Streptococcus 2

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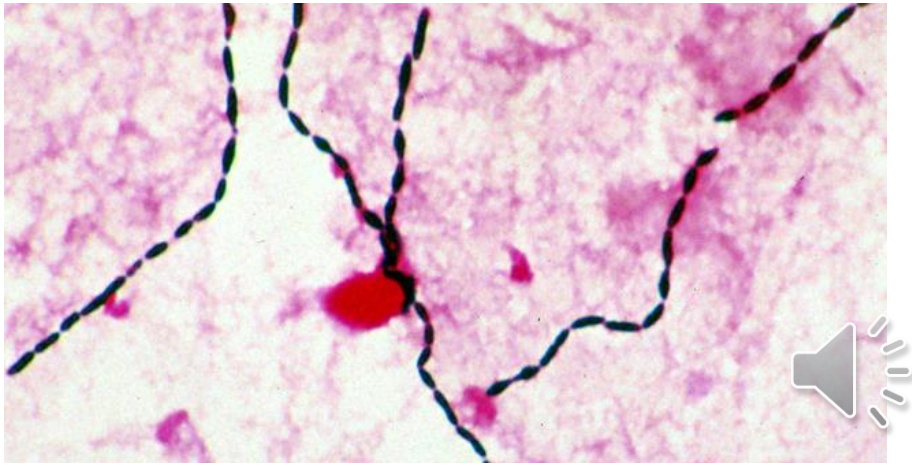
Streptococcus viridans

General Characteristics

- Many streptococci isolated from human source do not possess Lancefield polysaccharide, and they do not belong to any serological group.
- They produce alpha haemolysis on blood agar.



Biochemical reactions

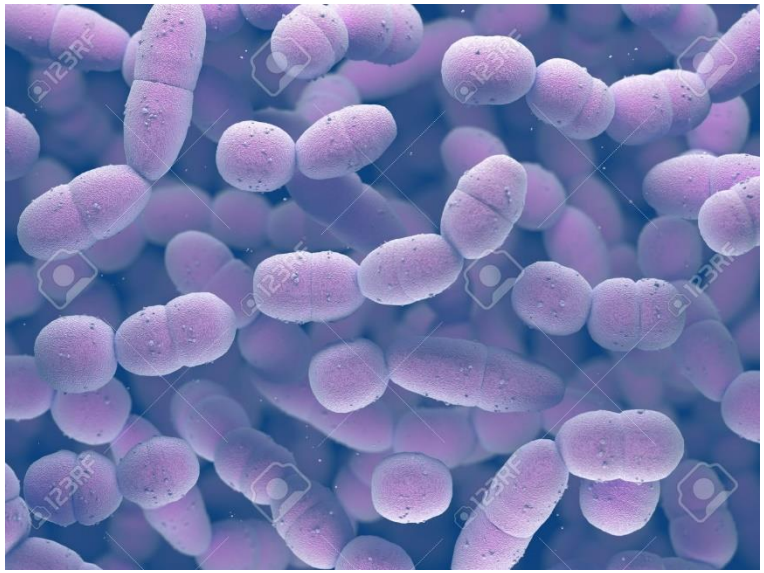
- Based on biochemical reactions, streptococcus viridans group have been classified into five species:
- Streptococcus salivarius
- Streptococcus mutans
- Streptococcus sangius
- Streptococcus mitior
- Streptococcus milleri
- The biochemical reactions are very helpful in differentiating Streptococcus viridans from pneumococcus.

Viridans vs Pneumococcus

characters	pneumococcus	viridans
1-Morphology	Lancelate diplococcus	Rounded cocci in chains
2-Capsule	capsulated	Non capsulated
3-Colony characters on blood agar	Draughtman	Dome shaped
4-Bile solubility test	positive	negative
5-Optochin sensitivity 5µg/Disc	Positive	negative
6-Inulin fermentation	positive	negative
7-Mouse pathgenicity	Positive	negative
8-Specific polysaccharide capsular antigen	present	absent

Streptococcus pneumoniae (pneumococcus)

- Diplococcus Gram positive coccus
- Lancet shaped, in pairs
- Capsulated
- Non motile
- Non sporing forming
- Lysed by bile salts



Streptococcus pneumoniae (pneumococcus)

- Inhabited of upper respiratory tract of man and some animals.
- Causes infection primarily of the respiratory tract, conjunctivitis, otitis media, peritonitis and meningitis.

Cultural characters

It may be cultured on the following media:

- **Glucose broth and serum broth**
- **Blood agar**
- **Chocolate agar**

The growth on ordinary culture media is poor, but it is greatly improved by the addition of glucose, blood, serum.

Cultural characters

- It is aerobic and facultative anaerobe
- Optimum temperature for growth is 37C cultivation Man atmosphere of 5-10% CO2 by using candle jar and
- PH of the medium should be between 7.2-7.4 after sterilization.

Cultural characters

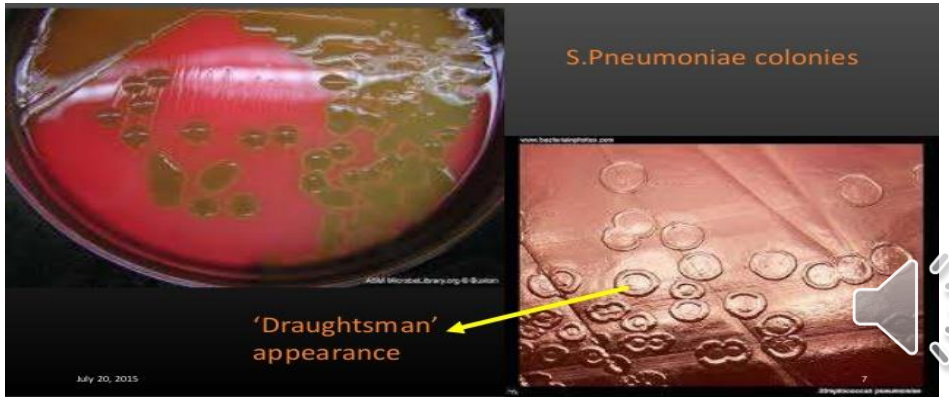
liquid culture media

- After 24hrs of incubation.
- There is inform turbidity of the medium and prolonged incubation may produce clearing of the culture medium due to autolysis of the organisms.

Cultural characters

Blood agar

- After 24hrs the colonies are small about 1mm in diameter semitransparent and surrounded by a zone of alpha-haemolysis.
- The colonies first are dome shaped and later on become draughtsman colonies.



Cultural characters

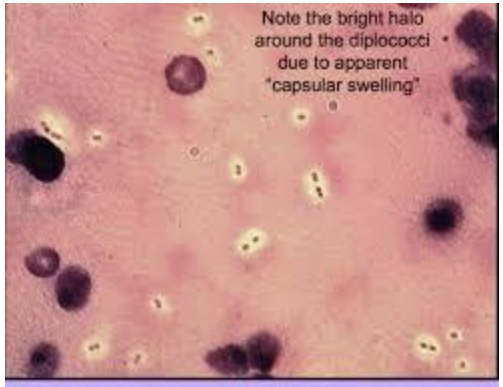
Chocolate agar

- The zone of alpha-haemolysis is better seen on this medium.
- The pneumococci are structurally very delicate organisms and autolyse much more readily than most of the other bacteria and this is due to intracellular ferments.
- Autolytic enzymes action the muramic acid of the cell wall only when the choline containing teichoic acid is present.

Cultural characters

Morphology

- Smear direct form the morbid material shows gram positive diplococci Lanceolate and showing clear zone of halo around the diplococci.



Streptococcus pneumoniae

Capsule

- May be demonstrated either by special capsular staining or by the presence of a halo around the diplococci.

Cultural characters

Bile salt solubility test

- The bile solubility of pneumococci is a constant characteristics although different strains vary in their sensitivity to bile.
- The test contains of adding one part of sterilized 10% solution of sodium taurocholate in normal saline, to 10 parts of a broth culture, PH of which should not be lower than 6.8.

Cultural characters

- Alternatively, 0.2m1 of 10% solution of sodium deoxycholate may be added to 10m1 broth culture.
- The PH of the broth should be in neutral range.
- The lysis occurs within fifteen minutes 37C.

Cultural characters

Optochin sensitivity

The pneumococcus is sensitive to optochin (ethyl-hydro-cuppreine hydrochloride). Sterile filter paper discs 8mm in diameter, impregnated with 51.1g of optochin, are placed over the radially streaked cultures on blood agar plate.

Cultural characters

- The pneumococci are inhibited in a zone of at least 5mm from the edge of the disc
- Strains of Streptococcus viridans grow up to the disc edge.

Cultural characters

Inulin fermentation

- The fermentation of inulin has been used as a differential test to distinguish pneumococcus from Streptococcus viridans while it is true that inulin fermentation is a property of pneumococcus.
- It is not reliable test when used it self, since certain strains of streptococcus especially those of the salivarius group share this property.

Antigenic structure

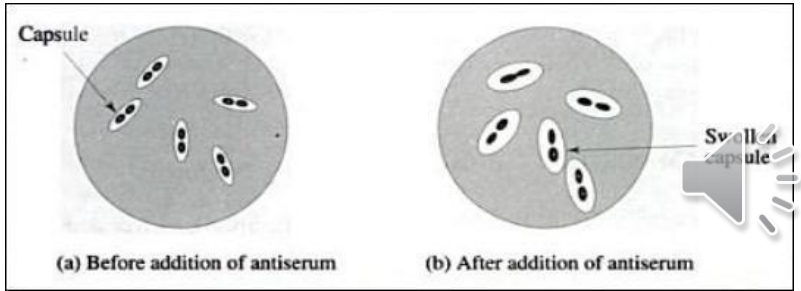
Pneumococci have the following important antigenic components:

1- Capsular polysaccharide: Specific soluble substance(SSS)

- **This substance present on the surface of pneumococci diffuses into the culture medium or infective exudates and tissues.**
- **It is called specific soluble substance, at least 85 specific serotypes of pneumococci have been recognized on the basic of differences in the capsules which surrounded the cells**

Antigenic structure

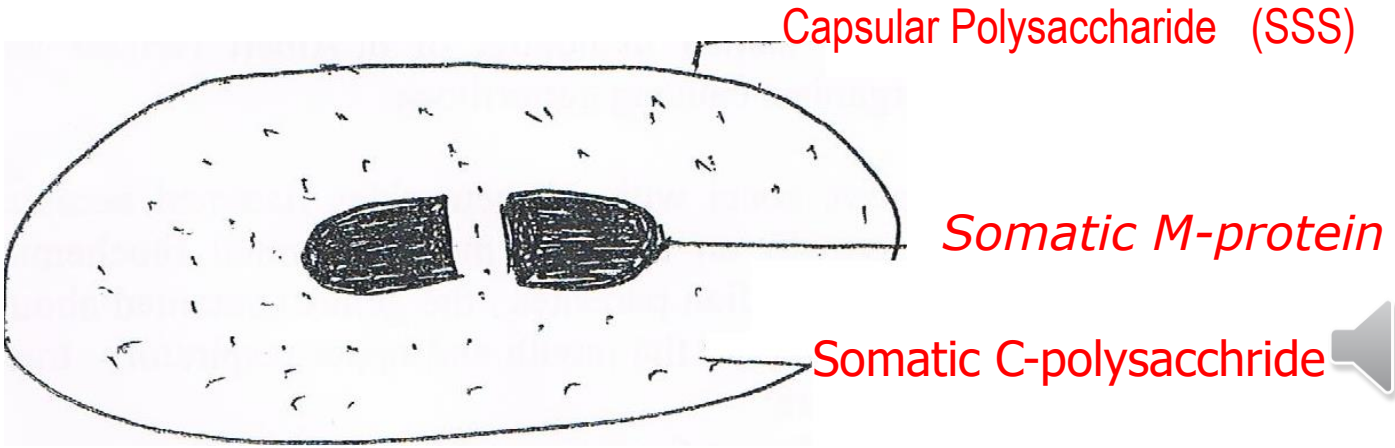
- The capsule composed of species specific polysaccharide antigen which is immunologically distinct for each type.
- The type identification can be established by means of agglutination or by capsular swelling or Quellung reaction it is carried out by mixed sputum or a saline suspension of fresh growth from blood agar or loopful and mixed with antibodies, cover with a cover glass and examined under oil immersion objective. The capsule becomes apparently swollen and enlarged with in 1-2 minutes.



Antigenic structure

2- Somatic M-protein

- As the indicates, this is somatic protein of pneumococci which contains an M-protein antigen. This is deep in the cell and is characteristic for each type.
- **Antigen structure of pneumococci.**



Antigenic structure

3- Somatic C-carbohydrate

- Antigen is common to all pneumococci.
- Bind with C-reactive protein, a substance found in the serum of certain patients suffering from inflammatory or destructive lesions.
- Antibodies to these antigens are not protective.

C- Reactive proteins (CRP)

- These are abnormal proteins (beta globulin) that precipitate with somatic C-antigen of pneumococcus.
- This appears in the acute phase sera of cases of pneumonia and other acute infections.
- It is not an antibody, but is an acute phase substance whose production is stimulated by bacterial infections, inflammatory reaction and tissue destruction.
- The test is performed by passive agglutination using latex particles coated with anti CRP-antibody

Pathogenicity

It may cause

- **Lobar pneumonia**
- **Otitis media**
- **Meningitis**
- **Peritonitis**
- **Sinusitis**
- **Conjunctivitis and septicemia.**

Laboratory diagnosis

Common material referred to the laboratory for isolation and identification of pneumococci are:

- **Sputum**
- **Laryngeal swab**
- **C.S.F.**
- **Pus**
- **Pleural fluid**
- **Blood**

The examination of the material may be considered under the following heading:

- **Direct smear examination.**
- **Capsular swelling reaction (Quellung reaction)**
- **Culture**
- **Animal pathogenicity**