



# RESPIRATORY SYSTEM

MICROBIOLOGY LAB  
(NOTES & SLIDES)

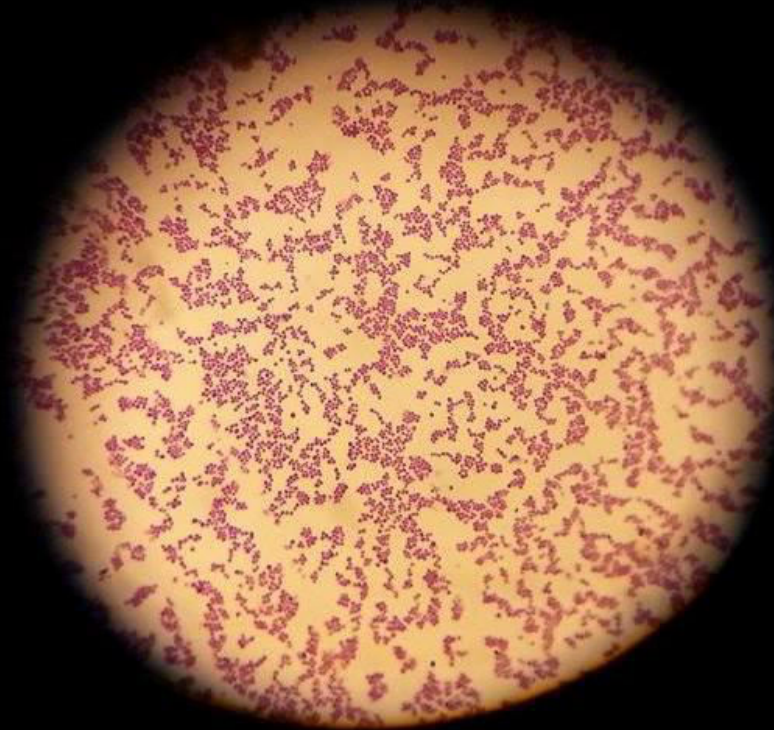
# ■ Gram Positive Bacteria

-Staphylococcus spp.

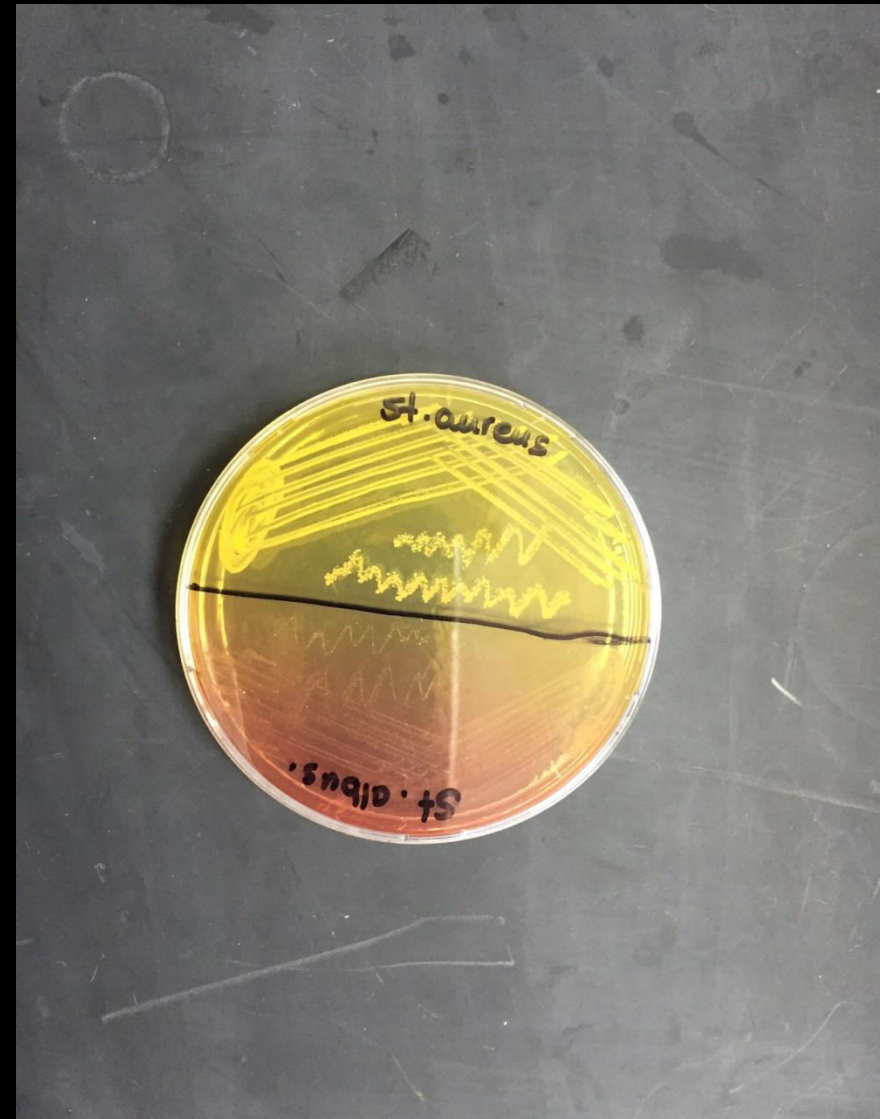
-Streptococcus spp.

# 1) Staphylococci :

- Gram +ve cocci arranged in clusters  
(microscopic appearance )



- Blood agar is used to isolate staphylococci.
- We're concerned about two species; staph. Aureus and staph. Albus .
- We can differentiate between them by Coagulase Test using mannitol salt agar (a pink-colored medium).



- Staph. Aureus (Yellow Colony) :

- Because it's a mannitol fermentor, it changes the color of the medium (pink) into deep yellow. This means that it's Coagulase +ve



- Staph. Albus (White Colony):

- It's a -ve mannitol fermentor, it appears as white colonies on mannitol salt agar. So, it's Coagulase -ve.



## 2) Streptococci:

- Gram positive bacteria
- They are classified based on their hemolytic activity on blood agar into:
  - 1- Alpha-hemolytic species: cause partial hemolysis giving a **greenish** color on blood agar.
    - Streptococcus viridians.
    - Streptococcus pneumonia.
  - 2- Beta-hemolytic species : cause complete hemolysis and this appears as **clear** areas surrounding bacterial colonies. They are further classified according to sensitivity to bacitracin (antibiotic):
    - Group A (Streptococcus pyogenes): bacitracin sensitive.
    - Group B (Streptococcus agalactia): bacitracin resistant.
  - 3- Gamma-hemolytic species (Enterococcus spp): don't cause hemolysis.



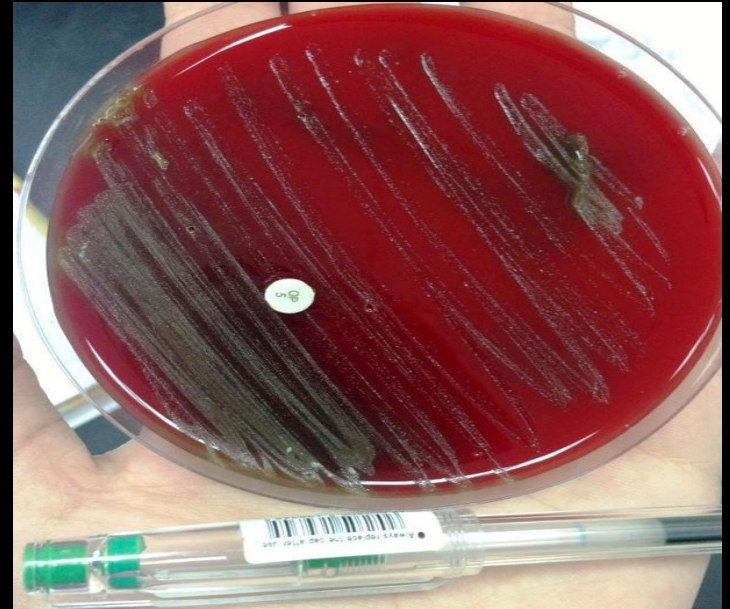
# • Alpha Hemolytic streptococcus:

## 1- Strep. Viridians:

- They are gram +ve short streps.
- Unsusceptible to Optochin test.

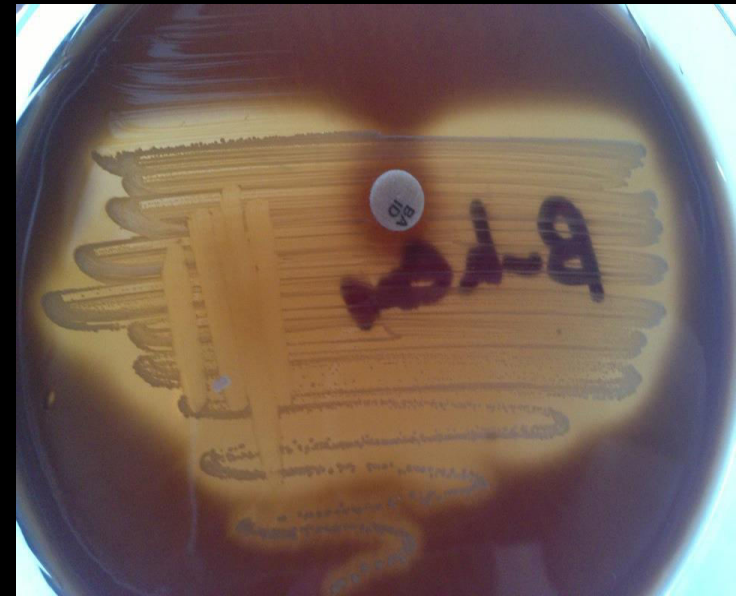
## 2- Strep. Pneumonia :

- Gram +ve diplococci (lancet-shaped)
- Susceptible to Optochin test



# • Beta Hemolytic Streptococci :

- Gram +ve long streps.
- 1- Strep. Pyogens (Group A):
- Susceptible to Bacitracin.



## 2- Strep. Agalactia (Group B) :

- Resistant to Bacitracin .





# Bacitracin Sensitivity Test

## Strep. Pyogens

Notice the zone of inhibition which indicates that it's sensitive to bacitracin

## Strep. Agalactia

No zone of inhibition >> Bacitracin resistant



# ■ Filamentous Fungi :

- filamentous fungi contain a lot of species, like *Aspergillus niger*, *Aspergillus flavus*, *Aspergillus parasiticus*, and others.

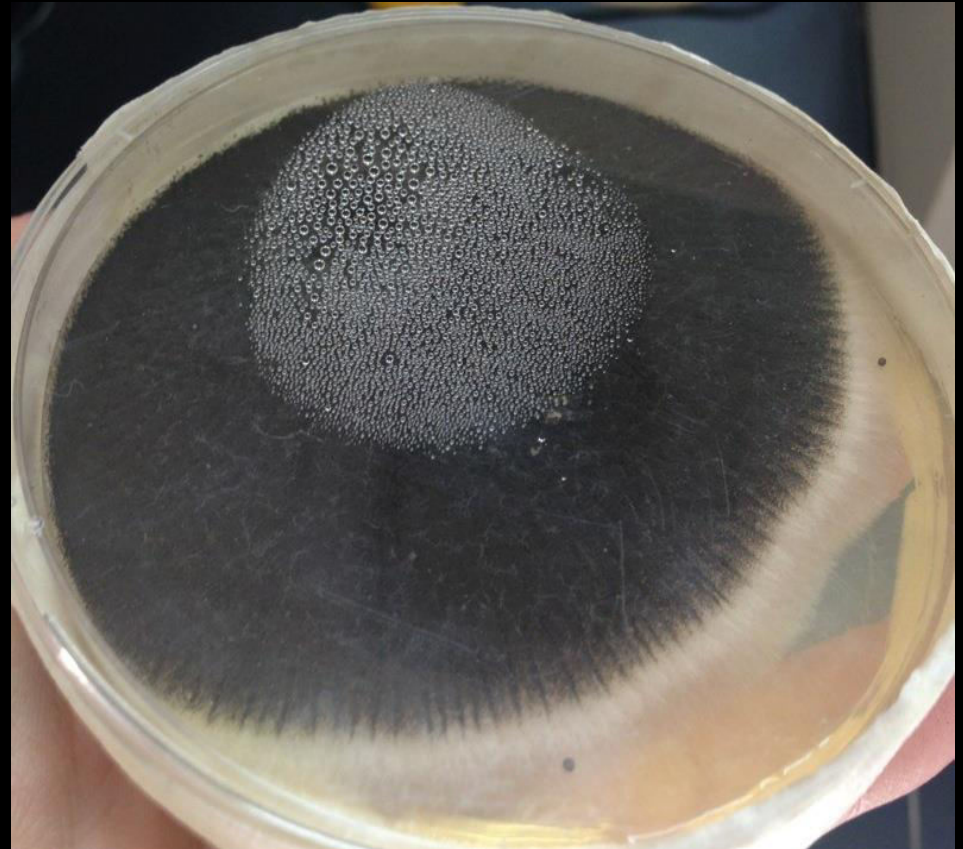
- **Aspergillus Niger :**

- Non-pathogenic filamentous fungi.
- Black colonies on Sabaroud Dextrose Agar.

Aspergillus niger colony develop on the surface of media within seven to ten days of incubation at 25-30 degrees Celsius after the development of hyphae and black spores.

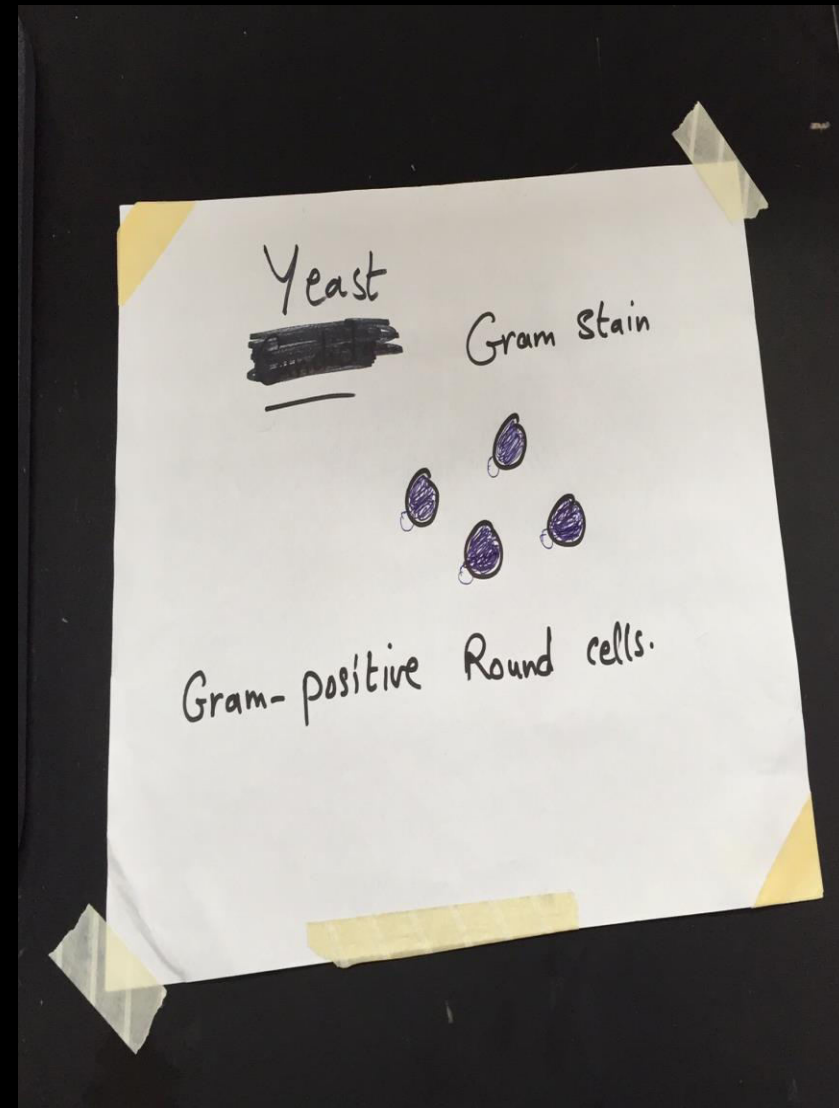
- this is an example on molds that contaminate pickles especially on pickled olives and fruits in addition to Aspergillois disease caused by other species of this fungi.

# Aspergillus Niger



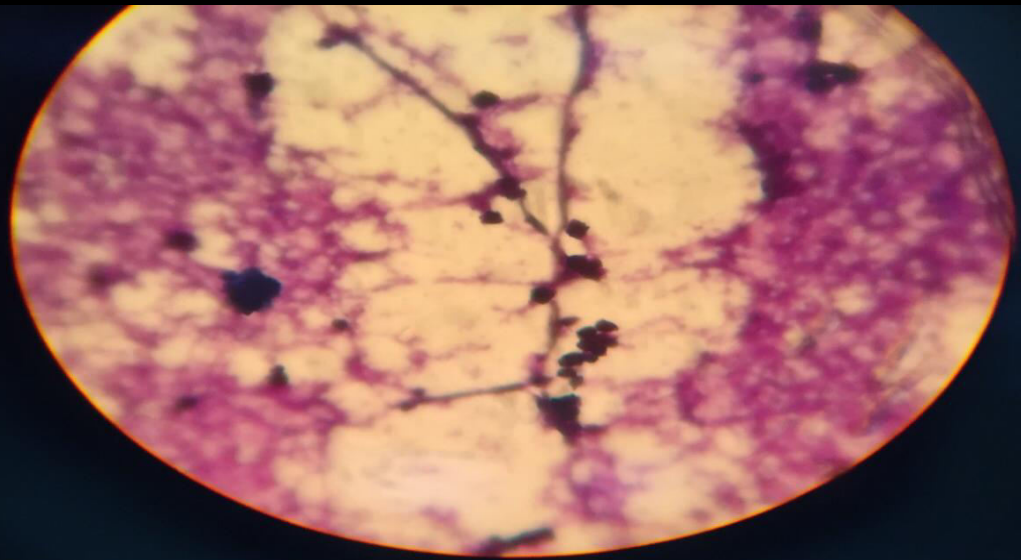
## ▪ Yeast:

- Yeast is a big family which includes both non-pathogenic members such as *Saccharomyces cerevisiae* (baking yeast), and pathogenic members like *Candida*.





- Under the microscope, they appear as Gram positive-stained ,big ,round cells .



# ■ Candida:

Includes many species :

- Candida Albicans.
- Candida *tropicalis*,
- *Candida glabrata*.



# • Candida Albicans:

- causes many infections such as those seen in immune-compromised patients, in children as thrush on their tongues, and in vaginitis cases isolated from vaginal swabs .

- On Sabouroud Dextrose Agar, *Candida Albicans* appear as *creamy-colored colonies with yeast smell*.



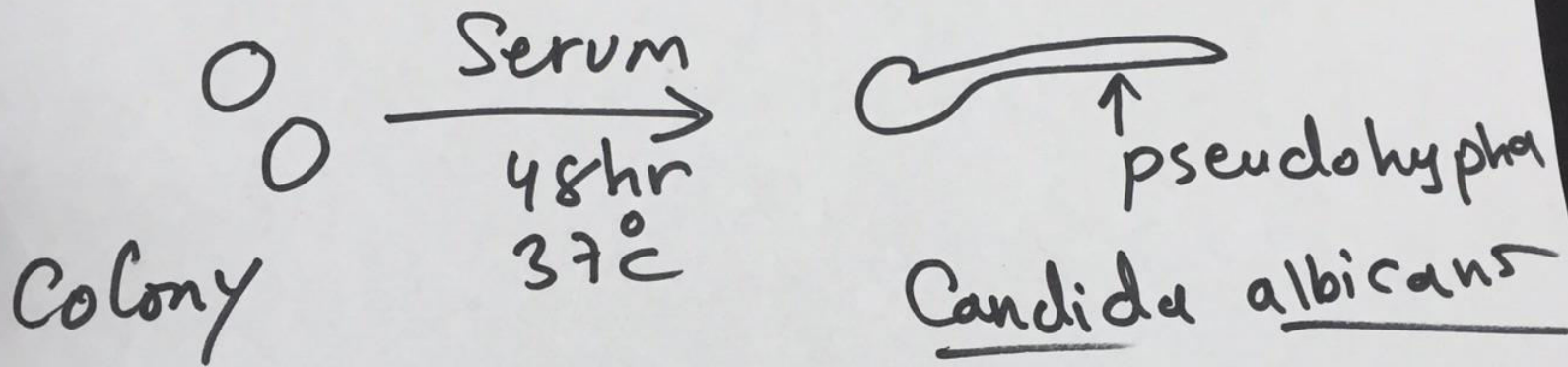
# ■ Candida Albicans

## -Germ Tube Test :

A test used to identify Candida Albicans.

Few colonies are suspended with serum in a tube and incubated for 4 hours, then wet mount preparation is stained by crystal violet (gram stain) and observed under the microscope. *pseudohyphae* are the character of *Candida albicans*.

# Germ Tube Test



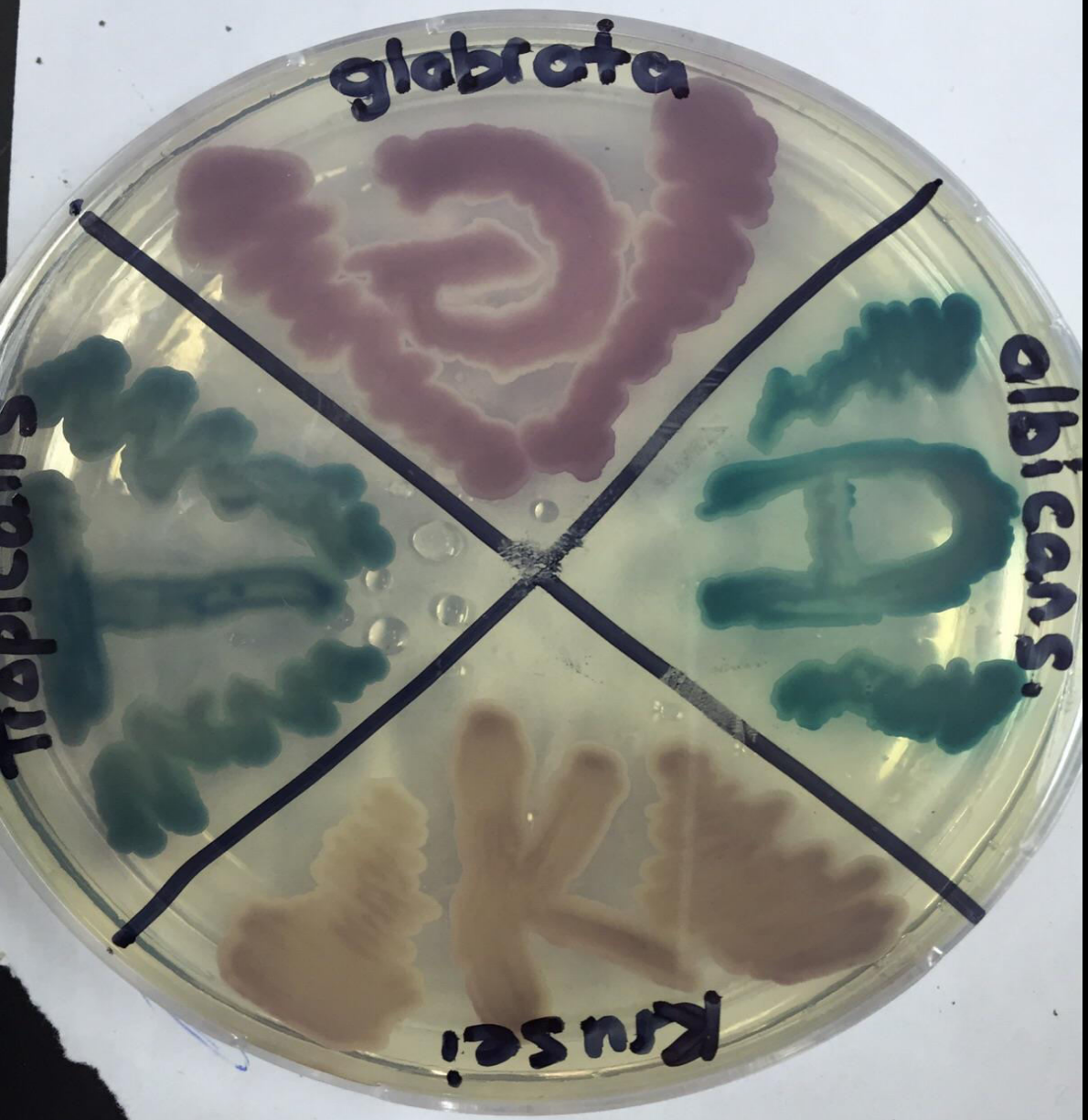
# •How to identify different candida species ?

-By using *Chrom Agar Medium.*

It's a transparent agar medium that contains chromogenic mixture. It can differentiate between various types of *Candida spp.*

- Suspected *Candida colonies* are subcultured into *chrome agar medium* and incubated for 48 hours at 37 degrees Celsius.
- *Candida albicans*: produces **green** colonies.
- *Candida tropicalis*: produces **blue** colonies.
- *Candida glabrata* : produces **pink** colonies.







Tentative differentiation of commonly isolation clinical aerobic enteric bacilli by means of Kligler's iron agar and other biochemical tests during 24-hours incubation at 37°C

+ Black      orange ⊖      blue ⊕      pink ⊕  
 ⊕      ⊖      ⊕      ⊖  
 Pink      Green ⊖      pinking ⊕

Organisms	Slant	Butt	Gas	H <sub>2</sub> S	Urease	Citrate	Indole	Motility	Oxidase
<i>E. coli</i>	Y*	Y	±	—	—	—	+	±	—
<i>Citrobacter spp.</i>	Y*	Y	+	+	W	+	—	±	—
<i>Enterobacter-serratia</i>	Y*	Y	±	—	—	+	±	±	—
<i>Klebsiella spp.</i>	Y*	Y	±	—	±	+	—	—	—
<i>Proteus spp.</i>	R	Y	+	+	+	±	±	+	—
<i>Morganella spp.</i>	R	Y	—	—	+	—	+	+	—
<i>Providencia spp.</i>	R	Y	±	—	+	+	+	+	—
<i>Salmonella spp.</i>	R	Y	+	+	—	+	—	±	—
<i>Shigella spp.</i>	R	Y	—	—	—	—	±	—	—
<i>Pseudomonas spp.</i>	R	R	—	—	—	—	±	—	—
<i>Vibrio cholera</i>	R	Y	—	—	—	±	—	+	+
<i>Acinetobacter</i>	R	R	—	—	—	+	+	+	+

Y= YELLOW, Y\* = Few strains may be fermented after 24 hours, R= RED, W= WEAK.

Ferred red  
 6-5  
 +1 → jpi  
 Fermentation, Lactose, glucose

SIM  
 H<sub>2</sub>S + Indol + Motility

**\*\*THE END \*\***

**DONE BY, DUHA NAJI.**