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DIPHTERIA DISEASE'S CAUSES, ITS SYMPTOMS, TREATMENT AND PREVENTION

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Annotation: *diphtheria is a serious infection caused by strains of bacteria called Corynebacterium diphtheriae that make toxin. It can lead to difficulty breathing, heart rhythm problems, and even death. CDC recommends vaccines for infants, children, teens, and adults to prevent diphtheria.*

Key words: *Corynebacterium diphtheriae, C. ulcerans , gram-positive , Respiratory diphtheria, nasal diphtheria, pharyngeal and tonsillar diphtheria, laryngeal diphtheria, cutaneous diphtheria.*

INTRODUCTION

Diphtheria is a serious infection caused by strains of bacteria called Corynebacterium diphtheriae that make a toxin. It is the toxin that can cause people to get very sick. Diphtheria is an acute, bacterial disease caused by toxin-producing strains of Corynebacterium diphtheriae. Infection can result in respiratory or non-respiratory disease, such as cutaneous infections. Two other Corynebacterium species (C.ulcerans and C.pseudotuberculosis) may produce diphtheria toxin; both species are zoonotic. Toxin-producing C. ulcerans may cause disease indistinguishable from that caused by toxin-producing C. diphtheriae, but person-to-person spread has not been documented. Toxin-producing *C.* pseudotuberculosis can cause lymphadenitis in humans. Non-toxin-producing strains of C. diphtheriae can also cause disease. It is generally less severe, potentially causing a mild sore throat and, rarely, a membranous pharyngitis. Invasive disease, including bacteremia and endocarditis, has been reported for non-toxin-producing strains of C. diphtheriae. Vaccination is highly protective against disease caused by toxin-producing strains, but does not prevent carriage of C. diphtheriae, regardless of toxin production status.

C. diphtheriae is an aerobic gram-positive bacillus. Toxin production (toxigenicity) occurs only when the bacillus is itself infected (lysogenized) by a specific virus (bacteriophage) carrying the genetic information for the toxin (*tox* gene). Transmission is most often person-to-person spread from the respiratory tract. Rarely, transmission may occur from skin lesions or articles soiled with discharges from lesions of infected persons (fomites).

The incubation period of diphtheria is usually 2–5 days (range: 1–10 days). Diphtheria can involve almost any mucous membrane. For clinical purposes, it is convenient to classify diphtheria into type of manifestation, depending on the site of disease. These sites mostly commonly include:

Respiratory diphtheria

Nasal diphtheria

Pharyngeal and tonsillar diphtheria

Laryngeal diphtheria

Cutaneous diphtheria

Respiratory diphtheria has a gradual onset and is characterized by:

- Mild fever
- Sore throat
- Difficulty swallowing
- Malaise
- Loss of appetite
- Hoarseness (if the larynx is involved)

The hallmark of respiratory diphtheria is a pseudomembrane that appears within 2–3 days of illness. It appears over the mucous lining of the tonsils, pharynx, larynx, or nares and can extend into the trachea. Fatal airway obstruction can result if the pseudomembrane extends into the larynx or trachea or if a piece of it becomes dislodged.

Cutaneous diphtheria may present as a scaling rash or ulcers with clearly demarcated edges and membrane, but any chronic skin lesion may harbor C. diphtheriae along with other organisms. The systemic complications from cutaneous diphtheria with toxigenic strains appear to be less than from other sites.

Signs and symptoms: Symptoms of diphtheria usually begin 2–5 days after exposure to the bacteria. Typical symptoms of the infection include a sore throat, fever, swollen neck glands and weakness. Within 2–3 from infection, the dead tissue in the respiratory tract forms a thick, grey coating that can cover tissues in the nose, tonsils and throat, making it hard to breathe and swallow. Most severe disease and deaths from diphtheria occur as a result of the diphtheria toxin and its effects. Complications can include inflammation of the heart and nerves. For unvaccinated individuals without adequate treatment, diphtheria can be fatal in around 30% of cases, which children younger than 5 years of age at greater risk of dying.

Diagnostic testing and differential diagnoses

Diagnosis of diphtheria is confirmed by isolating C. diphtheriae and testing the isolate for toxin production by the Elek test, an in vitro immunoprecipitation (immunodiffusion) assay. Other tests, such as polymerase chain reaction (PCR) and matrix assisted laser desorption/ionization-time of flight mass spectrometry (MALDI-TOF), may identify C. diphtheriae. However, when used alone, these tests do not confirm toxin production and are considered supplemental.

Specimens for culture should be obtained from the nares and oropharynx, or any mucosal or cutaneous lesion. If possible, material should be obtained from beneath the membrane (if present) or a portion of the membrane itself. Specimens are more likely to be culture-positive if obtained before the patient receives antibiotic treatment.

Respiratory diphtheria is uncommon in the United States. Infection with other pathogens could result in a similar clinical presentation as diphtheria; testing for other pathogens should be considered. Pathogens include group A beta-hemolytic Streptococcus, Staphylococcus aureus, Candida albicans, and viruses such as Epstein-Barr, cytomegalovirus, adenovirus, and herpes.

Diagnosis of respiratory diphtheria is usually made on the basis of clinical presentation since it is imperative to begin presumptive therapy quickly. After making the provisional clinical diagnosis, obtain appropriate clinical specimens, and start antitoxin and antibiotic treatment. Respiratory support and airway maintenance may be needed. Even though disease is usually not contagious 48 hours after antibiotic treatment begins, maintain droplet precautions until the diphtheria patient has completed the antibiotic course and is culture-negative. Document elimination of the organism by obtaining two consecutive negative cultures 24 hours apart, once antibiotic therapy is completed.

Complications: most complications of respiratory diphtheria**,** including death, are attributable to effects of the toxin. The most frequent complications of respiratory diphtheria are myocarditis and neuritis. Other complications include otitis media and respiratory insufficiency due to airway obstruction, especially in infants. The overall case-fatality rate for diphtheria is 5%–10%, with higher death rates (up to 20%) among persons younger than 5 and older than 40 years of age. Cutaneous diphtheria infection rarely results in severe disease.

Treatment: the risk of complications or death decrease considerably if appropriate treatment is provided early in the course of illness. For this reason, if diphtheria is suspected, testing to confirm the disease should be done promptly and treatment should be started as soon as possible. Cases of diphtheria are usually treated with diphtheria antitoxin as well as antibiotics. Diphtheria specific antitoxin neutralizes circulation toxin in the blood. Detailed instructions for giving antitoxin can be found in the WHO treatment guidelines. Antibiotics stop bacterial replication and thereby toxin production, speed up getting rid of the bacteria and prevents transmission to others. However, many current strains of diphtheria have exhibited resistance to some commonly used antimicrobial drugs. Anyone that has had diphtheria should also receive vaccine after the acute phase of the illness is over. Individuals who have been in contact with cases of diphtheria should be treated with antibiotics prophylactically to prevent illness. Their immunization status of all contacts should also be checked. If they are not fully vaccinated, they should also be offered vaccine.

All in all, diphtheria can be prevented by vaccines that are often given in combination with tetanus and pertussis and other diseases. WHO recommends a total of 6 diphtheria-containing vaccine doses be given starting at 6 weeks of age through adolescence to provide long term protection. Community-wide vaccination with high coverage as a part of routine immunization services embedded in primary health care is the most effective way to prevent diphtheria. All children should be vaccinated against diphtheria with a full primary series and 3 additional booster doses for long term protection. The vaccine is safe and effective.

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