

# Enterobacteriaceae

Gram-Negative Bacteria

Prepared by: Rana Alqusumi

Identification



Classification

Characteristics

## Characteristics

- All of Enterobacteriaceae are:
  - 1-Gram-negative rods
  - 2-Non-spore forming **except** *Klebsilla*
  - 3-Reduce nitrates into nitrites( $\text{NO}_3$  into  $\text{NO}_2$ )
- Facultative anaerobic
- Motile except *Klebsilla* and *Shigella*
  - Non-fastidious
- Grow on bile containing media (MacConkey agar)
- Transient colonizers of water stream.

True  
Pathogenic

Opportunistic

Lactose  
Fermentation

## True Pathogens:

- 1-*Salmonella* spp.
- 2-*Shigella* spp.
- 3-*Yersinia* spp

## Opportunistic

Most members of the Enterobacteriaceae are opportunistic or cause secondary infections of wounds, the urinary and respiratory tracts, and the circulatory system e.g. E. coli.

## Lactose Fermentation

Enterobacteriaceae divided into TWO main groups according to action on lactose fermentation:

-Lactose Fermenters (LF):

E. coli, Citrobacter, Klbsesiella, Enterobacter

-Non-Lactose Fermenters (NLF):

Salmonella, Shigella, Proteus, Yersinia.

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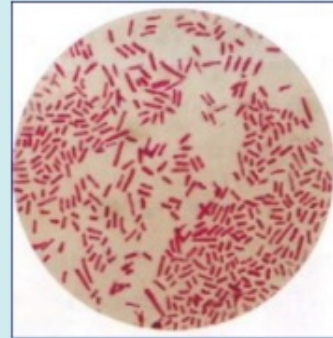
## Identification of Enterobacteriaceae

Gram  
Stain

Biochemical  
Reactions

# Gram Stain

- All Enterobacteriaceae are Gram-negative rods
- Arranged in single





# Biochemical reactions:

Oxidase test:

- All members of Enterobacteriaceae are oxidase negative
- Pseudomonas oxidase positive

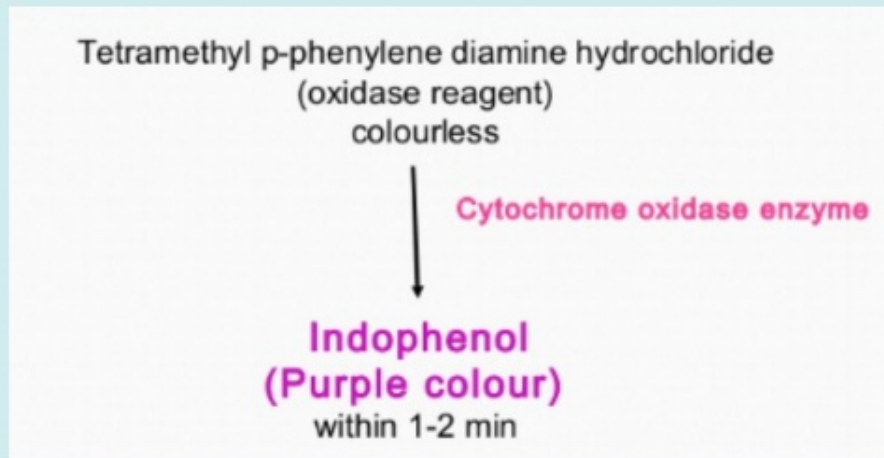
O/F test :

- All members of Enterobacteriaceae are O+/F+
- Pseudomonas O+/F-

Oxidase test

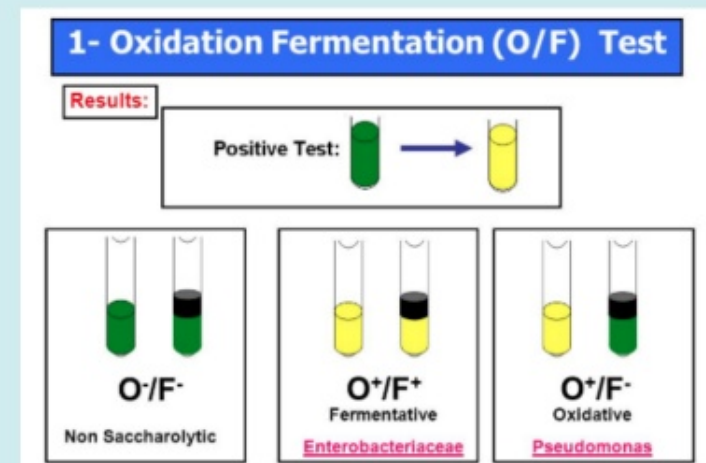
O/F test

# Oxidase test:



# O/F Test (Oxidation Fermentation Test):

- Saccharolytic bacteria attack carbohydrates either:
  - Fermentatively (in absence of oxygen) to yield relatively strong acids, or
  - Oxidatively (in presence of oxygen) to yield weak acids.
- Oxidation process is much more easier than Fermentation process.



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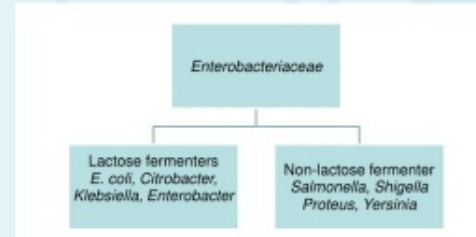
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## Classification

· There are several selective and differential media used to isolate and distinguish between LF & NLF



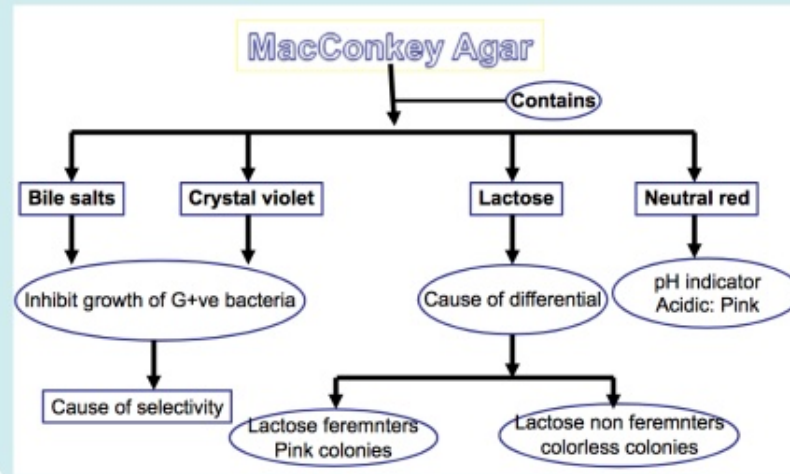
- The most important media are:
- MacConkey agar
- Eosin Methylene Blue (EMB) agar
- Salmonella Shigella (SS) agar
- Triple Sugar Iron (TSI) agar

LF & NLF  
on  
MacConkey  
agar

LF & NLF  
on  
SS agar

## Differentiation between LF & NLF by growth on MacConkey agar

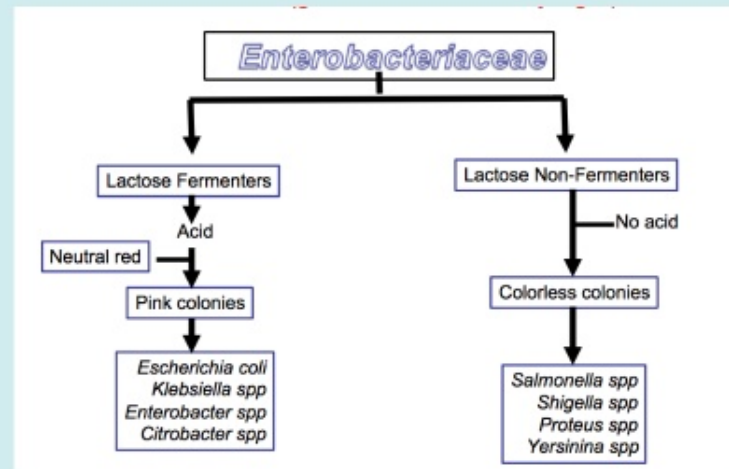
MacConkey agar is selective & differential medium  
for Enterobacteriaceae



Classification

Identification

Classification of Enterobacteriaceae according to lactose fermentation (growth on MacConkey Agar)

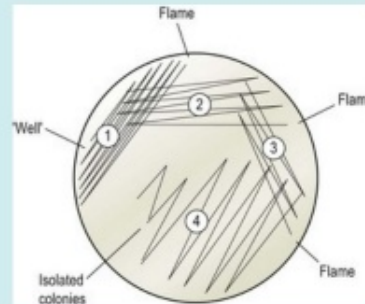


## Identification of Enterobacteriaceae differentiation between LF & NLF by Growth on MacConkey agar

### Method:

- MacConkey agar is inoculated with tested organism using streak plate technique
- Incubate the plate in incubator at 37 C/24 hrs

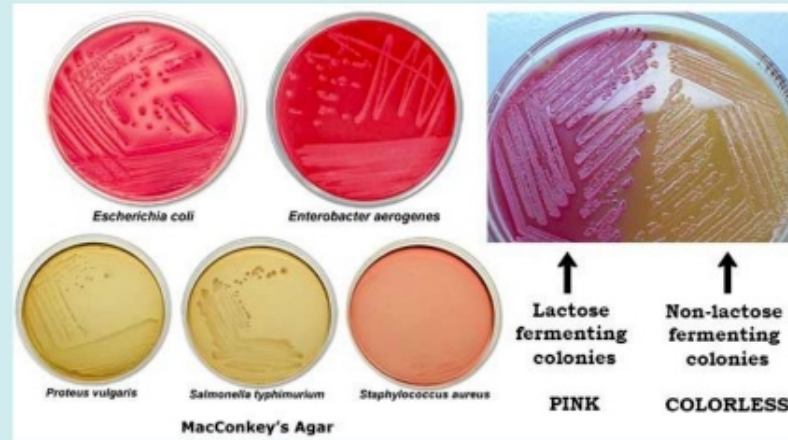
- ### Results:
- LF organism appears as pink colonies (e.g. E. coli)
  - NLF organism appears as colorless colonies (e.g. Shigella)



Result



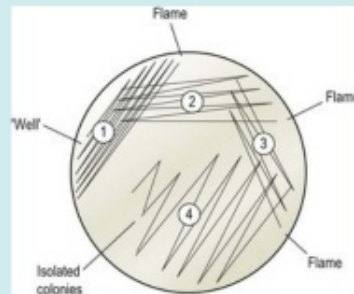
# Result



**Identification of  
Enterobacteriaceae differentiation  
between  
LF & NLF by growth on SS agar**

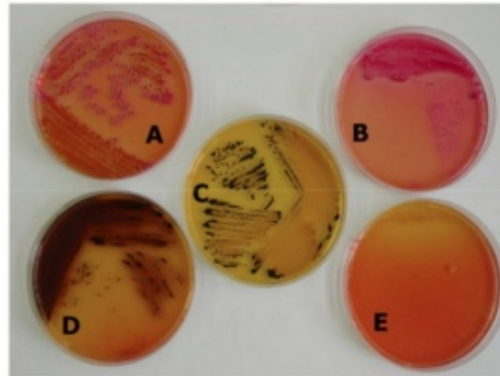
**Method:**

- SS agar is inoculated with tested organism using streak plate technique
- Incubate the plate in incubator at 37 C/24 hrs



**Result**

# Result



- A *Klebsiella pneumoniae*
- B *Escherichia coli*
- C *Salmonella sp*
- D *Proteus mirabilis*
- E *Ps. aeruginosa*

- Both are lactose fermenters
- Both *Salmonella sp.* & *Proteus* product H<sub>2</sub>S
- *Pseudomonas* colonies are nearly colorless





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A quote by Robert T. Kiyosaki is displayed on a sunset background. The quote is: "Losers quit when they fail. Winners fail until they succeed." The background shows a sun setting behind mountains, with a warm orange and yellow glow. The quote is centered in two lines, with the author's name below it. The entire image is framed within a light blue circle on a teal background with geometric patterns.

Losers quit when they fail.  
Winners fail until they succeed.

Robert T. Kiyosaki

quoting

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