

## **Bacterial Cell Structure**

- The bacterial cell is surrounded by a cell wall composed of **peptidoglycan** consisting of chain of alternating N-acetyl muramic acid and N-acetyl glucosamine units cross linked by tetrapeptide and pentaglycine units.
- The cell wall allows the inward passage of nutrients and the outward passage of waste matter and digestive enzymes.
- All the material inside the cell wall constitutes the **protoplast**.
- The protoplast consists of a cytoplasmic or protoplast membrane, which determines the degree of selective permeability of various substances into and out of the cell.
- The cytoplasmic membrane of bacteria resembles those of eukaryotes, but also contains respiratory and other enzymes located in the bacteria.
- The **cytoplasm**, which is a complex mixture of proteins, lipids, carbohydrates, many other organic compounds, minerals and water.
- The nuclear material consists of large circular **chromosome**, composed of DNA.
- The chromosomal DNA makes up the main body of genetic material of the bacterium and appears as a spherical, ellipsoidal, dumb-bell or Y-shaped body in the cytoplasm, but without any membrane.
- Such nuclear material does not show meiosis and mitosis.
- Some species also have additionally single or multiple copies of smaller circular genetic material called **plasmids**.
- Plasmids can move from one bacterium to another and even from the bacterium to plants as in crown gall disease. This special property is being utilized with much success in genetic engineering for transformation of some desired genes from one plant to another by using it as vector.

### **Flagella**

- In bacteria, flagella are the organs of locomotion.
- They are very delicate and fragile and cultures are to be handled carefully for their staining.
- The flagella vary from 10-12 nm in width which is smaller than

wavelength of light, therefore, cannot be seen by ordinary staining.

- Mordants like potassium sulphate and mercuric chloride are generally precipitated on flagella making the width more for making them visible under light microscope.

### **Parts of a Flagellum**

- **Filament:** It is the outermost region of flagellum, and is helical, composed of flagellin with a molecular weight of 30000-40000 and is synthesized in the cell, which moves to the hollow core of the flagellum to the tip. Flagellin is a protein with 14 amino acids and is characterised by higher content of aromatic amino acids and absence of cysteine in many cases.
- **Hook:** Filament is attached to hook which is wider than the flagellum. This is 45 nm wide and made up of different types of protein. The hook of gram positive bacterium is longer than that of gram negative bacteria.
- **Basal body:** The third part called basal body consists of small central rod which is inserted into a system of rings. The gram positive and gram negative bacteria are different in the number of rings. The inner pair of rings (S and M) are embedded in cell membrane and are formed in both gram positive and gram negative bacteria. L and P rings are formed only in gram negative bacteria. S and M rings are important for movement of flagella.

### **Pili**

- In some bacteria, small hair like structures are also present which are called pili.
- These are shorter than the flagella and are thicker (3-15 nm in diameter).
- The term fimbriae is sometimes also used for pili, but the term pili is reserved for those which are involved in conjugation.
- They are made up of protein sub-units pilin of molecular weight of 70000.
- It consists of a helically coiled fibre with a central hole of 2 nm in diameter.
- Fimbriae may be involved in attachment, whenever there is infection. Both flagella and pili originate from cell membrane and extend outward through the cell wall