Corynebacterium diphtheriae

Corynebacterium diphtheriae is a gram positive bacilli that causes the disease diphtheria, which is an upper respiratory tract illness characterized by pseudomembranous pharyngitis and lymphadenopathy. Later stages of disease can also include myocarditis and polyneuritis. Diphtheria is spread by direct contact or breathing of aerosolized secretions and produces Diphtheria exotoxin, which alters protein function in the host via ADP ribosylation of elongation factor 2 (EF2). The diphtheria toxin gene is encoded by a beta prophage that is integrated into the bacterial chromosome via lysogenization. The organism is cultured on a selective medium called tellurite agar and tends to lie parallel to one another or at acute angles resembling Chinese letters. They may also contain inclusion bodies known as metachromatic granules that stain red while the rest of the bacillus stains blue when stained with an aniline dye like methylene blue. Diphtheria has largely been eradicated in industrialized nations via widespread vaccination with the diphtheria pertussis tetanus vaccine.



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Characteristics

Gram-Positive
Graham-cracker Positive-angel
This organism stains positive on gram stain due to thick a peptidoglycan layer which absorbs crystal violet.

Bacillus
Rod
This bacteria is rod shaped.

Exotoxin
Bursting-toxic-balloon
An exotoxin is classified as a toxin that is released by bacteria into the environment. Corynebacterium diphtheriae produces Diphtheria exotoxin, which alters protein function in the host via ADP ribosylation of elongation factor 2.

ADP Ribosylation of Elongation Factor 2
ADP Red-bull with elongating elf wearing (2) Tutus
Corynebacterium diphtheriae uses the virulence factor diphtheria toxin to ADP ribosylate elongation factor 2 in host cells, similar to the mechanism of pseudomonas exotoxin A. Defective elongation factor 2 causes the inability of the host cell to synthesize proteins and leads to necrosis.

Beta Prophage
Beta-fish propeller
A prophage is a viral genome that is inserted and integrated into the circular bacterial DNA chromosome. The gene containing Diphtheria toxin is located on the DNA of a beta prophage. C. diphtheriae is infected by the beta prophage thus acquiring the ability to produce the toxin and become pathogenic.

Lysogeny
Lasso-jeans
Lysogenization is a process in which the DNA of a temperate bacteriophage is incorporated into the structure of a bacterial DNA where it remains in a latent form. C. diphtheriae acquires the ability to produce diphtheria toxin via lysogenization.

Tellurite Agar
Telephone-write
Tellurite agar is a specific medium used to grow Corynebacterium diphtheriae.

Chinese Letters
Chinese Characters
The organism tends to lie parallel to one another or at acute angles resembling Chinese letters and can help with bacterial identification.

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Metachromatic Blue Red Granules
Metal-chrome Blue Red Balls
They may also contain inclusion bodies known as metachromatic granules that stain red while the rest of the bacillus stains blue when stained with an aniline dye like methylene blue.

Aniline Stains Deeply Methylene Blue
Aliens stained blue
They may also contain inclusion bodies known as metachromatic granules that stain red while the rest of the bacillus stains blue when stained with an aniline dye like methylene blue.

Signs and Symptoms

Pseudomembranous Pharyngitis
Sumo-man-bra Pharaoh
Pseudomembranous pharyngitis is characterized by an adherent membrane on the pharynx caused by cell necrosis due to Diphtheria toxin.

Lymphadenopathy
Lymph-lime-add (+)
Lymphadenopathy is enlargement of lymph nodes and is a common symptom of diphtheria.

Myocarditis
Mayo-heart-card
Myocarditis is an inflammation of the myocardium often caused by an infection of the heart. Myocarditis can be a late stage complication of diphtheria and occurs in about 20% of cases.

Polyneuritis
Poly-with-neuron-legs
Polyneuritis refers to damage of the nerves of the peripheral nervous system in more than one location. This can be a late stage complication of diphtheria and is seen in about 10% of cases.

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