# Staphylococcus
# Part/ 2
# Lab Diagnosis

# Lab diagnosis:

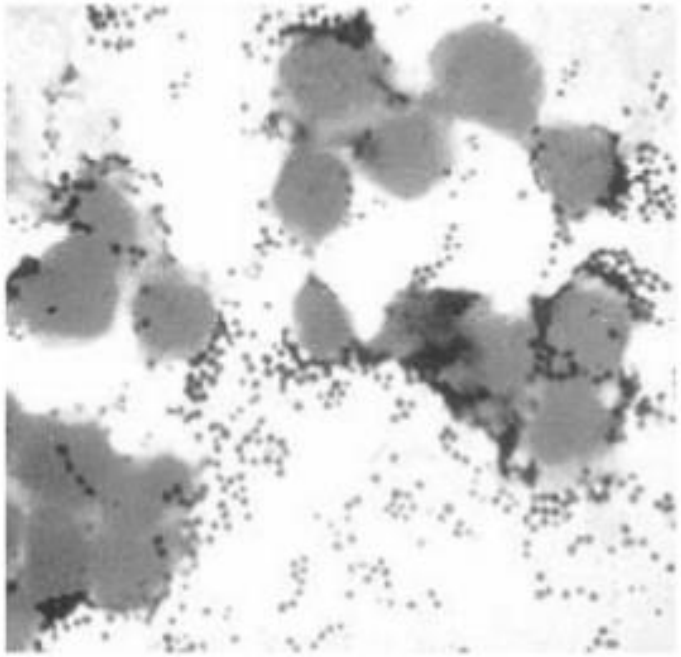
**Specimens collected**: Depends on the type of infection.

- Suppurative lesion- Pus,
- Respiratory infection- Sputum,
- Bacteremia & septicemia- Blood,
- Food poisoning- Feces, vomit & the remains of suspected food,
- For the detection of carriers- Nasal swab.

# Methods of examination:

## I) Direct microscopy:

- Direct microscopy with Gram stained smear is useful in case of pus, where cocci in clusters are seen.
- This is of no value for specimen like sputum where mixed flora are normally present.



# 2-CULTURE:

Media used :-

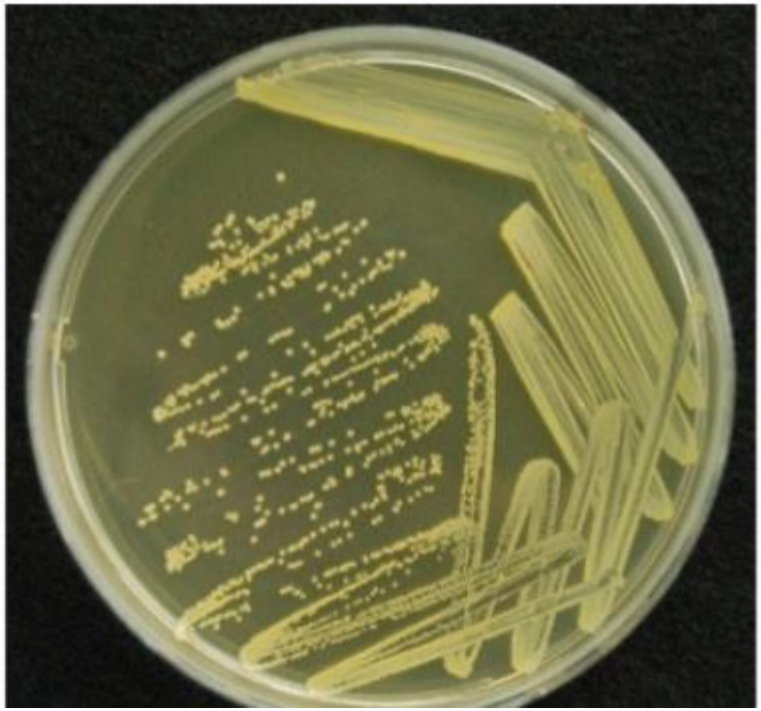
Non selective media: Nutrient agar,
Blood agar,
MacConkey's agar.

Selective media: Salt-milk agar,
Mannitol salt agar

## Cultural Characteristics:

**On nutrient agar-** The colonies are large, circular, convex, smooth, shiny, opaque and easily emulsifiable. Most strains produce golden yellow pigments.

*Staphylococcus aureus* on nutrient agar ( showing golden yellow endopigment )

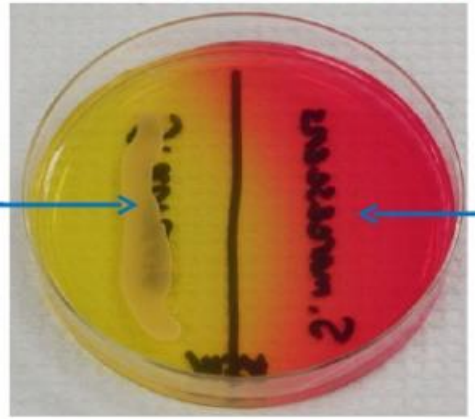


On MacConkey's agar- The colonies are small & pink in colour.

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

On MSA- the colonies are yellow and turns the media yellow

# Mannitol salt agar



*Staphylococcus aureus* grows

*Serratia marcescens* does not grow

**Selective medium**

High salt (NaCl) concentration in medium favors organisms that tolerate high salt concentration, e.g. *Staphylococcus*.

# 3- Biochemical reactions

Coagulase test- Coagulase which converts soluble fibrinogen in plasma to insoluble matrix fibrin

- There are two types of coagulase:-

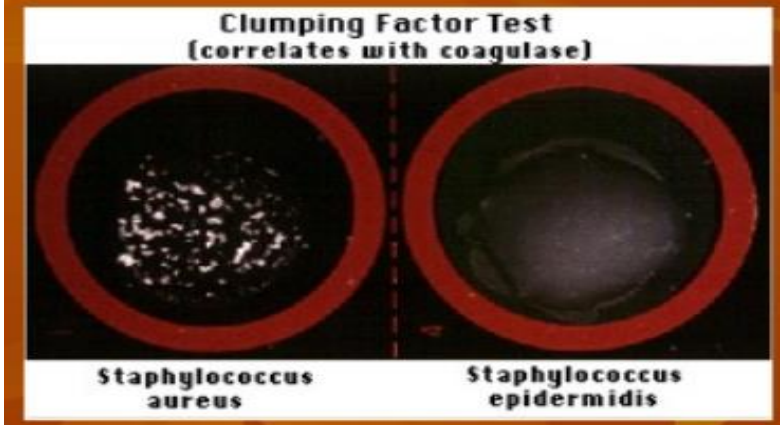
bound coagulase → on the surface of the bacteria causes the bacteria to clump together

free coagulase → secreted from the bacteria into the environment

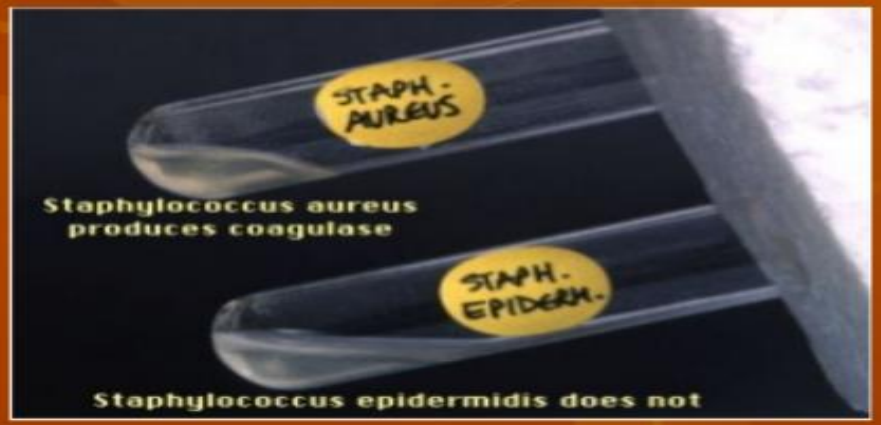
Coagulase test-

i) Slide coagulase test- Positive.

ii) Tube coagulase test- Positive._




SLIDE COAGULASE TEST




TUBE COAGULASE TEST

# Test system to identify *Staphylococcus*

-Reduces nitrate to nitrite.

-Ferments mannitol anaerobically with acid only.

- Urea hydrolysis test- Positive.

- Gelatin liquefaction test- Positive.

- Produces Lipase.

-Produces Phosphatase.

- Produces Thermostable nuclease.

# Treatment:

- Drug resistance is common.
- Benzyl penicillin is the most effective antibiotic, if the strain is sensitive.
- Cloxacillin or Methicillin is used against beta-lactamase producing strains.
- Methicillin Resistant Staphylococcus aureus (**MRSA**) strains have become common.
- Vancomycin is used in treatment of infections with MRSA strains.

## Prevention:

- Isolation & treatment of MRSA patients.
- Detection of carriers among hospital staff, their isolation & treatment.
- Avoid indiscriminate usage of antibiotics.

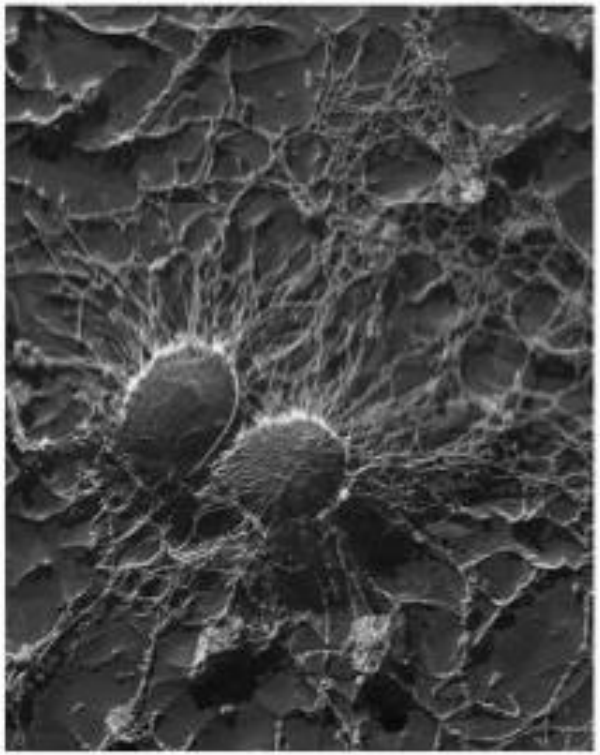
# Coagulase Negative Staphylococci( CoNS ):

Two species of coagulase negative Staphylococci can cause human infections-

1. *Staphylococcus epidermidis*
2. *Staphylococcus saprophyticus*

# *S. epidermidis*

- It is a common cause of stitch abscesses.
- It has predilection for growth on implanted foreign bodies such as artificial valves, shunts, intravascular catheters and prosthetic appliances leading to bacteraemia.
- In persons with structural abnormalities of urinary tract, it can cause cystitis.
- Endocarditis may be caused, particularly in drug addicts.

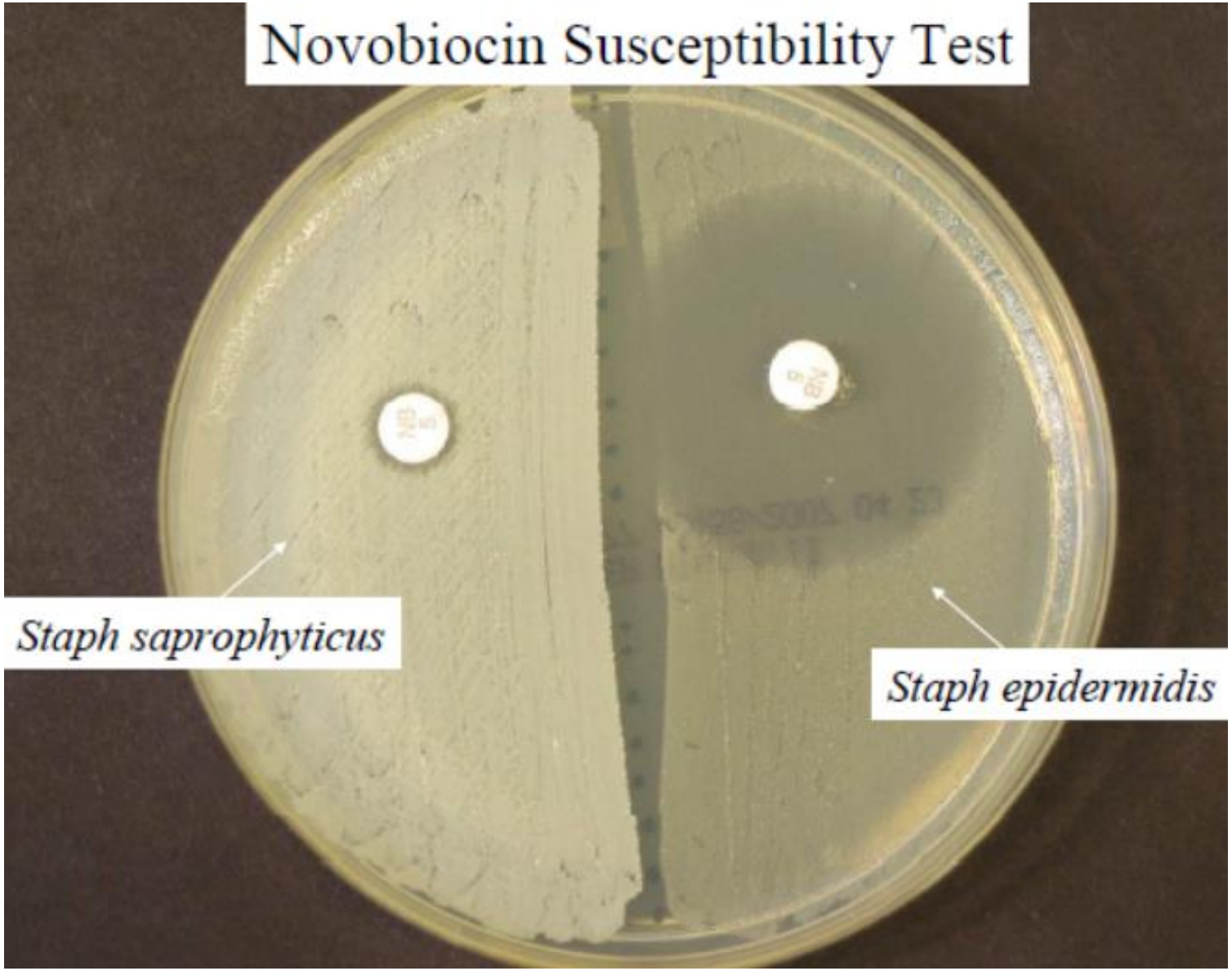


# *S.saprophyticus*:

- It causes urinary tract infections, mostly in sexually active young women.
- The infection is symptomatic and may involve the upper urinary tract also.
- Men are infected much less often.
- It is one of the few frequently isolated CoNS that is **resistant** to **Novobiocin**.

## Distinguishing features of the major species of staphylococcus

| Characters | S.aureus | S.epidermididis | S.saprophyticus |
|---|---|---|---|
| Coagulase | + | - | - |
| Novobiocin sensitivity | Sensitive | Sensitive | Resistant |
| Acid from mannitol fermentation anaerobically | + | - | - |
| Phosphatase | + | + | - |


Novobiocin Susceptibility Test
Staph saprophyticus
Staph epidermidis


Thank you