute levels are high, diphtheria is unlikely to be cause of illness. |

**Adapted from Manual for the Surveillance of Vaccine-Preventable Diseases, CDC, September 1999, Chapter 19, Table 3.**

**Attachment C**

# Algorithm for Diagnosis, Treatment and Follow-up

## Suspected Diphtheria Cases and Infected Contacts

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[1] **Maintain isolation until elimination of the organism is demonstrated by negative cultures of two samples obtained at least 24 hours apart and taken ≥ 2 weeks after completion of antimicrobial therapy. If antibiotic therapy is not taken, cultures should be done after symptoms resolve and it is ≥ 2 weeks since their onset.**

[2] Both nasal and pharyngeal swabs should be obtained for culture.

[3] If equine diphtheria antitoxin is needed, contact your State Health Department. Before administration, patients should be tested for sensitivity to horse serum and, if necessary, desensitized. The recommended dosage and route of administration depend on the extent and duration of disease. Detailed recommendations can be obtained from the package insert and other publications.

[4] Antimicrobial therapy is not a substitute for antitoxin treatment. Antimicrobials: 1) Intramuscular procaine penicillin G (25,000 - 50,000 units/kg/day for children and 1.2 million units/day for adults, in two divided doses), or 2) aqueous crystalline penicillin G intramuscularly (100,000 to 150,000 units/kg/day, in four divided doses), or 3) parenteral erythromycin (40-50 mg/kg/day, maximum 2 g/day) have been recommended until the patient can swallow comfortably, at which point oral erythromycin in four divided doses or oral penicillin V (125-250 mg four times per day) may be substituted for a recommended total treatment period of 14 days.

[5] Vaccination with Td toxoid is required because clinical diphtheria does not necessarily confer immunity.

[6] Persons who continue to harbor the organism after treatment with either penicillin or erythromycin should receive an additional 10-day course of oral erythromycin and should submit samples for follow-up cultures.

[7] Close contacts include household members and other persons with a history of direct contact with a case-patient (e.g. caretakers, relatives, or friends who regularly visit the home) as well as medical staff exposed to oral or respiratory secretions of a case-patient.

[8] A single dose of intramuscular benzathine penicillin G (600,000 units for persons < 6 years of age and 1.2 million units for persons ≥ 6 years of age) or a 7- to10-day course of oral erythromycin (40 mg/[kg/d] for children and 1g/d for adults) has been recommended.

[9] Preventive measures may be extended to close contacts of carriers but should be considered a lower priority than control measure for contacts of each case.

[10] Refer to published recommendations for the schedule for routine administration of DTaP.

Adapted from: Farizo KM, Strebel PM, Chen RT, et al. Fatal respiratory disease due to *Corynebacterium diphtheriae*: Case report and review of guidelines for management, investigation, and control. Clin Infect Dis 1993: 16:59-68. As reproduced in : Centers for Disease Control and Prevention. Manual for the Surveillance of Vaccine-Preventable Diseases 1996; 2-9.

**Attachment D**

# Diphtheria Control
# Important Telephone Contacts

***State Hygienic Laboratory*:** **(319) 335-4500**
***102 Oakdale Campus***
***Iowa City, Iowa 52242-5002***

**Center for Acute Disease Epidemiology** **(800) 362-2736**
**(Epidemiologist-on-call: 24 hours/7 days a week**

**Disease Reporting Hotline** **(800) 362-2736**

**The information below is for reference only, contact IDPH to access CDC.**

## *Centers for Disease Control and Prevention:*
***Child Vaccine-Preventable Disease Branch***
***Epidemiology and Surveillance Division***
***National Immunization Program***

**Dr. Tanja Popovic** **(404) 639-1730**
**Building 5; Room 346 (Diphtheria Laboratory)** **(404) 639-4057 (lab)**

**CDC**
**1600 Clifton Road, Mailstop C02**
**Atlanta, GA 30333**

**Diphtheria duty officer** **(404) 639-8255**
**(Officer available: Monday through Friday, 8:00 am to 4:30 pm)**

**Diphtheria duty officer** **(404) 639-2889**
**(Officer available: nights, weekends, holidays)**