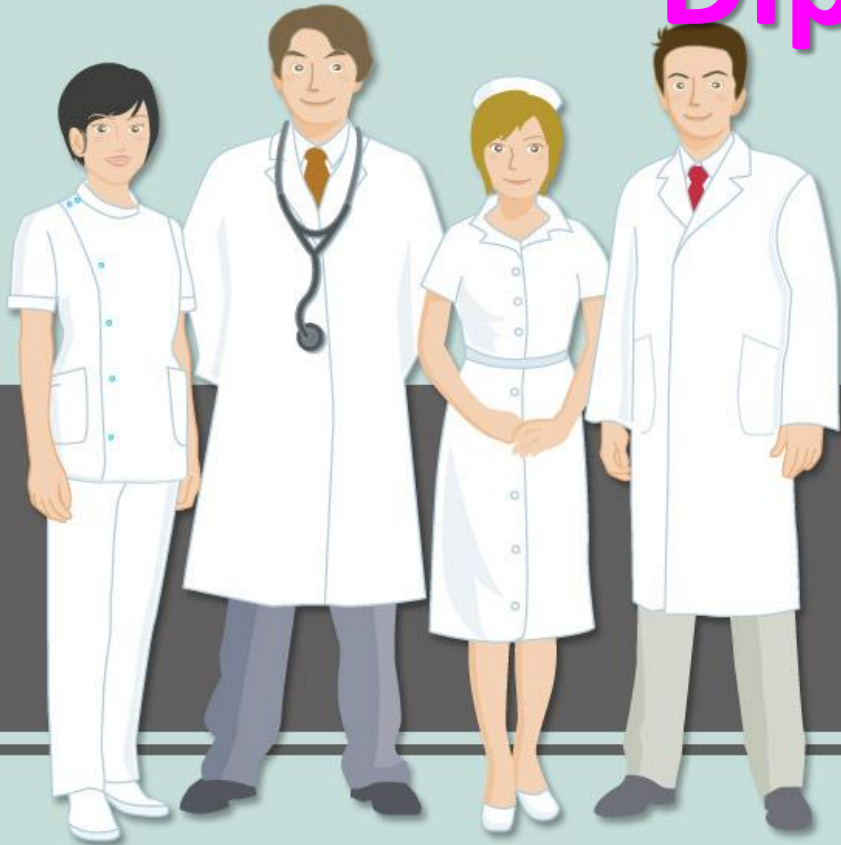


Epidemiology of Diphtheria



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Definition:

- Diphtheria is an acute, toxin-mediated disease caused by toxigenic *Corynebacterium diphtheriae*
- It's a very contagious and potentially life-threatening bacterial disease.
- It's an infectious disease, which usually attacks the throat and nose mucous membrane.



Diphtheria

- Greek diphtheria (leather)
- Recognized by Hippocrates in 5th century
- Epidemics described in 6th century
- *C. diphtheriae* described by Klebs in 1883
- Toxoid developed in 1920s



Etiology:

- *C. diphtheriae* is an **aerobic gram-positive bacillus**.
 - Pleomorphic, club-end
 - Non-spore-forming
 - Non-acid-fast
 - Non-motile



Infectious agent:

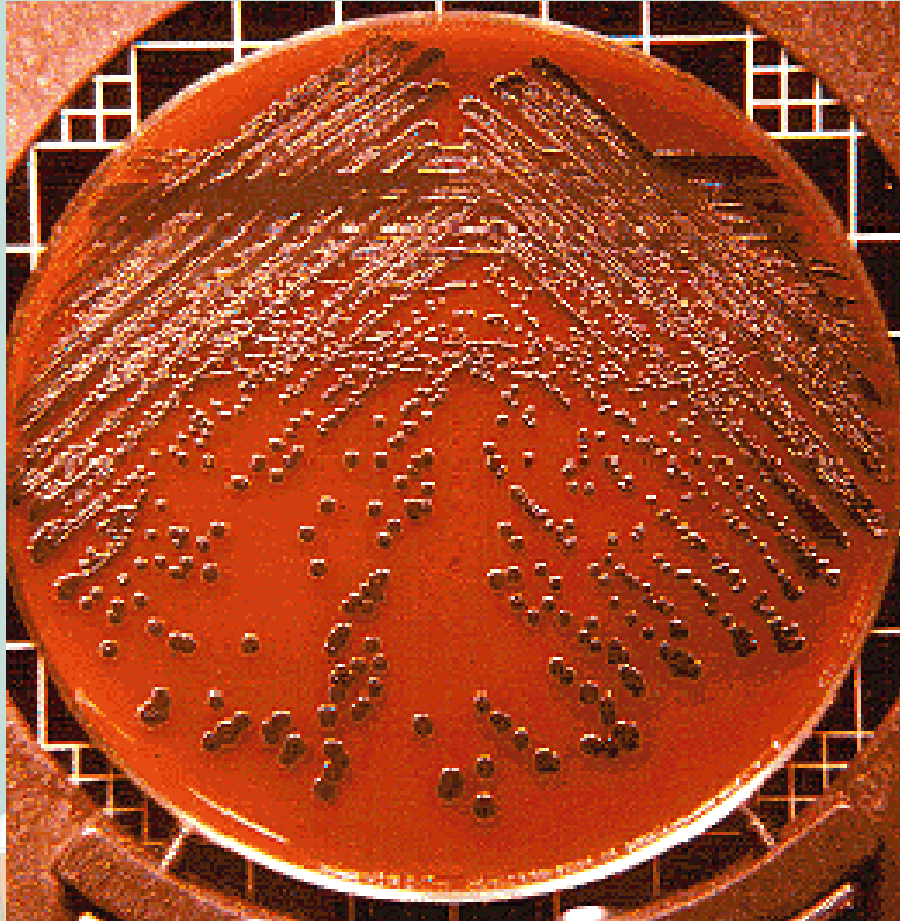
- Toxin production (toxigenicity) occurs **only** when the **bacillus is itself infected** (lysogenized) **by a specific virus** (bacteriophage) carrying the genetic information for the toxin (toxogene).



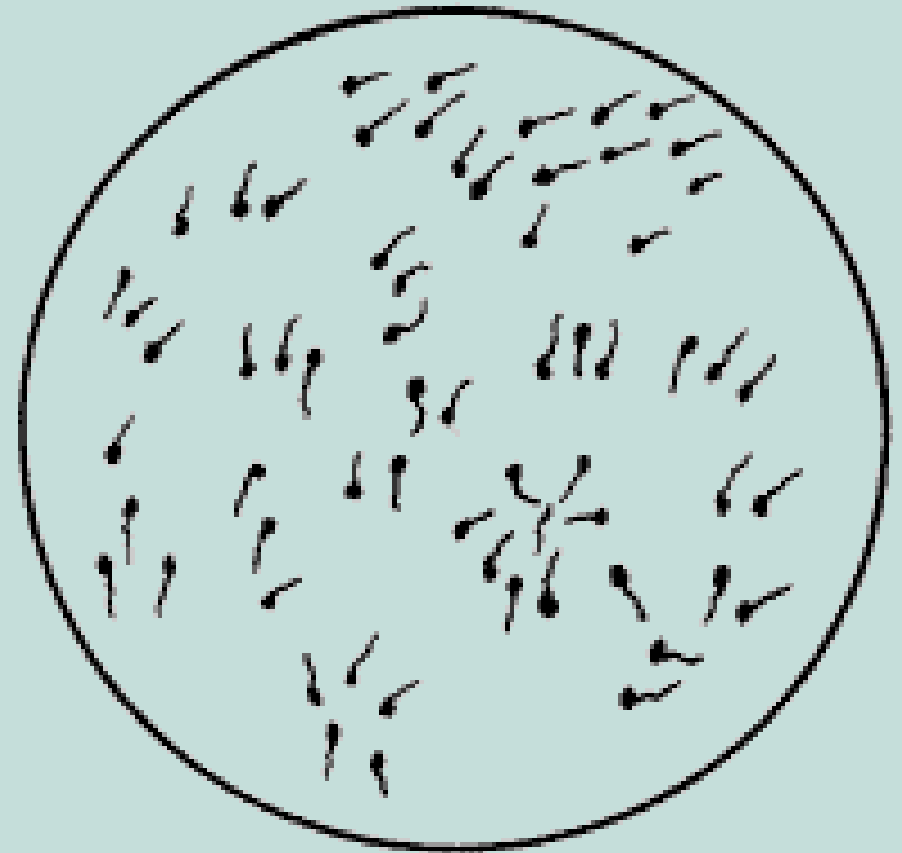
- **C. diphtheriae** has four biotypes—gravis, intermedius, mitis and belfanti.
- All strains may produce toxin and can cause severe disease.
- All isolates of **C. diphtheriae** should be tested for toxigenicity.



Gram +ve Bacilli and Colonies



***Corynebacterium diphtheriae*, mitis**
Chocolate tellurite agar



Pathogenesis and pathology:

- **Susceptible persons** may acquire toxigenic diphtheria bacilli in the nasopharynx, middle ear or anterior nares or skin.
- The organism produces a toxin that **inhibits cellular protein synthesis** and is responsible for local tissue destruction and **pseudomembrane formation.**



Pathogenesis and pathology:

- **The pseudomembrane** consists of **coagulated fibrin**, **inflammatory cells**, **destroyed mucous tissues** and **bacteria**.
- The pseudomembrane in **larynx**, **trachea** or **bronchi** may have the potential for **airway obstruction**.
- The toxin is responsible for the **major complications** of **myocarditis** and **neuritis**, and can also cause low platelet counts (**thrombocytopenia**) and protein in the **urine (proteinuria)**.



EPIDEMIIOLOGY



Occurrence:

- Diphtheria occurs **worldwide** and is more prevalent in **winter** months in **temperate** zones.
- It was **eradicated** from most of the **developed** world by **mass vaccination** in the mid-20th century.
- However, it's still **common** in developing countries where immunizations aren't given.



- In **1993** and **1994**, thousands cases were reported during a serious **outbreak of diphtheria** in countries of the **former Soviet Union**.
- The epidemic has **declined** after a **peak in 1995** ,it was responsible for over **140 000 cases** and over **4000 deaths**.
- Over **70%** of cases were aged **15 years or older**.



Transmission:

- Transmission is most often person-to-person spread from the respiratory tract (by small droplet when coughing or sneezing).
- Rarely, transmission may occur from **skin lesions** or **articles soiled with discharges** from lesions of infected persons.



Source of infection:

Patients and asymptomatic carriers

Reservoir:

Humans are the usual reservoir and carriers are usually asymptomatic.

Incubation period:

usually 2–5 days , occasionally longer (1–10 days).



Period of communicability:

- Transmission may occur as long as virulent bacilli are present in discharges and lesions.
- The time is **variable** but is usually **two weeks** or less and seldom more than **four weeks** without antibiotics.
- **Appropriate antibiotic** therapy promptly terminates shedding. The **rare** chronic carrier may shed organisms for **six months or more.**



Susceptibility and resistance:

- Infants born of immune mothers are relatively immune, but **passive immunity is usually lost by six months of age.**
- **Lifelong immunity** is usually, but not always, acquired after disease or inapparent infection.
- **A primary course of toxoid vaccination** provides **long lasting** but **not** lifelong immunity.



Risk factors

1. Children under 5 and adults over 60 years old are particularly at risk.
2. People living in crowded or unclean conditions (low socio-economic status).
3. Undernutrition.
4. Children and adults who don't have up-to-date immunizations.



Clinical Features:

- Disease can involve almost any mucous membrane.
- For clinical purposes, it is convenient to classify diphtheria into a number of manifestations, **depending on the anatomical site of disease.**



Clinical features of diphtheria

Acute infection

- Nasal infection
- Pharyngotonsillar infection
- Laryngeal infection
- Skin/wound/conjunctival infection (rare)



1. Anterior nasal diphtheria

- The onset is **indistinguishable** from that of the common cold and is usually characterized by a **mucopurulent nasal discharge** (containing both mucus and pus) which may become **blood-stained**.
- A **white pseudomembrane** usually forms on the nasal septum.



2. In pharyngotonsillar diphtheria

- **Insidious** onset of exudative pharyngitis
- Fever not high, but patient appears **toxic**
- Exudate spreads to form adherent “**pseudomembrane**”
- In **early** stages – whitish membrane which can be wiped off easily over pharynx or tonsils.
- Later it becomes **thick, white- blue to grey – black and adherent**. It is difficult to remove if tried to remove it will result in bleeding.



- ❖ Mucosal erythema around the membrane
- ❖ Edema of submandibular area
- ❖ Bull neck appearance



Diphtheria - notice the pseudomembrane in the posterior pharynx. It can become very large and may obstruct the airway.





Pharyngeal Diphtheria: Distant Complications

- Myocarditis
 - Cardiac arrhythmias in acute phase
 - Sudden death
- Neuropathy
 - Motor neuropathy
 - Paralysis of soft palate from **3rd week**
 - Eye muscles, limbs, diaphragm after **5th week.**





**10 y/o boy with
severe diphtheria**

- ◆ conjunctivitis
- ◆ pharyngeal membrane
- ◆ bull neck
- ◆ severe myocarditis



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3. Laryngeal diphtheria

- Laryngeal diphtheria can be either an **extension** of the pharyngeal form (often) or the only site involved (rarely).
- Symptoms include mild fever (with little absorption of toxin), dyspnea, **hoarseness, and a barking cough.**
- The pseudomembrane can lead to **airway obstruction, coma, and death.**



Laryngeal diphtheria



4. Cutaneous and Other site diphtheria

- Skin infections are quite common in the **tropics** and are probably responsible for the high levels of **natural immunity** found in these populations.
- Skin infections may be manifested by a **scaling rash** or by **ulcers** with clearly demarcated edges and pseudomembrane.



Cutaneous (skin) diphtheria



Diphtheria Complications

Most attributable to toxin, severity generally related to extent of local disease

- Most frequent complications are myocarditis About **25%** of survivors of the early toxæmia may later develop **myocarditis** with **arrhythmias** or cardiac failure.
- **Neurological involvement** occurs in **75%** of cases.
- **Death** occurs in **5-10%** .Death from **acute circulatory failure** may occur within the first 10 days.



Diagnostic tests:

- Specimens for **culture** should be obtained from the nose or throat or any mucosal or cutaneous lesion.
- Material should be obtained from **beneath the membrane** , or a **portion of the membrane itself** should be submitted for culture.



Treatment:

- Children and adults with diphtheria are treated in a **hospital**. After a confirmation of the diagnosis through a throat culture.
- The infected person receives a special **anti-toxin**, given to neutralize the diphtheria toxin already circulating in the body.
- as well as antibiotics to kill the remaining diphtheria bacteria.



- **Immediate hospitalization and strict isolation with early intervention** allow most patients to recover from diphtheria.
- After the antibiotics and anti-toxin have taken effect, patient with diphtheria will need bed rest for a while **(4 to 6 weeks, or until full recovery)**.
- Bed rest is particularly important if the person's heart has been affected by the disease.

(Myocarditis)



Treatment

- Antibiotic **not useful** in Acute infections.
- Antitoxin is a must.
- Antitoxin obtained from **horse serum**

Mild 20,000 to 40,000 units

Moderate 40,000 to 60,000 units

Severe 80,000 to 1,00,000 units

- Commonly used antibiotics

Penicillin parentrally,
Oral **Erythromycin**



- Those who have recovered should still receive a full course of the **diphtheria vaccine to prevent a recurrence.**
- because the occurrence of disease doesn't guarantee lifelong immunity.



Prevention:

- Preventing diphtheria depends almost completely on:
- immunizing children with the diphtheria/pertussis/tetanus (DPT) vaccine.
- non-immunized adults with the diphtheria/tetanus vaccine (Td).
- Most cases of diphtheria occur in people who haven't received the vaccine **at all** or haven't received the **entire course**.



The immunization schedule:

- DPT vaccines at 2, 4, and 6 months of age.
- 1st booster dose given at 12 to 18 months.
- 2nd booster dose given again at 4 to 6 years (pre-school).
- booster shots given every 10 years after that to maintain protection.



Diphtheria Toxoid

- **Formalin-inactivated diphtheria toxin**
- **Schedule** Three doses + 2booster
Booster shots every 10years
- **Efficacy** Approximately 95%
- **Duration** Approximately 10 years
- **administered with tetanus toxoid .**



Diphtheria and Tetanus Toxoids Adverse Reactions:

- **Local reactions (erythema, induration)**
- **Exaggerated local reactions.**
- **Fever and systemic symptoms not common.**
- **Severe systemic reactions are rare.**



Diphtheria and Tetanus Toxoids contraindications and Precautions:

- **Severe allergic reaction to vaccine component following a prior dose.**
- **Moderate or severe acute illness.**



CONTROL MEASURES:

***Prompt notification** to the local public health officials.

***Identification of close contacts** of a person suspected to have diphtheria .



***For close contact , **regardless** of their immunization status ,the following measures should be taken :**

1- Surveillance for **7 days for evidence of disease.**

2-Culture for C. diphtheria.

3- Antimicrobial prophylaxes with **oral erythromycin.**



Treating Contacts

- All contacts are advised to receive 500 mg Erythromycin 4 times a day.



Follow up:

- Pharyngeal culture should be obtained from contacts proven to be carriers at a minimum of **2 weeks** after completion of therapy.
- If cultures are **positive** , an additional **10- day** therapy of erythromycin should be given .



Outbreak measures:

- Outbreaks of diphtheria require **immunising the largest possible proportion** of the population involved.
- Emphasising the need for protection of **infants and preschool children.**
- In outbreaks amongst adults immunize groups that are **at high risk.**



- **Repeat** immunisations may be recommended after **one month**.
- Outbreak investigations involve **enhanced case surveillance** with laboratory confirmation of all suspected cases.
- **Identification** and appropriate **management** of close contacts and asymptomatic carriers.



DIPHTHERIA
is deadly-



IMMUNISATION
is the
safeguard

ASK AT YOUR
LOCAL COUNCIL
OFFICES
OR
WELFARE CENTRE

Issued by the Ministry of Health
and the
Central Council for Health Education



THANK
YOU

