

Lec.8: *Corynebacterium diphtheriae*

Corynebacteria are small, **slender**, **pleomorphic**, **gram-positive rods**. They are **non-motile** and **unencapsulated**, and they **do not form spores**. The pathogen *C. diphtheriae*, **grows aerobically** on standard laboratory Media such as: **blood agar**. arranged in **V or L shapes** on **Gram stain**. *C. diphtheriae*, cause (**Diphtheria**), is an acute respiratory or cutaneous disease and may be life threatening.



Figure 8.1: **V or L shapes** *Corynebacterium diphtheriae*

C. diphtheriae from clinical material or culture has a distinctive morphology when stained, for example, with **methylene blue**. This morphology includes characteristic bands and **reddish (polychromatic) granules** that are often seen in thin, sometimes **club-shaped rods** that appear in clumps, suggestive of **Chinese characters**.

Virulence and toxin

1-Diphtheria is caused by the local and systemic effects of **exotoxins** that inhibits eukaryotic protein synthesis. The toxin molecule is a heat-labile polypeptide that is composed of two fragments, A and B. Fragment B binds to susceptible cell membranes and mediates the delivery of fragment A to its target. Inside the cell, fragment A separates from fragment B and catalyzes a reaction between nicotinic adenine dinucleotide (NAD⁺) and the eukaryotic polypeptide chain elongation factor, EF-2. In figure 8.2.

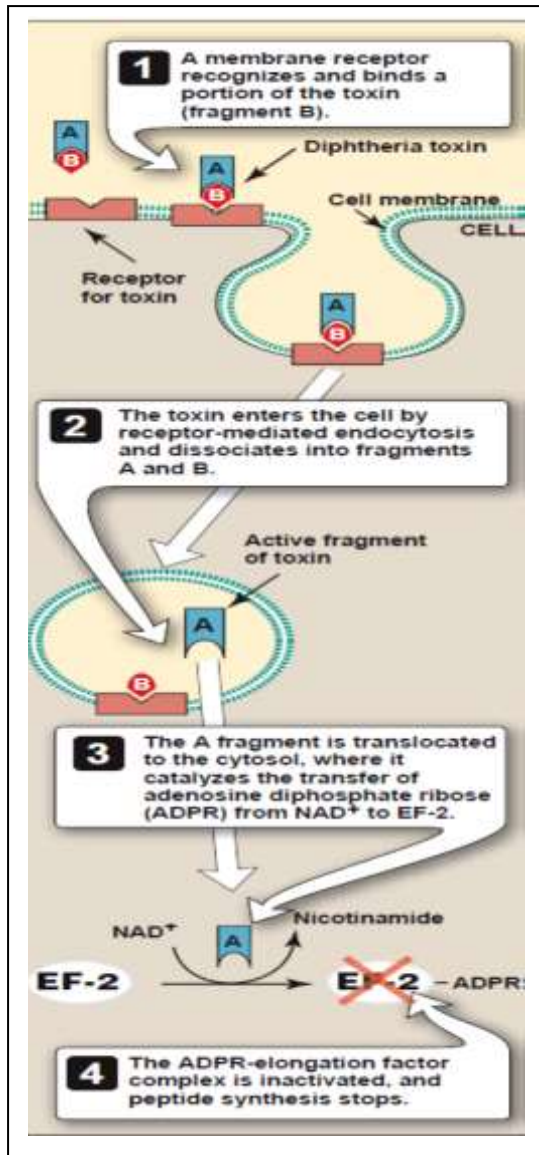


Figure 8.2: Action of Diphtheria toxin

2-Diphtheria is a strictly localized infection, usually of the throat. The infection produces a distinctive **thick, grayish, adherent exudate (pseudomembrane)** that is composed of cell debris from the mucosa and inflammatory products. It coats the throat and may extend into the nasal passages or downward in the respiratory tract, where the exudate sometimes obstructs the airways, even leading to suffocation.

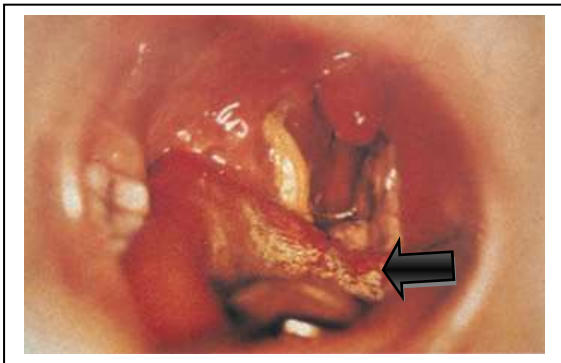


Figure 8.3 pseudomembrane grayish coat the throat.

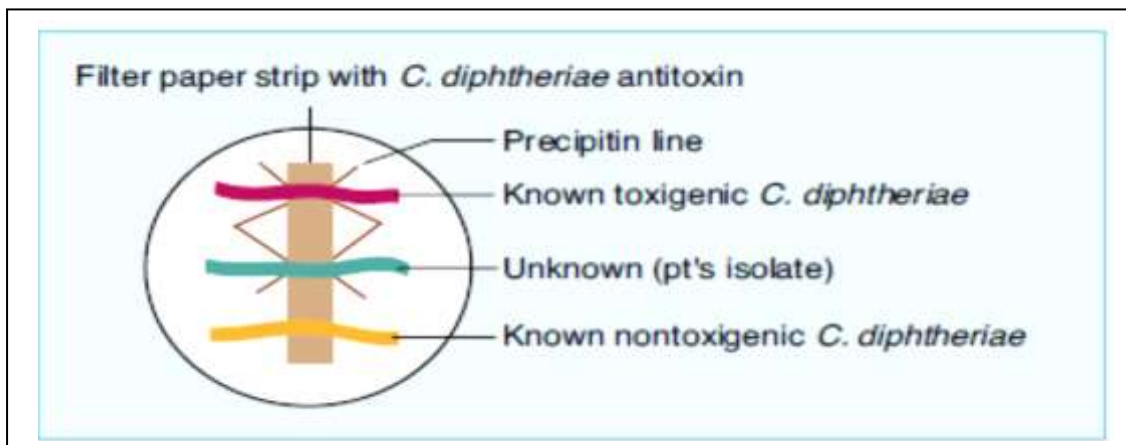
3-Cutaneous diphtheria: A puncture wound or cut in the skin can result in introduction of *C. diphtheriae* into the **subcutaneous tissue**, leading to a chronic, non-healing ulcer with a gray membrane. Rarely, exotoxin production leads to tissue degeneration and death.

Immunity: Diphtheria toxin is antigenic and stimulates the production of antibodies that neutralize the toxin's activity, and this material used for immunization against the disease, usually administered in the **DTP** triple vaccine, together with tetanus toxoid and pertussis antigens

Elek test

to document toxin production (ELISA for toxin is now gold standard)

- Toxin produced by strains diffuses away from growth
- Antitoxin diffuses away from strip of filter paper
- Precipitin lines form at zone of equivalence



Shick test

Intradermal test worked by injection diphtheria toxin 0.2ml intradermally into the skin forearm while opposite arm is injected by the same route of injection and toxin inactivated by heat as (control).

Reading the result after 1, 4, 7 days.

Diphtheroids

C. diphtheriae, are common commensals of the nose, throat, nasopharynx, skin, urogenital tract, and conjunctiva. They are therefore called **diphtheroids** and are generally unable to produce exotoxins.