

Diphtheria

- Organism:** *Corynebacterium diphtheriae*, an aerobic gram-positive pleomorphic bacillus. It is an acute toxin-mediated disease that occurs only in humans. Clinical presentation can involve almost any mucous membrane. The most common site is the pharynx and tonsils. Early symptoms include malaise, sore throat, anorexia, and low grade fever. Within 2-3 days, an asymmetrical bluish-white membrane forms which can vary in size from covering a small patch on the tonsils to most of the soft palate. Membrane can be grayish-green or black if bleeding has occurred. Extensive membrane formation may result in respiratory obstruction. Absorption of diphtheria toxin can lead to myocarditis, with heart block and progressive congestive failure beginning about 1 week after onset.
- Incubation:** Usually 2-5 days, occasionally longer
- Infectious period:** Usually 2 weeks or less, rarely up to 4 weeks. Effective antibiotic therapy promptly terminates shedding; usually within 4 days. A rare chronic carrier may shed the organisms 6 months or more. Humans are the only known reservoir.
- Transmission route:** Transmission is most often person-to-person spread via respiratory droplets and direct contact with either respiratory secretions or exudates from infected skin lesions. Fomites can play a role in transmission and epidemics have been caused by contaminated milk.
- Treatment:** If diphtheria is strongly suspected based on clinical findings (see under **Verify the Diagnosis** below), begin immediate treatment with:
- **Diphtheria antitoxin (DAT)**
After completion of tests to rule out hypersensitivity, a single dose of DAT 20,000-120,000 units IV (IM in mild or moderate cases) immediately after bacteriological specimens are taken, without waiting for results.
 - DAT dose depends on area of involvement and severity of disease (in the range of 20,000 for anterior nasal diphtheria to 120,000 for extensive disease of 3 days duration.
 - SOE stores DAT at depot. Call 907-269-8000 or 1-800-478-0084 after hours and ask to speak to Epi Team member.
 - **Antibiotic**
Erythromycin administered orally or parenterally for 14 days, penicillin G administered intramuscularly or intravenously for 14 days, or penicillin G procaine administered intramuscularly for 14 days constitute acceptable therapy. Antimicrobial therapy is required to stop toxin production, to eradicate *C diphtheriae*, and to prevent

transmission but is not a substitute for antitoxin, which is the primary therapy. Elimination of the organism should be documented 24 hours after completion of treatment by 2 consecutive negative cultures from specimens taken 24 hours apart.

The disease is usually not contagious 48 hours after antibiotics are instituted.

Information Needed for the Investigation

Verify the Diagnosis

- What are the patient's clinical symptoms? The health care provider **must act on a presumptive diagnosis** based upon (1) an upper respiratory illness characterized by sore throat, difficulty in swallowing, malaise and a low grade fever, (2) an adherent membrane that is asymmetrical and grayish white in color over the tonsil(s), pharynx, or larynx, (3) the characteristic membrane, caused by reaction to a potent antitoxin, is strongly adherent to the underlying tissue, and attempts to dislodge usually results in bleeding, (4) accompanying inflammation of the cervical lymph nodes and surrounding soft-tissue swelling of the neck give rise to a "bull neck" appearance.
- What laboratory tests were conducted and what are the results?
- **Diphtheria antitoxin (DAT)** is available from the SOE Vaccine Depot (Call 907-269-8000 during work hours or 1-800-478-0084 after hours to consult with an Epi Team member).

Determine the Extent of Illness

- Determine if household or other habitual close contacts are ill or are at risk for disease including people sharing utensils or kitchen facilities.
- Health care personnel exposed to nasopharyngeal secretions.
- Daycare involvement? Travel recently?
- Notify an Epi supervisor immediately of all presumptive diphtheria cases.

Laboratory Specimens

- Both throat and nasopharyngeal specimens are necessary in cases of respiratory illness. Multisite sampling is thought to increase sensitivity.
- Material should be obtained from beneath the membrane, or a portion of the membrane itself should be submitted for culture.
- Because special medium is required for isolation (cystine-tellurite blood agar or modified Tinsdale agar), laboratory personnel should be notified that *C diphtheriae* is suspected.
- Specimens collected for culture can be placed in any transport medium (eg, Amies, Stuart media) or in a sterile container and transported at 4°C or in silica gel packs to a reference laboratory for culture.
- Collect nasopharyngeal swabs from suspected carriers if appropriate.
- Obtain sera for a diphtheria antibody titer prior to administering antitoxin. In the event that prior antibiotic therapy may have impeded a positive culture in a suspect diphtheria case, a low non-protective diphtheria antibody titer in sera may aid in a presumptive diagnosis.

Contact and Control Measures

- Immediate action on all highly suspect cases (including cutaneous) is warranted until it is shown not to be toxigenic *C. diphtheriae*.
- Obtain appropriate culture and preliminary clinical and epidemiological information including vaccine history.
- Determine the source of infection.
- Identify close contacts, especially household members and other persons directly exposed to oral secretions of the patient. Culture all close contacts, regardless of their immunization status. Ideally, culture should be from both throat and nasal swabs.
- **Prophylaxis**
 - For close contacts, *regardless of their immunization status*, the following measures should be taken: (1) surveillance for 7 days for evidence of disease; (2) culture for *C diphtheriae*; and (3) antimicrobial prophylaxis with oral erythromycin (40-50 mg/kg per day for 10 days, maximum 2 g/day) or a single intramuscular injection of penicillin G benzathine (600 000 U for children weighing less than 30 kg and 1.2 million U for children weighing 30 kg or more and adults). The efficacy of antimicrobial prophylaxis is presumed but not proven. Follow-up cultures of pharyngeal specimens should be performed after completion of therapy for contacts proven to be carriers after completion of therapy (see Carriers, p [309](#)). If cultures are positive, an additional 10-day course of erythromycin should be given, and follow-up cultures of pharyngeal specimens should be performed.
- **Immunizations**
 - Previously immunized contacts: booster dose of an age-appropriate diphtheria toxoid-containing vaccine (DTaP [or DT], Tdap, or Td) if >5 years since last dose.
 - Inadequately immunized contacts: boosters on an accelerated vaccine administration schedule. See the Red Book for current guidelines.
 - Unimmunized contacts: start a series of DTaP/DT/Td vaccine and be monitored closely for symptoms for 7 days.
 - Contacts who cannot be kept under surveillance should receive penicillin G benzathine but not erythromycin, because adherence to an oral regimen is less likely, and if not fully immunized or if immunization status is not known, they should be immunized with DTaP, Tdap, DT, or Td vaccine, as appropriate for age.
- **Work issues**
 - Employees who work with food or school children should be excluded from work until proven not to be carriers.

Hospital Considerations

- Patients with pharyngeal diphtheria should be placed in “droplet precautions” until off antimicrobial treatment and culture negative.
- Patient with cutaneous diphtheria should be placed in “contact precautions” until off antimicrobial treatment and culture negative.

Reporting Requirements

- FTR: write up all confirmed, presumptive, and probable cases.

- AK-STARS: enter all confirmed and probable cases.
- CDC Case Definition is used for case definition.

References

- <http://www.cdc.gov/diphtheria/clinicians.html>
- Control of Communicable Diseases Manual, 20th Edition
- Red Book, 2012 Report of the Committee on Infectious Diseases, 29th Edition
- Siegel JD, Rhinehart E, Jackson M, Chiarello L, and the Healthcare Infection Control Practices Advisory Committee. 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings. Available at <http://www.cdc.gov/hicpac/pdf/isolation/isolation2007.pdf>

Diphtheria (*Corynebacterium diphtheriae*)

2010 Case Definition

CSTE Position Statement Number: 09-ID-05

Case classification

Probable:

In the absence of a more likely diagnosis, an upper respiratory tract illness with

- an adherent 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.

Confirmed:

An upper respiratory tract illness with an adherent membrane of the nose, pharynx, tonsils, or larynx; and any of the following:

- isolation of *Corynebacterium diphtheriae* from the nose or throat; or
- histopathologic diagnosis of diphtheria; or
- Epidemiologic linkage to a laboratory-confirmed case of diphtheria.

[2010, January Case Definition](#)

[1995 Case Definition](#)

[1990 Case Definition](#)