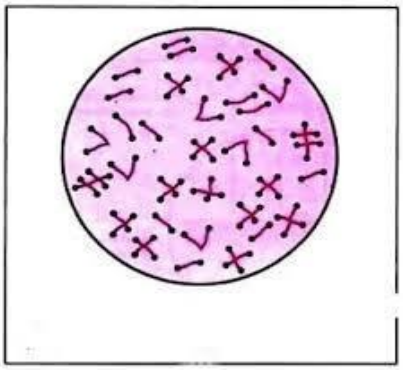
Corynebacterium diphtheria:

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

Important Properties:

1- Corynebacteria are gram-positive rods that appear **club-shaped** (wider at one end) and are arranged in palisades or in V- or L-shaped formations.

2- The rods have a beaded appearance. The beads consist of granules of highly polymerized polyphosphate—a storage mechanism for high-energy phosphate bonds.



3- The granules stain **metachromatically** (i.e., a dye that stains the rest of the cell blue will stain the granules red).

Transmission

Humans are the only natural host of *C. diphtheriae*. Both toxigenic and nontoxigenic organisms reside in the upper respiratory tract and are transmitted by **airborne droplets**. The organism can also infect the skin at the site of a preexisting skin lesion. This occurs primarily in the tropics but can occur worldwide in indigent persons with poor skin hygiene.

Pathogenesis

Although exotoxin production is essential for pathogenesis, invasiveness is also necessary because the organism must first establish and maintain itself in the throat. Diphtheria toxin inhibits protein synthesis by **ADP-ribosylation of elongation factor-2** (EF-2). The toxin affects all eukaryotic cells regardless of tissue type but has no effect on the analogous factor in prokaryotic cells.

The toxin is a single polypeptide with two functional domains. The binding (B) domain mediates binding of the toxin to glycoprotein receptors on the cell membrane.

The active (A) domain possesses enzymatic activity that cleaves nicotinamide from nicotinamide adenine dinucleotide (NAD) and transfers the remaining ADP-ribose to EF-2, thereby inactivating it.

The host response to *C. diphtheriae* consists of the following:

(1) A local inflammation in the throat, with a fibrinous exudate that forms the tough, adherent, gray **pseudomembrane** characteristic of the disease.

(2) Antibody that can neutralize exotoxin activity by blocking the interaction of the binding domain with the receptors, thereby preventing entry into the cell.

Clinical Findings :

1-The most prominent sign, the thick, gray, adherent **pseudomembrane** over the tonsils and throat .

2- The other aspects are nonspecific: fever, sore throat, and cervical adenopathy.

There are three prominent complications:

(1) Extension of the membrane into the larynx and trachea, causing airway obstruction.

(2) Myocarditis accompanied by arrhythmias and circulatory collapse.

(3) Nerve weakness or paralysis, especially of the cranial nerves.

Laboratory Diagnosis

Laboratory diagnosis involves both isolating the organism and demonstrating toxin production.

1- A throat swab should be cultured on Loeffler's medium, a **tellurite plate,** and a blood agar plate.

2- If *C. diphtheriae* is recovered from the cultures, either animal inoculation or an antibody-based gel diffusion precipitin test is performed to document toxin production.

3- A PCR assay for the presence of the toxin gene in the organism isolated from the patient can also be used.

Treatment

The treatment of choice is **antitoxin,** which should be given immediately on the basis of clinical impression because there is a delay in laboratory diagnostic procedures. The toxin binds rapidly and irreversibly to cells and, once bound, cannot be neutralized by antitoxin. The function of antitoxin is therefore to neutralize unbound toxin in the blood. Because the antiserum is made in horses, the patient must be tested for hypersensitivity, and medications for the treatment of anaphylaxis must be available. Serum sickness may occur after administration of antiserum made in horses.

Treatment with penicillin G or erythromycin is also recommended, but neither is a substitute for antitoxin. Antibiotics inhibit growth of the organism, reduce toxin production, and decrease the incidence of chronic carriers.

Q1- Fill in the blanck?

1- Corynebacteria are gram-positive rods that appear ----------.

2- *C. diphtheriae* is organism reside in the upper respiratory tract and are transmitted by ----------.

3- Diphtheria toxin inhibits ---------- by ADP-ribosylation of elongation factor-2 (EF-2).

4- There are three prominent complications occur *C. diphtheria* ----------,----------,----------.