Bacterial Cell Structure-Inside the Cell Membrane

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Structure of Cell Membrane:

- It lies in between cell wall and protoplasm.
- Cell membrane is a thin structure that completely surrounds the cell only about 8 nm thick.
- The cell membrane is also highly selective barrier enabling the cell to concentrate a specific metabolite and excrete waste material.
- It is composed primarily of Phospholipids (about 20 to 30 percent) and proteins (about 60 to 70 percent).
- The phospholipids form a bi-layer.

Cell wall

- Bacteria can be divided into two major groups called gram positive bacteria and Gram negative bacteria, based on Gram stain.
- Gram positive bacteria and Gram negative bacteria differ in the appearance of cell wall.
- The cell wall of Gram negative bacteria is multilayered structure and quite complex whereas Gram positive bacteria contain primarily single type of molecule and is often much thicker .

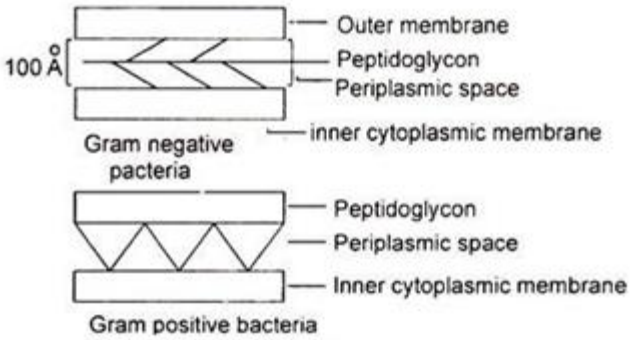

Fig.V. Cell wall of Gram + and Gram –ve Bacteria

Chemical composition of bacterial cell wall:-

- The cell wall of bacteria is made up of mucopeptide.
- Mcopeptide is a polymer made up of alternating units of NAG(N-acetyl glucosamine) and NAM(N-acetyl muramic acid) joined by β,1-4 linkages.
- NAG and NAM are amino sugars
- The mucopeptide chains are laterally linked by short chains of amino acids, which originate at the carboxyl group of the muramic acid molecules.
- The amino acids chains are linked among themselves by a di-amino acid like lysine and di-aminopimelic acid.
- The cell walls of Gram positive and Gram-ve bacteria differ in their chemical composition.
- The wall of Gram +ve bacteria is homogenous containing 85% or more mucopeptide and simple polysaccharide, like teichoic acids which are polymers of ribitol and glycerol phosphates.
- Teichoic acids serve as antigens and also regulate entry of ions.
- The cell wall of Gram-ve bacteria contain only 3-12% mucopeptide, the rest being lipo-protein and lipo-polysaccharides.
- The cell wall of Gram-ve bacteria appears tripartite i.e. 3-layered

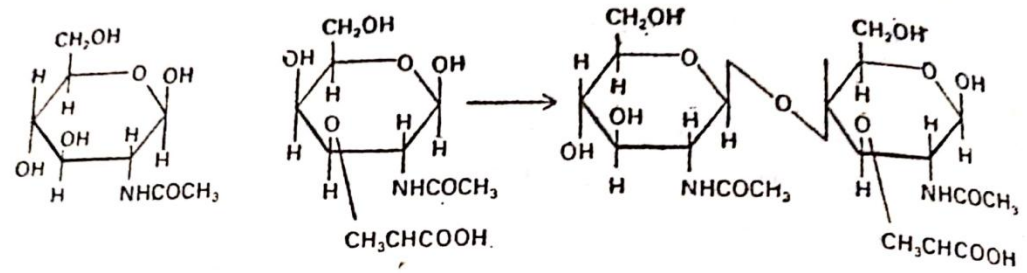

Fig.VI. Part of a nucleotide;the backbone polymers linked by short amino acids chain

The Nucleoid:

- In bacteria, the genetic material (DNA) is not bound with proteins to form chromosome.
- The genome consists of a single closed ring 1000µ long.
- DNA molecule is attached to the cell membrane at mesosome.
- It form a concentrated gel like structure is called **nucleoid** .
- It is merely composed of loosely-coiled chromatin thread which is chemically DNA molecules-the genetic material.
- There is no nuclear membrane, and Spindles are not formed during cell division.

Cytoplasm

- The cytoplasm contains large number of enzymes and t-RNA, amino acids, nucleotides, granules of fat, volutin etc.

Lamellae and chromatophores:

- Photosynthetic bacteria have lamellae or vesicles also called chromatophores.
- Lamellae consist of two parallel unit membranes, small or long-extending throughout the cytoplasm.
- Chromatophores are hollow spherical structures about 300Å in diameter.
- Lamellae and chromatophores contain the pigments together with enzymes and electron transport system for photosynthetic phosphorylation of light reaction.
- They are devoid of enzymes associate with dark reaction.

Ribosomes:

- These are small particles (100 A^0in diameter) lie free in cytoplasm and of 70s type.

Mesomes:

- These are extensions of the plasmamembrane, which simultaneously initiate DNA replication and septum formation during cell division.

Endospores:

- In genera *Bacillus*, *clostridium* and a few *cocci* and *spirilla* fom resistant structure known as endospores.
- The bacterial cell in which the endospore is formed is called a **sporangium**.
- The endospore cell is surrounded by a number of envelops.
- Endospores liberate ,germinate and produce bacterium.