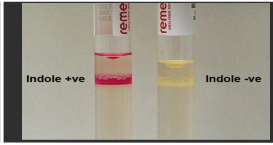
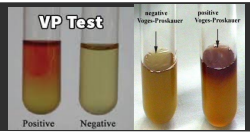
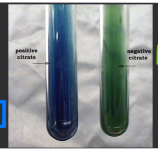
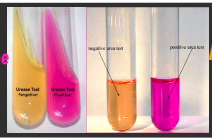
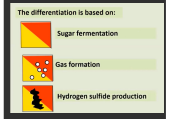
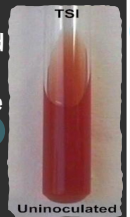
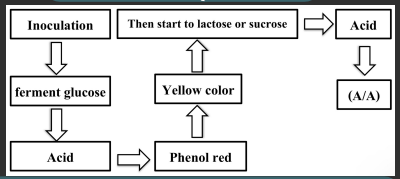
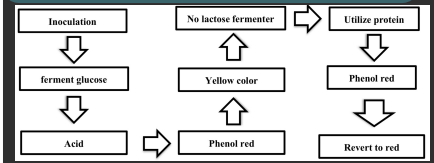
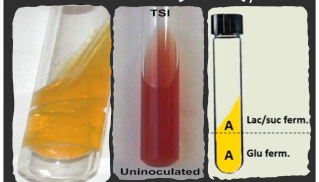
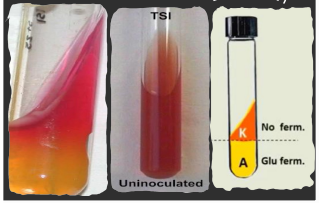
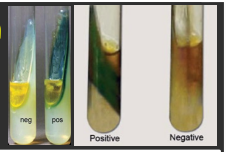
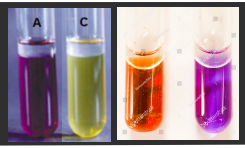
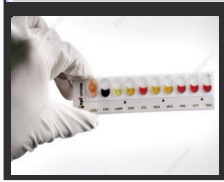
the test	The purpose of the test	The media	The indicator + the reaction	The result
1) Indole test	Test the ability of the bacteria to break (Tryptophan) = having the enzyme (Tryptophanase)	Peptone (liquid) + Tryptophan (nutrient / Source)	[Kovac's R.] If the media turn pink = +indole = The tryptophan metabolized and produce Indole that react with the reagent Yellow = - Indole	
2) methyl red test	Test the ability of the bacteria to perform mixed acid fermentation from (Glucose)	Peptone + Glucose [Incubate at 37 for 48h]	[MR] if the media turn red = +MR = large amounts of mixed acid Acetic , Lactic , Sunccinic acid = low ph < 4 (Sensed)	Low Ph < 4 Red Acidic  High Ph > 6 Yellow Alkaline
3) Voges - proskauer test (V.P)	Test the ability of the bacteria to perform Acetyl methyl carbonil (Acetone) frome the fermentation of (Glucose)	Peptone + Glucose [Incubate at 37 for 48h]	[a-naphthol + 40% KOH] if the media turn dark red = +VP = the Acetone react with the indecator & gets oxidized to Diacetyl	
4) Citrate utilization test	Test if the bacteria have the enzyme citrase that metabolized & utilize citrate and liberated (produce) CO2 [using citrate as carbon source]	Citrate [Incubate at 37 for 48h]	bromothymol blue = if the medium turn from green to blue = +citrate = CO2 interact with sodium Na and from sodium carbonate NaCO3 (Alkaline)	High PH [+PH]  Neutral PH
5) urea's test	Test the ability of the bacteria to break (Urea) = having the enzyme (Urea's)	Urea	Phenol red = if the media turn pink = +urea = the Urea break and give (Ammonia \ Alkaline) that interact with the indicator \ yellow = -Urea acidic	Alkaline ph 8  Acidic Ph 6
6) TSI Triple sugar iron  	Test if the bacteria can ferment these 3 sugars which give acid : 0.1% glucose + 1% lactose 1% sucrose  # Detection of gas production by break up the medium or pushed up the tube (slightly elevation)	Semi sold with a gel-like gelatinous consistency media = Ferrous sulfate The test tube should be placed at an angle obliquely to have a slant on top. 	PH indicator : phenol red  Glucose fermenter \ Lactose fermenter  Glucose fermenter \ Non-lactose fermenter	(Acid \ Acid (A\ A))  (Acid \ Alkaline (A\K)) 

the test	The purpose of the test	The media	The indicator + the reaction	The result
If the bacteria cannot ferment lactose, they will instead utilize the proteins present in the alkaline media. As a result, the media will remain alkaline, and the red color will persist, indicating no change. In contrast, the presence of a yellow color indicates successful fermentation of glucose. 	If the organism can not use the glucose in the medium. The color of the medium remains red. No sugar fermenter			(Alkaline \ Alkaline (k\k))  Enterobacteriaceae is a family of bacteria that includes many members such as: *Proteus, Salmonella, and Shigella*. 
H2S production	Test the ability for the to reduce sulfur =(H2S) use sulfur as electron acceptor	Sulfur 	Iron = if the media turn black = + H2S = hydrogen sulfide react with the intermediate and give ferric sulfide (Black)	
7) Phenylalanine deaminase	Distinguishes Proteus from Salmonella & Shigella as they 2 have the don't have contain phenylalanine deaminase	Phenylalanine	Ferric acid = if the media turn green = + phenylalanine = the have phenylalanine deaminase enzyme = produce Phenyl pyruvic acid + NH3 so it's PROTEUS	Salmonella + shigella Proteus 
8) Ornithine decarboxylase	Distinguish between Providencia rettgeri & Morganella morgani by the present of Ornithine decarboxylase	Ornithine Source of carbon (energy for growth) + glucose	Bromocresol purple = if the media turn purple = + ornithine decarboxylase = Morganella morgani (+ve) Fermentation of glucose Yellow = P.rettgeri(-ve)	

9) The analytical profile index (API) (Biochemical tests for identification)

Several API systems for different groups of organism - streptococcus B

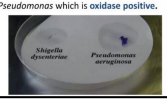


We inoculate each tube, place them in an incubator, and after 24 hours, we record the color changes according to the catalog. This allows us to identify the type of bacteria.

Some bacteria produce Oxidase enzyme Detection by adding few drops of colorless Oxidase reagent Colonies turn deep purple in color (positive)

Oxidase Test

- All Enterobacteriaceae are oxidase-negative.
- This test is used to differentiate enterobacteriaceae from *Pseudomonas* which is oxidase positive.

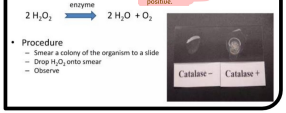


-indication(color change): after adding colorless oxidase reagenta purple color →indicates the presence of Pseudomonas bacteria.
no color is present →the bacteria is from the Enterobacteriaceae.

Some bacteria produce catalase enzyme Addition of H2O2 lead to production of gas bubbles (O2 production)

Catalase test:

- Is used to differentiate between staphylococci(catalase +ve) and streptococci(catalase –ve).
- Principle:



- Procedure
  - Smear a colony of the organism to a slide
  - Drop H_2O_2 onto smear
  - Observe

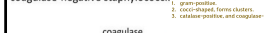
Coagulase test:

Some bacteria produce coagulase enzyme Coagulase enzyme converts fibrinogen to fibrin (plasma clot)

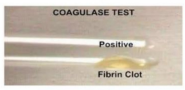
Detected by slide or test tube method

Coagulase test

is used to differentiate *Staphylococcus aureus* from coagulase-negative staphylococci



fibrinogen —coagulase→ fibrin (clot formation)



Characteristic	Staphylococci	Streptococci
Catalase Test	Catalase positive	Catalase negative
Morphology	Forms clusters	Forms chains
Gram Staining	Gram-positive	Gram-positive
Shape	Cocci (spherical bacteria)	Cocci (spherical bacteria)

The Shape is not enough

Staphylococcus aureus is the only member of the Staphylococcus family that is coagulase-positive.
-Indication: forming of fiber clot, indicate Coagulase-positive bacteria

The End.