

# Bacteria Classification

**Staphylococcus spp**

**Lab 1**

# Scientific Classification of Staphylococcus Spp.

**Domain: Bacteria**

**Phylum: Firmicutes**

**Class: Bacilli**

**Order: Bacillales**

**Family: Staphylococcaceae**

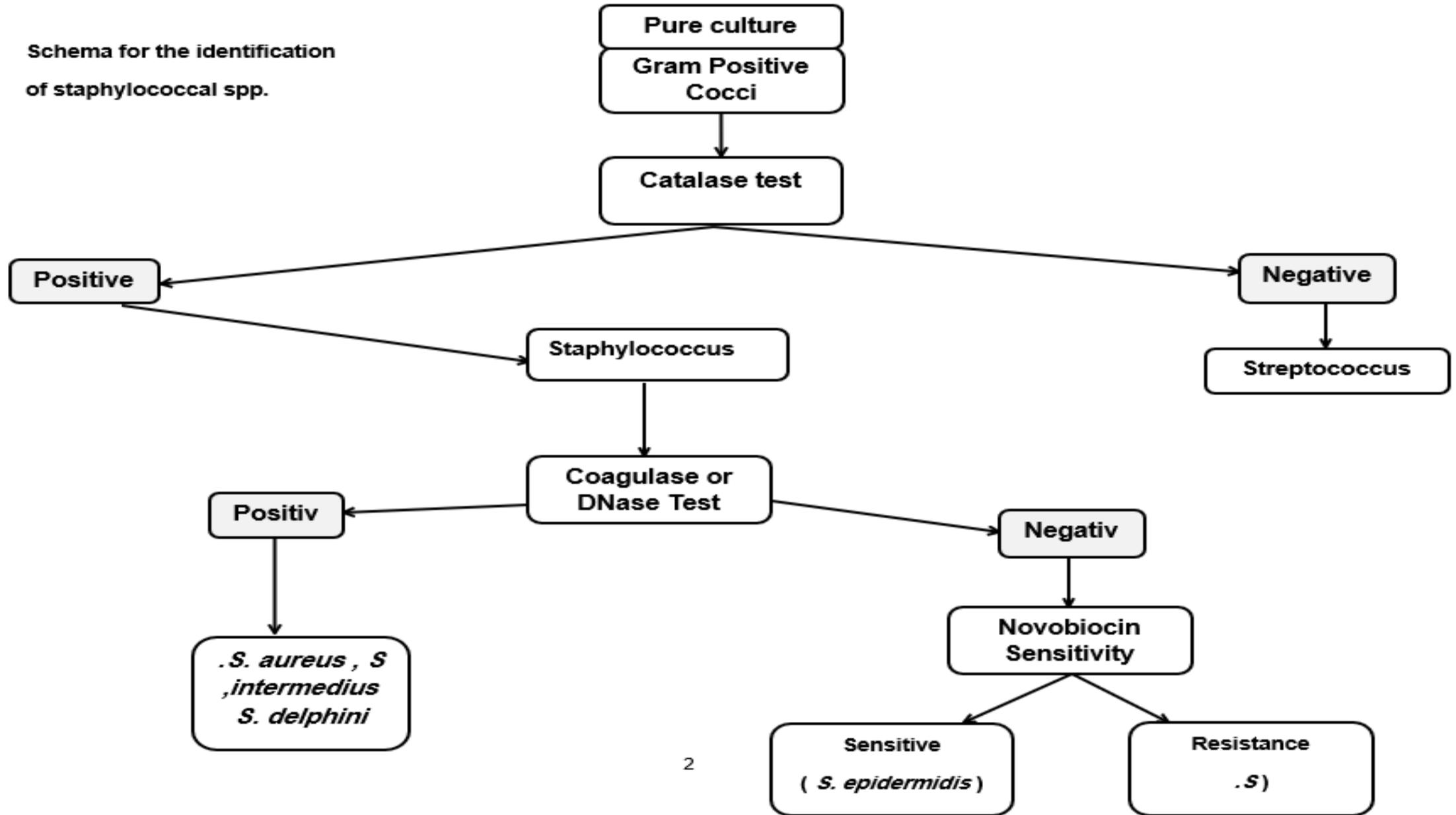
**Genus: Staphylococcus** ... .. include at least 40 species.

**Species: *Staphylococcus aureus***

❖ *S. epidermidis*

❖ *S. saprophyticus*

Schema for the identification of staphylococcal spp.



# Catalase test

Catalase is an enzyme, which is produced by microorganisms that live in oxygenated environments to neutralize toxic forms of oxygen metabolites;  $H_2O_2$ . The catalase enzyme neutralizes the bactericidal effects of hydrogen peroxide and protects them. Anaerobes generally lack the catalase enzyme.

- ❑ Catalase mediates the breakdown of hydrogen peroxide  $H_2O_2$  into oxygen and water.
- **Obligate aerobes and most facultative anaerobes bacteria have both enzymes (Catalase and superoxide dismutase).**
- Some facultative and aerotolerant anaerobes have superoxide dismutase but lack catalase.
- Most obligate anaerobes lack both enzymes and succumb to the toxic effects of superoxide and hydrogen peroxide.

# Catalase Test



Catalase +ve



Catalase -ve



Catalase -ve



Catalase +ve

# Coagulase test

Coagulase is an enzyme produced by *S. aureus*, *S. intermedius*, *S. delphini*, *S. lutrae*, and some strains of *S. hyicus*, that converts (soluble) fibrinogen in plasma to (insoluble) fibrin.

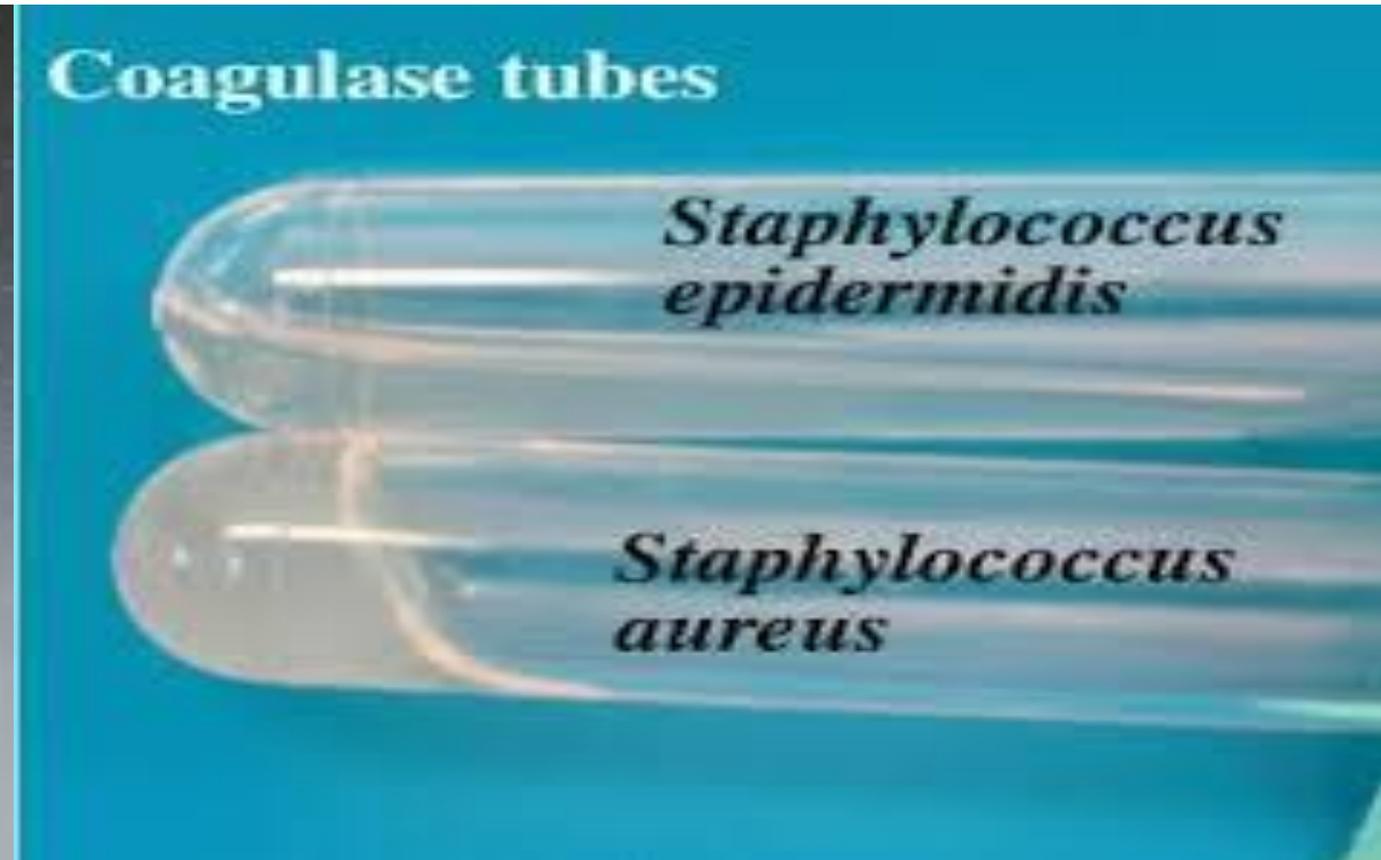
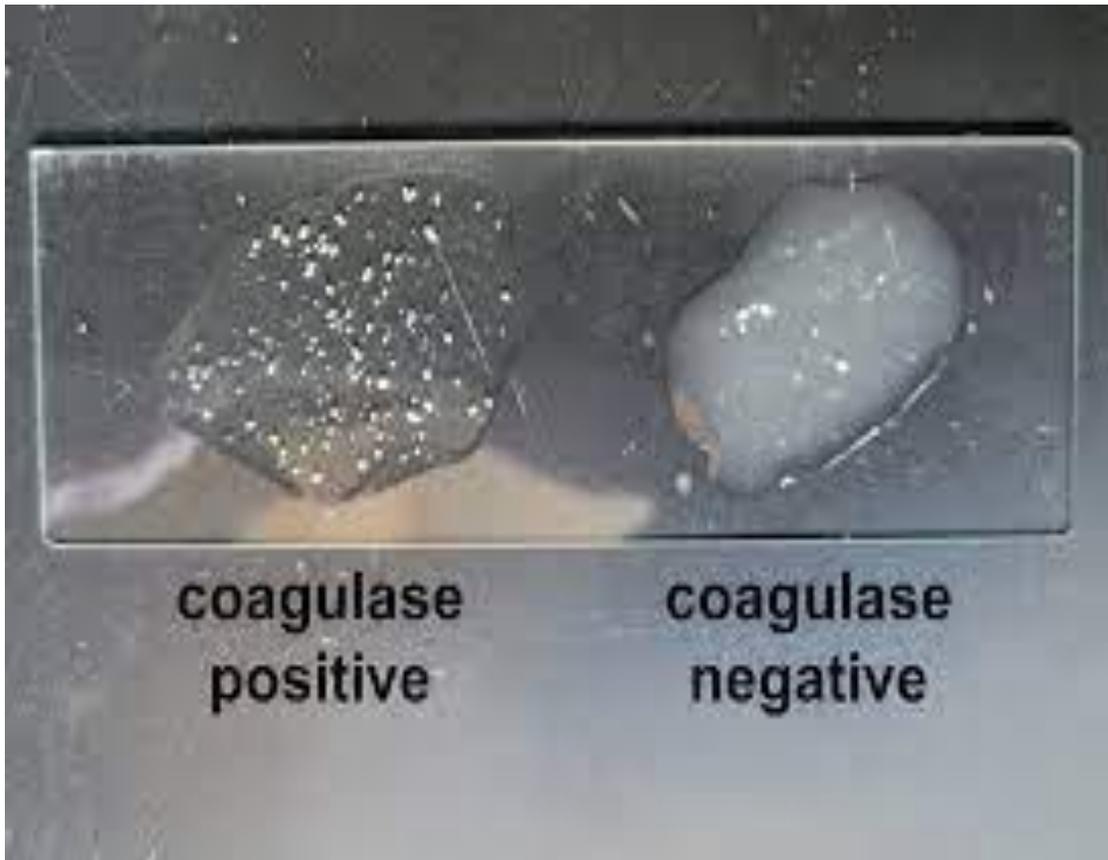
*Staphylococcus aureus* produces two forms of coagulase, **bound and free**.

❑ **Clumping factor**, formerly referred to as **cell-bound coagulase**, causes agglutination in human, rabbit, or pig plasma and is considered an important marker for *S. aureus*.

Clumping factor on the surface of the bacterial cells directly **converts fibrinogen to fibrin**, which precipitates onto the cell surface, causing agglutination.

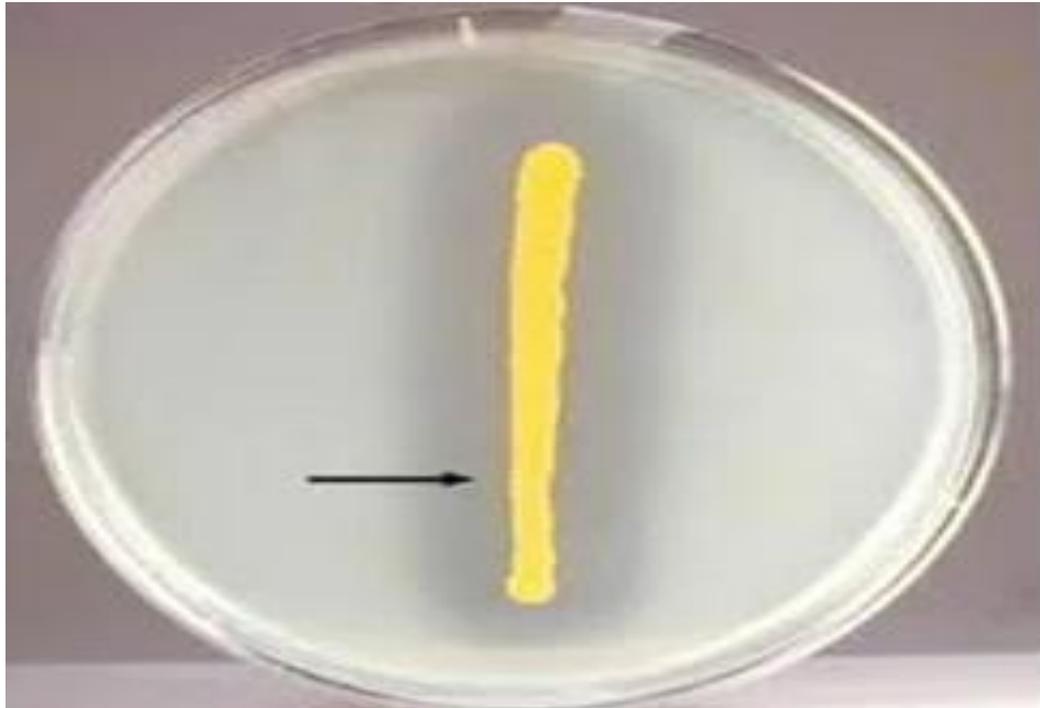
Because about **5%** of *S. aureus* organisms do not produce clumping factor, any negative slide coagulase test result must be confirmed with the **tube method**, which detects **Staphylocoagulase**, or **free coagulase**.

□ **Staphylocoagulase** is an extracellular molecule that causes a clot to form when bacterial cells are incubated with plasma. Staphylocoagulase reacts with a thermostable, thrombin-like molecule called coagulase-reacting factor (CRF) to form coagulase-CRF complex. The coagulase - CRF complex resembles thrombin and indirectly converts fibrinogen to fibrin.



## DNase Test

The fact that coagulase-positive bacteria are also able to hydrolyze DNA makes the DNase test a reliable means of confirming *S. aureus* identification. The following procedure can be used to determine if a staph-like organism can hydrolyze DNA.



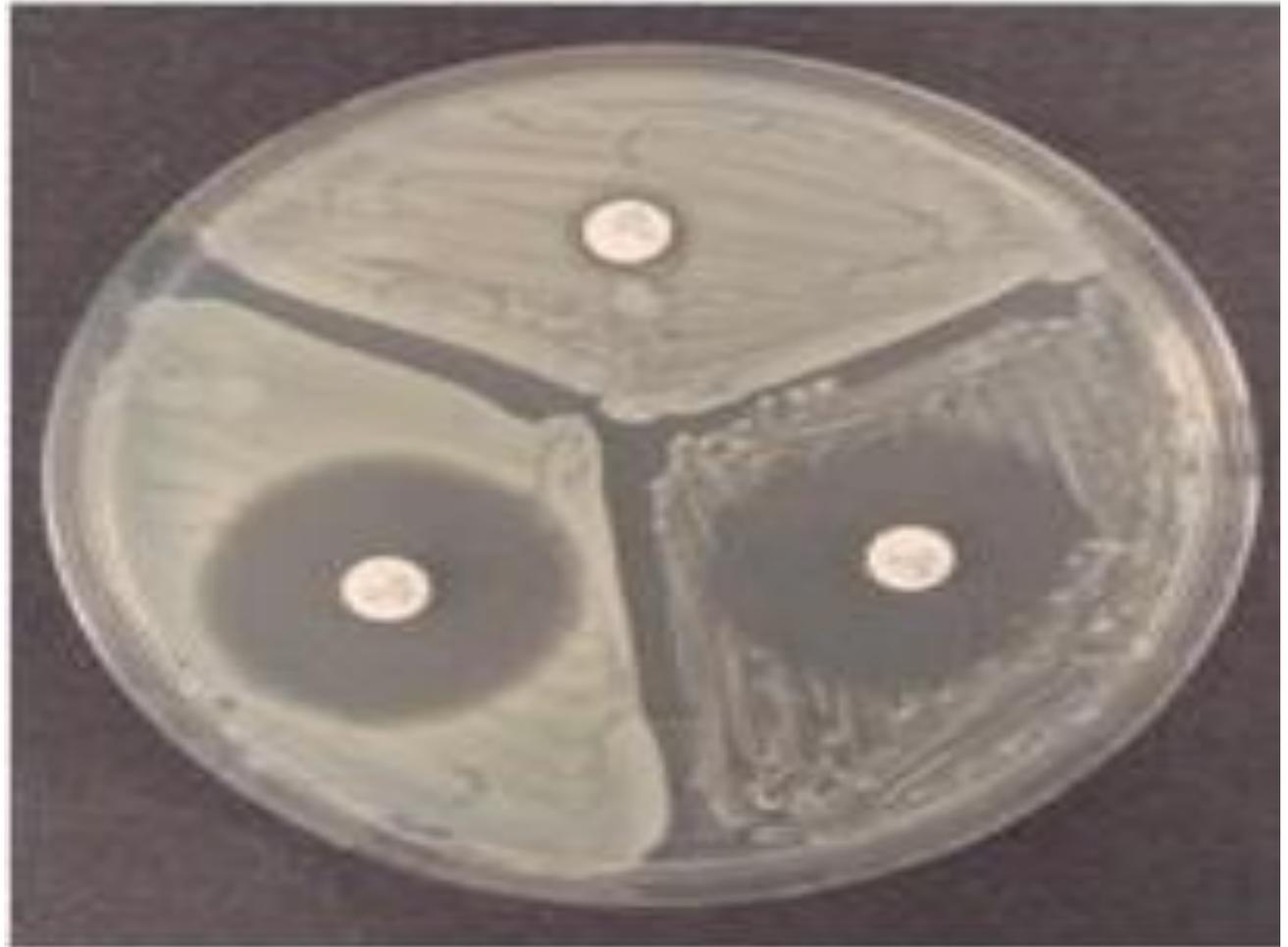
**A:** Positive - Staph aureus



**B:** Negative - Staph epidermidis

## Novobiocin test

- ❑ Resistant – zone size of < **12** mm
- ❑ Sensitive – zone size greater or equal to **16** mm.



**Novobiocin test**