

A microscopic image showing numerous green, rod-shaped bacteria against a dark background. The bacteria are scattered throughout the frame, with some appearing in small clusters. The lighting highlights the texture and shape of the individual cells.

Bacteria

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Ph.D

- **The prokaryotes:** are a group of organisms that lack a cell nucleus or any other membrane-bound organelles. They differ from eukaryotes, which have a distinct nucleus.
- Prokaryotes are unicellular organisms which are divided into two groups :
 - ❖ Bacteria
 - ❖ archaeobacteria

- The Prokaryotic cell rather small not more than 1-10 micron .
- There is no mitochondria and chloroplast .
- Contain nuclear (genetic) materials which is not membrane-bound that appear under electron microscopy as very fine threads in the cytoplasm which is called (nucleoid) .

❖ What are bacteria?

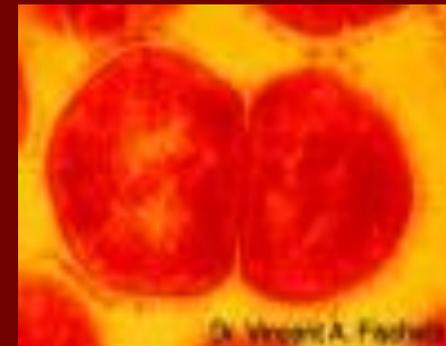
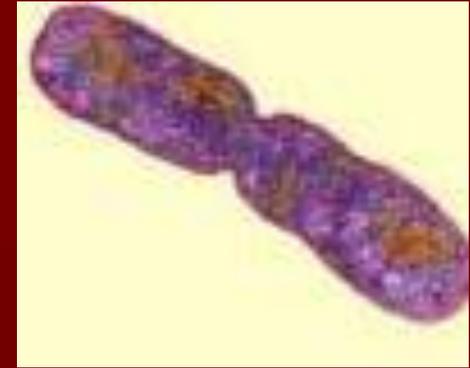
- Single celled organisms
- Very small
- Need a microscope to see
- Can be found on most materials and surfaces
 - Billions on and in your body right now



Streptococcus can cause strep throat.

■ How do bacteria reproduce?

- Grow in number not in size
- Make copies of themselves by dividing in half (which multiply by binary fission)



Bacteria can classify according to :

1. Energy source:

- **Photosynthetic bacteria**
- **Chemosynthetic bacteria**

2. Nutrition requirements :

- **Bacteria need simple nutrients.**
- **Bacteria need complex nutrients.**

3. Growth ability in living tissue :

- **Saprophytic bacteria**
- **Pathogenic (parasitic) bacteria**

4. Temperature of growth:

- Psychrophilic bacteria
- Mesophilic bacteria
- Thermophilic bacteria

5. Oxygen requirements :

- Obligate aerobes (strict)
- Obligate anaerobes
- Facultative anaerobes
- Microaerobic organisms

6. Motility :

- **Motile bacteria** : have locomotion organelles which is called (**flagella**)
- **Non-motile bacteria**

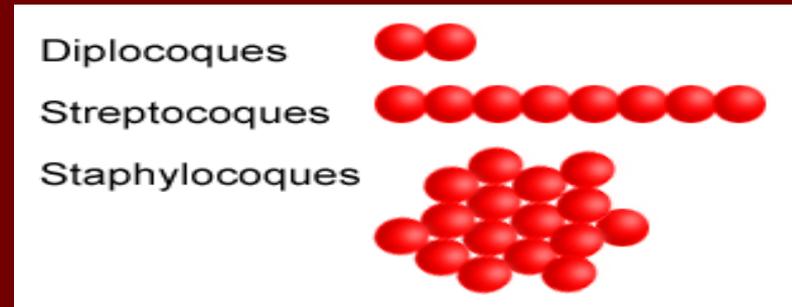
7. Spore formation :

- **Non-spore forming bacteria** : e.g . *Corynebacterium*
- **spore forming bacteria** : e.g . *Clostridium*

8. Morphology:

A. Spherical or cocci : these bacteria are spherical or oval shape having one of these arrangements based on number and planes of division:

- Single
- Pairs (diplococci)
- Streptococci (chains)
- Staphylococci (grape-like)
- Tetrads (4 cells)



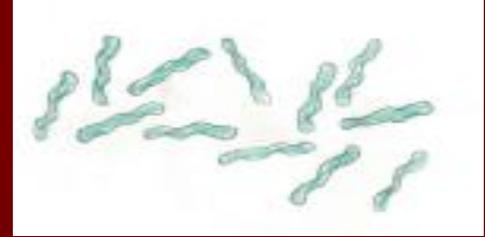
B. Rod or Bacilli :

•this shape occur in single ,streptobacilli, diplobacilli or coccobacilli.



C. Spiral or screw shaped :

- this type coiled in three dimensions and don't have rigid cell wall as in spirochetes.

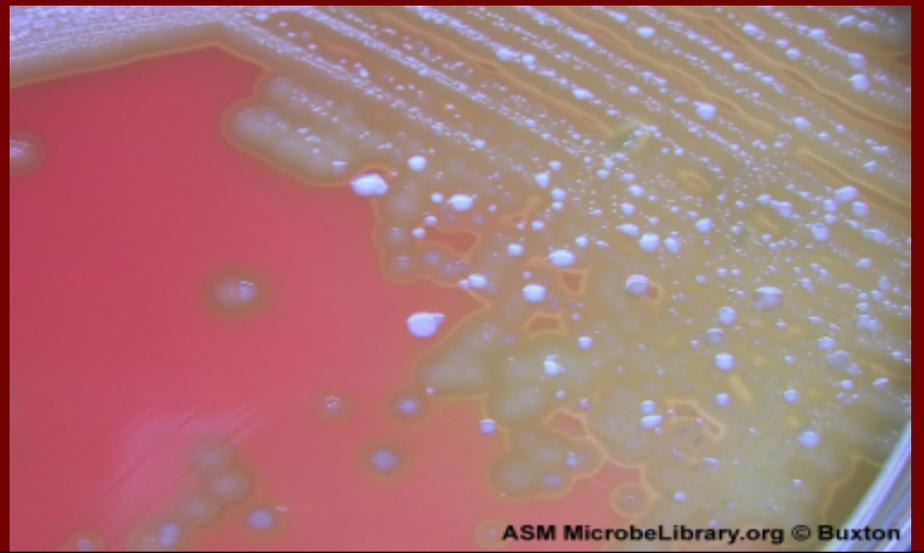
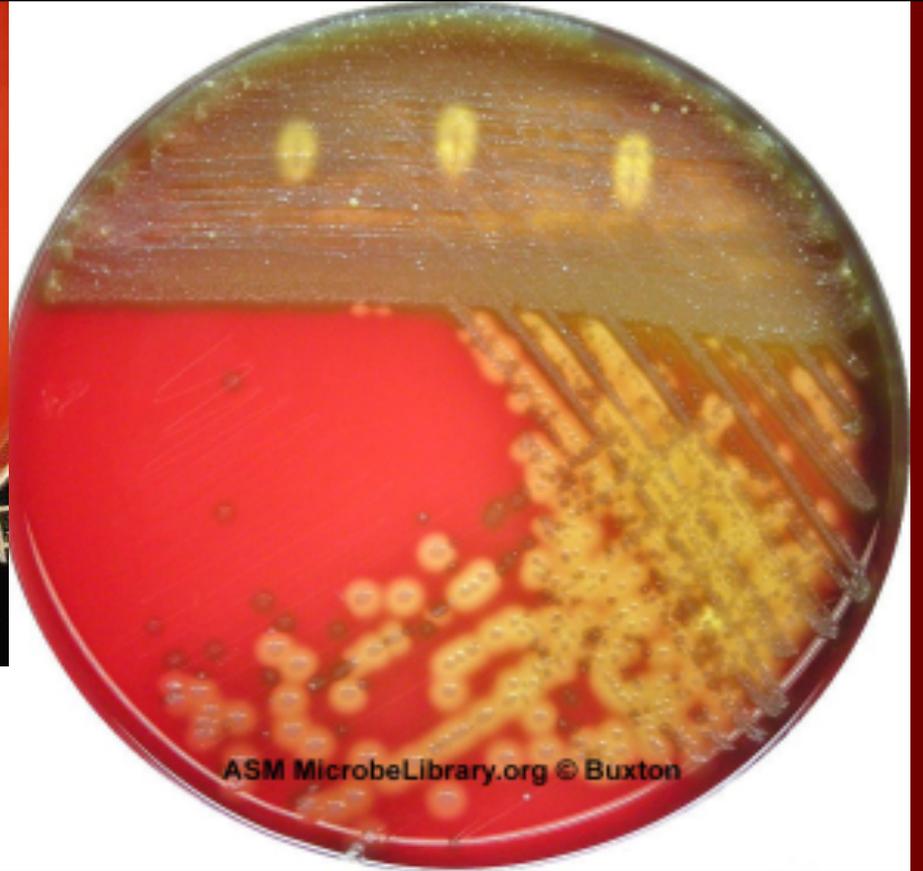
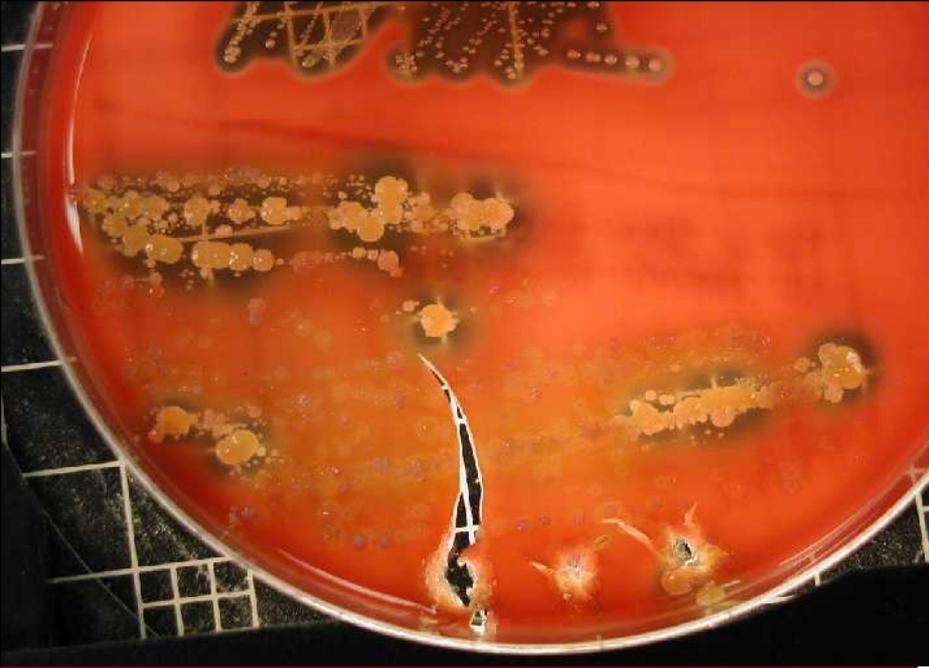


D. Comma or curved shaped

E. Exception to the above :

Trichomes ,stalked , filamentous, square, star-shaped, spindle-shape.



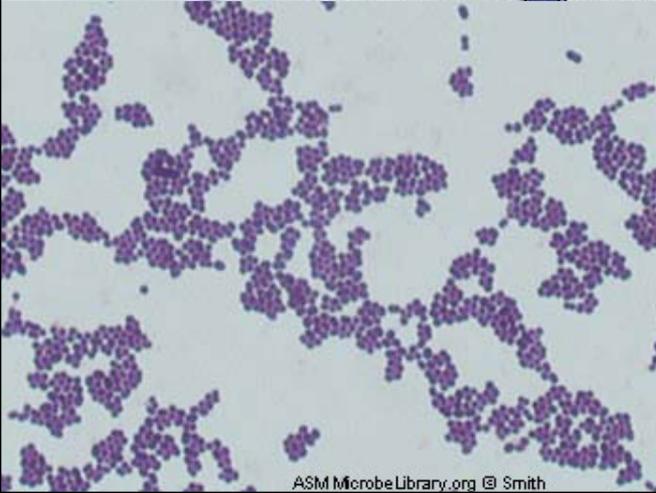




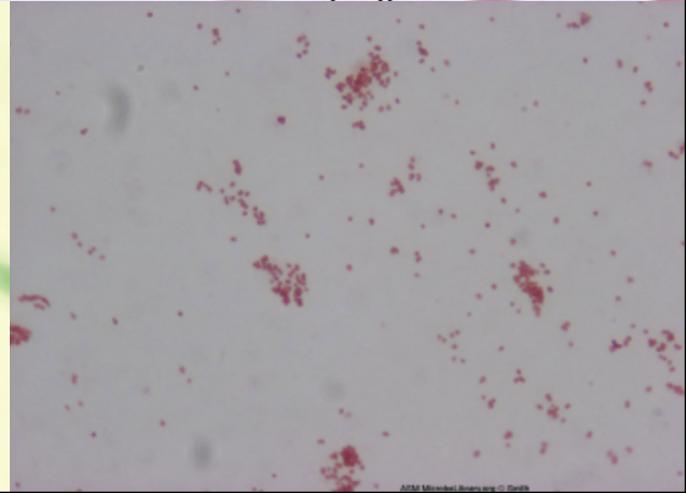
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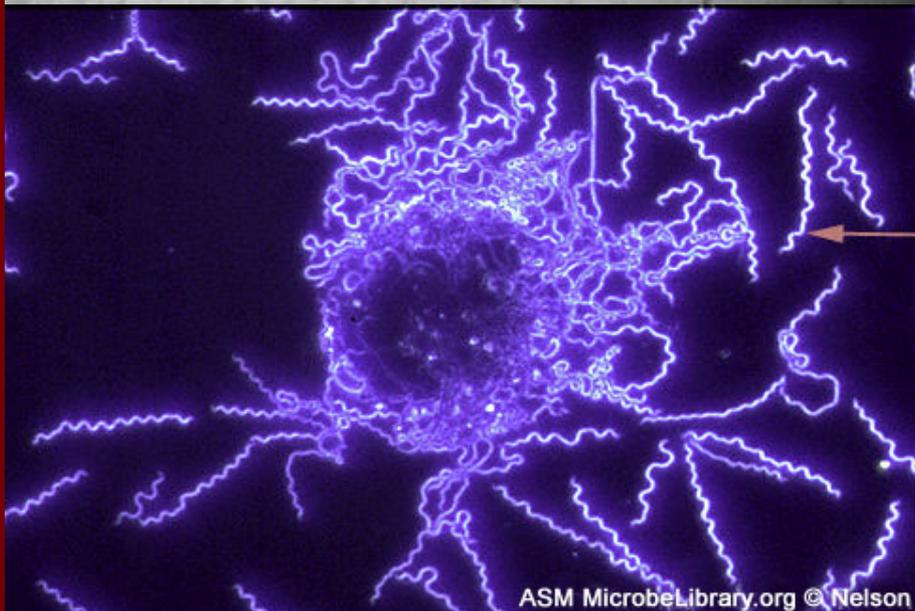
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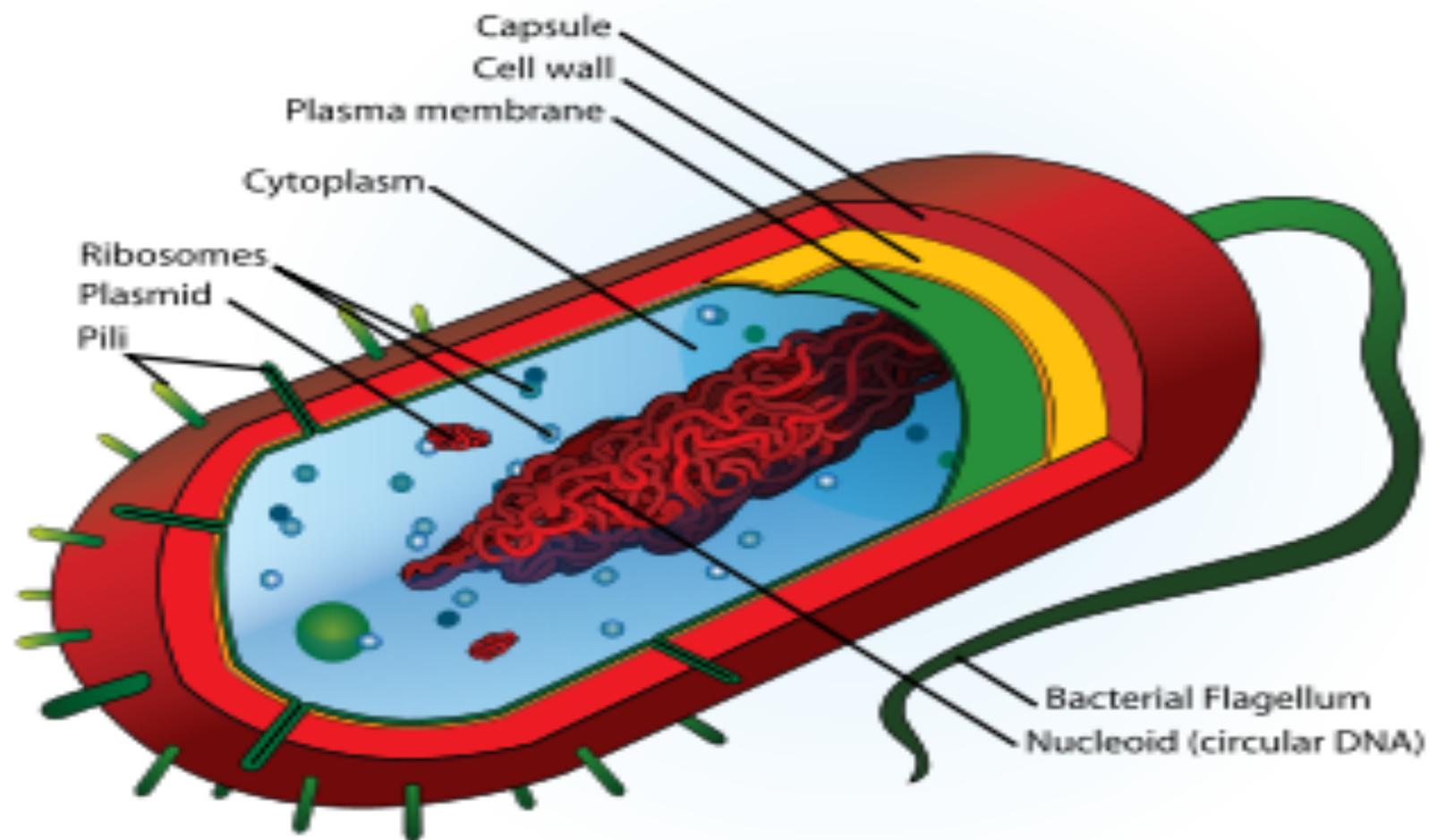


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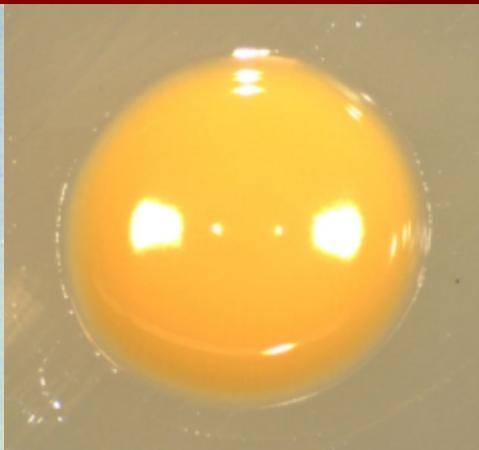
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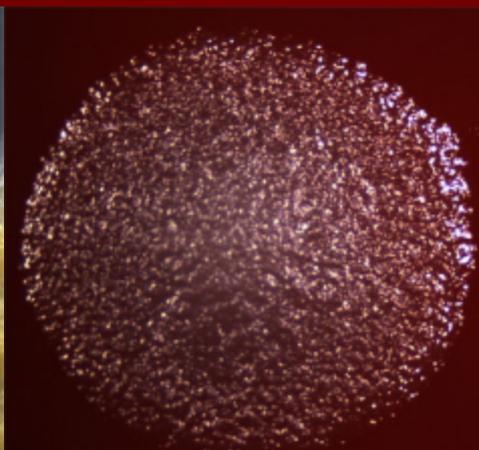
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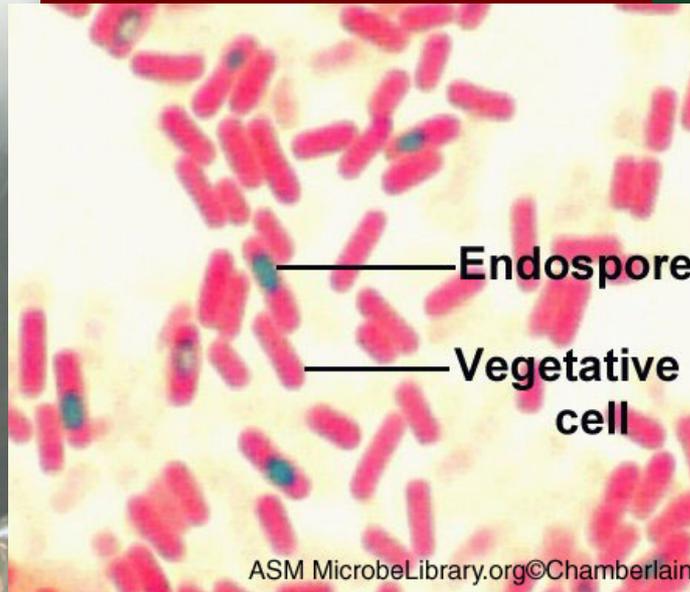
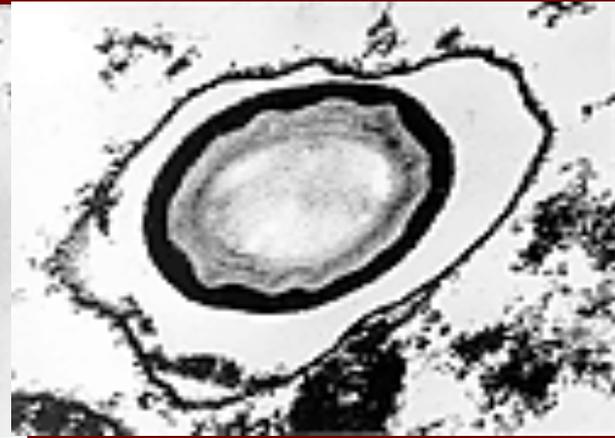
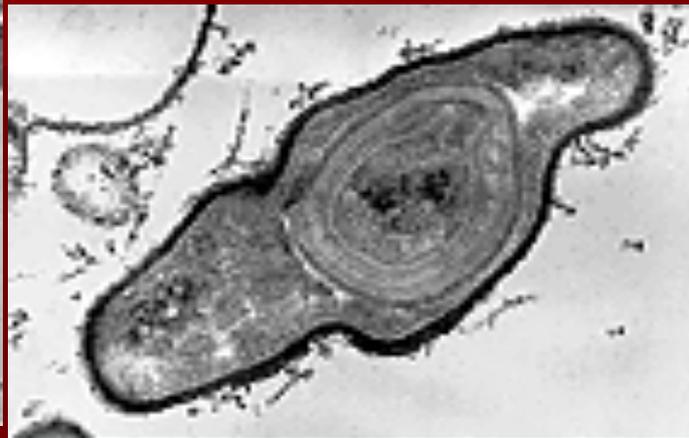
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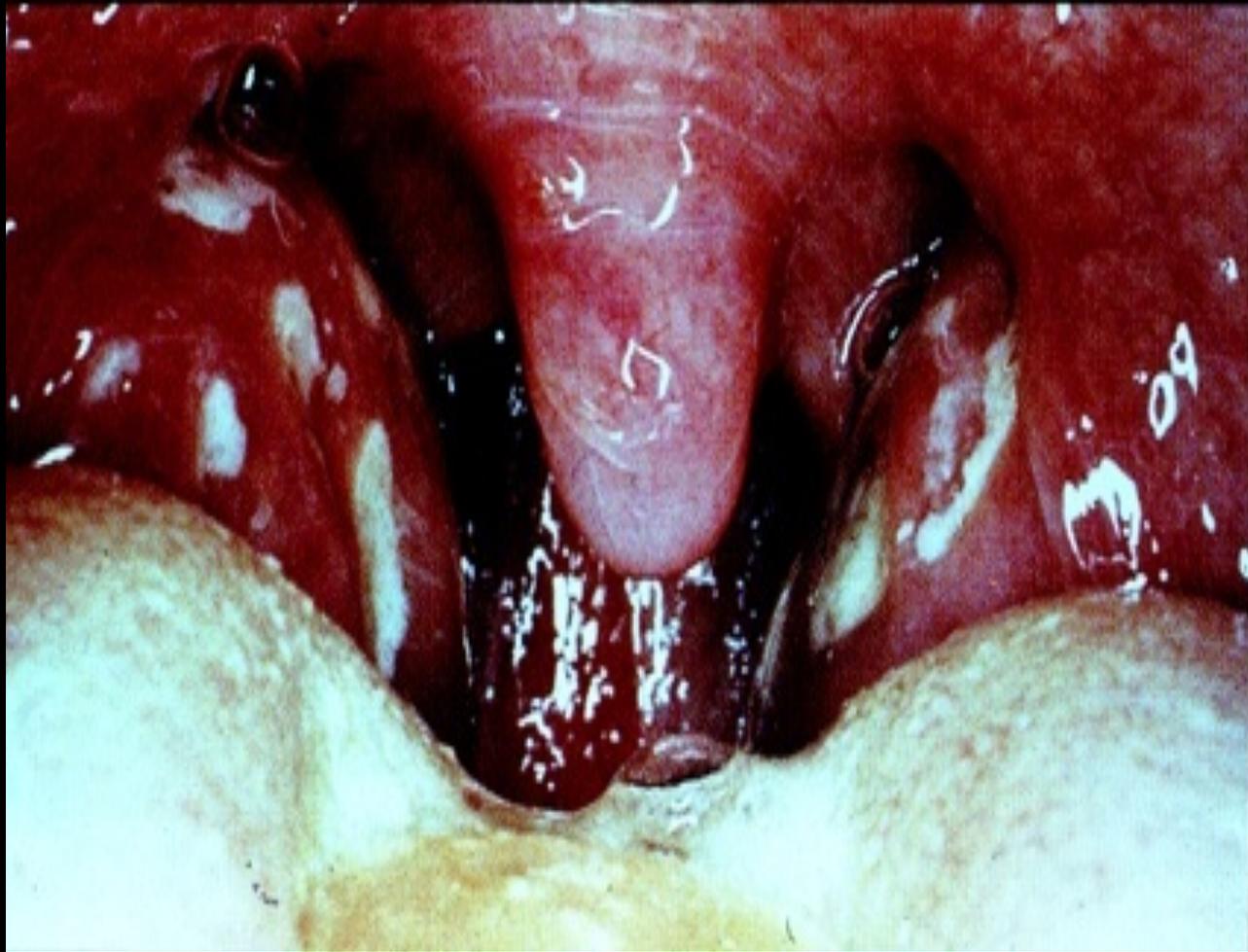
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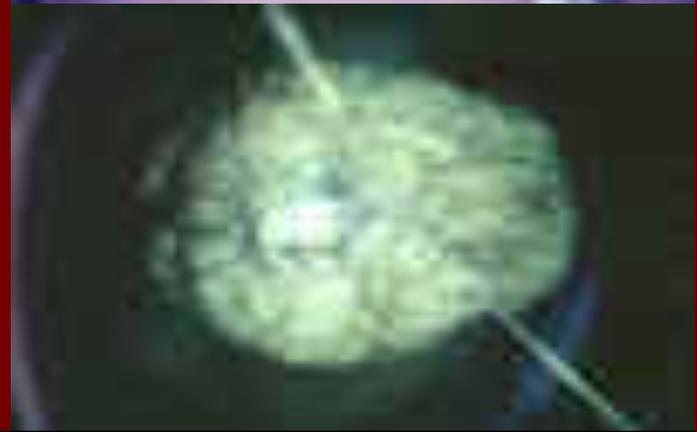


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Diseases caused by bacteria







9. Gram reaction :

- The Gram stain, which divides most clinically significant bacteria into two main groups, is the first step in bacterial identification

❖ **Gram positive bacteria (G^{+ve})**

❖ **Gram negative bacteria (G^{-ve})**

The Gram stain has four steps:

- 1. **Crystal violet**, the *primary stain*: followed by

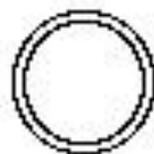
- 2. **Iodine**, which acts as a *mordant* by forming a crystal violet-iodine complex, then

- 3. **Alcohol**, which *decolorizes*, followed by

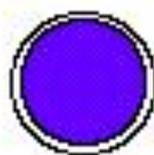
- 4. **Safranin**, the *counterstain*.



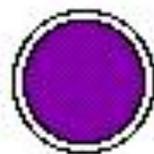
GRAM +



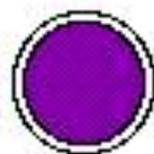
Fixation



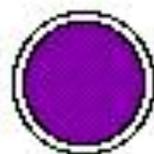
Crystal
Violet



Iodine
treatment

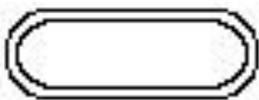
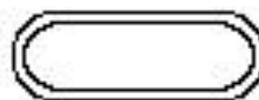


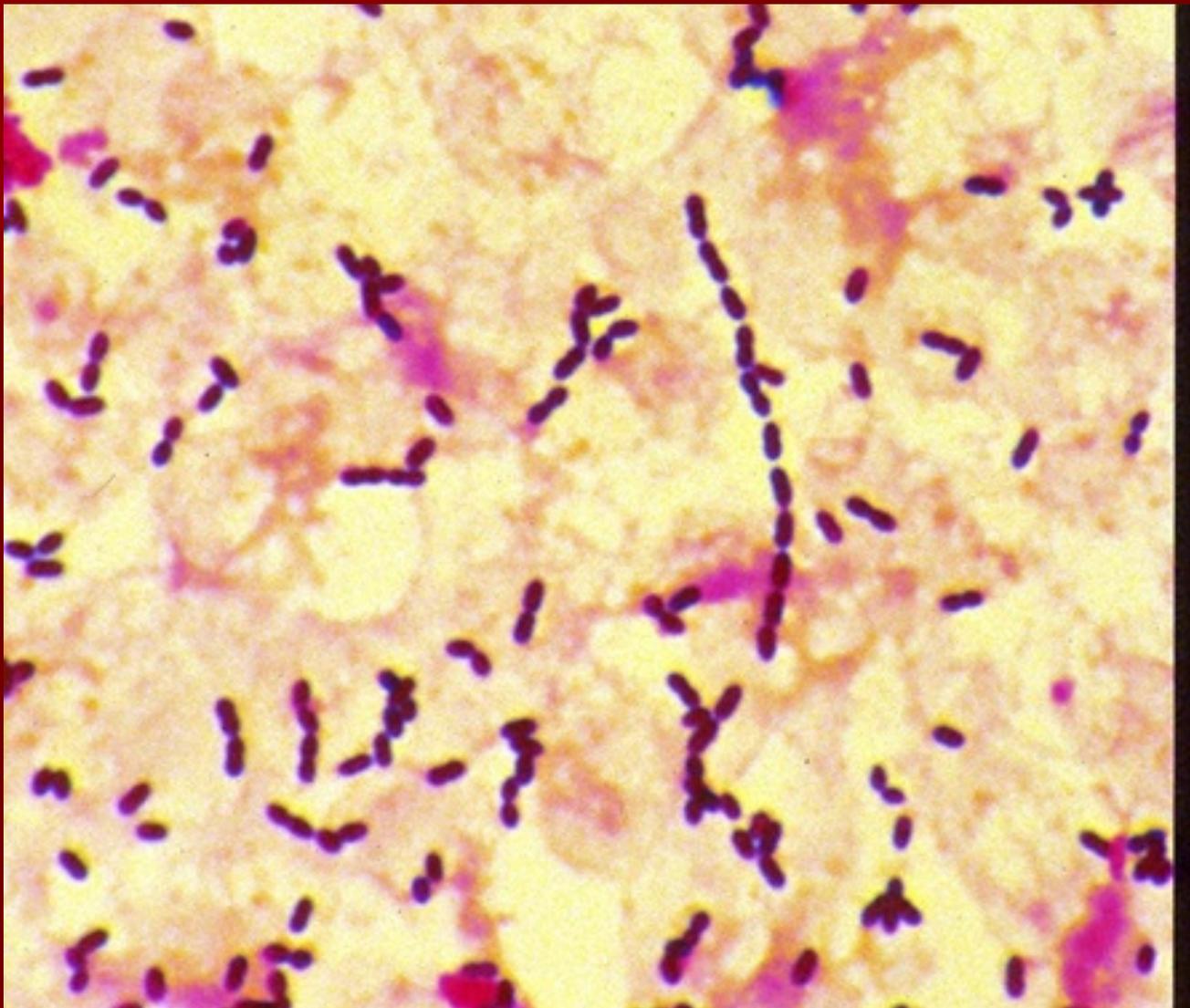
Decolorization



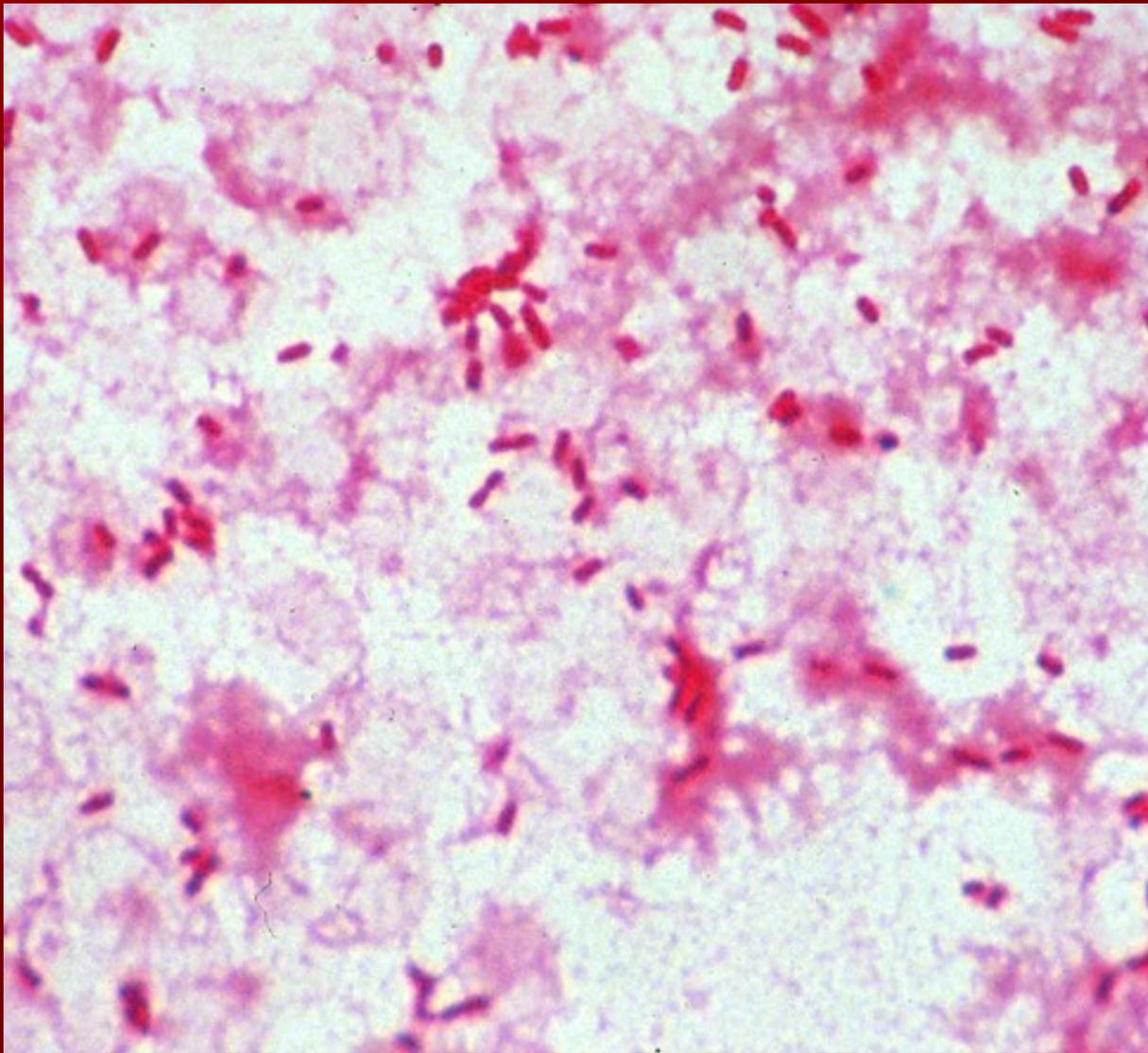
Counter stain
(safranin)

GRAM -





Is this gram stain positive or negative?
Identify the bacteria.



Is this gram stain positive or negative?
Identify the bacteria.

Cultivation of bacteria :

- Bacteria are classified according to growth ability on the living tissues into **pathogenic** and **saprophytic** bacteria .
- **Pathogenic bacteria** causes disease to human and animals ,therefore proper diagnosis of bacteria must be obtained in pure colonies in artificial culture media .

Types of culture media :

Culture media are classified according to :

1. Consistency :

- Liquid media (broth) → not contain agar .
- Semi-solid media → contain 0.5% agar .
- Solid media → contain 2-3% agar .

2. Nutritional value in to :

- Simple culture media → e.g. Nutrient agar .
- Enrichment culture media → e.g. Blood agar

D. Diagnostic value :

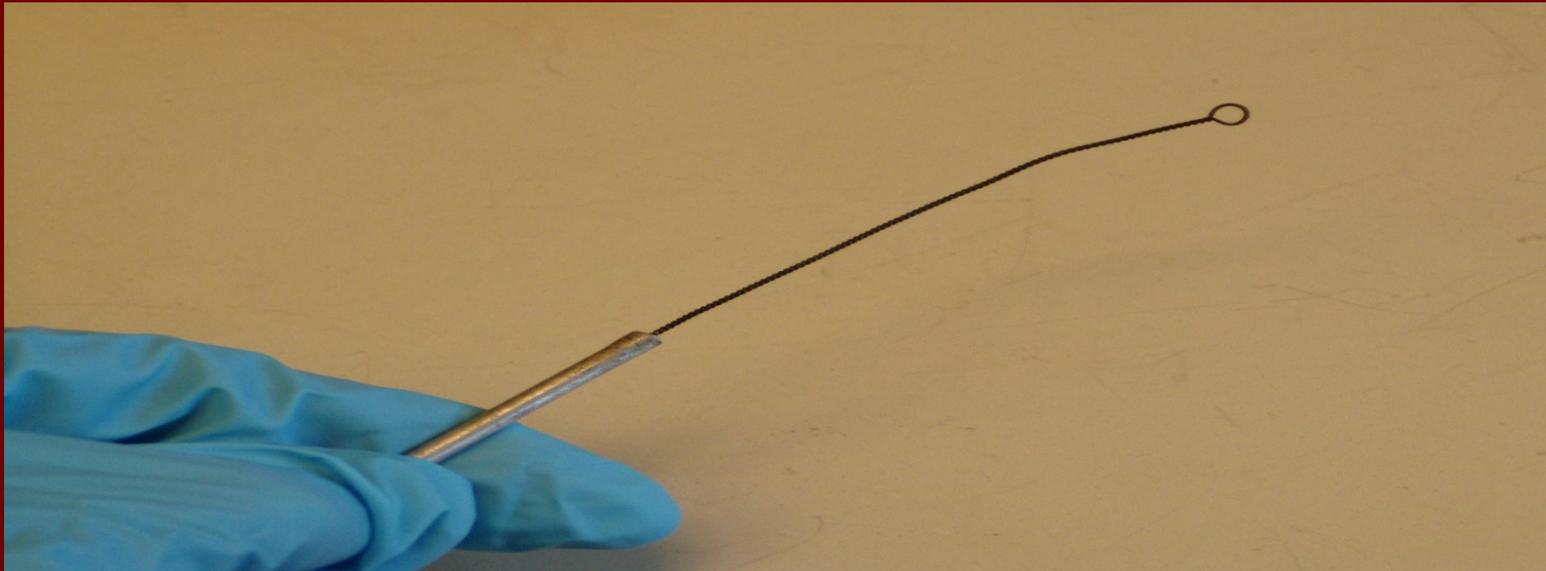
- **Differential culture media** → MacConkey agar (Lactose) .
- **Special or selective media** → Lowenstein-Jensen medium (which used to isolate *Mycobacterium tuberculosis*) , also Thayer-martin medium (which used to isolate *Neisseria gonorrhoea*) .

➤ Cultivation of specimens:

The specimens are cultured to isolate a pure culture , contain pure colonies, which are essential for identification of different types of pathogenic bacteria.

❖ **Streaking procedure** used to well spread sample over surface of culture media by using wire loop or swab ,and incubated with $37c^{\circ}$ for 18-24 hr . in the incubator to obtain a pure culture (single type of bacteria).

❑ **Loop** :it is article uses in microbiological ,research laboratories ,composed of holder and platinum wire use to transfer sample from place to another.



□ **Petri dish** : it is plate contains culture media ,which used to culture the bacteria.



□ **Incubator** : it is instrument that gives distinct temperature and used for incubation the cultured Petri dishes.

Urinary Tract Infection (UTI)

UTI definition

Symptomatic, asymptomatic

Female more than male?

Upper UTI: pyelonephritis

Lower UTI: Cystitis- urethritis

DX

Sampling: patient should stop receiving drugs.

MSU

Calibrated loop

Streaking

Incubation

Dx

Disc diffusion method.. Incubation..Dx zone of inhibition.

Interpretation chart

Writing the report

Why pus but no growth? Viral. Drugs. anaerobic



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