Staphylococcus spp.

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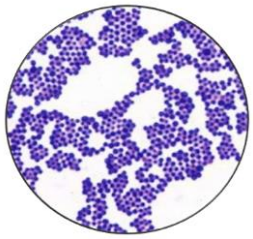

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Species

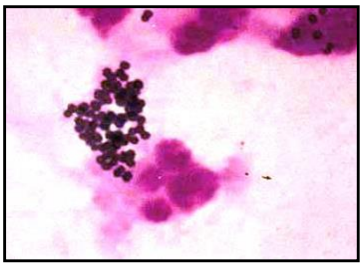
Staphylococcus aureus — Coagulase-positive *Staphylococcus* spp.

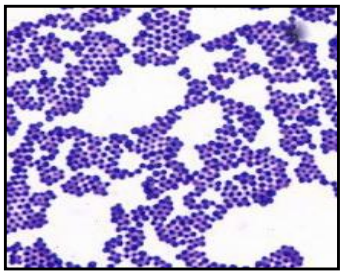
- ***S. saprophyticus***
- ***S. epidermidis***
- ***S. haemolyticus***
- ***S. hominis***

Coagulase-negative *Staphylococcus* spp.

Morphology and Staining

- Staphylococci are Gram positive cocci, approximately 1 µm in diameter.
- Occurring in bunches or clusters which is observed in smears prepared from growth on solid culture.
- They are non motile, non spore forming.





Cultural Characteristics

Staphylococci are aerobic or facultative anaerobic and grow on a simple media at temperatures between 15 and 40 °C. Optimum temperature for growth is 37 °C. They can grow on the following culture media:

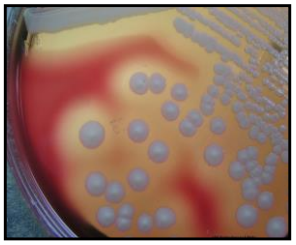
1. **Nutrient agar**
2. **Blood agar**
3. **Milk agar**
4. **Mannitol slat agar**

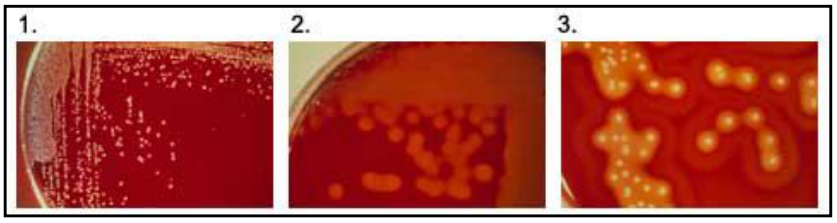
1. Nutrient Agar

The colonies are pigmented golden yellow, circular 1 to 2 mm. in diameter, convex , opaque, glistering, with entire edges.

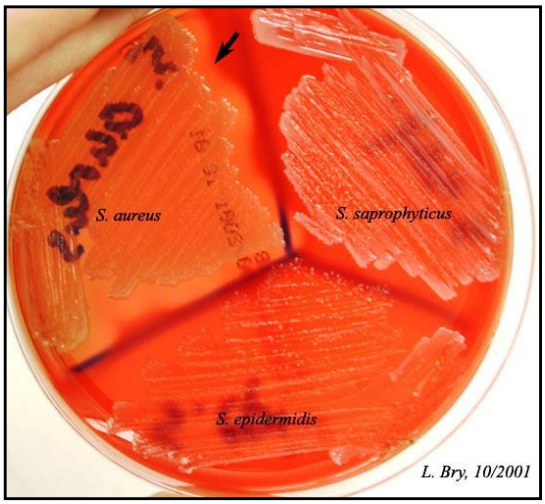
2. Blood Agar

Pathogenic strains on blood agar produce a wide zone of β–haemolysis (clear zone) and the other strains does not .





Types of haemolysis produce by Staphylococci on blood agar



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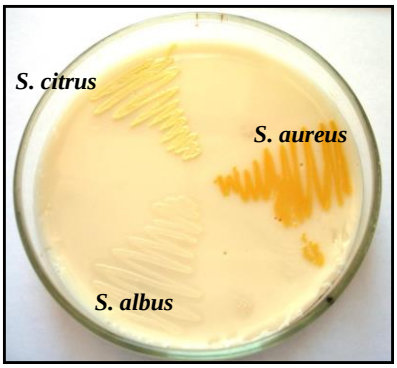
3. Milk Agar

The colonies are similar to these on Nutrient Agar. This media stimulates production of endopigmentation which is produce by some strains, for e.g.:

Golden yellow color produce by *Staphylococcus aureus* .

Lemon yellow color produce by *S. citrus* .

White color produce by *S. albus*.



Endopigmentation produced by staphylococci

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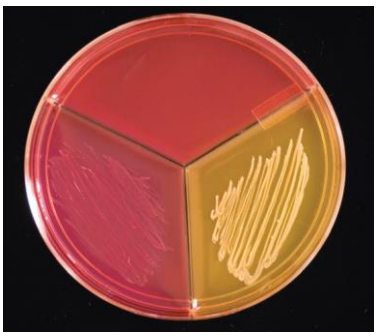
4. Mannitol Salt Agar (MSA)

- Because of Staphylococci tolerance to high salt concentration the MSA act as highly selective media for them. It contains 7.5–10% of NaCl (sodium chloride).
- This medium could be used for isolation of pathogenic staphylococci from specimen (pus, feces).

Growth on the MSA

- *Staphylococcus aureus* on MSA is capable of fermenting the (sugar) mannitol in the medium to acid and causes the medium to change color to yellow because of the presence of phenol red indicator.
- MSA able to differentiate between bacteria that can ferment mannitol and those that cannot ferment mannitol.



Mannitol salt agar (selective and differential) for isolation of ***staphylococci***.

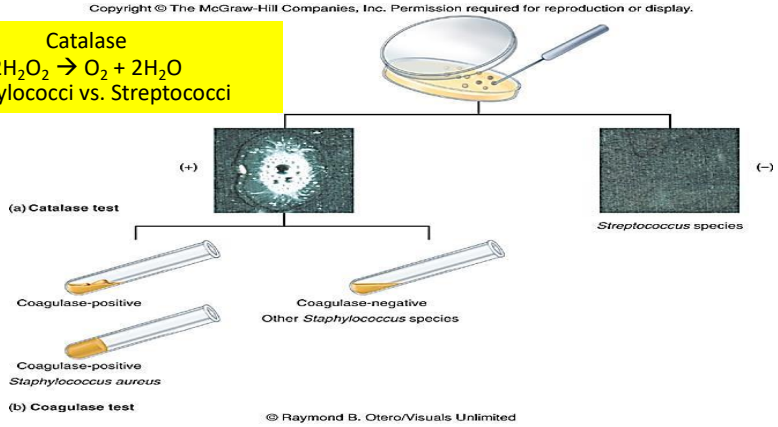
Biochemical tests

- In clinical specimens, *Staphylococcus* species must be differentiated from *Streptococcus* species and from *Micrococcus* species.
- Staphylococci are generally catalase-positive and streptococci catalase negative. *Staphylococcus* species are usually categorized by their colonial appearance, haemolytic pattern, biochemical profiles.

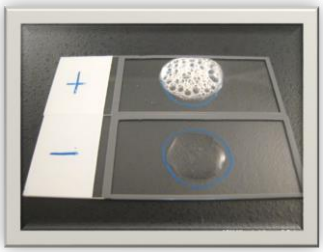
Tests	*S. aureus*	*S. epidermidis*	*S.saprophyticus*
Catalase	+	+	+
Coagulase	+	-	-
β – haemolysis	+	-	-
Mannitol fermentation	+	-	-

Differentiation of Gram-positive cocci

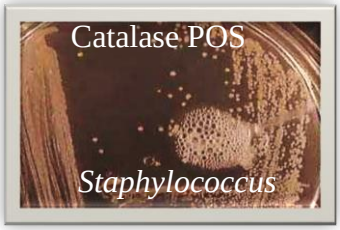
Catalase
$2H_2O_2 \rightarrow O_2 + 2H_2O$
Staphylococci vs. Streptococci



1. Catalase Test



Catalase
$2H_2O_2 \rightarrow O_2 + 2H_2O$
Staphylococci vs. Streptococci

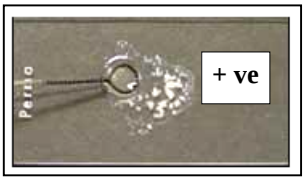


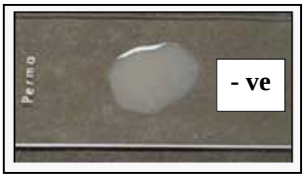
2. Coagulase Test

Most strain of *S. aureus* produce bound Coagulase or clumping factor which is detected by slide Coagulase test.

Procedure:

A loop full of the Staphylococcal culture is emulsified in a drop of water on a microscopic slide then anther loop full of rabbit plasma is added and mixed well with the bacterial suspension . Positive reaction is indicated by clumping within one or two minute .





Positive and negative reaction for slide test

Diseases

Suppurative skin lesion

Environmental Decontamination

Need adequate surface disinfection

Diagnosis

1. In suppurative conditions, the likelihood of staphylococcal infection must be considered and appropriate specimens such as pus exudates collected for laboratory procedures.

2. Gram-stained smears of pus or other suitable specimens may reveal typical staphylococcal clusters.

3. Specimens are cultured on blood agar, selective blood agar and incubated aerobically at 37°C for 24 hours.