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CORE CONCEPT OF
Microbiology

ULTRASTRUCTURE OF BACTERIAL CELL

Most bacteria are unicellular, there are some mycelioid forms too, cross-walls are absent except in the mycelioid ones (actinomycetes). According to the shape of cells, bacteria may be of four types. They are widely distributed in nature under varied conditions. They vary greatly according to the species.

STRUCTURE

A bacterial cell has certain definite structures inside and outside the cell-wall. The cell-wall and cytoplasm are common to almost all cells. Again some structures are present in only certain species. The cell-wall of a bacteria is a thin membrane or covering called the cytoplasmic membrane also called bacterial cell membrane or simply the plasma membrane. It is semipermeable, selective membrane that controls the passage of nutrients and waste products into and out of the cell. The bacterial cell membrane is an important centre of metabolic activity. The cell wall accumulates to form a thick capsule. It is composed of polysaccharides. The capsulated bacteria are very resistant to adverse conditions and such bacteria are commonly the cause of diseases.

The cell wall is composed of acetylglucosamine and acetylmuramic acid. The amino acid which is most frequent in cell walls is diaminopimelic acid. Teichoic acids have been reported from Gram +ve bacteria. Cellulose and chitin are absent. Plasma membrane is of



eukaryotic type. The cytoplasm lacks membrane bound organelles like mitochondria, chloroplast, endoplasmic reticulum etc. The ribosomes are of 70s type and a bacterial cell average contains about 10,000 ribosomes found free in the cytoplasm. Ribosomes found in groups are called polyribosomes or polysomes. Infoldings of cell membrane into the cytoplasm are called mesosomes which play an important role in the initiation of bacterial DNA replication and septum formation during cell division.

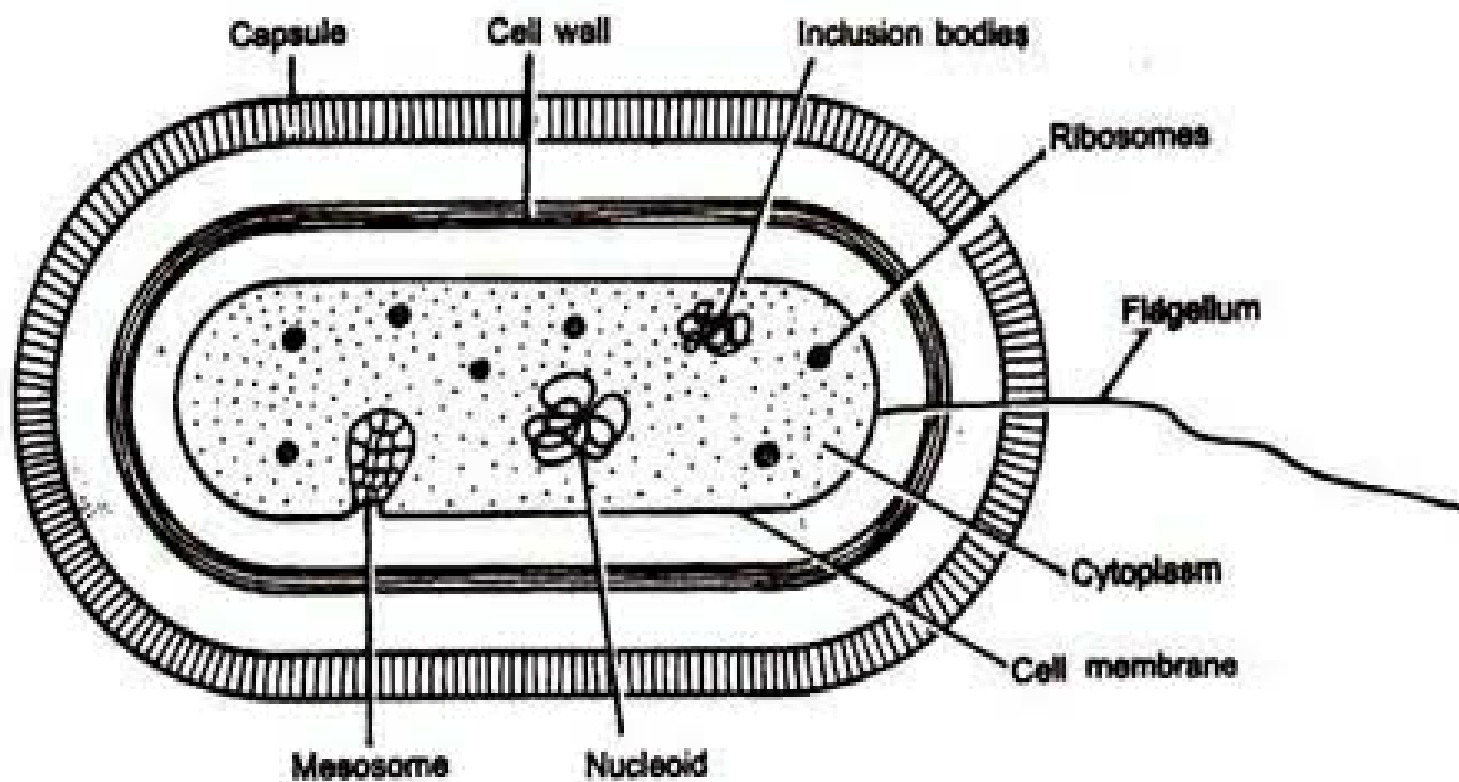


Fig 1. ULTRASTRUCTURE OF BACTERIAL CELL



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Presence of lamellae structures called chromatophores are known in the photosynthetic bacteria. Photosynthetic bacteria means containing photosynthetic pigments- bacteria chlorophyll or bacterio viridian. The nucleus of bacterial cell is turned nucleoid or chromatin body, because it lacks nuclear membrane and nucleolus. The genetic material occurs in the form of a single, two stranded circular DNA which lacks histone protein.

Extra chromosomal DNA called F - factor or episome or plasmid are known to occur in some bacteria. It is capable of autonomous replication. The bacteria possessing F - factor are called F+ (male) while those devoid of it are called F- (female). The bacteria that retain the Gram stain after alcohol treatment are called Gram +ve whole those that lose the stain are called Gram -ve. The Gram +ve and Gram -ve bacteria differ in the chemical composition of the cell wall. Structures that may be present external to the bacterial cell wall such, flagella, pili, prosthecae and capsule. Flagella are extremely thin hair like structure and they are responsible swimming motility. They 0.01 to 0.02 μ m in diameter and upto 70 μ m in length. The bacterial flagellum lacks 9+2 arrangement. Pili are minute hair like appendages and work as the organells of attachment. They are composed of a protein called pilin. Capsule are not essential structures because they are not synthesized under all environmental conditions. Mutant exists which have lost the ability to produce them. Cells from which they have been removed by enzymic digestion remain viable. They may be 10 μ thick.

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