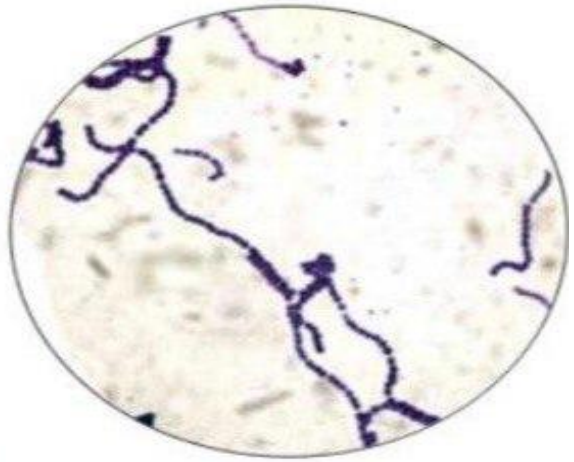
Streptococcus spp.

- Species
- Morphology and Staining
- Cultural Characteristics
- Biochemical Tests
- Diseases
- Diagnosis





Assistant Lecturer Wasan Jassim Hassan

Department of Environmental Health

Species

Family Streptococcaceae consist of a large family of medically important species, including Streptococcus spp. and Enterococcus spp.

Beta-hemolytic streptococci neonatal meningitis and septicemia

- Streptococcus pyogenes (group A streptococci)
- Streptococcus agalactiae (group B streptococci)
- Streptococcus pneumoniae (Groups C, F, and G beta-hemolytic streptococci)

alpha-hemolytic (Viridans streptococci) oral dental caries

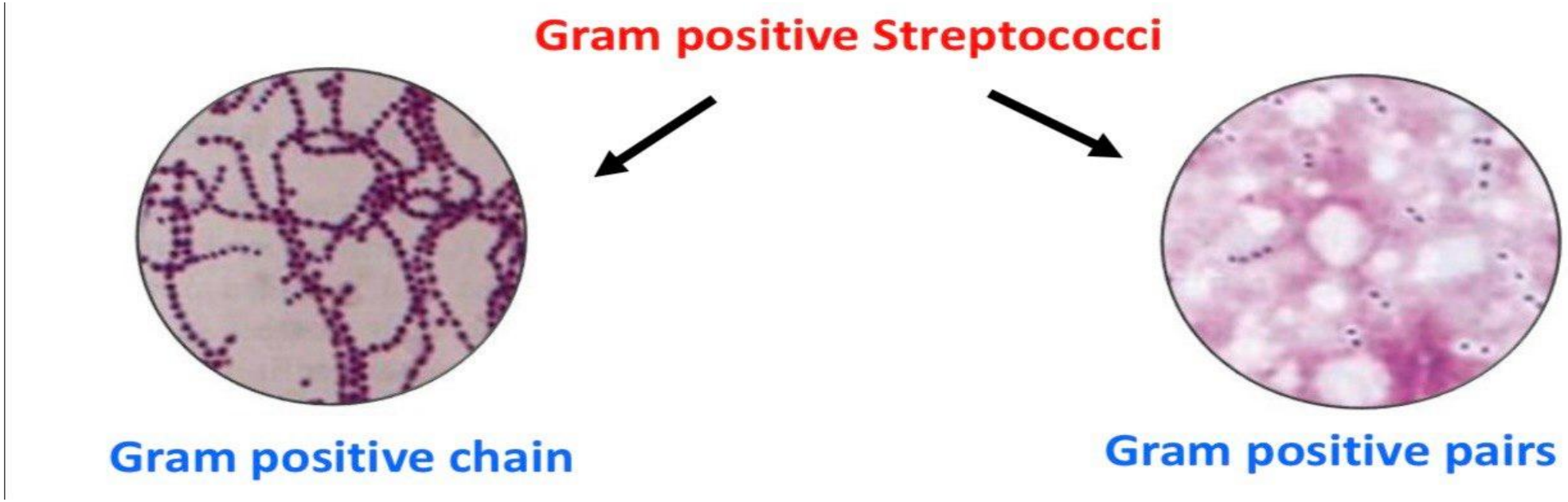
- Streptococcus mutans group
- Streptococcus salivarius group

Enterococci (most commonly isolated) urinary tract infection fecal contamination

- Enterococcus faecalis
- Enterococcus faecium

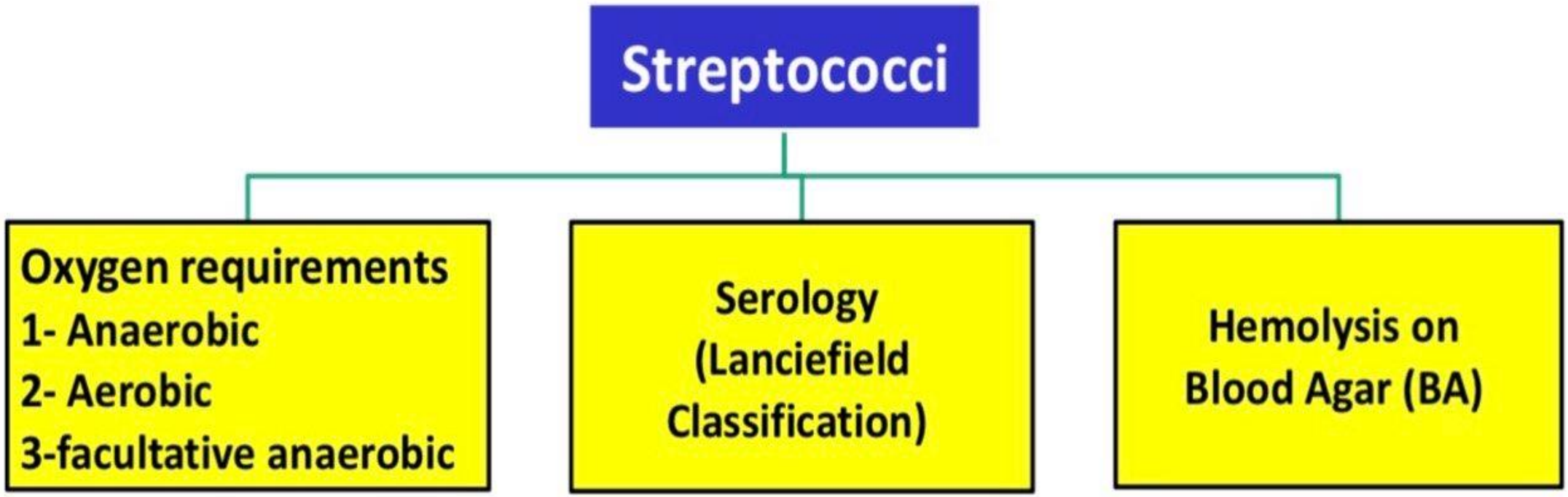
Morphology and Staining

- Streptococci and enterococci are Gram positive cocci.
- Each coccus is about 1 µm in diameter.
- They occur in pairs or chains of varying length.
- Usually capsulated.
- Non motile, non spore forming .



Classification of Streptococci

Streptococci can be classified according to:



Cultural Characteristics

- Streptococci are aerobes or facultative anaerobes.
- They are fastidious and require the addition of blood or serum to cultural media.
- Optimum temperature for growth is 37 °C .

The media used to cultivate the Streptococci are:

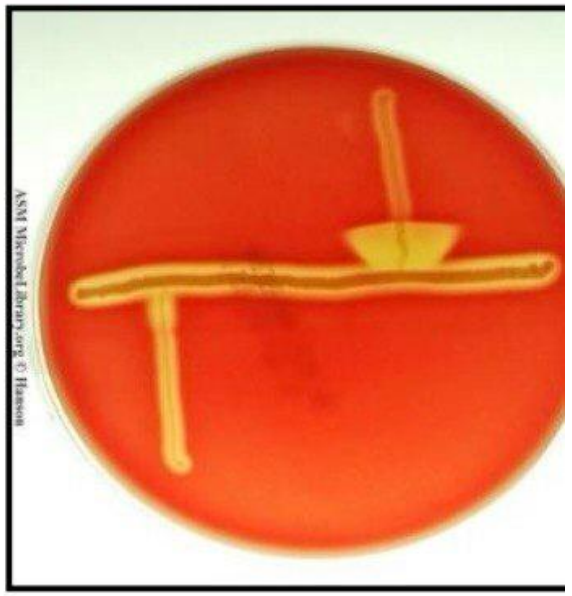
1- Blood Agar: It is the most important media for cultivated these bacteria, because it shows different types of haemolysis. The colonies are circular in shape 1 µm in diameter, white to grayish in col

CAMP Test

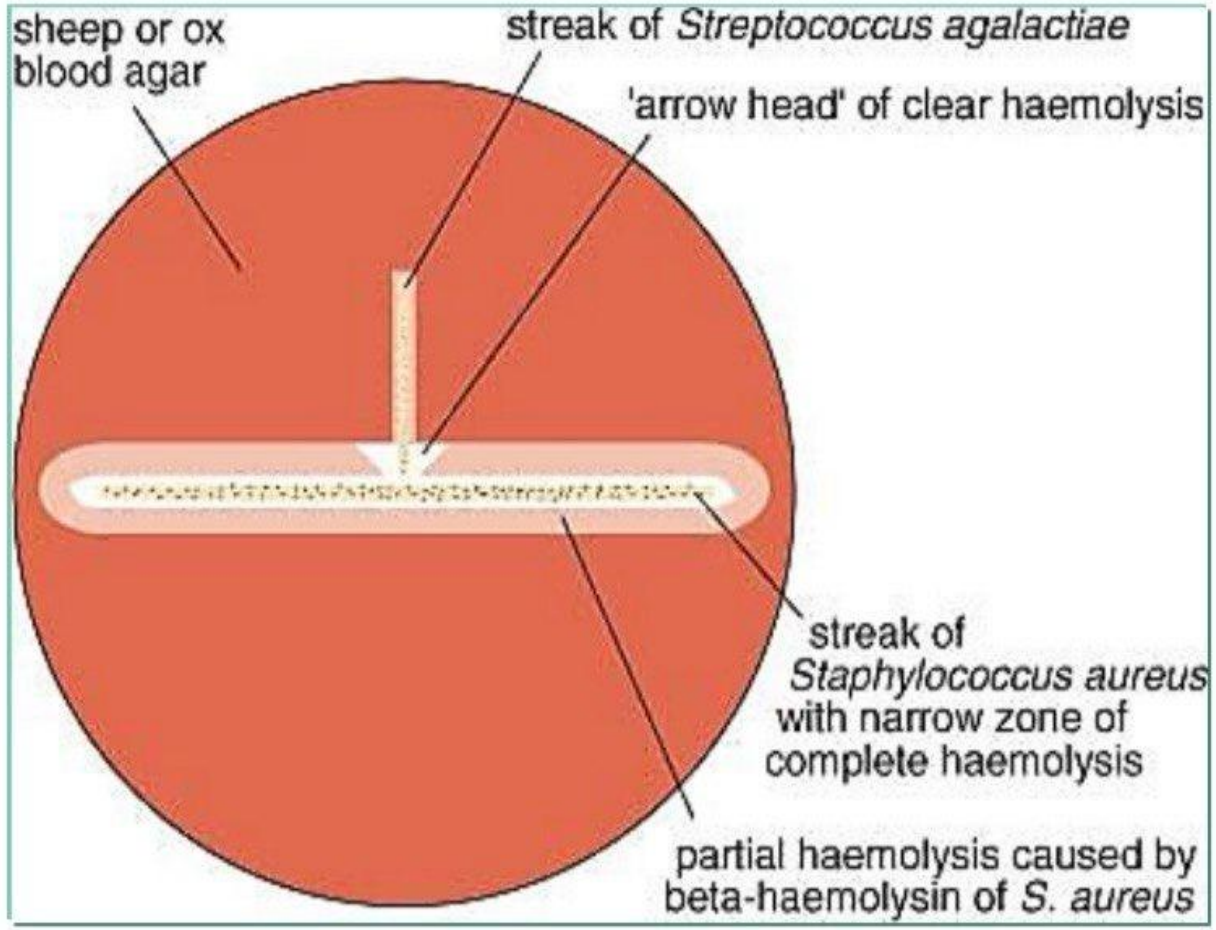
- Principle:

  Group B streptococci produce extracellular protein (CAMP factor)

  CAMP act synergistically with staphylococcus β-lysin to cause lysis of RBCs

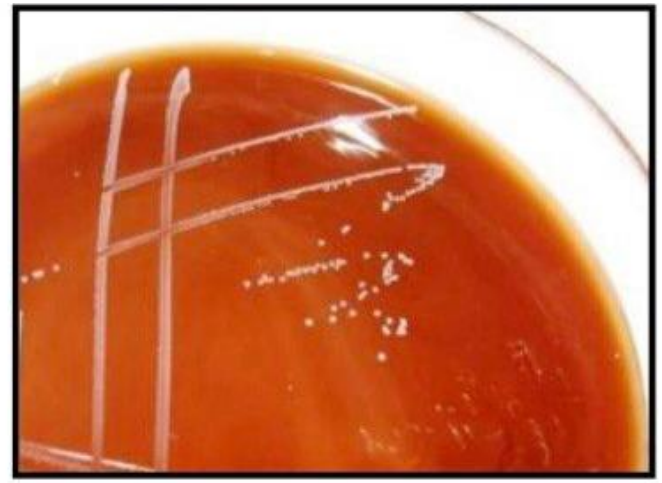


- Procedure:
  - Single streak of *Streptococcus* to be tested and a *Staphylococcus aureus* are made vertical to each other with 3-5 mm distance was left between two streaks.
  - After incubation, a positive result appear as an **Arrow head shaped zone of complete hemolysis.**
  - *S. agalactiae* is CAMP test positive while non group B streptococci are negative



CAMP test. *Streptococcus agalactiae* elaborates a factor which completely lyses the red cells already damaged by the β-haemolysin of *Staphylococcus aureus*, producing a characteristic clear '**Arrow head**' zone of complete haemolysis.

2- Edwards medium: It is selective media for Streptococci. This medium contains esculain (sugar) and crystals violate which inhibiting other contaminates bacteria.



3- MacConkey Agar: used for cultivating of Enterococci which tolerate the bile salts on this medium and appear as small pin – head colonies .



4- Brain heart infusion Agar: Use to cultivate of Streptococci. In this medium the characteristic chains arrangement seen more obviously in microscopic examination.

Biochemical tests

- Aerobic or facultative anaerobes, fastidious.
- Streptococci are catalase and oxidase_negative (Staphylococci are catalase positive).
- The type of the haemolysis which produced by Streptococcal species can be variable and important characteristic in the recognized.



α, β, γ hemolysis produced by different Streptococci

Diseases

Identification of *S. pneumonia* and *viridans streptococci*

- The alpha-hemolytic streptococci, or viridans (**Green**) group (e.g. *S. mutans, S. salivarius*), are normal inhabitants of the mouth causes dental caries and inhabitant of nasopharynx, and respiratory tract causing Pneumonia.

- Alpha-hemolytic streptococci may be isolated by blood culture in cases of bacterial endocarditis and meningitis.

- **Specimens include: Sputum, blood, throat swab, ear swab, CSF.**

Diagnosis

Diagnostic procedures

1. Streptococci are highly susceptible to desiccation and specimens should be cultured immediately.

2. Pus or exudate collected on swabs should be placed in a transport medium if specimens cannot be processed immediately.

3. Chains of Gram-positive cocci may be demonstrable in smears from specimens.

4. Specimens should be cultured on blood agar, selective blood agar and MacConkey agar. Plates are incubated aerobically at 37°C for 24 to 48 hours.

5. Identification criteria for isolates:
   – Small, translucent colonies, some of which may be mucoid
   – Type of haemolysis on blood agar
   – Chains of Gram-positive cocci
   – No growth on MacConkey agar with the exception of *Enterococcus* species – Negative catalase test.

6. Lancefield grouping (carbohydrate antigens).

7. Biochemical test profile.

8. Detection of antigens is possible using latex agglutination or enzyme-linked immunosorbent assay (ELISA) technologies.

9. Polymerase chain reaction (PCR) is a sensitive technique using the can be used.