

Staphylococcus & Streptococcus

❖ *Morphology :*

Staphylococcus are gram-positive bacteria, forming clusters (grape like). These are found on the skin and the nasal passage .

Streptococcus are also gram-positive bacteria, forming a short chain of round cells produced small colonies called pin –like colonies appear grey-white in colour . These are found in respiratory tract and mouth .

❖ *Cellular arrangement:*

In Staphylococcus : The cells are arranged in clusters (grape-like) because their division in various directions .

In Streptococcus : These show a chain of ovoid cells because their division in one direction

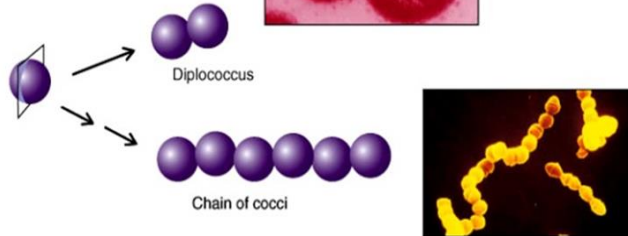
❖ *Division :*

In Staphylococcus : division occurs in multiple directions (multiple axes), even they do not require enriched media to grow.

In Streptococcus : division occurs in the single direction and form a chain like structure, they require enriched media to grow.

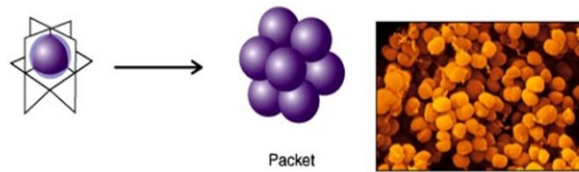
(a) Chains

Cell divides
in one plane



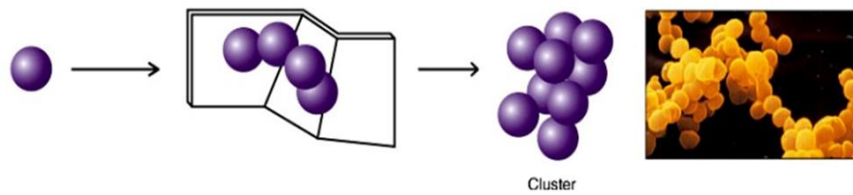
(b) Packets

Cell divides
in two or more planes
perpendicular
to one another



(c) Clusters

Cell divides in several
planes at random



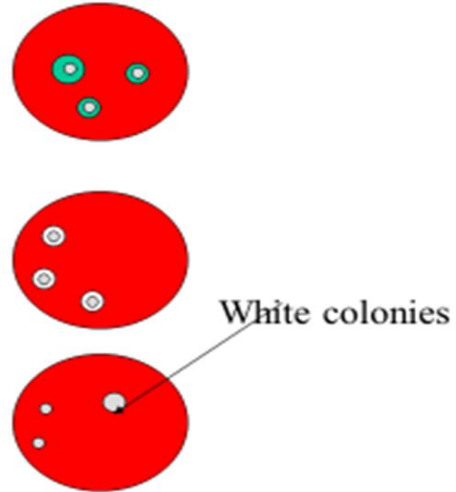
❖ **Hemolysis :**

In Staphylococcus : Beta hemolysis or no hemolysis

In Streptococcus : alpha or beta or gamma hemolysis.

2- Hemolysis reaction - sheep blood agar

- **α (alpha)**
 - partial hemolysis
 - green color
- **β (beta)**
 - complete clearing
- **γ (gamma)**
 - no lysis



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❖ *Similarities :*

- Gram-positive bacteria.
- ovoid or spherical .
- Non-sporing.
- Non-motile.
- Facultative anaerobes.
- Non capsulated .

Thirty one species are placed in Staphylococcus

On the basis of pigments production three type are identified :

- *Staphylococcus aureus* .
- *Staphylococcus epidermidis* .
- *Staphylococcus citreus* .

Staphylococcus aureus :produced golden-yellow colony and is pathogenic .

Staphylococcus epidermidis :produced white colony and is non pathogenic .

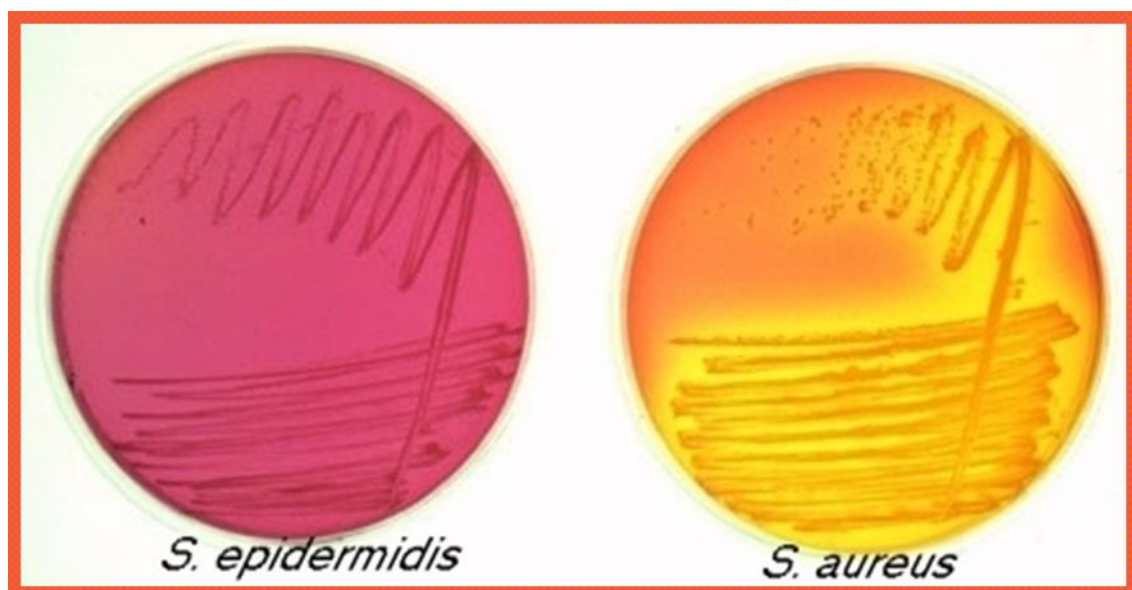
Staphylococcus citreus : produced lemon-yellow colony and is also non pathogenic organisms.

❖ ***Cultural features of staph.aureus :***

- **Blood agar :** A wide zone of beta-haemolysis (clear zone) is produced around colonies which indicated completely decomposition of RBCs in medium .

- **Mannitol salt agar (MSA) :** A selective medium used for screening staph. aureus , it will be containing 7.5 % NACL , phenol red indicator .Colonies on this medium appear as a golden –yellow surrounding yellow zone .

- **Cultivation: on Mannitol Salt Agar(MSA):**



MSA is a differential and selective medium .

Staphylococcus aureus ferment mannitol----golden yellow colonies.

Staphylococcus epidermidis does not ferment mannitol - ---- white colonies on pink MSA agar.

On blood agar- Most strains produce β - haemolytic colonies.

On the basis of haemolysis on sheep blood agar:

❖ *Streptococci can be divided to :*

Streptococcus pyogenes :Produced beta-haemolysis - which mean complete decomposition of RBCs ,appear as a clear , transparent zone around colonies .

Streptococcus pneumoniae : Produced alpha –haemolysis which mean partial decomposition of RBCs in medium appear as a green edge surrounded the colonies .

Streptococcus faecalis :Produced gamma haemolysis ,which mean no haemolysis .

❖ *Biochemical differentiation :*

Catalase test :

staphylococci

staphylococci are catalase positive

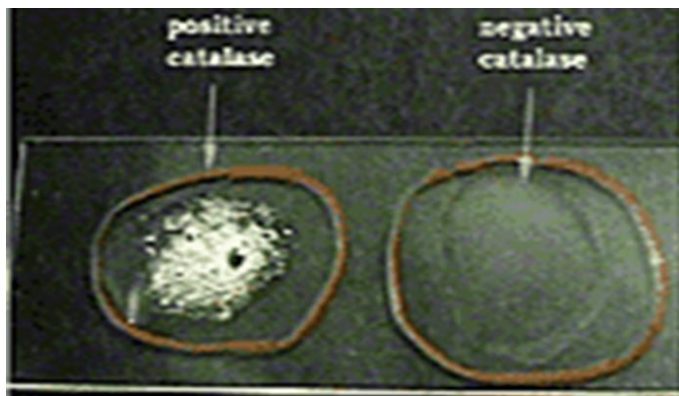
streptococci

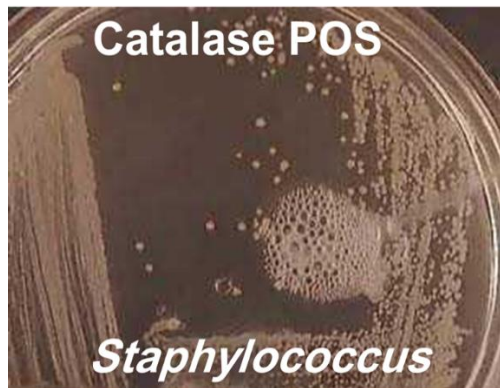
streptococci are catalase negative .

Catalase is an enzyme used by bacteria to induce the reaction of reduction of hydrogen peroxide into water and oxygen .the presence of gas bubbles (O₂) indicate the positive result of the test .



Differential Characteristics :





Coagulase test :

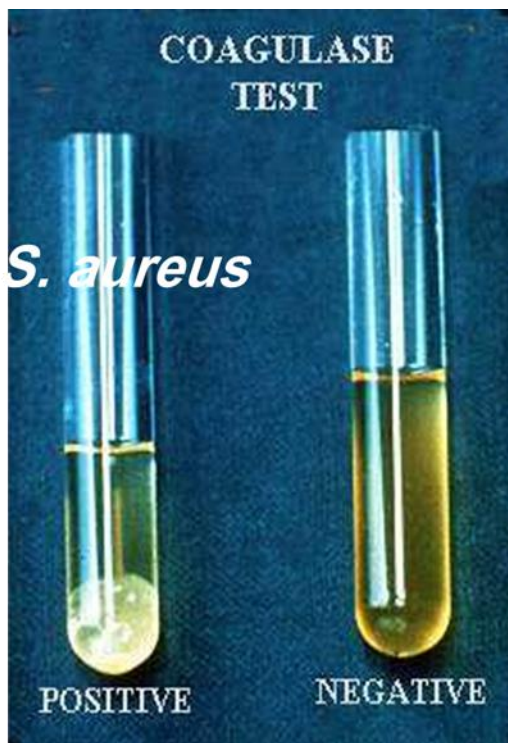
- Which is positive for staphylococcus aureus .
- negative for all staphylococci .

Coagulase :is an enzyme used by staphylococcus aureus to induce coagulation and convert soluble fibrinogen into fibrin which will protect bacteria from the immune system . It is also a clumping factor for bacteria's coalescence .

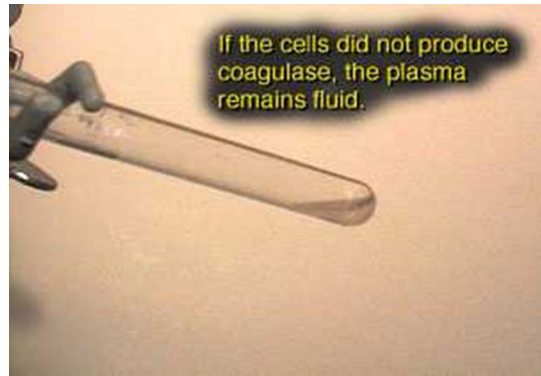
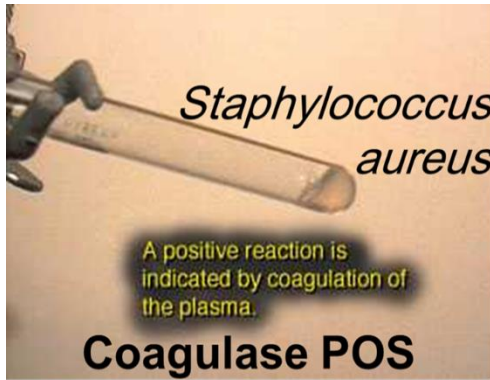
Differential Characteristics :

Coagulase

Fibrinogen → Fibrin




Coagulase test :



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