Al-Mustaqbal University
Dept. Medical Lab. Techniques
Diagnostic Microbiology 25-2026
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Lecture-14: *Streptococcus pneumoniae*

Morphology:

1-gram-positive cocci in pairs (diplococci), 2- slightly elongated cocci, with one end rounded, 3- non-motile and non-sporing, 4- all freshly isolated strains are capsulated and the capsule encloses each pair.

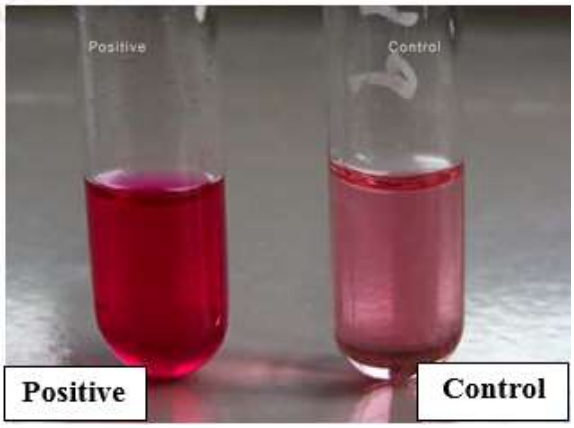
Cultural Characteristics

1-They are aerobes and facultative anaerobes.

2- It grows best in air or hydrogen with 5-10 percent CO2.

Biochemical Reactions

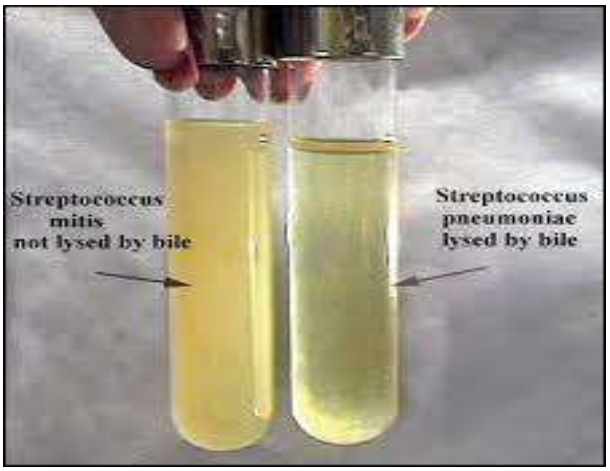
1. Inulin Fermentation: Pneumococci ferment inulin with the production of acid without gas. Fermentation of inulin by pneumococci is a useful test for differentiating them from streptococci as the latter do not ferment it.



2. Bile Solubility Test: Procedure:

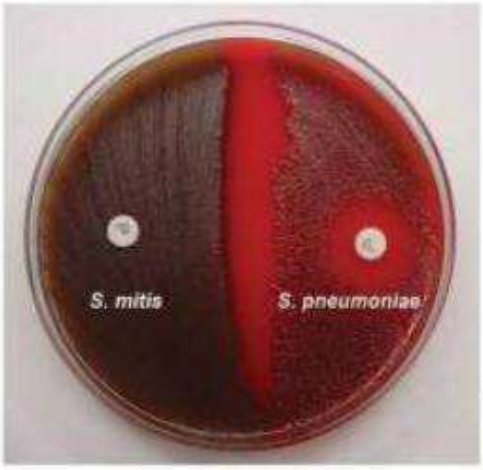
1- Grow the isolate to be tested for 18 hours at 37°C in 5 ml serum, digest broth or infusion.

2- While still warm, add 0.5 ml of 10 percent, bile salt (sodium deoxycholate solution) and re-incubate at 37°C. Pneumococci are lysed within 15 minutes and the initially turbid culture becomes clear and transparent. Pneumococci are soluble in bile; viridans and other streptococci are not.



3. Pneumococci are **Catalase** and **Oxidase negative**.

4- Optochin Sensitivity:



Left Side

S. mitis

Resistant to optochin

Right Side

S. pneumoniae

Susceptible to optochin

Comparison between *Streptococcus pneumoniae* and Viridanc Streptococci

Features	*S. pneumoniae*	Viridans streptococci
Colony	Draughtsman	Dome shaped
Bile solubility test	Positive	Negative
Optochin (ethyl hydrocupreine hydrochloride) 5µg sensitivity test	Sensitive	Resistant
Inulin fermentation	Positive	Negative
Pathogenicity	**Positive**	**Negative**
Capsule	Present	Absent
Quellung reaction	Positive	Negative

Laboratory Diagnosis

1. Specimens: Sputum, lung aspirate, pleural fluid, cerebrospinal fluid (CSF) or blood are collected according to the site of lesion. Sputum specimens must be mucus from the lungs rather than samples of saliva.

2. Microscopy and Antigen Detection

Gram stain of sputum specimens is a rapid way to diagnose pneumococcal disease. If the smears are gram-positive lancet-shaped diplococci, a presumptive diagnosis of pneumococcal pneumonia may be made. A centrifuged deposit of the CSF should be examined immediately in a Gram film in case of meningitis and presumptive diagnosis may be made by finding gram-positive diplococci.

3. Culture: Specimen is inoculated on plates of blood agar and heated blood agar (chocolate agar) and incubated in air with 5-10% CO2 for 18-24 hours.

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Pseudomonas aeruginosae

It is gram negative, motile and rod shaped. It occurs as single bacteria, in pairs, and occasionally in short chains.

Specimens: Specimens depend on the site of infection including skin lesions, pus, urine, blood, spinal fluid, sputum, and other material should be obtained by different procedures.

Culture: Pseudomonads grow readily on most culture media. It does not ferment lactose and is easily differentiated from the lactose- fermenting bacteria.

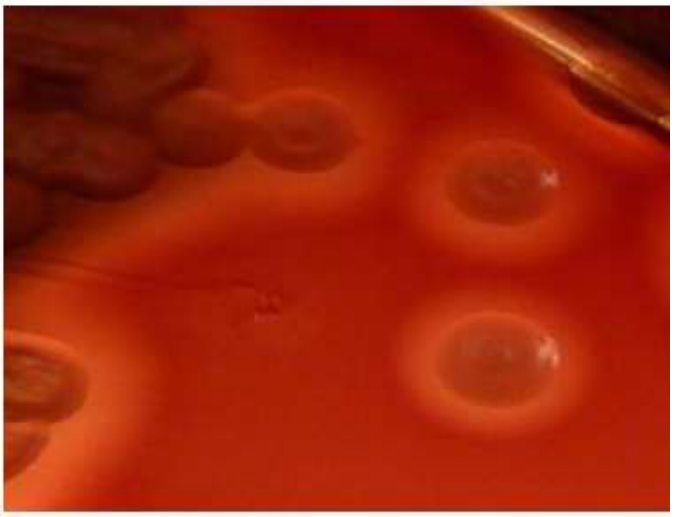
P. aeruginosa is an obligate aerobe but can grow anaerobically if nitrate is available, that grows readily on many types of culture media, sometimes producing **a sweet or grapelike** or corn taco–like odor. Some strains **hemolyze blood**.

P aeruginosa forms smooth round colonies with a **fluorescent greenish color**. It often produces the; 1- non-fluorescent **bluish pigment pyocyanin**, which diffuses into the agar. Many strains produce the 2- **fluorescent pigment pyoverdin**, which gives a greenish color to the agar. Other strains produce the 3- **dark red pigment pyorubinor**, or the 4- **black pigment pyomelanin**.

Pseudomonas aeruginosa
on Citrimide medium

On MacConkey agar plates (**as shown below**) it produces non-lactose fermenting colonies (**compared with *E. coli* or *Klebsiella***) and the pigments are often poorly observed.

On **blood agar** plates, it is surrounded by a zone of hemolysis (**as show below**), while in broth culture it forms a dense turbidity with a surface **pellicle**.



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