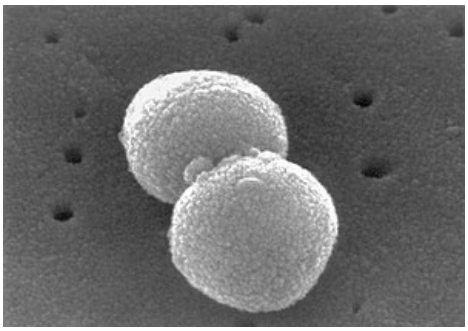
Streptococcus pneumoniae

Streptococcus pneumoniae is a gram-positive, facultatively anaerobic, α-hemolytic, viridating coccus that grows in pairs and has a lancet shape. It commonly colonizes the mucosa of the upper respiratory tract in unencapsulated form (70% of children are colonized). It is a conditioned pathogen - in encapsulated form (the case surrounds the whole pair) it can cause serious infections - meningitis, pneumonia, sepsis.

It is usually preceded by other infections and influences that reduce local immunity - elderly patients, with reduced spleen capacity, reduced opsonization, damaged liver. It does not have a group-specific antigen (β-hemolytic only). It is highly sensitive to external influences (important for transport and investigation methods). It is capnophilic and causes β-hemolysis under anaerobic conditions (due to Streptolysin O). Lacks group specific capsule Ag - Lancfield classification. Ag specificity is given by a specific teichoic acid (sometimes also C-substance) that reacts with CRP.

Diagnostic procedure



Streptococcus_pneumoniae-263

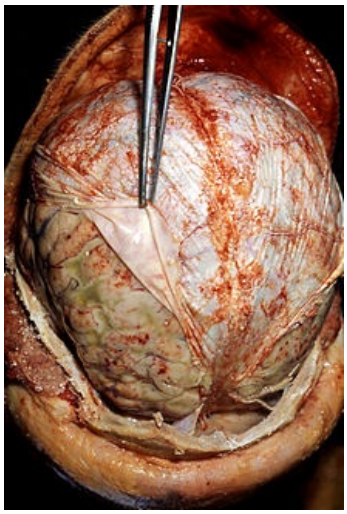
- **material:** urine, cerebrospinal fluid, sputum
- **identification:**
  - **microscopy:** G + cocci, staining on cases;
  - **cultivation:** KA (small, transparent colonies with α-hemolysis);
  - **tests:** positive optoquine test, positive bile solubility test.
- **serological methods:** detection of capsular antigen by immunoelectrophoresis, imunofluorescence.

Virulence factors

- capsular polysaccharide antigen (in M and S-phase);
  - more variants (80–100), some ex. identical to the blood antigen;
  - anti-phagocytic properties, not toxic;
  - **sheath** is a major pathogenicity factor;
  - phagocytosis only after complement opsonization (IgG2 anti-encapsulation antibodies) → vaccination;
- **pneumolysin**,
  - cytolysin, retards oxidative processes and chemotaxis PMN;
  - necrotizing effects - damage to endothelial and DC epithelial membranes;
  - promotes inflammation, needs complement;
- **high metabolic activity**;
  - consumes blood sugar and glycogen stores → lactic acid is formed → acidosis;
  - blood glucose drops;
  - metabolic disruption of the organism (especially in patients with damaged liver);
- adhesins, invasins (hyaluronidase, neuraminidase).

Diseases

S. pneumoniae is a conditioned pathogen, its infections are preceded by other infections and influences that reduce local immunity (viral infection, aspiration of contaminated nasopharyngeal secretions). He is primarily responsible for the damage **inflammatory reaction of the organism** – pneumococcus is not toxic but invasive.



Autopsy finding - brain surrounded by pus as a result of bacterial meningitis

Infections caused by *S. pneumoniae* are:

- **pneumococcal pneumonia**,
  - 20% pneumonia, community-acquired pneumonia
  - penetration into the interpleural cavity - purulent deposits, bacteremia (almost always)
- **purulent meningitis**,
- upper respiratory tract infections: **sinusitis, otitis media**.

S. pneumoniae It multiplies in the bloodstream, where it consumes blood sugar, especially glucose, which it converts into lactic acid, which can cause a drop in blood sugar and acidosis.

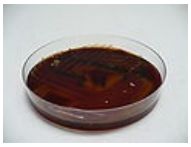
Therapy

penicilin is used, however, a number of strains have developed resistance (by modifying the penicillin binding protein, or by using mosaic genes for "pbp" resistance - by recombination of the original DNA with DNA from related species (viridizing streptococci)). The source of resistance is the natural microflora. In addition to penicillin, it is also used**cefalosporin**. Alternatives are: macrolides.

- **Vaccine**: In vulnerable people (immunosuppression, old age, asplenie) vaccination with polysaccharide

capsules of 23 types of pneumococci is performed.

Photo gallery



Cultivation of *Streptococcus pneumoniae* on blood agar, M-phase

Streptococcus pneumoniae M-phase-blood agar-detail hemolyzy.jpg

Cultivation of *Streptococcus pneumoniae* on blood agar, M-phase, detail of hemolysis

Cultivation of *Streptococcus pneumoniae* on blood agar, R-phase

Cultivation of *Streptococcus pneumoniae* R-phase-detail of hemolysis

Summary video

https://www.youtube.com/watch?v=VcU_xgSzk4k

Links

related articles

- **Streptococcal infections**: Group A streptococcal infection • Scarlet fever • Sleep angina • Erysipel • Impetigo • Infections caused by virulent streptococci • Complications and treatment of streptococcal infections • Rheumatic fever

References

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