Definition :

Bacteria are Prokaryotes cells, single-celled (unicellular) microorganisms which :

- have cell walls
- lack organelles and an organized nucleus
- their size (0.2-10μm)
- cell division by binary fission
- and have single-stranded circular DNA.
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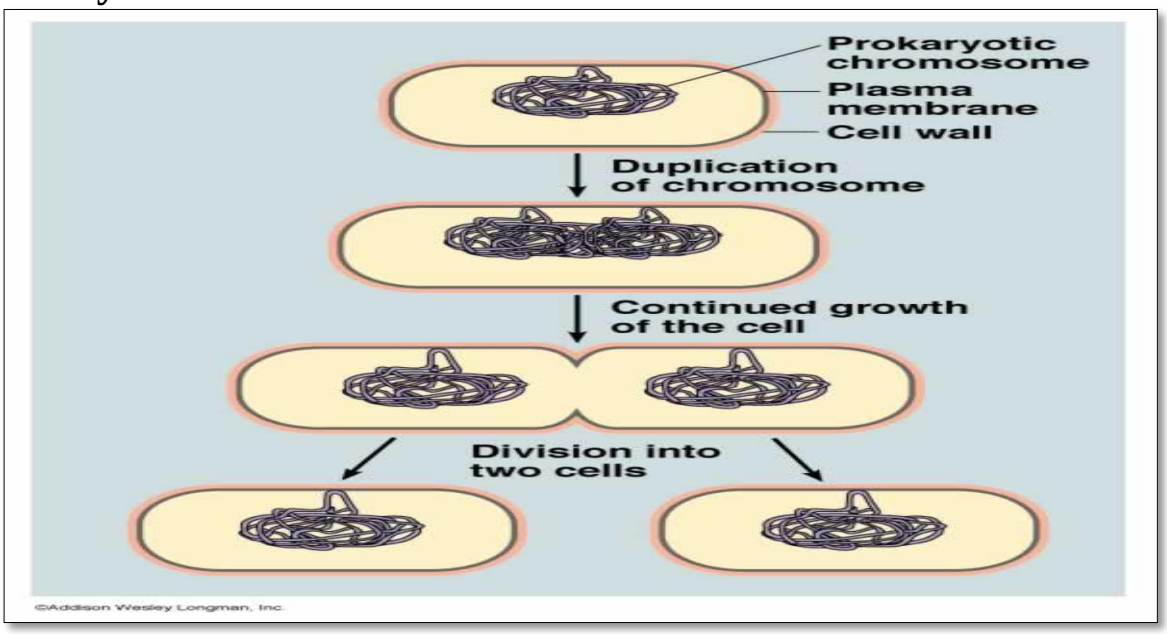
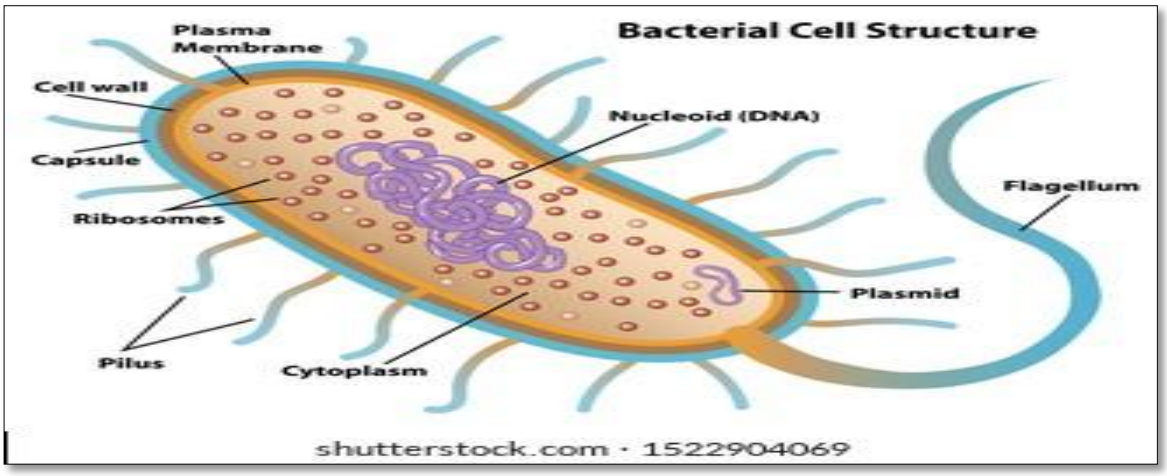
Binary fission of Bacteria



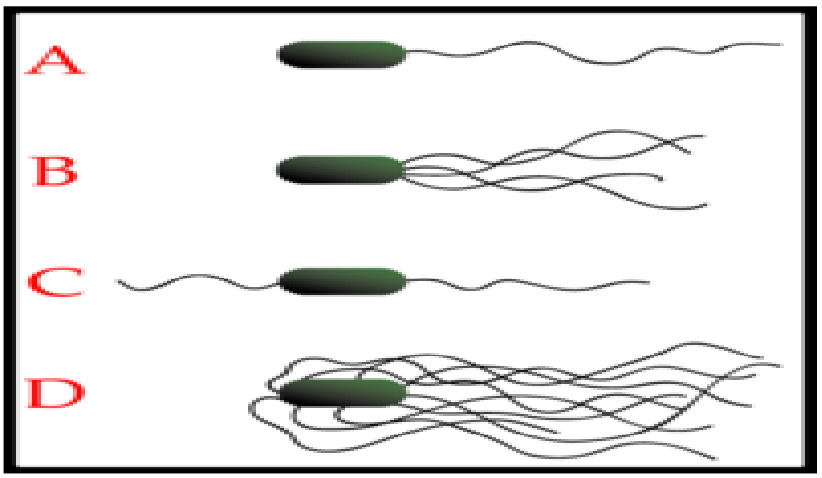


Bacterial structures

No.	Bacterial structure	Composition	function
1.	s-layer (slim layer)	G+ : proteins G-: Lipopolysaccharide	protection against environment conditions
2.	Capsule	polysaccharide	protection against environment conditions
3.	cell wall	Peptidoglycan	Provides bacterial shape and rigidity
4.	Cytoplasmic membrane	phospholipid bilayer	Exchanging molecules
5.	Flagella	flagillin protein	movement
6.	Pili	Pilin protein	adhere to host tissue surfaces

Types of Flagella

A. Monotrichous – Single flagellum
B. Lophotrichous – A tuft of flagella found at one of the cell poles
C. Amphitrichous – Single flagellum found at each of two opposite poles
D. Peritrichous – Multiple flagella found at several locations about the cell

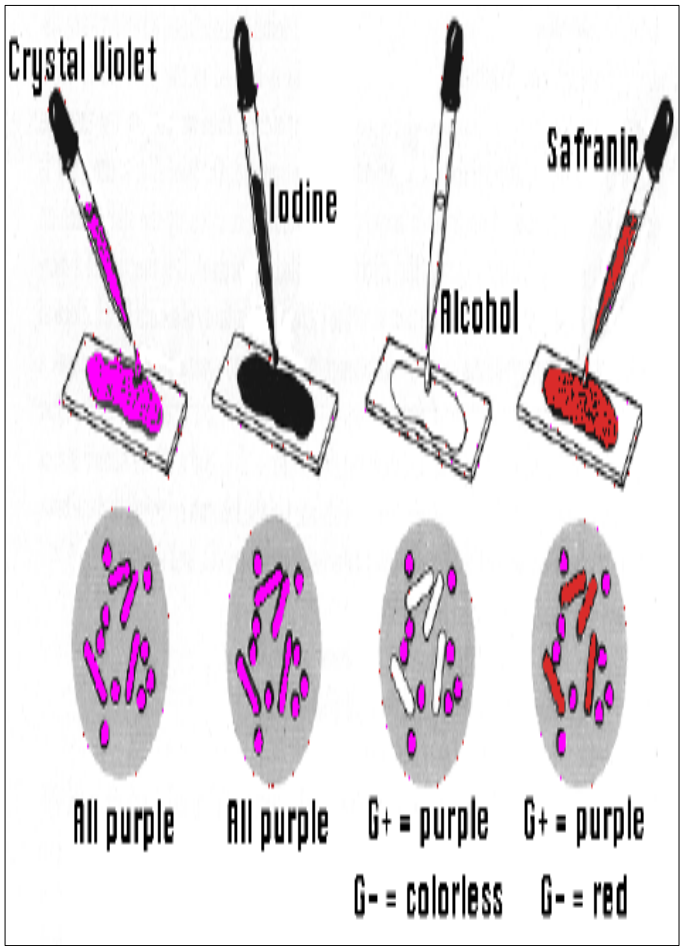


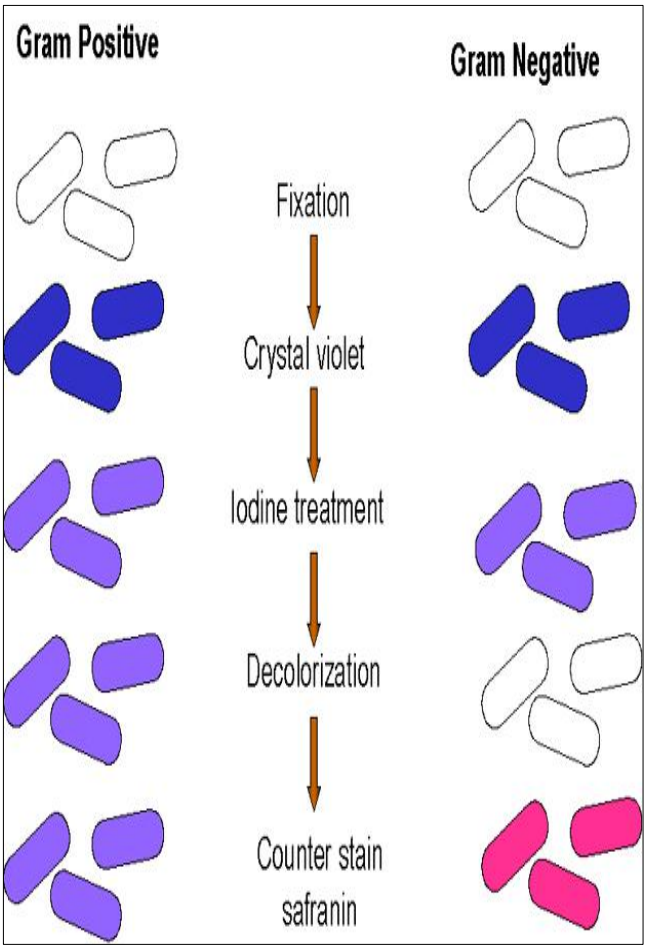
Classification of bacteria

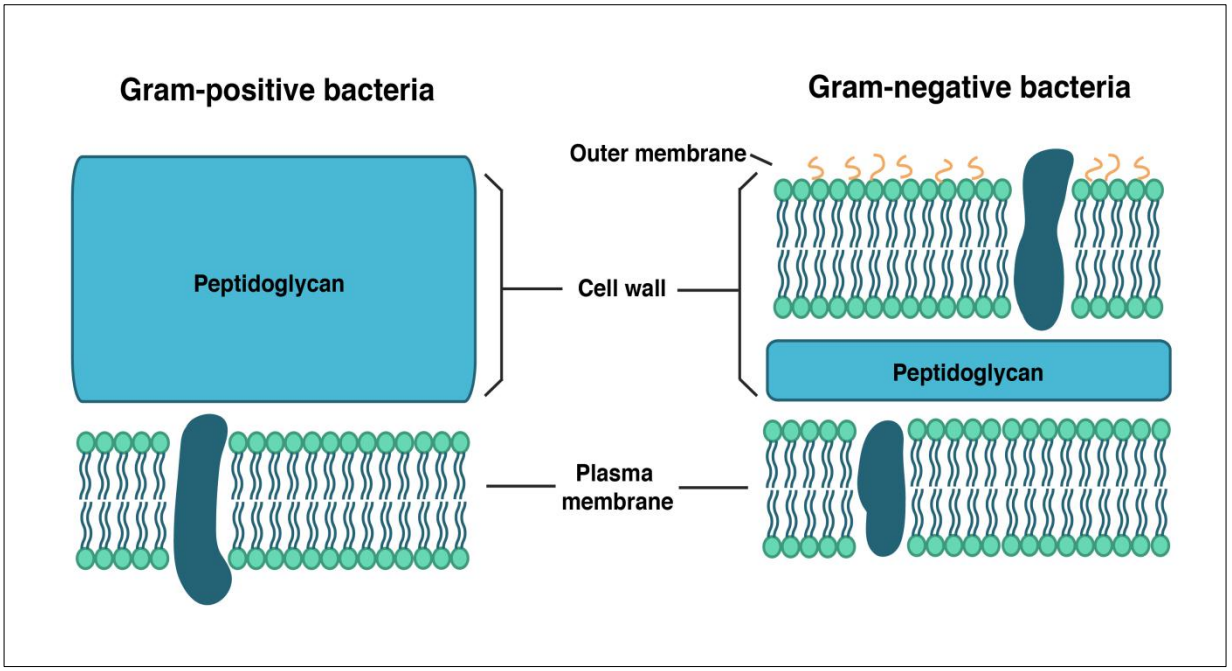
I. **Classification on gram stain**
II. **Classification on the shape**
III. **Classification on the basis of mode of nutrition**
IV. **Classification on the basis of oxygen requirement**

I. Classification on gram stain

Grams stain classify bacteria to: G +ve (purple cells) and G -ve (red cells).







II. Classification on the shape

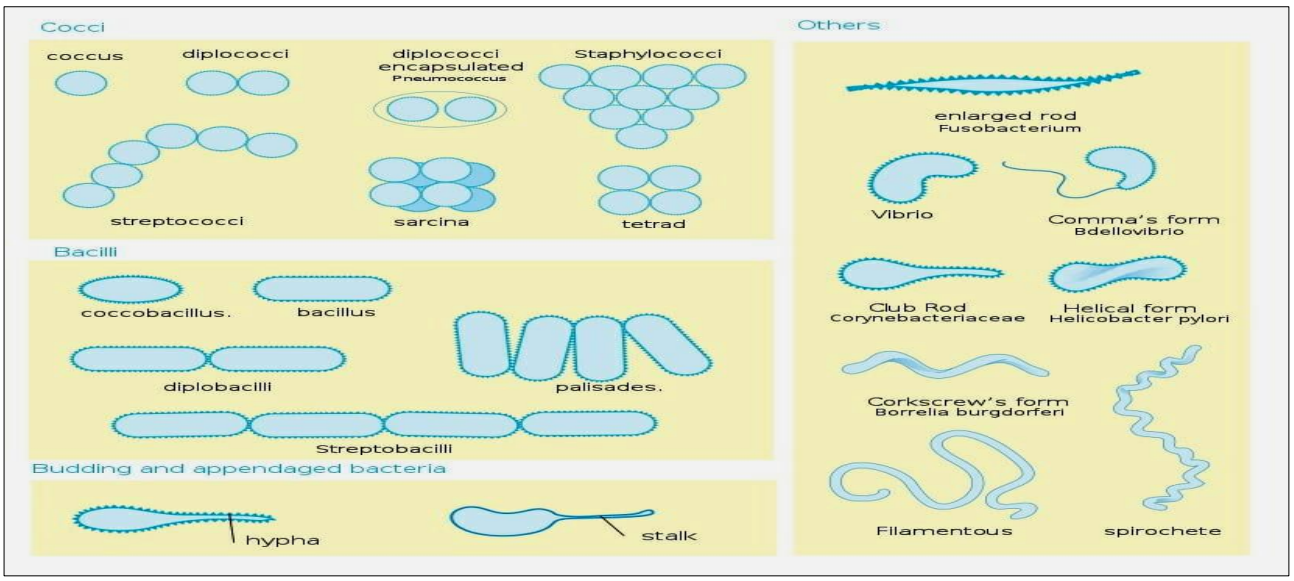
A. Cocci: These types of bacteria are unicellular, spherical or oval shape

- **Monococcus**: they are also called micrococcus its single cell
- **Diplococcus:** two cells attached to each other.
- **Streptococcus**: its chain of cells.
- **Tetracoccus**: this consists of four cells.
- **Staphylococcus**: the cells forming a structured like bunches of grapes.

B. Bacilli: These are rod shaped or cylindrical bacteria which either remain singly or in pairs.

C. Vibrio: its the curved, comma shaped bacteria and represented by a single genus.

D. Spirilla: These type of bacteria are spiral or spring like with multiple terminal flagella.



III. Classification on the basis of Mode of Nutrition

1.Phototrophs:

- Those bacteria which gain energy from light.
- Phototrops are further divided into two groups on the basis of source of electron.
- Photolithotrophs: these bacteria gain energy from light and uses reduced inorganic compounds such as H_2S as electron source.
- Photoorganotrophs: these bacteria gain energy from light and uses organic compounds such as succinate as electron source.

2. Chemotrophs:

Those bacteria gain energy from chemical compounds.

- They cannot carry out photosynthesis.

Chemotrops are further divided into two groups on the basis of source of electron.

- hemolithotrophs: they gain energy from oxidation of chemical compound and reduces inorganic compounds such as NH3 as electron source.
- Chemoorganotrophs: they gain energy from chemical compounds and uses organic compound such as glucose and amino acids as source of electron.

3. Autotrophs:

- Those bacteria which uses carbon dioxide as sole source of carbon to prepare its own food.
- Autotrophs are divided into two types on the basis of energy utilized to absorption carbondioxide. ie. Photoautotrophs and chemoautotrophs.
- Photoautotrophs: they utilized light to assimilate CO_2. They are further divided into two group on the basis of electron sources to:- Photolithotropic autotrophs and Photoorganotropic autotrophs
- Chemoautotrophs: They utilize chemical energy for absorption of CO_2

4. Heterotrophs:

- Those bacteria which uses organic compound as carbon source.
- They lack the ability to fix CO_2.
- Most of the human pathogenic bacteria are heterotropic in nature.
- Some heterotrops are simple because they have simple nutritional requirement.

IV. Classification of bacteria on the basis of Oxygen Requirement

1. Obligate Aerobes:

- Require oxygen to live.
- Example: Pseudomonas.
- Can use oxygen, but can grow in its absence.
- They have complex set of enzymes.
- Examples: *E. coli*, *Staphylococcus*, yeasts, and many intestinal bacteria.

2. Obligate Anaerobes:

- Cannot use oxygen and are harmed by the presence of toxic forms of oxygen.
- Examples: *Clostridium* bacteria that cause tetanus and botulism.

3. Aerotolerant Anaerobes:

- Cannot use oxygen but tolerate its presence.
- Can break down toxic forms of oxygen.
- Example: *Lactobacillus* carries out fermentation regardless of oxygen presence.

4.Microaerophiles:

- Require oxygen but at low concentrations.
- Sensitive to toxic forms of oxygen.

Types of culture media used in microbiology

These are classified into six types of routine laboratory media :

1. **Basal media**:-
   Basal media are those that may be used for growth (culture) of bacteria that do not need enrichment of the media. Examples: Nutrient broth
2. **Enriched media:-**
   The media are enriched usually by adding blood, serum or egg. Examples: Enriched media are blood agar
3. **Selective media**:-
   These media favor the growth of a particular bacterium by inhibiting the growth of undesired bacteria and allowing growth of desirable bacteria. Examples: MacConkey agar. Antibiotic may be added to a medium for inhibition.
4. **Indicator (differential) media:-**
   An indicator is included in the medium. A particular organism causes change in the indicator, e.g. blood. Examples: Blood agar and MacConkey agar are indicator media.
5. **Transport media:-**
   These media are used when specie-man cannot be cultured soon after collection.
6. **Storage media:-**
   Media used for storing the bacteria for a long period of time.