Ultrastructure of Bacterial Cell

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Paper: I

Group: ‘C’ (Microbiology)

Ultrastructure of Bacterial Cell (cont.)

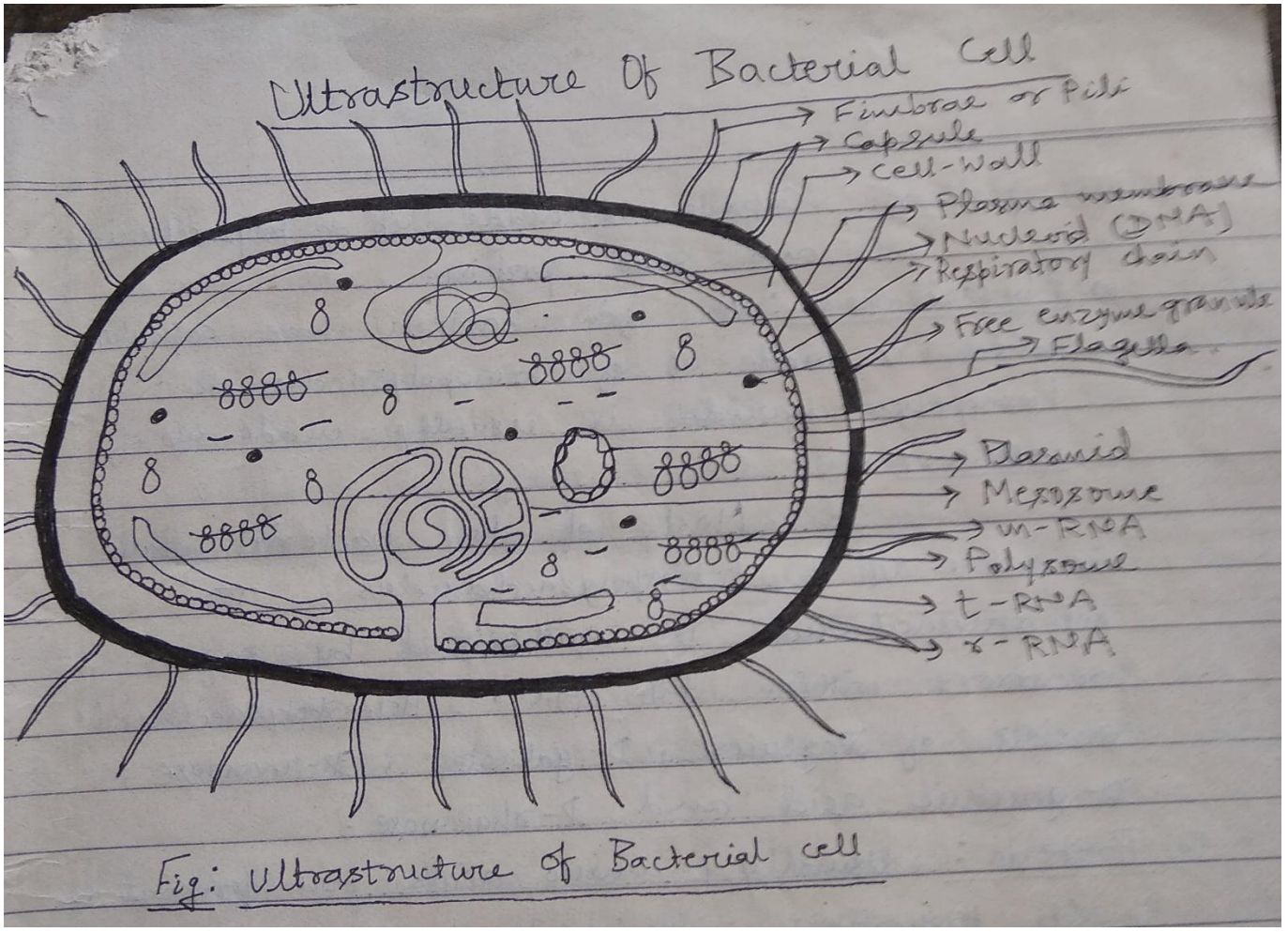


Fig: Ultrastructure of Bacterial cell

Ultrastructure of Bacterial Cell (cont.)

- For the shake of convenience, ultrastructure of bacterial cell can be described under the following sub-heads:

  A. Cell-envelope

  B. Cytoplasm

  C. Nucleoids.

  A.Cell-envelope is divided into two parts:

  I. Cell-layers or Surfaces, and

  II. Appendages.

Ultrastructure of Bacterial Cell (cont.)

- I. Cell-layers or surfaces are differentiated into:
  (1). Capsule and Slime
  (2). Cell-wall
  (3). Plasma-membrane

(1). Capsule and Slime:

Definition: Capsule is a layer of polysaccharide and small protein responsible for cell adhesion and functions as buffer between cell and exterior environment.

Composition: Made up of Homopolysaccharide (cellulose) ;

Heteropolysaccharides(D-glucose, D-galactose, D-mannose, D-gluconic acid and D-rhamnose.) and small amount of protein (L-amino acids)

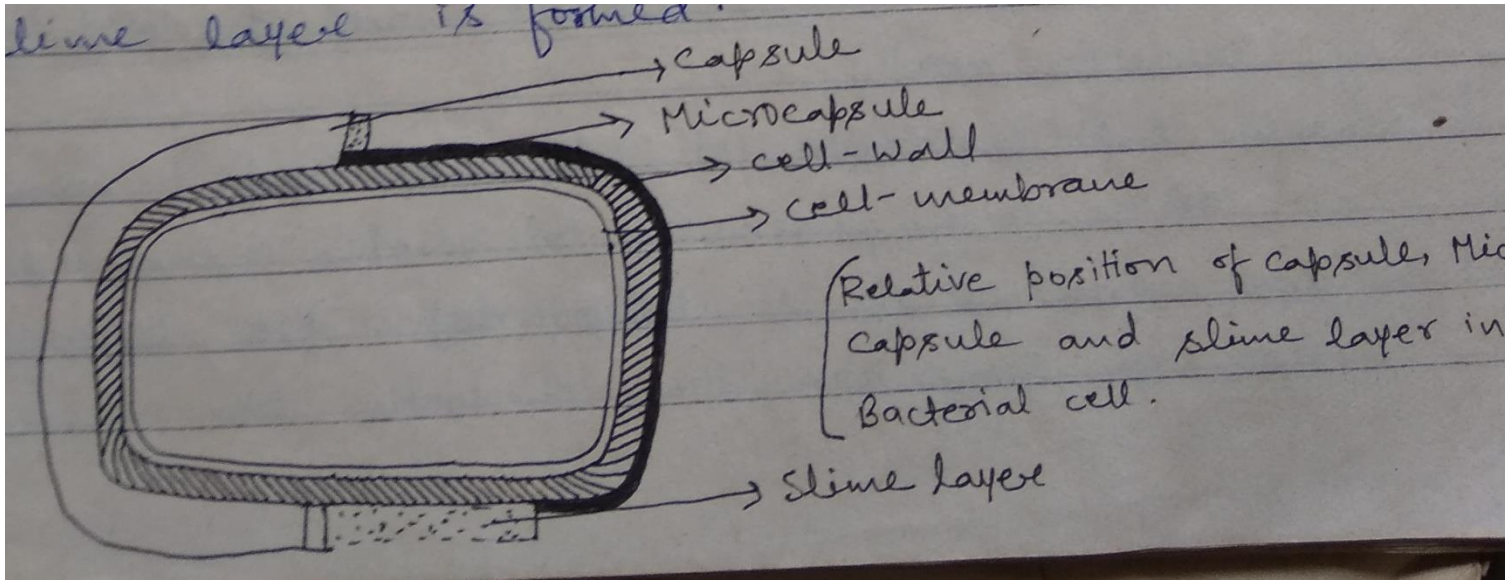
Ultrastructure of Bacterial Cell (cont.)

- Formation: Capsule is formed by secretion of protoplast and its deposition over the surface of cell-wall.
- Presence/Absence: Present in pathogenic state; while in non-pathogenic state it is absent.
- Significance:
    i. Phagocytosis
    ii. Immunology
    iii. Antibiotic and drought resistant
    iv. Pathogenicity

Ultrastructure of Bacterial Cell (cont.)

Slime Layer: Viscous substances secreted by protoplast, and made up of Dextrose .

Genetically, it is stated that due to mutation in genes related to chemicals of capsule, slime layer is formed.

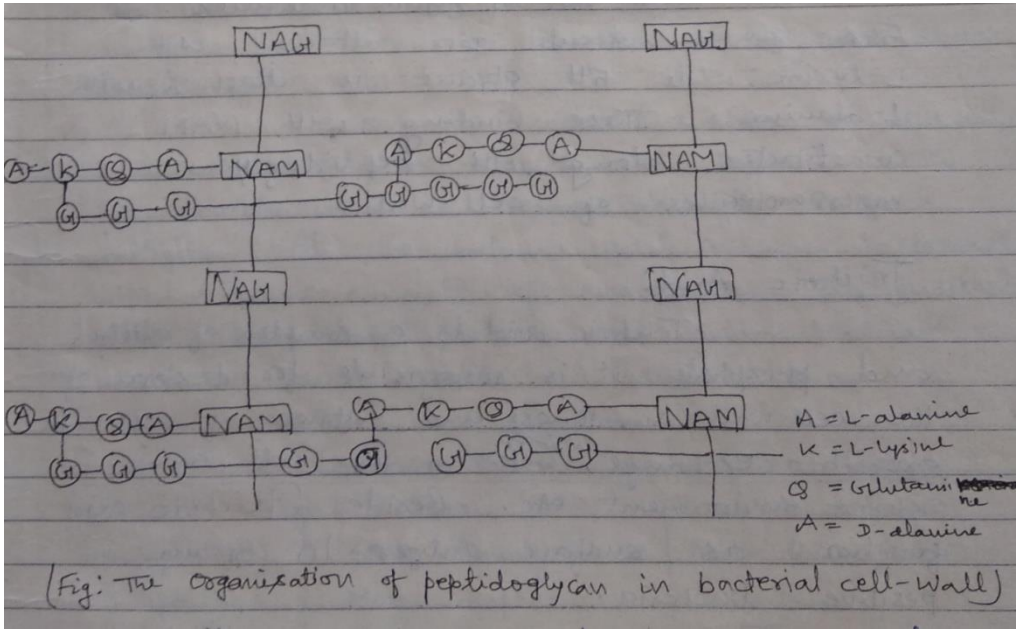


Ultrastructure of Bacterial Cell (cont.)

(2). Cell-Wall: Cell-wall of bacteria is peptidoglycan macromolecule that is responsible for protection of the cell and defines definite cell-shape.

Structure: Made up of heteropolymers called peptidoglycan or mucopeptides also called 'Murein'.

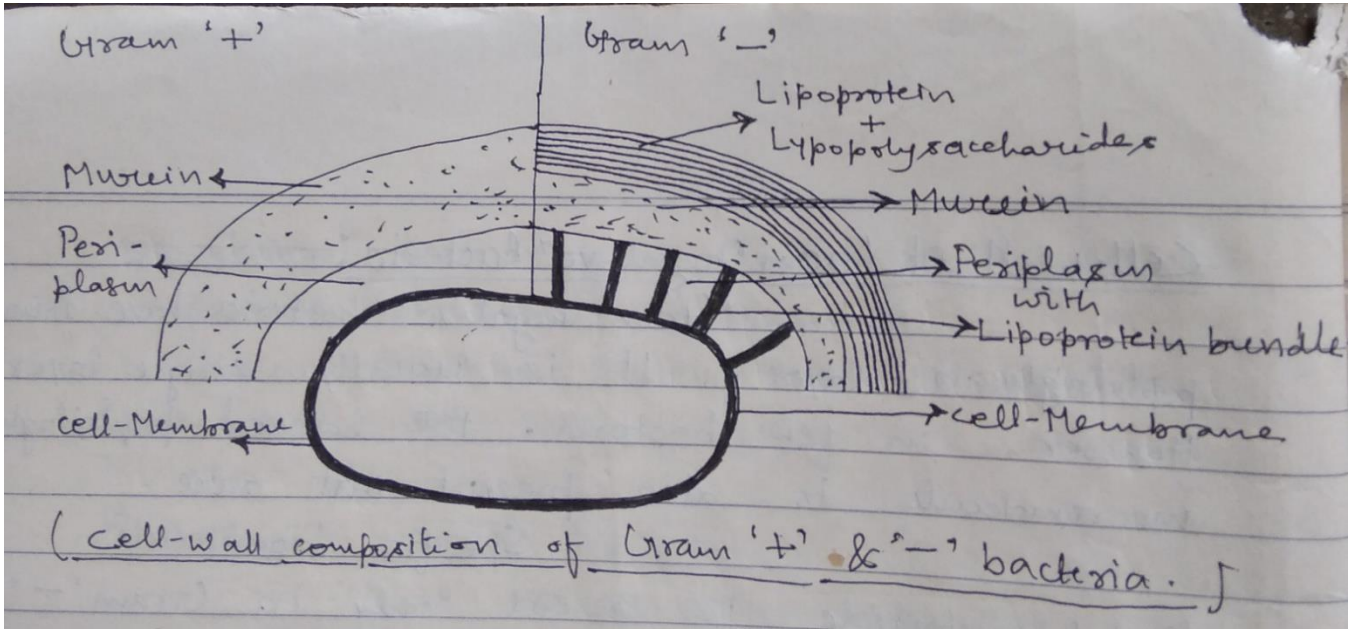
Sugar: It is of two types- N-acetyle glucosamine and N-acetyle muramic acid.



(Fig: The organization of peptidoglycan in bacterial cell-wall)

Ultrastructure of Bacterial Cell (cont.)

- Cell-Wall composition of Gram '+' & '-' bacteria.



Ultrastructure of Bacterial Cell (cont.)

(3). Plasma- Membrane: Same as Eukaryotic cell.

It is 7.5 nm thick and made up of mainly phospholipid and protein.

Glycolipid and glycoproteins are also present.

Function:

In bacteria, plasma membrane has the genetic and metabolic functions.

(i). It is selectively permeable layer.

(ii). Energy-production

(iii). Replication

II. Surface-Appendages: These are of following types:

(i). Pili

(ii). Fimbriae

(iii). Spinae

(iv). Flagella

Ultrastructure of Bacterial Cell (cont.)

B. Cell-Cytoplasm:

Cytoplasm is the ground substance of cell in which enzymes, proteins, ions, several organic and inorganic substances are present.

Function:

(i) As a site of intermediary metabolism.

(ii) Provides a chemical environment for cellular activities.

Structures present in Cytoplasm:

(i). Mesosome

(ii). Plasmid

(iii). Chromatophore

(iv). Ribosome

(v). Storage granules

Ultrastructure of Bacterial Cell (cont.)

(C). Nucleoids:

It bacteria, nucleus does not have nuclear membrane. Therefore bacterial nucleus is called Nucleoid.

In bacteria, there is a single chromosome. DNA is present in a single molecule. DNA has no Histone.

In lieu of histone, Protamines are present.

Bacterial chromosome is attached with plasma-membrane. It has a single origin of replication.

In bacteria, *E.coli* chromosome is the largest chromosome in living system.