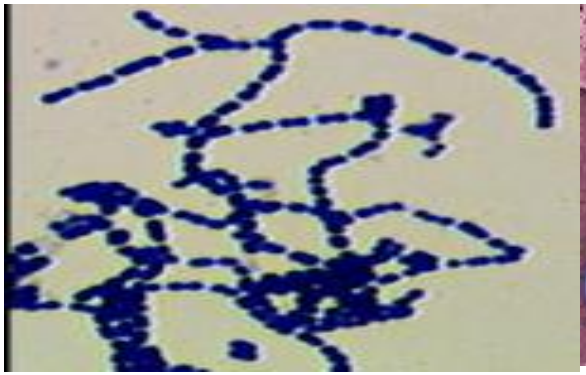
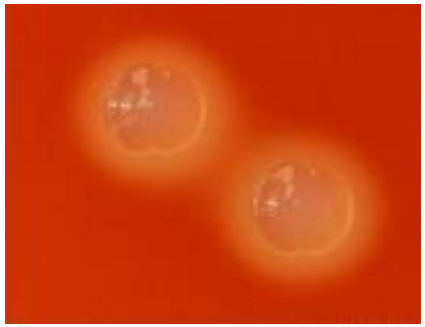
Medical bacteriology – Lecture 8

Streptococcal Diseases



Streptococcus agalactiae



***Strep. agalactiae* on blood agar**

- Beat haemolytic
- Lancifield group B
- Regularly resides in human vagina, pharynx and large intestine
- Can be transferred to infant during delivery and cause severe infection

- **Clinical features:**
- **Neonatal sepsis**
- **pneumonia**
- **meningitis**
- **Septic abortion**
- **Puerperal sepsis**

- **Groups A & B Streptococci are treated with penicillin/ Erythromycin.**
- No vaccines available

Group B Strep
GBS
S. agalactiae

Normally Inhabit lower GI
Female genital tract (20%)

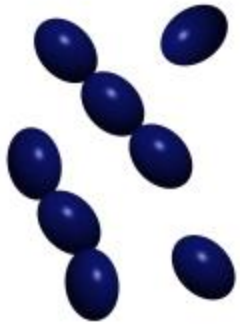
↓

neonatal sepsis, meningitis and pneumonia

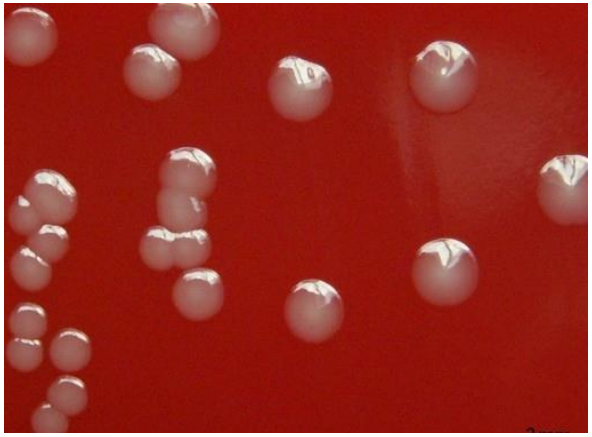
↙ ↘

20% fatal:30-50%w/permanent brain damage

Enterococcus faecalis



- Lancefield Group D
- normal colonists of human large intestine
- Nosocomial Infections
- cause opportunistic urinary, wound and skin infections
- Grow in the presence of 6.5% NaCl.
- Grows in macconkey agar
- Usually α hemolytic or non-hemolytic
- Naturally high levels of antibiotic resistance
- Sensitivity testing needed for enterococci
- Treatment (Penicillin+ Gentamycin)
- No vaccines available



Enterococcus faecalis **colonies on Blood Agar, Gamma hemolysis**

Viridans streptococci

- They possess no Lancefield antigens.
- Non haemolytic- alpha haemolytic.
- **Optochin resistant**.
- Not soluble in bile salts
- Heterogeneous group of organisms

–Human commensals

–Pathogens

- eg. *Streptococcus mutans (***dental caries)**
- *Streptococcus salivarius*

- **Clinical features**
- endocarditis
- bacteremiae

Streptococcus pneumoniae

Diplococcus pneumoniae

***Strep. pneumoniae colonies* on blood agar**

- Gram-positive, cocci. Usually, pairs of cocci (**diplococci)**, may also occur singly and in short chains.
- **alpha hemolytic**. usually cultured in media that contain blood- **fastidious** - growing best in 5% Co2.
- do not form spores- nonmotile.
- Possess a **capsule** of polysaccharide that permits typing with specific antisera
- Young colonies resemble dew-drops due to capsule- spontaneous autolysis of older bacteria
- fermentative aerotolerant anaerobe (Special tests such as inulin fermentation, bile solubility, Quelling reacion, optochin antibiotic) sensitivity must be routinely employed to differentiate the pneumococcus from *Strep. viridans.*

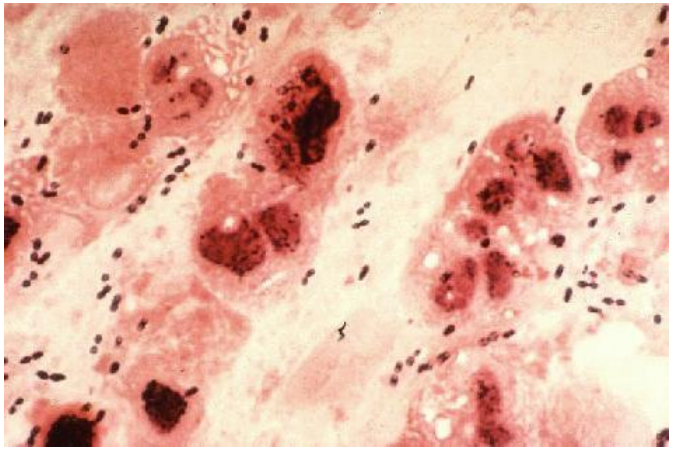
- **Like other streptococci,** they lack catalase and ferment glucose to lactic acid.
- **Unlike other streptococci,** they do not display C- substrate cell wall composition

- normal inhabitant of the human upper respiratory tract- can cause pneumonia, sinusitis, otitis media, meningitis- It also causes osteomyelitis, septic arthritis, endocarditis, cellulitis and brain abscesses.
- usually secondary to one of the former infections.
- *Strep. pneumoniae* is currently the leading cause of invasive bacterial disease in children and the elderly.
- **IgA Protease**

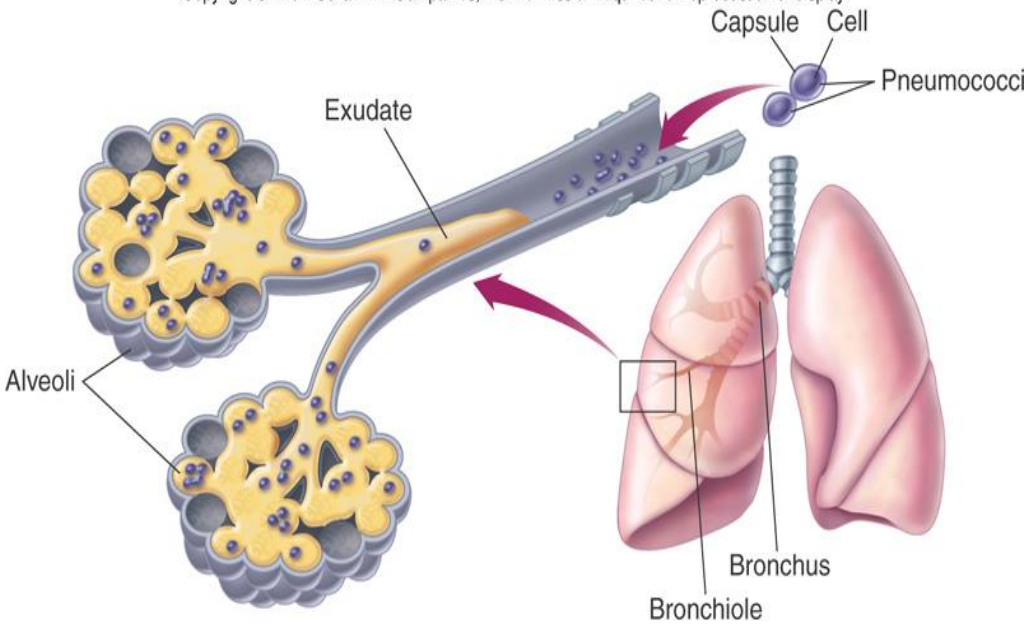
Pneumonia is a disease of the lung that is caused by a variety of bacteria including *Streptococcus, Staphylococcus, Pseudomonas, Haemophilus, Chlamydia & Mycoplasma,* several viruses, and certain fungi and protozoans. The disease may be divided into two forms, **bronchial pneumonia** and **lobar pneumonia**.

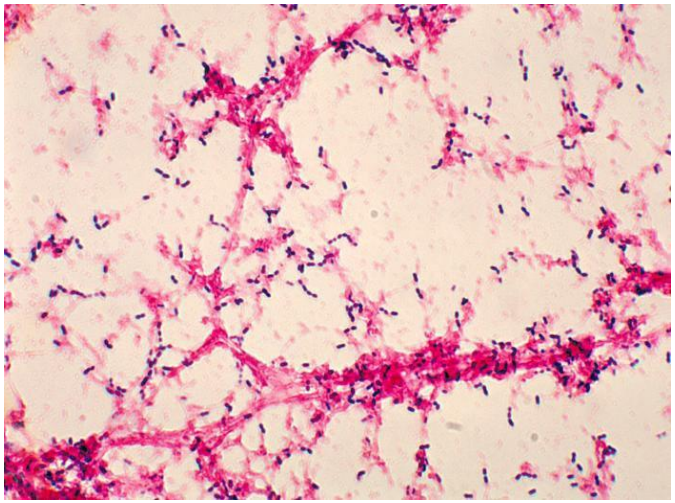
Bronchial pneumonia is most prevalent in infants, young children and aged adults. It is caused by various bacteria, including *Strep. pneumoniae.*

Lobar pneumonia is more prone to occur in younger adults. A majority (more than 80%) of the cases of lobar pneumonia are caused by *Strep. pneumoniae.*

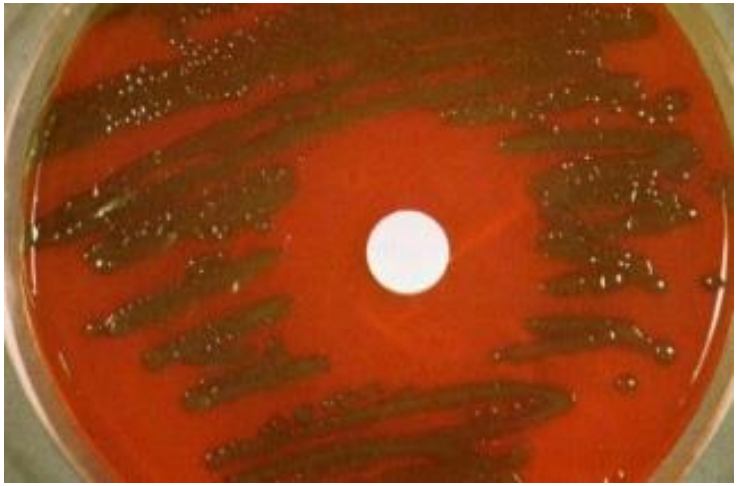


Gram stain of a sputum from a case of lobar pneumonia. CDC.





Strep. pneumoniae **gram stain of blood broth culture. CDC.**



Strep. pneumoniae **A mucoid strain on blood agar showing alpha hemolysis (green zone surrounding colonies). the zone of inhibition around optochin. Viridans streptococci are not inhibited by optochin**

Cell Surface Structure

- **Capsule**

  polysaccharide

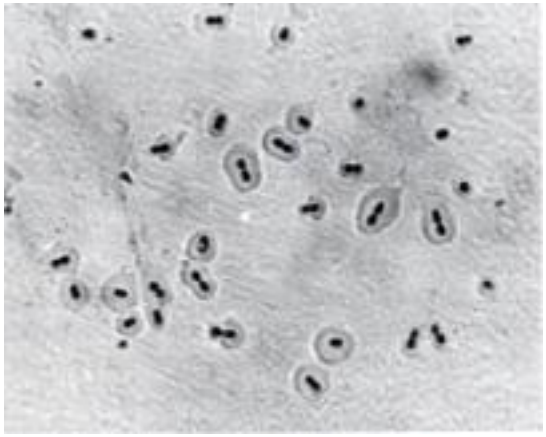
  Completely envelops the pneumococcal cells.

  During invasion; the **capsule is an essential determinant of virulence.**

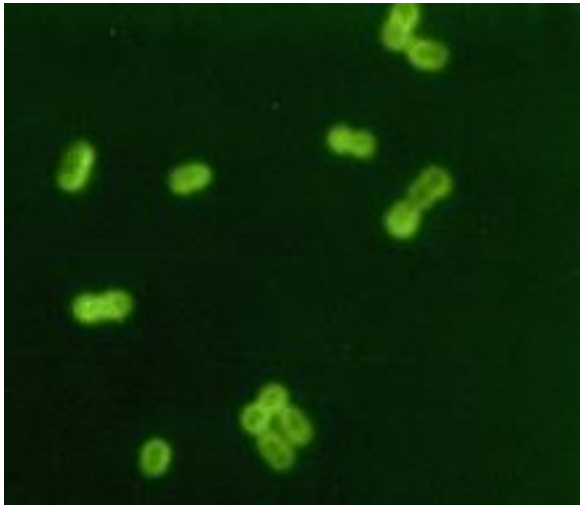
  The capsule interferes with phagocytosis by preventing complement C3b opsonization of the bacterial cells.

  90 different capsule types of pneumococci have been identified and form the basis of antigenic serotyping of the organism.

- **Anti-pneumococcal vaccines** are based on formulations of various capsular (polysaccharide) antigens derived from the highly-prevalent strains.



Strept. pneumoniae **Quellung (capsular swelling) reaction can be used to demonstrate the presence of a specific capsular type of the bacterium.**



Strept. pneumoniae **Fluorescent antibody stain of capsular material. CDC.**

Treatment

- Traditionally treated with
- Amoxicillin
- Chloramphenicol
- Third generation Cephalosporins

Differentiation of streptococcus species

Specie	Lancifield Group	Blood Haemolysis	Catalase test	Bacitracin test	Optichan test	Bile Soluble test	Litmus Milk Reduction test	CAMP test	Ferment lactose
S. pyognes									
S. agalactiae									
Enterococci									
Viridans Streptococci									
S.pneumoniae									

Review Questions

- 1- Compare between *Streptococcus pneumonia* & *viridians streptococci*- *Streptococcus pyogenes* & *Streptococcus agalacteae*?
- 2- Compare between *S.aureus* and *S. pyogenes?*
- 3- Compare between two types of pneumonia with examples
- 4- what is the major virulence factors of *Strep. Pneumoniae?*