

Streptococci (Gram positive cocci)

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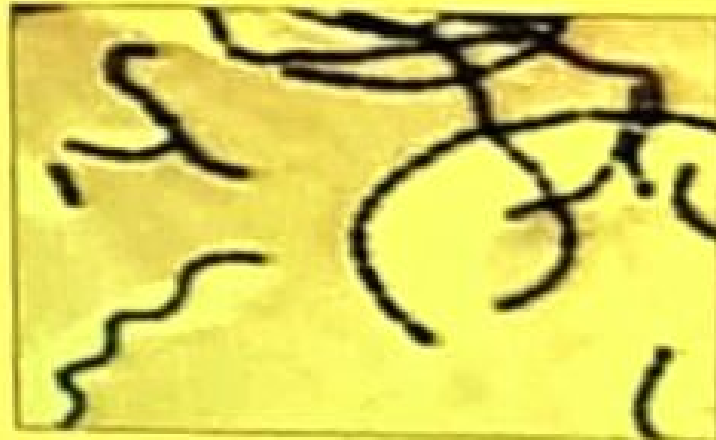
: @docmureithi

Streptococci

- **Characters of Streptococci**

- Gram positive cocci
- 1 μm in diameter
- Chains or pairs
- Usually capsulated
- Non motile

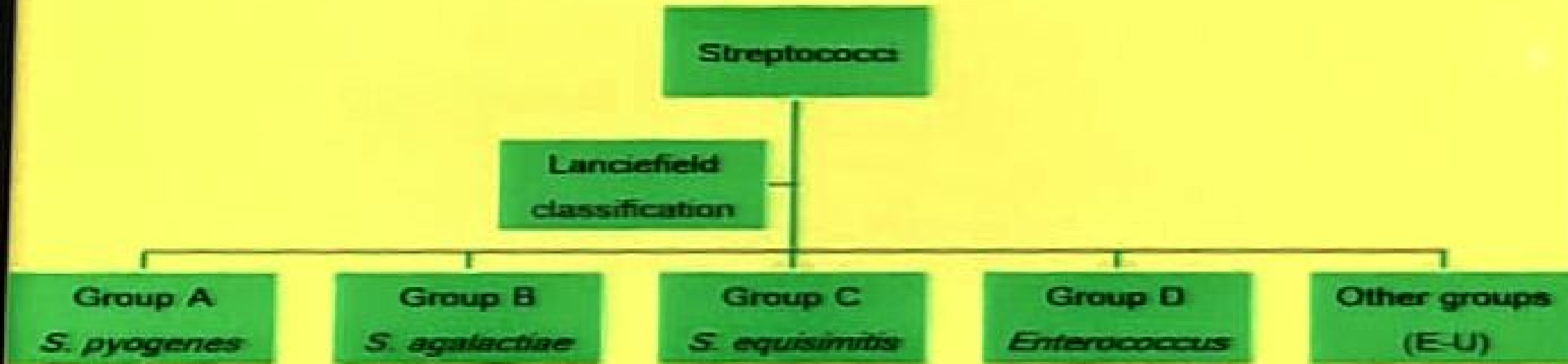
- Non spore forming
- Facultative anaerobes
- Fastidious
- Catalase negative (Staphylococci are catalase positive)



Classification of Streptococci

- Streptococci can be classified according to:
 - **Oxygen requirements**
 - Anaerobic (*Peptostreptococcus*)
 - facultative anaerobic (*Streptococcus*)
 - **Serology (Lanciefield Classification)**
 - **Hemolysis on Blood Agar (BA)**

Serology: Lancefield Classification



- Streptococci classified into different groups

Classification based on C-carbohydrate antigen of cell wall

Classification of Streptococci Based on Hemolysis on Blood Agar

■ Hemolysis on BA

– α -hemolysis

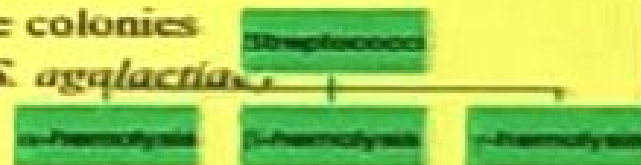
- Partial hemolysis
- Green discoloration around the colonies- Iron oxidation.
- e.g. non-groupable streptococci (*S. pneumoniae* & *S. viridans*)

– β -hemolysis

- Complete hemolysis
- Clear zone of hemolysis around the colonies
- e.g. Group A & B (*S. pyogenes* & *S. agalactiae*)

– γ -hemolysis

- No lysis
- e.g. Group D (*Enterococcus spp*)

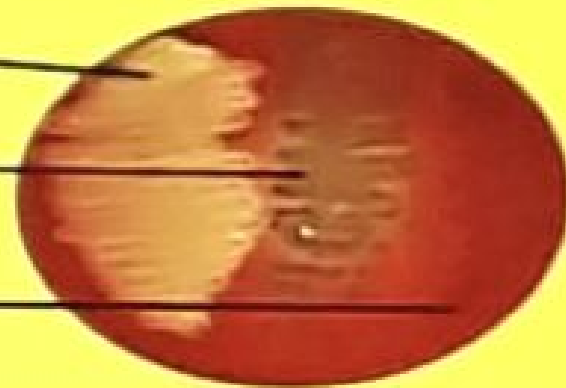


Hemolysis on Blood agar

β -hemolysis

α -hemolysis

γ -hemolysis



Beta hemolytic Group A Streptococcus (GAS)



Group A Streptococci(GAS)

Streptococcus pyogenes:

Pyogenes means pus producing

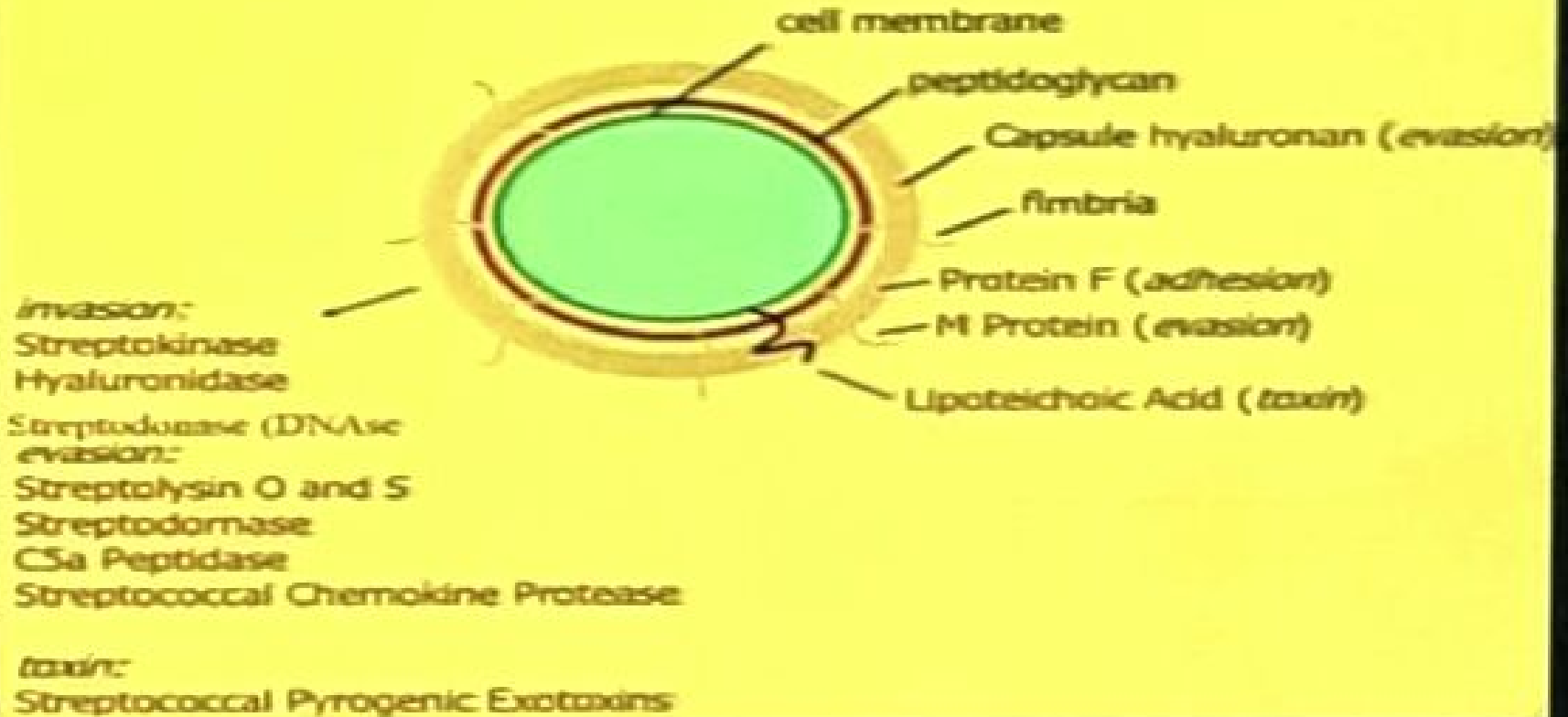
- Gram-positive cocci in chains
- Aerobes/facultative anaerobes
- Catalase negative
- Non-motile
- Non spore forming

Commensals- skin and mucous membranes

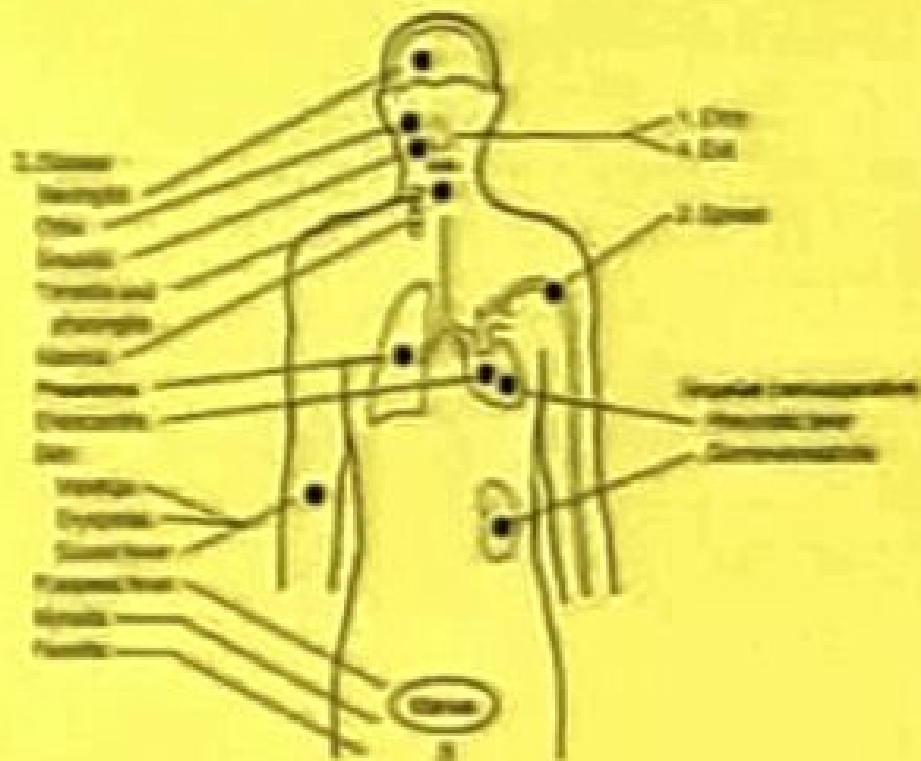
- Transmission- mainly droplet



GAS Virulence Factors



Infections caused by *Streptococcus pyogenes* (GAS)



- Superficial diseases

pharyngitis, skin & soft tissue infⁿ, erysipelas, impetigo, vaginitis, post-partum infⁿ

- Deep infections

bacteraemia, necrotising fasciitis, deep soft tissue infⁿ, cellulitis, myositis, puerperal sepsis, pericarditis, meningitis, pneumonia, septic arthritis

- Toxin-mediated

scarletina, toxic shock-like syndrome

- Immunologically mediated

rheumatic fever, post-streptococcal GN, reactive arthritis

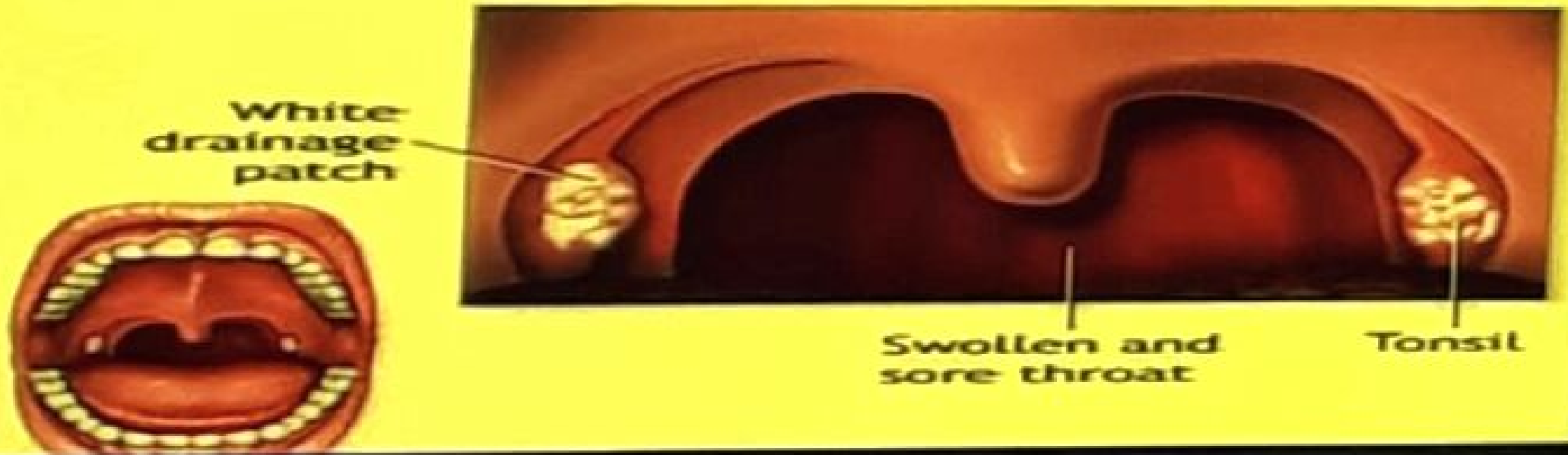


Strep throat

β - hemolytic - Group A (GAS) streptococci: *S. pyogenes*

Droplet Transmission

Symptoms: Sore throat, high fever, coughing, otitis media may also occur



Complications of Strep Throat

S. pyogenes causes two major autoimmune complications (antibodies cross-react)

1. Acute rheumatic fever:

Short period of arthritis and fever followed in ~ 50% of affected by **rheumatic heart disease**

⇒ heart valve damage ⇒ chronic valvular disease (stenosis and/or incompetence) ⇒ heart failure and/or subacute bacterial endocarditis

2. Acute poststreptococcal *glomerulonephritis*

Laboratory diagnosis

- **Specimen:** Throat swabs, pus swabs, blood, CSF etc
- **Direct Gram stain-** Gram-positive cocci in chains, pus cells
- **Culture:**
 - BA, aerobically, 37°C for 18-24 hours
 - Smooth circular colonies of 2-3 mm diameter, β -haemolysis
- Gram-positive cocci in chains
- Catalase negative
- Bacitracin sensitive

Treatment and Prevention

Treatment

- Cephalosporins
- Tetracyclines
- Erythromycin
- Chloramphenicol

Prevention

- Infection control
- Treat pharyngitis as early as possible to prevent ARF
- No vaccine

"A sore throat
can lead to a
broken heart"



Group B Streptococci(GBS)

Streptococcus agalactiae

- Colonises GUT or lower GIT in 5-10%
- Gram-positive cocci in chains
- Non-sporing
- Non-motile
- Usually capsulated



Clinical manifestations

- Neonates
 - Neonatal sepsis and meningitis
 - Neonatal pneumonia

Early onset neonatal disease(1st 7 days of life)-

- Vertical transmission in utero or at time of delivery

Late onset(7-90 days)- nosocomial/vertical



Lab diagnosis – Group B Streptococci

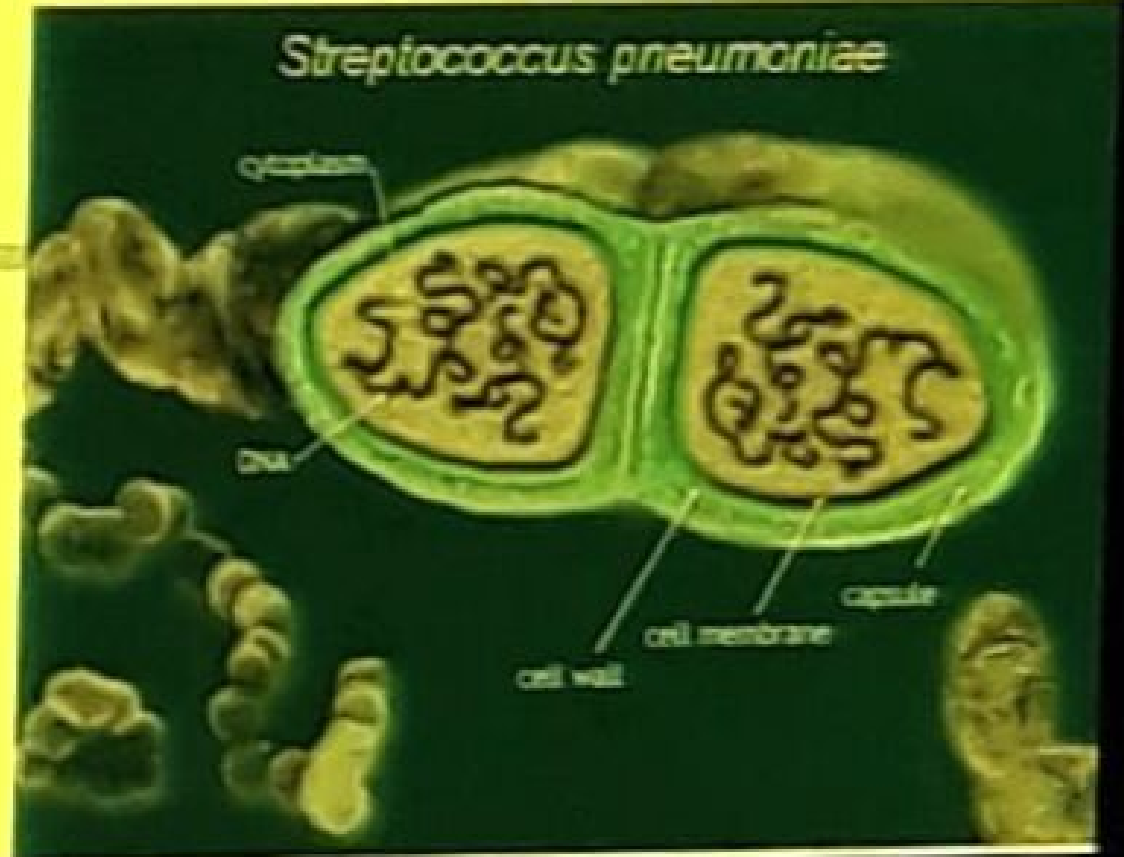
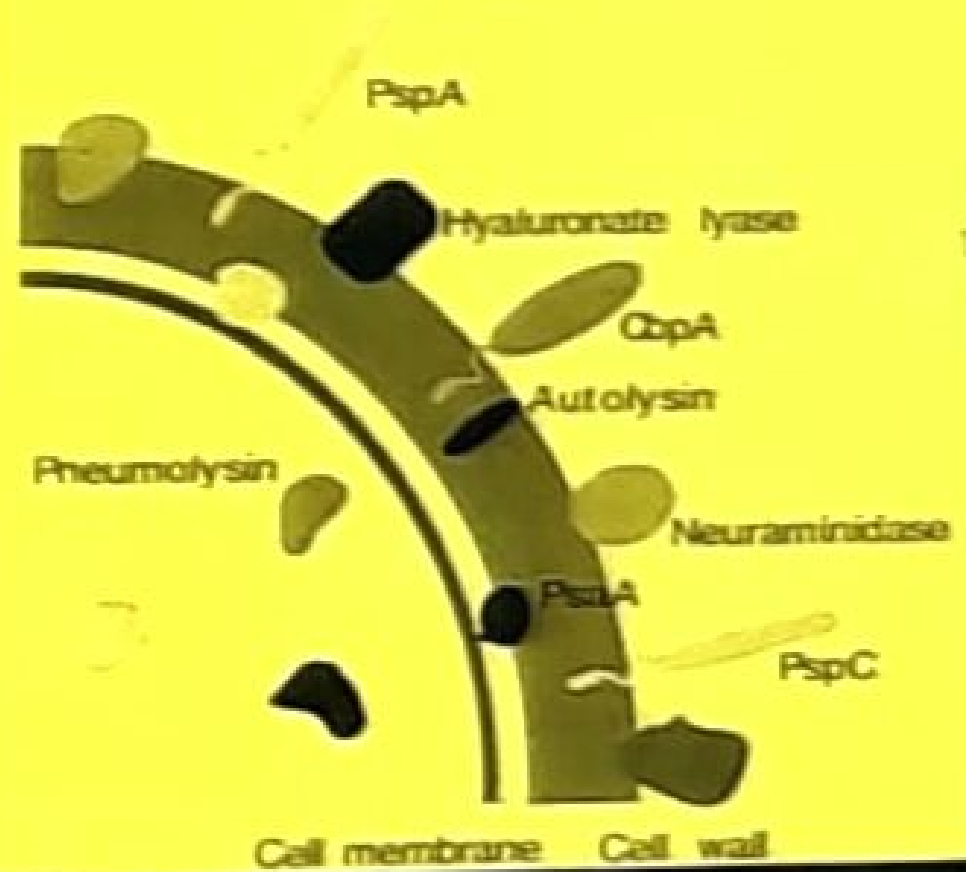
- Specimens: CSF, blood, vaginal smears, urine
- Microscopy :Gram stain – **GPC in chains**
- Culture: BA - **beta hemolytic colonies**
- Identification tests
 - Catalase negative
 - **Bacitracin resistance**
 - **CAMP Test +**
 - Penicillin sensitive

Instructions for the collection of a genital swab for the detection of a group B streptococcus (GBS)



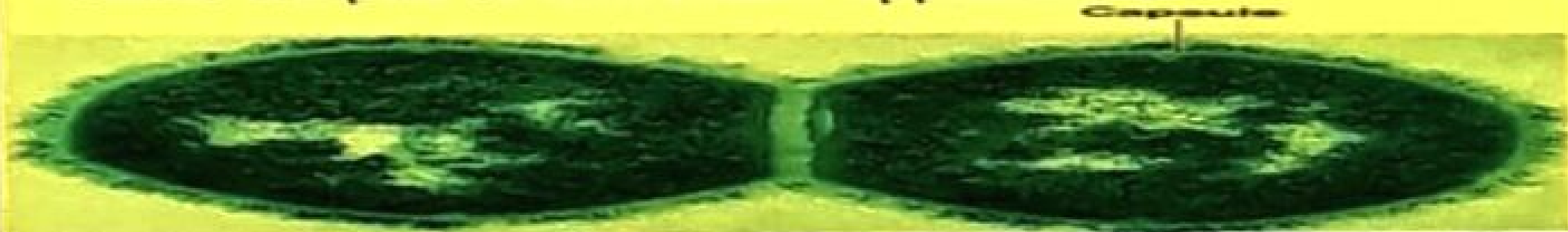
Alpha hemolytic streptococci

Streptococcus pneumoniae



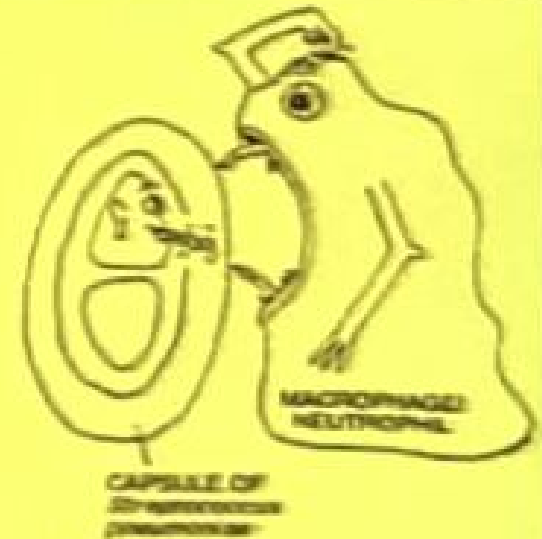
INTRODUCTION:

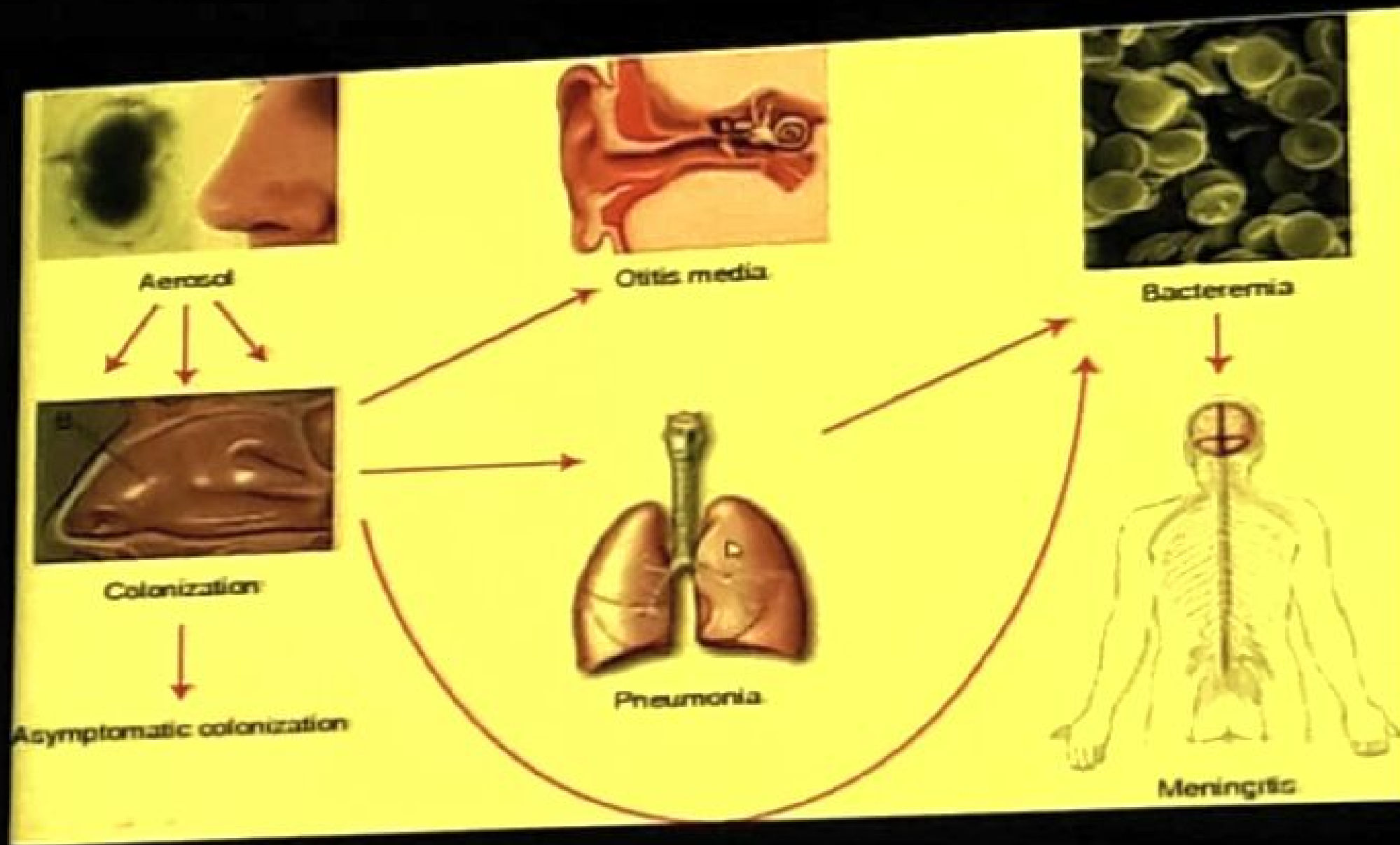
- Common name **Pneumococcus.**
- **Has over 95 Serotypes**
- Normal inhabitants of the upper respiratory tract of human beings.
- Gram positive small($1\mu\text{m}$), slightly elongated cocci, with one end broad & other end pointed, presenting a flame shaped or lanceolate appearance.



Virulence

- **Capsular polysaccharide**– antiphagocytic
- **IgA₁ protease**
- **Pneumolysins**
 - Slows ciliary beating
 - Toxic to pulmonary endothelial cells
 - Spread of organism from alveoli into bloodstream
- **Autolysin**
 - Breaks the peptide cross-linking of the cell wall peptides leading to cell lysis





Lab diagnosis

Specimen: CSF, blood, sputum, pus, swabs

Microscopy: Gram stain – GPC in pairs, capsulated, lanceolate shaped

Culture

– BA – alpha hemolytic colonies

Identification tests

- Catalase –ve
- Optochin sensitive
- Bile solubility
- Quellung reaction



2. Quellung(capsular swelling) reaction:

- It is described by Neufeld.
- On a slide the sputum is mixed with type specific antiserum against capsular antigen & a loopful of methylene blue solution. The capsule becomes swollen & refractile.



Treatment and Prevention

Treatment

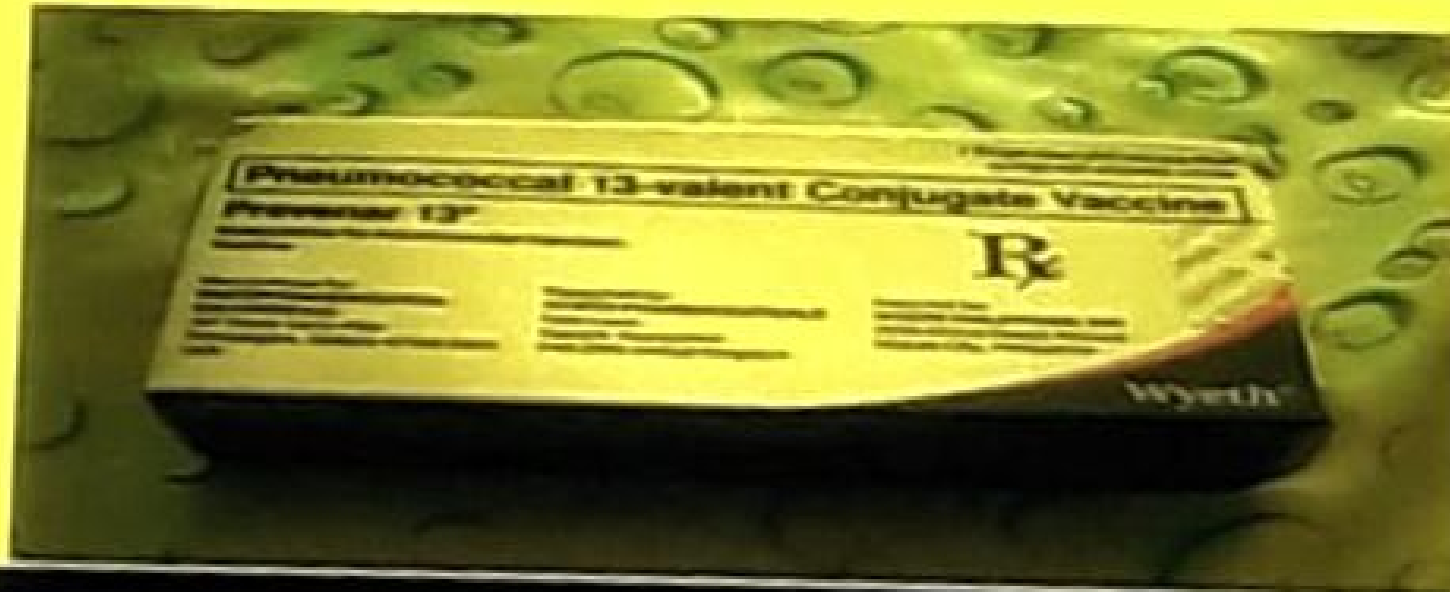
- Penicillins, ampicillin- resistance increasing
- Ceftriaxone, cefotaxime, carbapenems, fluoroquinolones, erythromycin, chloramphenicol, vancomycin

Prevention

- Vaccine

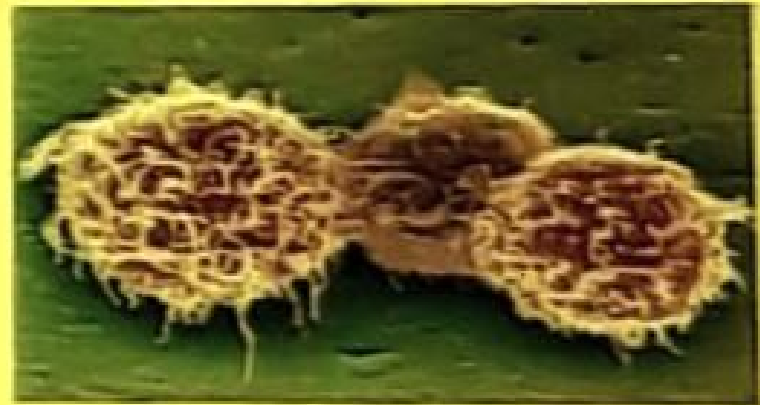
Conjugate Vaccine

- A new generation of pneumococcal vaccines
- Coating removal of the capsular polysaccharide
- 7 (9, 11 or 13, ...) types of saccharide is separately activated and conjugated to protein carrier



Viridans Streptococci

- Normal flora of oral cavity, nasopharynx, genital tract and skin
- *S.mitis*
- *S.mutans*
- *S.milleri*
- *S.salivarius*
- *S.sanguis*



Viridans Streptococci

- Entrance into tissues usually occurs through dental and surgical instrumentation and manipulation
- **Dental procedures** can lead to bacteraemia, meningitis, abdominal infection and tooth abscesses

Clinical manifestations

- Dental caries
- Gingivitis, pyogenic oral infections
- Subacute bacterial endocarditis
- Brain abscesses, abdominal abscesses



Laboratory diagnosis

- Specimen: blood, pus
- Gram stain- Gram-positive cocci in chains
- Culture on BA
 - Incubate in air at 37°C for 18-24 hours
- Biochemical tests
 - Catalase negative
 - Optochin resistant
 - bile insoluble
- Molecular studies e.g. PCR

Treatment

- Prophylaxis to patient at risk during dental surgery
- Penicillin and other β -lactam
- Ampicillin and Gentamicin
- Vancomycin- for penicillin allergies

Group D Streptococcus- Gamma Hemolytic

Enterococcus – 2 imp. species

E. faecalis

E. faecium

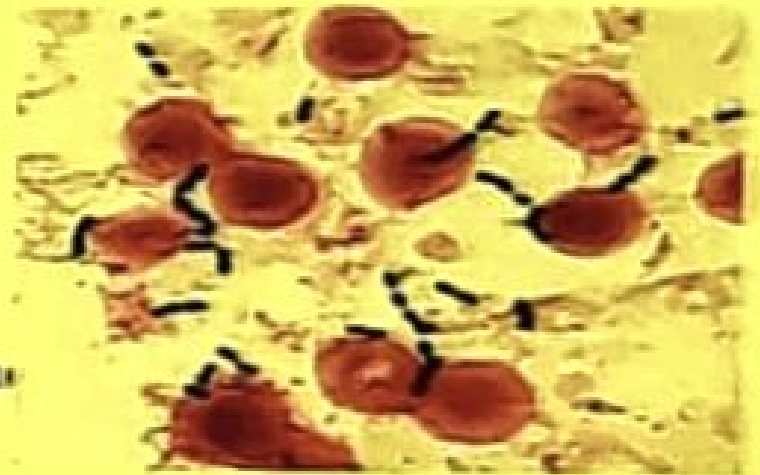


Normal flora in GIT, lower genital tra

Nosocomial / opportunistic pathogen

UTI, wound infection, endocarditis

Resistance to cephalosporins, even vancomycin



Hemolysis Patterns of Streptococci

