

Practical Pathogenic Bacteria

LAB: 3

Genus: *Streptococcus*

General Characteristics

- It is a Gram-positive bacterium.
- This genus includes: *S. pyogenes*, *S. pneumoniae*, *S. agalactiae*, *S. viridans*.
- Microscopic examination: Spherical (cocci), arranged in pairs or in chains.
- Most Streptococci are facultative anaerobic and some are obligate (Strict) anaerobes.
- Non-motile, non-spore forming, some species have capsule.
- Catalase: negative, oxidase: negative.
- It typically appears in purulent lesions or broth cultures as spherical or ovoid cells in chains of short to medium length (4 to 10 cells).
- This genus includes the most important pathogens of human pyogenic streptococci. These are Lancefield groups A (*S. pyogenes*) (GAS) and B (*S. agalactiae*) (GBS) which are the most common causes of serious disease.
- β - hemolysis streptococci (*S. pyogenes* and *S. agalactiae*) are isolated on blood agar as white to grey small colonies surrounded by a clear zone of hemolysis (complete lysis). The bacitracin test is used to differentiate and identify beta hemolytic group A streptococci (*S. pyogenes*) from other β -hemolytic streptococci (*S. agalactiae*).

- Pneumococci contain a single species, *S. pneumoniae*, (*Pneumococcus*). Its cellular morphology is an oval coccus arranged end to end in pairs (*Diplococcus*) giving the cells a bullet shape. Its distinctive feature is the presence of a polysaccharide capsule. This species is α -hemolytic. It is found in sputum of patient with pneumonia.

- α - hemolysis streptococci (*S. pneumoniae* and *S. viridans*) are isolated on blood agar as small, shiny, flattened, and translucent colonies which are surrounded by a greenish zone of hemolysis. This zone results from incomplete lysis of red blood cells. The optochin test is used to differentiate *S. pneumoniae* from other α -hemolytic streptococci (*S. viridans*).

- Viridans streptococci include five groups *S. anginosus*, *S. salivarius*, *S. sanguinis*, *S. mutans* and *S. mitis* show alpha hemolysis or no hemolysis on blood agar. Viridans group considered optochin resistance (-ve results). They are members of human oral microbiota. Their virulence is very low, however, they can cause subacute bacterial endocarditis.

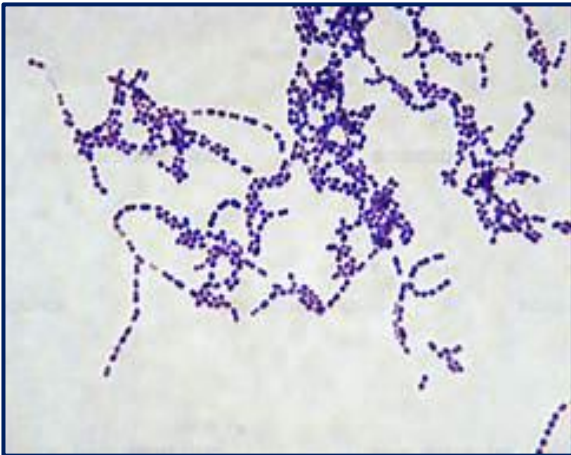
Laboratory Diagnostics

- 1- Gram staining
- 2- Catalase test
- 3- Oxidase test
- 4- Sterptokinase test
- 5- Bacitracin and Optochin test
- 6- Bile solubility test
- 7- Bile esculin test

8- Growth on 6.5% NaCl

9- Growth on blood agar for hemolysis

10- CAMP test



Streptococci



Streptococcus pneumoniae



Antibiotics Sensitivity Test

Differences between *S. pyogenes* and *S. pneumoniae*

| Tests | <i>S.pyogenes</i> | <i>S.pneumoniae</i> |
|------------------------|---------------------|-------------------------|
| Gram stain | Gram+ve &cocci | Gram+ve &cocci |
| Arrangement | Chain | Pair |
| Catalase | Negative | Negative |
| Oxidase | Negative | Negative |
| Streptokinase | Positive | Negative |
| Capsule | Negative | Positive |
| Inulin | None ferment | Ferment |
| Bile solubility | Negative | Positive soluble |
| CAMP reaction | Negative | Negative |
| Blood hemolysis | Beta | Alpha |
| Bile esculin | Negative | Negative |
| Nacl 6.5% | Negative | Negative |
| Motility | Negative | Negative |
| Spore forming | Negative | Negative |
| Optochin | R | S |
| Bacitracin | S | R |

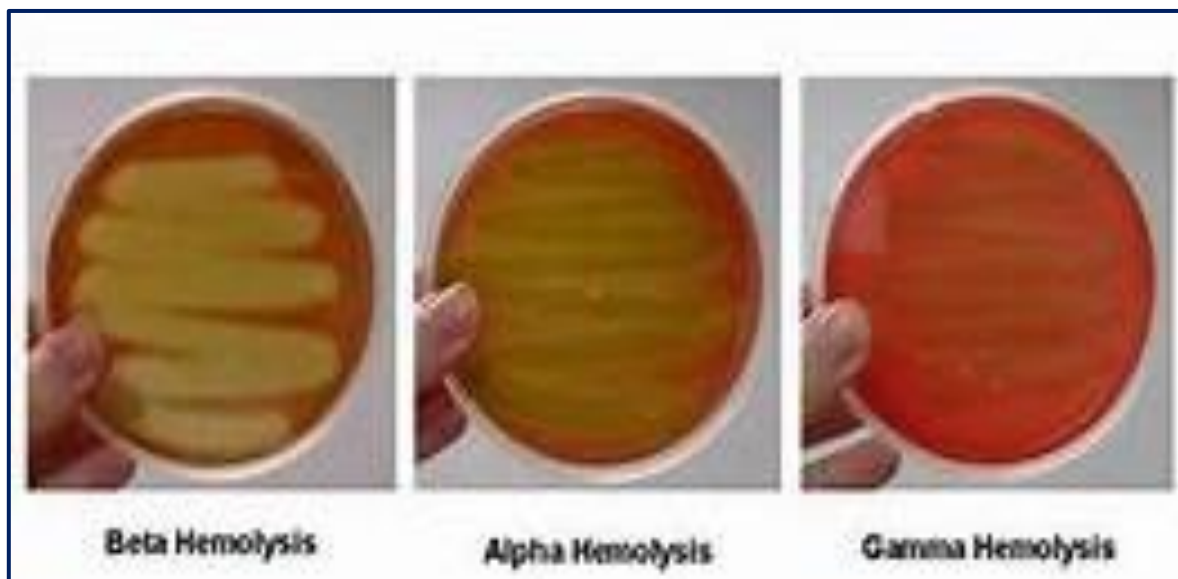
Differences between *S. pneumoniae* and Viridans Streptococci

Differences between *Str. pneumoniae* & Viridans Streptococci

| Property | Pneumococci | Viridans Streptococci |
|---|------------------------|--|
| Morphology | Lanceolate, diplococci | Spherical / oval cocci In long chains |
| Capsule | Present | Absent / Slime |
| Colony | Draughtsman | Dome |
| Bile solubility | Soluble | Insoluble |
| Optochin sensitivity | Sensitive | Resistant |
| Animal pathogenicity (mouse) | Virulent | Avirulent |

Hemolysis

- Beta (β) hemolysis
 - Complete lysis of RBC's surrounding colony causing a clear zone or clearing of blood from the agar
- Alpha (α) hemolysis
 - Partial lysis of RBC's surrounding colony causing a greenish discoloration in media
- Non-hemolytic
 - Also known as Gamma hemolysis (δ)
 - No lysing of RBC's and no color change of the medium surrounding colony



Streptococcus



Gram positive cocci in chains, catalase negative

α

Partial hemolysis

Optochin sensitivity

No

Viridans strep
(unencapsulated)

- *S. mutans*
- *S. mitis*

Yes

S. pneumoniae
(encapsulated)

β

Complete hemolysis

Bacitracin sensitivity

No

Group B strep
• *S. agalactiae*

Yes

Group A strep
• *S. pyogenes*

γ

No hemolysis

Growth in 6.5% NaCl

No

S. bovis

Yes

Enterococci

• *S. faecium*

• *S. faecalis*