

Bacterial Cell Structure-Outside the Cell Membrane

By:

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Size of a Bacterial Cell:

There are great variations in size of bacteria. They measure from 0.75 μ to 1.5 μ but on an average each cell of bacterium measures about 1.25 μ to 2 μ in diameter

Shape and Arrangement of Bacterial Cell:

Bacterial cells exhibit greater variation in their shape but usually four conventional shapes of cell have been recognized.

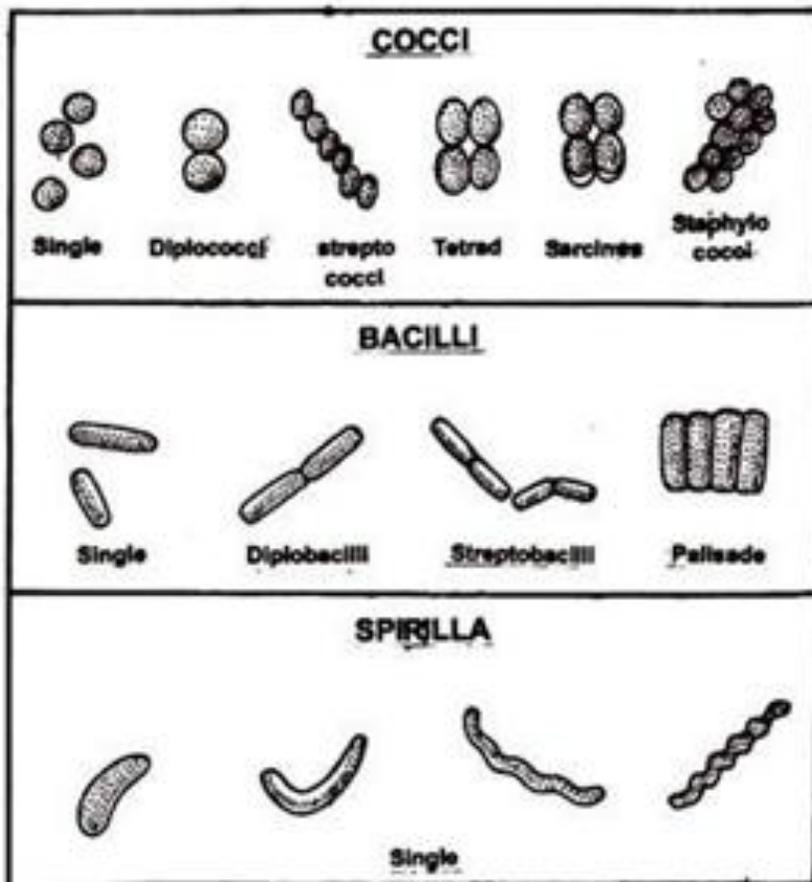
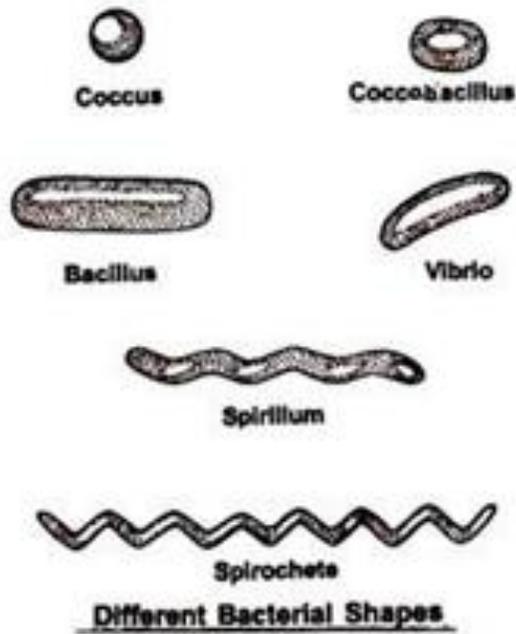


Fig.I. Different Bacterial shapes

1. Cocci:

Simplest form of bacteria in which bacterium appears like a spherical cell.

- i. **Micrococci:**
When bacterium appears singly.
- ii. **Diplococci:**
When they appear in pairs of cells.
- iii. **Streptococci:**
When they appear in chain form.
- iv. **Tetrad:**
Arranged in square of four.
- v. **Sarcinae:**
When arranged in cuboidal or in different geometrical or packet arrangement.
- vi. **Staphylococci:**
Arranged in irregular clusters like bunch of grapes.

2. Rod Shaped:

They are also called bacilli and are commonest in microbial world.

They are of two kinds:

(i) Short rods:

Very short rods, occurring mostly singly.

(ii) Long rods:

Cylindrical shape, are known as Bacilli or rods, occurring singly, in pairs or in chains.

3. Vibrios:

They are curved rods or comma shaped, their curvature is always less than a half turn.

4. Spirilla:

They are curved or spiral shaped cells, their curvature exceeds that of a half turn. They may be classified as either spirilla or spirochetes.

However, some bacteria are variable in shape and have a single characteristic form. These are called Pleomorphic (*Corynebacterium*, *Arthrobacter*).

Ultra-Structure of Bacterial Cell:

Bacterial cells with electron microscope reveals various component structures. Some of these are outside the cell membrane; others are internal to cell membrane.

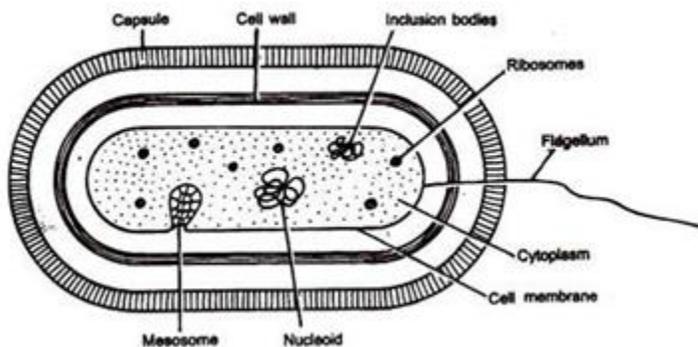


Fig.II. Ultra structure of Bacterial cell

Structures Outside the Cell Membrane:

Capsule:

- Some bacteria have a gelatinous covering around them.
- If the covering is a loose mass, it is called slime. When it is relatively narrow and well defined, it is called a capsule.
- These structures consist of polysaccharides, but in *Bacillus anthracis* it consists of proteins, polypeptide.
- Depending on the thickness, the capsule is designated as a macrocapsule (more than $.2 \mu$ thick) or a microcapsule (less than $.2 \mu$)

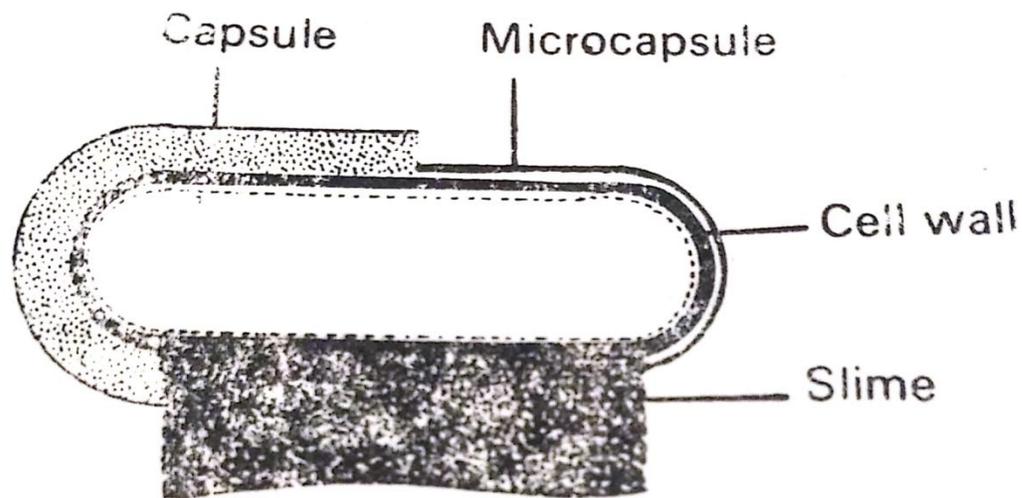


Fig.III. Surface layers of bacteria; capsule, microcapsule and slime layer.

Functions of Capsule:

- The capsules protect the pathogenic bacteria from phagocytosis and also serve as a storage product, which may be consumed when needed.
- Certain pathogenic bacteria (e.g. *Pseudomonas solanacearum*, causing wilt disease of several plants) owe their virulence to the capsule.

Flagella:

- Most motile prokaryotes move by use of flagella thread like locomotor appendages, extending outwards from the cell membrane and cell wall.
- Bacterial flagella are slender, rigid structures, about 20 nm across and up-to 15 to 20 μ m long.

Types of bacteria:-

On the basis of flagella distribution :-

1. Monotrichous bacteria have one polar flagellum.
2. Amphitrichous bacteria have either single or duster of flagellum at both pole.
3. Lophotrichous bacteria, have a cluster of flageila at one ends
4. Bacteria surrounded by lateral flageila are Peritrichous .

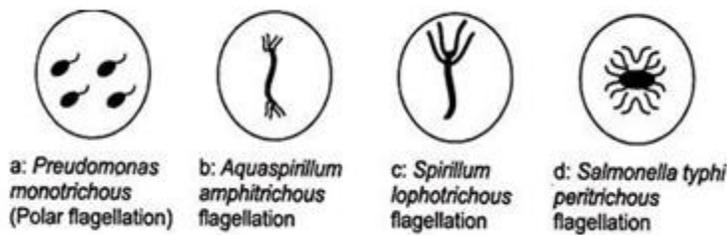


Fig.IV. Types of Bacteria

Fimbriae or Pili:

- Some bacteria mostly (Gram negative bacilli) contain, non-flagellar, extremely fine appendages called fimbriae or pili.
- The filament of pilus is straight and diameter is 7 n m.
- It is made up of pilin protein. Molecular weight is 17,000.
- Pili are nonmotile but adhesive structure.
- They enable the bacteria to stick firmly to other bacteria, or to surface of some eukaryotes such as, plants and animal cells.
- Pili help in conjugation (e.g. F. pili or sex pili) of male bacteria, in the attachment of pathogenic bacteria to their host cell.
- Pili are known to be coded by the genes of plasmid that determine cell capacity to carry out conjugative genetic exchange with other cells.

Spinae:

- Some Gram-positive bacteria have tubular unicellular and rigid appendage of single protein moiety called spinae.
- They are known to help the bacterial cell to tolerate some environmental conditions such as salinity, pH and temperature etc.