



Lecture 3. Morphology of bacteria cont.

Learning objectives

Upon completion of this lecture, student should be able to:

1. State the functions and biologic significance of the cell membrane and cytoplasm.
2. State the functions of slime layer and bacterial flagella.

Cell membrane

Cell membrane or plasma membrane is a thin (5–10 nm) **semipermeable** membrane that acts as an **osmotic barrier**.

It primarily contains **phospholipids** and **proteins**. It also contains **enzymes** associated with DNA biosynthesis, **cell wall polymers**, and **membrane lipids**.

The cell membrane has the following functions:

1. It acts as a **semipermeable** membrane regulating the **inflow** and **outflow** of metabolites to and from the protoplasm.
2. It helps in **electron transport** and **oxidative phosphorylation**.

Important to note

- The cell wall of **acid-fast bacilli**, such as *M. tuberculosis*, contains large amounts of waxes known as **mycolic acids**. The cell wall is composed of peptidoglycan and an outer asymmetric lipid bilayer.
- *Mycoplasma* are naturally occurring bacteria without cell wall. They do not possess any definite shape.



Cytoplasm

Bacterial cytoplasm is a colloidal suspension of a variety of **organic** and **inorganic** solutes in a **viscous watery solution**.

The cytoplasm consists of **ribosomes**, **mesosomes**, and **intracytoplasmic inclusions bodies**.

Cytoplasm contains all the biosynthetic components required by a bacterium for **growth** and **cell division**, together with **genetic material**.

Nucleus

The bacterial nucleus is **neither** enclosed in a **nuclear membrane** **nor** associated with any **nucleolus**.

The nucleus of the bacteria consists of a **single circle of double-stranded deoxyribonucleic acid (DNA)**, arranged in a supercoiled circular structure.

Capsule

An amorphous viscid colloidal material secreted by some bacteria extra cellularly.

The capsule is mostly made up of **polysaccharides**, often referred to collectively as **exopolysaccharides**.

Slim layer

Slime layer (S-layer) is a structured **paracrystalline protein** layer composed of a single kind of **protein molecule**, sometimes with **carbohydrates** attached.



It plays an important role in the **maintenance of cell shape**, and it may be involved in **cell adhesion** to host epidermal surfaces.

Surface appendages

Bacterial flagella are thread-like appendages intricately embedded in the cell envelope and are responsible for **conferring motility** to the bacteria.

Depending on the arrangement, flagella can be of the following types:

- **Monotrichous** (single polar flagellum), e.g., *Vibrio cholerae*.
- **Lophotrichous** (multiple polar flagella), e.g., *Spirilla*.
- **Peritrichous** (flagella distributed over the entire cell), e.g., *Salmonella Typhi*, *E. coli*, etc.
- **Amphitrichous** (single flagellum at both the ends), e.g., *Spirillum minus*.