Genus Streptococcus

It is gram positive cocci (spheres or ovoid) found in pairs or chains or diplococci appearance. They require media enriched with blood serum for growth do not grow on ordinary medium.

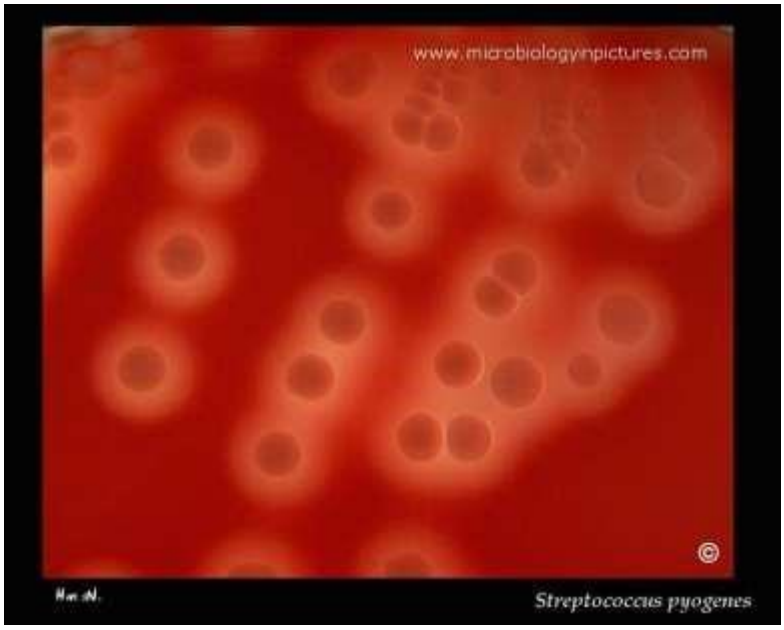
its classification depend on colony morphology and blood agar plate hemolysis type; cell wall group-specific substances (*Lancefield classification*) and capsular antigens especially to *S.pneumoniae* (*Pneumococcus;* over 90 serotypes are present) and for *S.agalactiae* (group B), biochemical reactions (through sugar fermentation or for detection of enzymes or susceptibility and resistance for certain chemicals), molecular study of species.

Many *Streptococci* able to hemolysed RBCs invitro, if it's a complete it called (β-hemolysis), partial destruction with green pigment formation called (α-hemolysis), or they non-hemolytic which called (γ-hemolysis).

Most streptococcal human infections are caused by groups A, B, C, F, and G.

Group A β–hemolytic Streptococcus pyogenes

it produce large hemolysis zone (1 cm) in diameter and colony size equal to 0.5 mm, it is susceptible to bacitracin, *Streptococcus pyogenes* is aerobic and facultative anaerobes with optimum temperature of growth being 37°C. required enriched media with whole blood, serum, or glucose favors rapid growth. colony on blood agar is small, 0.5 to 1 mm (pin point colonies), circular, transparent, low convex with area of hemolysis



its main habitat at pharynx and skin, and its main diseases are pharyngitis, impetigo, rheumatic fever, glomerulonephritis, toxic shock.

Most of group A produce a capsule composed of hyaluronic acid, it inhibit phagocytosis and it play role in bacterial virulence .Also its cell wall contain proteins M protein compose it important for bacteria attachments.

Streptococcal *toxins and enzymes*

1- ***Streptokinase*** (fibrinolysin) it convert human plasminogen to plasmin which digest the fibrin clot,

2- ***Streptodornase*** (deoxyribonuclease) it depolymerase DNA

3- ***Hyaluronidase*** it split hyaluronic acid which is important component of the connective tissue (spreading factor)

4- ***Pyrogenic (erythrogenic exotoxin)*** it associated with toxic shock syndrome and scarlet fever;

6- ***Proteinase and amylase***

7- ***Hemolysins*** it elaborate 2 hemolysin (streptolysin O) which rapidly inactivated by O2 so it responsible for hemolysis in the deep area of BAP; it is responsible for antibodies elaborate after strep infections known as antistreptolysin O (ASO) that its normal range from 160-200 units and any elevation is due to recent infection or reactivation , the other streptolysin is (S) which is O2 stable cause hemolysis at the BAP surface

Streptococcal pyogenes infections I-Infections due to bacterial invasion

Mostly they introduced through skin abrasion by burns or wound or surgical incision e.g. in:

1- Erysipelas 2- Cellulitis

3- **Puerperal fever** (endometritis) a sit enter the uterus after delivery

4- **Bacteremia / sepsis** it usually follow cellulitis and rarely due to pharyngitis

II-Local infection

1- **Sore throat or pharyngitis** as the bacteria attach to pharynx epithelial cells receptors in children the infection occur as subacute nasopharyngitis with serous discharge and mild fever and enlarged cervical lymph nodes.

In older children and adults get acute intense nasopharyngitis, tonsillitis with intense redness and purulent exudate over the mucus membrane, high fever plus tender lymphadenitis.

post streptococcal diseases (rheumatic fever and glomerulonephritis)

The nephritogenic strains, nephritis initiated with Ag-Ab complex deposit onto the glomerular basement membrane, which lead to RBCs and albumin in urine (edema) and elevated blood pressure, low serum complements, its sequel the majority will recovered and the minority get renal failure.

In rheumatic fever it a serious sequel of improper treatment or untreated cases of tonsillitis lead to damage the heart muscle and valves; as some Strep strain gain cell wall antigens cross react with cardiac muscles

antigens, it major clinical picture as fever, malaise, non-suppurative polyarthritis, signs of inflammation in all heart parts i.e. (endocardium and pericardium).

Streptococcus A laboratory diagnosis

1- Specimen throat swab

2- Smears shows cocci or pairs or chain,

3- Culture on BA with the assist of bacitracin diagnostic disk that inhibit its growth and anaerobic culture if suspected, beta hemolysin

4- Antigen rapid detection 5- Serological test:

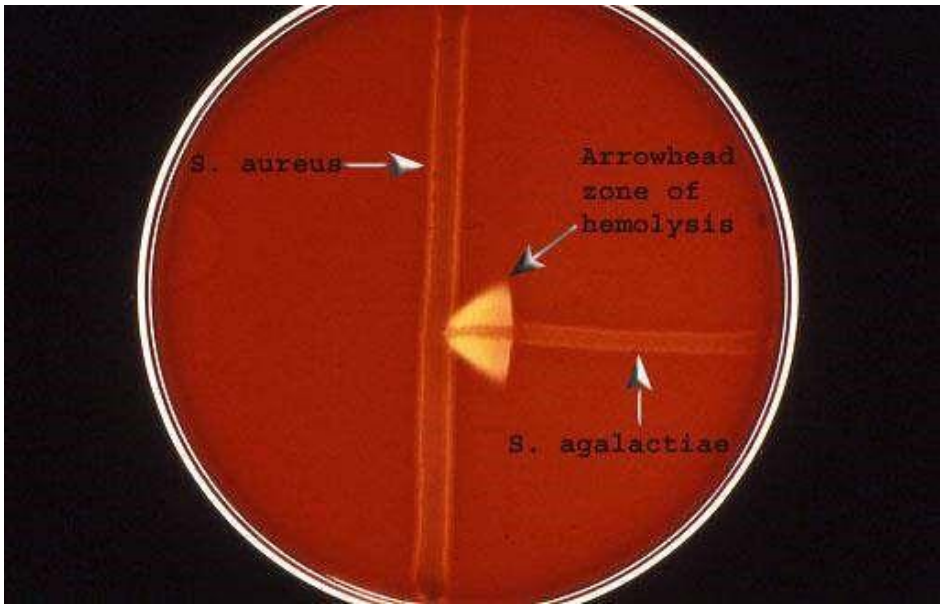
a- ASOT in pharyngitis case *S*

agalactiae

is part of normal flora in 5-25% of women in the genital tract plus lower GIT (asymptomatic carriers), and not all bacteria will cause babies infection when membrane delivery.

S agalactiae cause invasive infections in adults like bacteremia, UTIs,

identified by the **CAMP** reaction



Group D Enterococcus (Streptococci faecalis and bovis)

S faecalis grow in 6.5% NaCl They cause abdominal abscesses, UTIs, endocarditis,

Viridans Streptococci

The viridans streptococci are commensals of mouth and upper respiratory tract infection. The viridans group of streptococci are α- hemolytic *S mutans* produce large polysaccharides like dextrans or levans from sucrose which contribute to the formation of dental caries.

Enterococci or viridans Streptococci as they reach the blood stream (bacteremia) it will settle on normal or already deformed heart valves.

Pneumococci (diplococcus pneumoniae, *Streptococcus pneumoniae*)
Morphology
Pneumococci are gram-positive cocci in pairs (diplococci). presenting a lanceolate appearance. They may occur singly, in pairs, or in short chains but most often are seen as pairs (diplococci), with the They are non-motile and non-sporing. Differentiate from s.viridas by sensitivity to optichin and bile salts

All freshly isolated strains are capsulate. The capsule encloses each pair. The capsule may be demonstrated as a clear halo in Indian ink preparations or by the **Quellung** reaction.

Cultural Characteristics

They are aerobes and facultative anaerobes. It grows best 5-10 percent CO_2. Optimum temperature being 37°C. The pneumococcus grow only in enriched media. It can grow on ordinary media, but better on media with serum, blood or heated blood, which supplies nutrient, On blood agar, after incubation for 18 hours, the colonies are small (0.5-1 mm), dome shaped and glistening, with an area of green discoloration (alpha=hemolysis) around them similar to the greenish discoloration observed with the viridans streptococci.

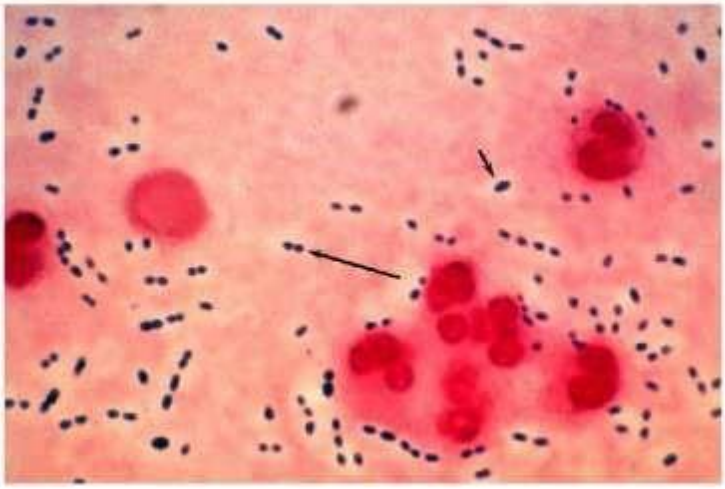
Pathogenicity:

- 50% of all pneumococcal bacteremia are fatal.

In children: are the most important because they are responsible for all pneumococcal infection in children.

Polysaccharide capsule which may prevent or delay phagocytosis. invade the lung producing pneumonia.

Predisposing Factors:

1. Viral infection.
2. Abnormality of respiratory tract.
3. Trauma of pharynx.
4. Allergy.

From lung they may invade the blood stream producing bacteremia.