Bacterial taxonomy Lab:7

Differential Media

Differential media (or indicator media) are specialized culture media designed to allow multiple types of microorganisms to grow while visually distinguishing them based on metabolic or biochemical differences. These media often contain specific substrates (e.g., sugars) and pH indicators (neutral red, phenol red , Bromothymol blue) that cause color changes in colonies or the agar, allowing for the differentiation of closely related species.

Purpose:

To differentiate species of microorganisms on a single plate by distinguishing between, for example, lactose fermenters and non-fermenters.

Mechanism:

Typically utilizes pH indicators to show metabolic changes (such as acid production) or reagents that produce color changes.

Examples:

Blood Agar:

Differentiates bacteria based on hemolysis (destruction of red blood cells), such as alpha, beta, or gamma hemolytic activity.

MacConkey Agar (MAC):

Differentiates based on lactose fermentation; lactose fermenters turn pink/red.

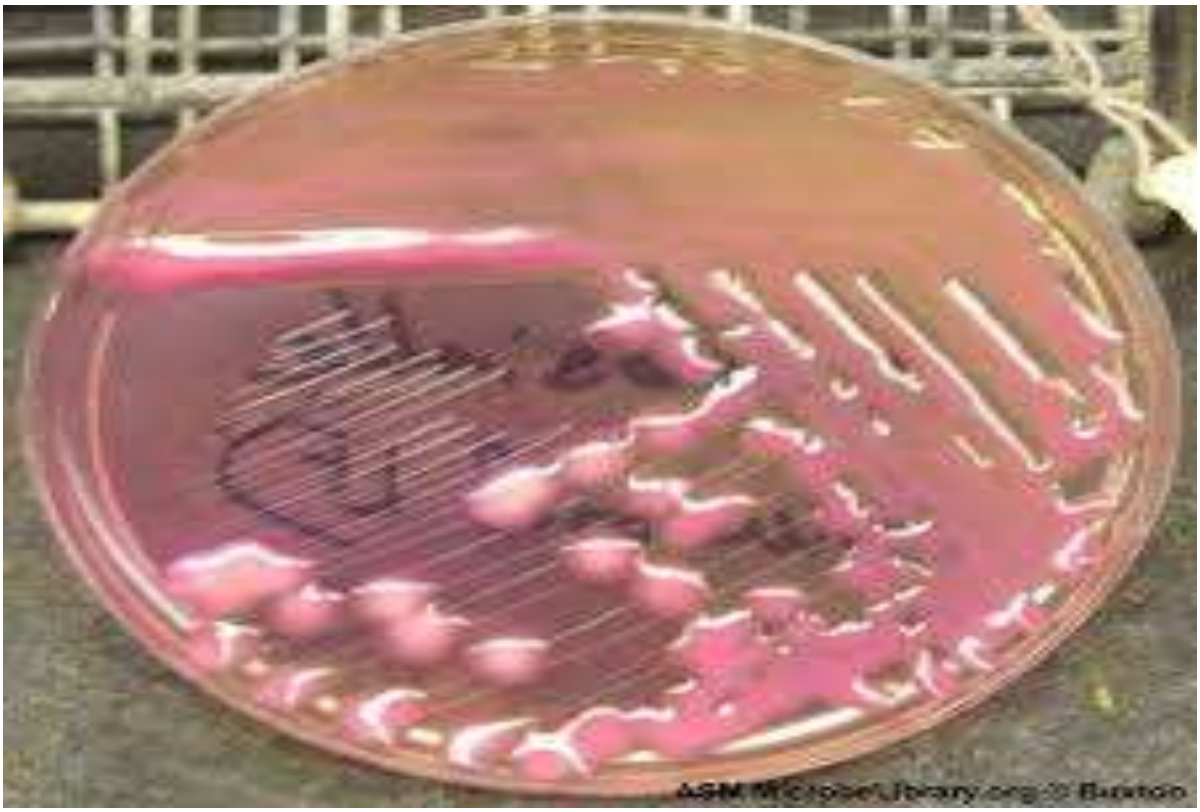
Mannitol Salt Agar (MSA):

Differentiates mannitol fermenters (e.g., *Staphylococcus aureus*, which turns the medium yellow) from non-fermenters such as *Staphylococcus epidermidis* which turns the medium red.

Eosin Methylene Blue (EMB) Agar:

Differentiates lactose fermentation *Escherichia coli* produces a green metallic sheen. These media are essential in clinical laboratories for identifying pathogens. such as separating *E. coli* from other Enterobacteriaceae.


Klebsiella pneumoniae
MacConkey agar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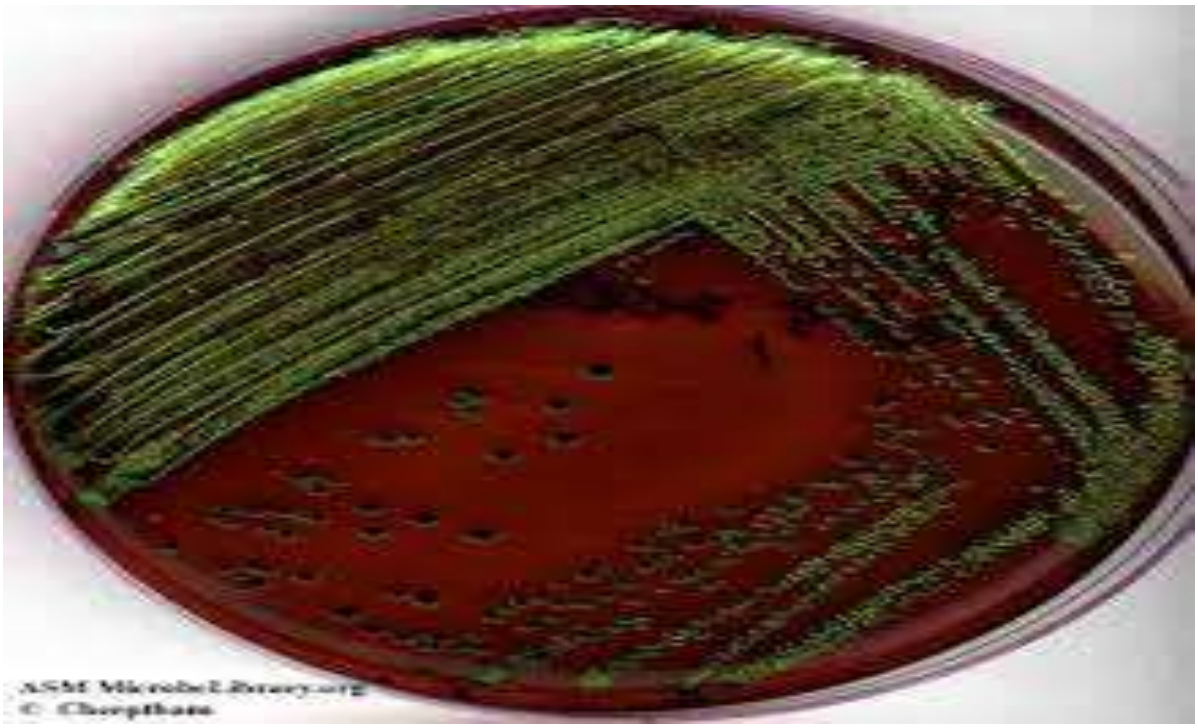
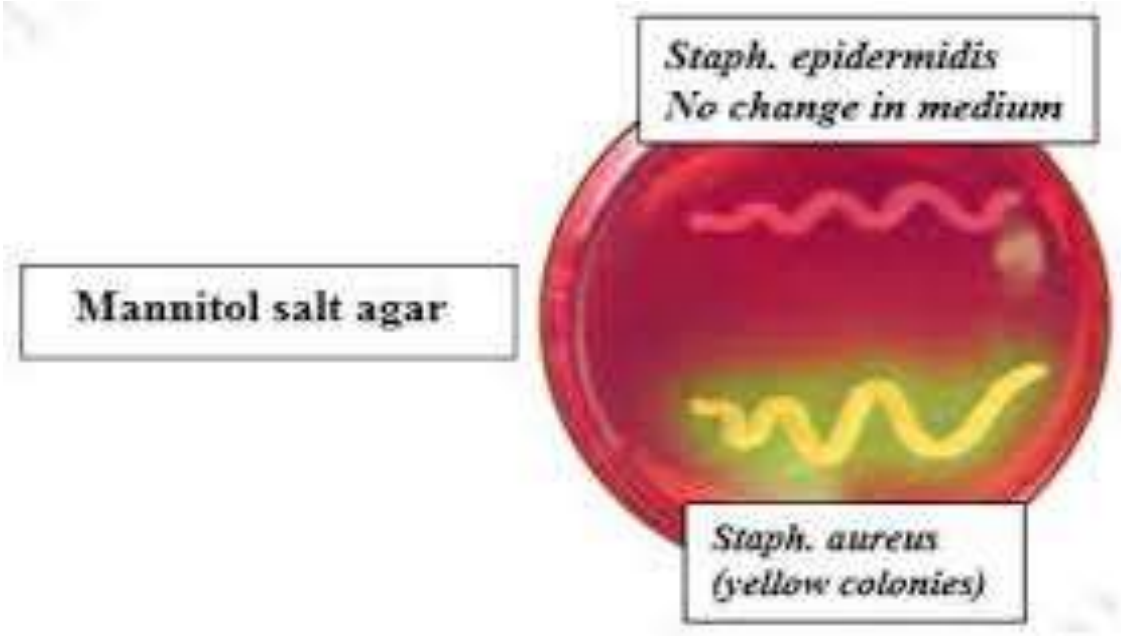
MacConkey agar



EMB agar



Mannitol salt agar

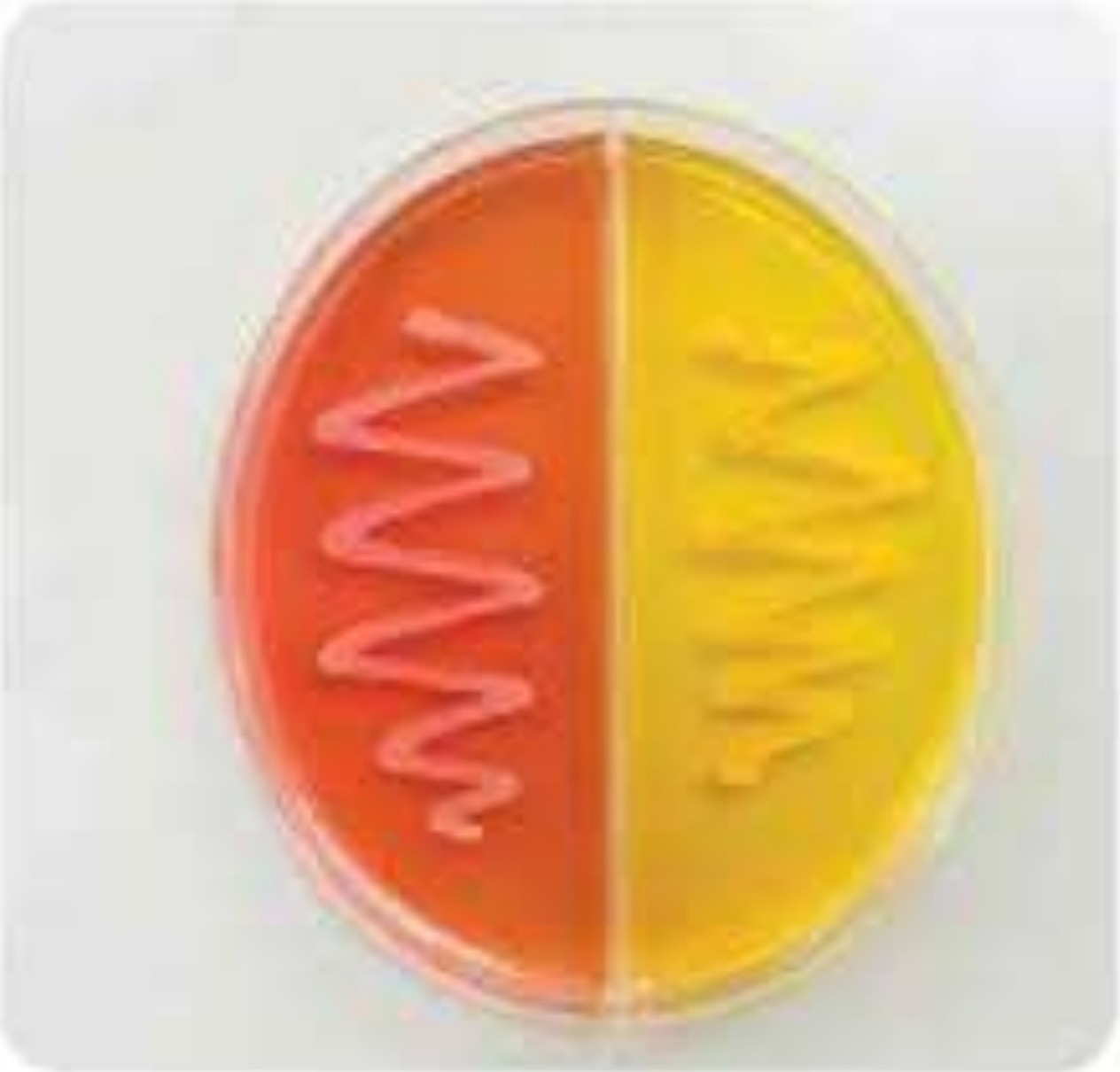
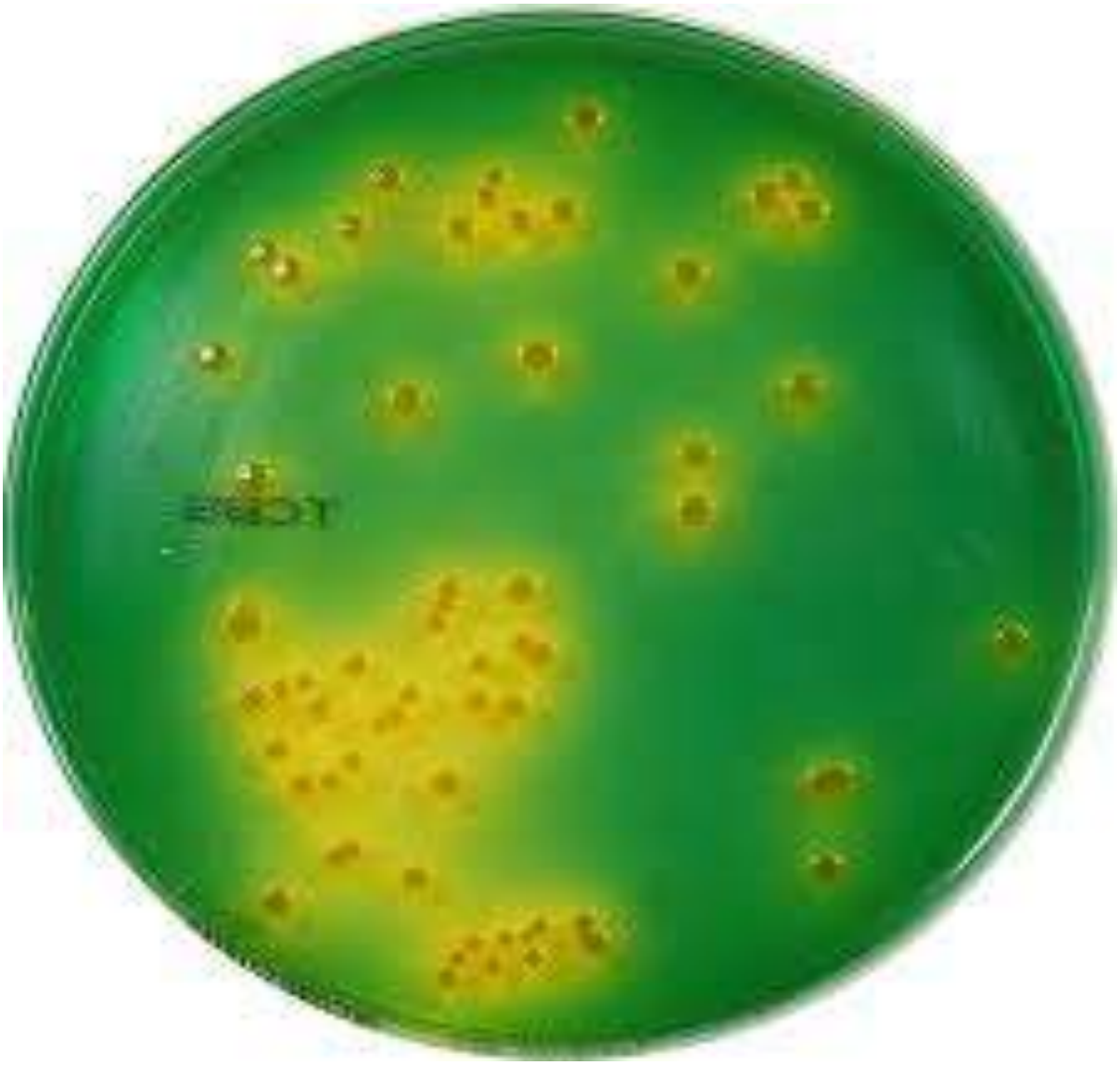


Figure 5.5: Growth of *Staphylococcus aureus* on Mannitol salt agar

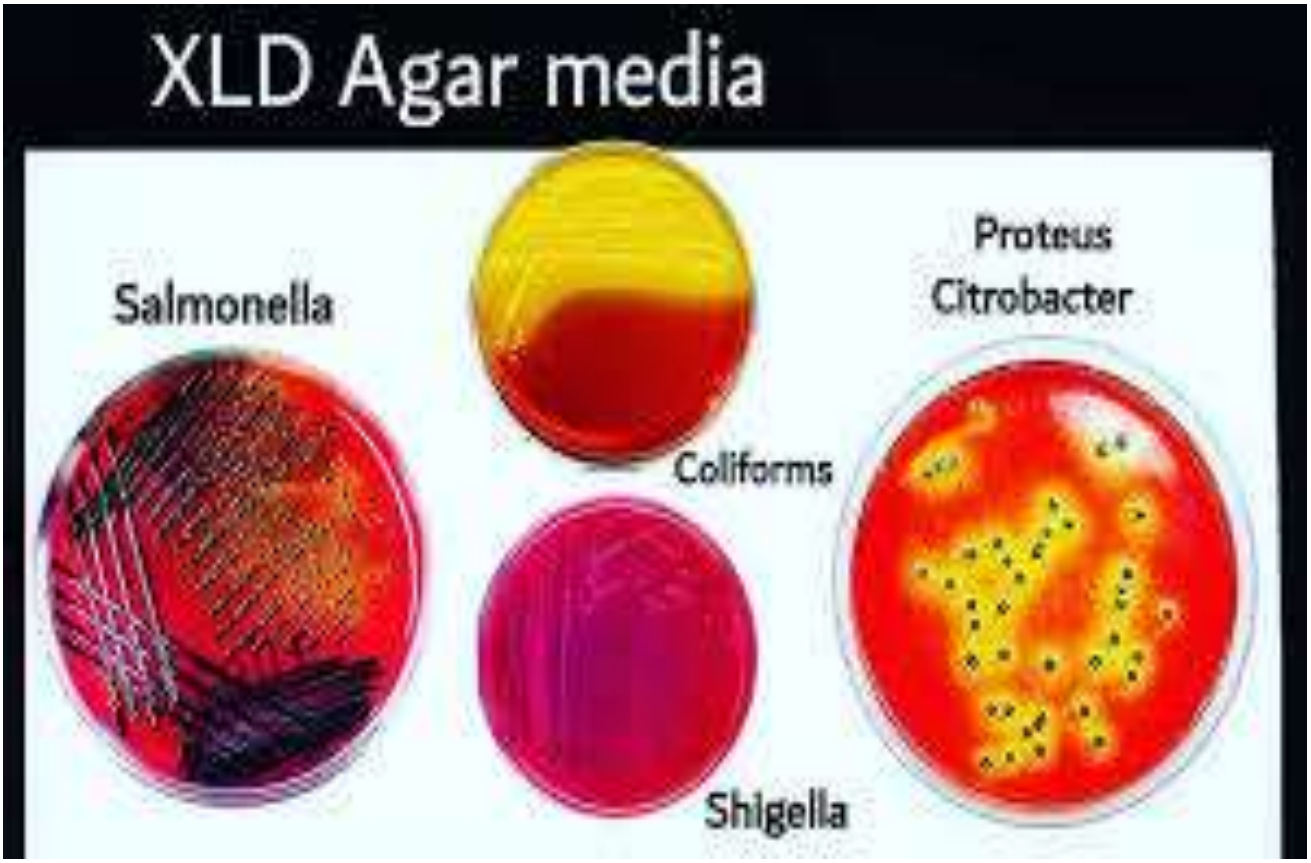
Vibrio cholerae on TCBS Agar

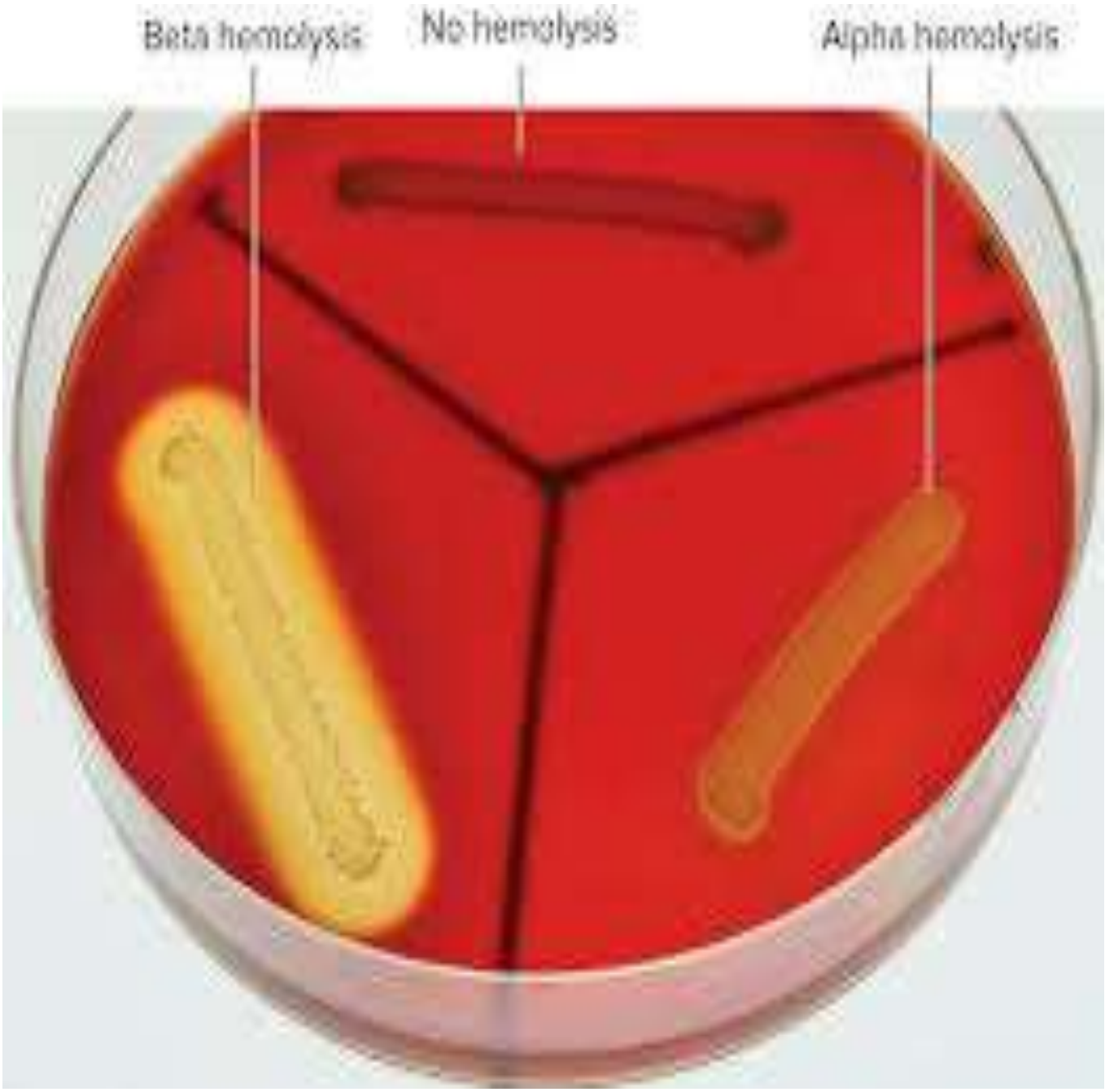
Vibrio parahaemolyticus on TCBS Agar



TCBS agar

Salmonella Typhimurium on XLD agar.





Blood agar

Selective media

Selective media are specialized culture media designed to isolate specific microorganisms from mixed populations by promoting the growth of desired organisms while inhibiting the growth of unwanted, contaminating microbes. This selectivity is achieved by adding specific inhibitors like antibiotics, dyes, high salt concentrations, or adjusting pH to inhibit unwanted bacteria.

Mannitol Salt Agar (MSA):

Selects for *Staphylococcus* species due to high sodium chloride concentration.

Eosin Methylene Blue (EMB) Agar:

Selects for Gram-negative bacteria by inhibiting Gram-positive bacteria with dyes

MacConkey Agar:

Selects for Gram-negative organisms, particularly Enterobacteriaceae.

Phenyl Ethyl Alcohol (PEA) Agar:

Inhibits most Gram-negative bacteria, selecting for Gram-positive organisms.

Thayer-Martin Agar:

Used to isolate *Neisseria gonorrhoeae*.

Lowenstein-Jensen Medium:

Selects for *Mycobacterium tuberculosis*.

Mechanisms of Selective Media

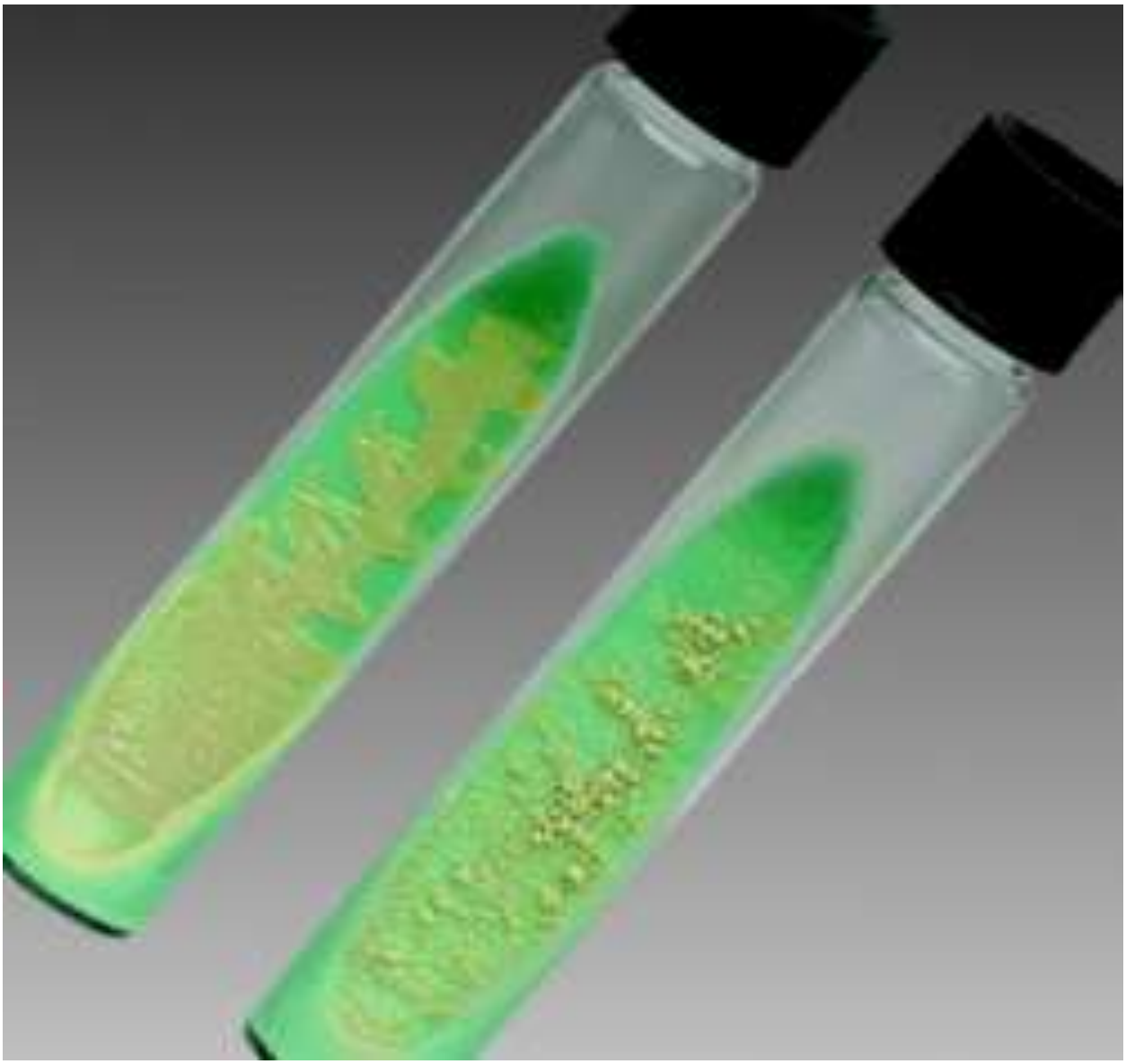
- **Antibiotics: PEA agar inhibits Gram-negative DNA synthesis.**
- **Dyes: Crystal violet inhibits Gram-positive bacteria.**
- **Salts: High NaCl concentrations (e.g., 7.5% in MSA) inhibit most bacteria except *Staphylococcus*.**

- **pH: Low pH (acidic) environments in Media like Sabouraud Dextrose Agar (SDA) are used to isolate fungi/yeast.**

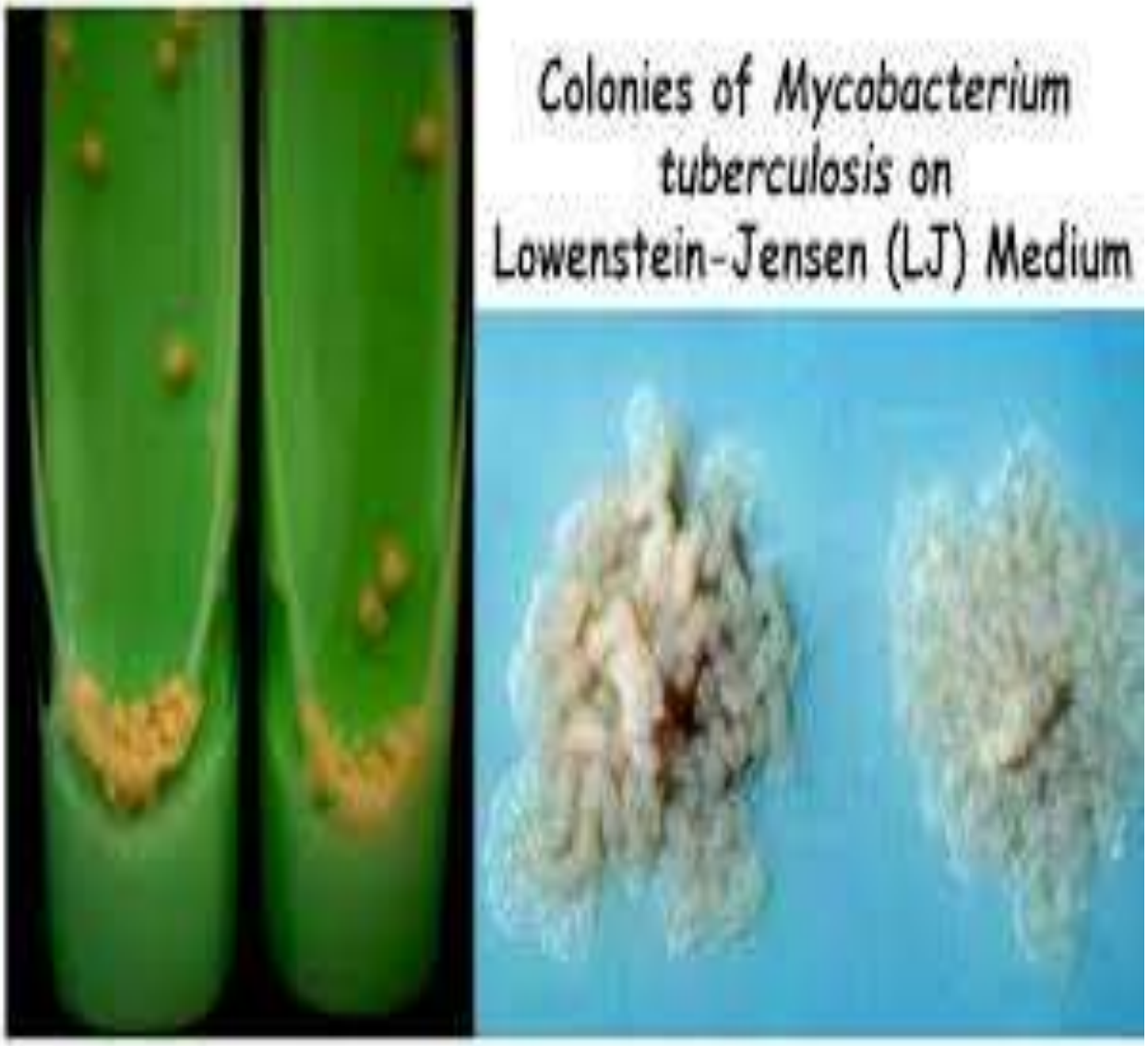
Selective media are essential in clinical, environmental, and food laboratories to quickly identify pathogens.

such as isolating *Salmonella* from food samples.


Thayer Martin Agar



Lowenstein-Jensen Medium:



Colonies of *Mycobacterium tuberculosis* on Lowenstein-Jensen (LJ) Medium

Phenyl Ethyl Alcohol (PEA) Agar: