



“बेटी बचाओ, बेटी पढ़ाओ”

## **JAYOTI VIDYAPEETH WOMEN'S UNIVERSITY, JAIPUR**

### **(Format for Preparing E Notes)**

#### **Faculty of Education And Methodology**

**Faculty Name-**                    **JV'n Shalini Devi Prajapati**

**Program-**                            **M.Sc. Microbiology First Semester**

**Course Name -**                    **Biomolecules and Microbial Biochemistry**

**Session No. & Name –** **Morphology and structure of bacteria**

#### **Academic Day starts with –**

- Greeting with saying ‘Namaste’ by joining Hands together following by 2-3 Minutes Happy session, Celebrating the birthday of any student of the respective class and the National Anthem

#### **Lecture Starts with-**

**Topic to be discussed today-** Today I will discuss about Morphology and structure of bacteria.

#### **Lesson deliverance (ICT, Diagrams & Live Example)-**

- PPT (7 Slides)
- Diagrams
- Tables

## INTRODUCTION

Bacteria are single-celled microorganisms that constitute one of the three domains of life, the other two being Archaea and Eukarya. They are among the most diverse and abundant life forms on Earth. Bacteria play crucial roles in various ecosystems, including their involvement in nutrient cycling, environmental degradation, and many symbiotic relationships with other organisms.

Here's a brief introduction to bacteria:

### 1. Microscopic Single-Celled Organisms:

- Bacteria are prokaryotic microorganisms, meaning they lack a cell nucleus and membrane-bound organelles. Their genetic material is contained within a single, circular DNA molecule located in the nucleoid region of the cell.

### 2. Diverse Shapes and Sizes:

- Bacteria come in a wide range of shapes and sizes, including spheres (cocci), rods (bacilli), spirals (spirilla), and more. Their diversity in morphology contributes to their adaptability to various environments.

### 3. Ubiquitous Distribution:

- Bacteria can be found in nearly every habitat on Earth, from the deep sea to high mountain ranges, from polar ice caps to geothermal hot springs. They are also present in and on the bodies of humans and animals.

### 4. Essential Roles:

- Bacteria are essential in various ecological and biological processes. They contribute to nutrient cycling by breaking down organic matter, fixing nitrogen in the soil, and aiding in the decomposition of dead organisms.

### 5. Symbiotic Relationships:

- Many bacteria form symbiotic relationships with other organisms, including humans. Some bacteria are beneficial and aid in processes like digestion and nutrient absorption, while others can be harmful and cause infections.

### 6. Medical Importance:

- Bacteria can be both beneficial and harmful to human health. Beneficial bacteria, such as those in the gut microbiome, aid in digestion and support the immune system. Pathogenic bacteria can cause a wide range of diseases and infections.

## 7. Industrial and Biotechnological Applications:

- Bacteria are used in various industrial and biotechnological processes. They are involved in the production of antibiotics, enzymes, and fermented foods like yogurt and cheese. Bacterial biotechnology plays a significant role in genetic engineering and the production of biofuels.

## 8. Antibiotic Resistance:

- The emergence of antibiotic-resistant bacteria is a major global health concern. Misuse and overuse of antibiotics have led to the development of bacteria that are no longer susceptible to commonly used antibiotics.

## 9. Research and Classification:

- Bacteria are extensively studied by microbiologists. They are classified into various phyla and genera based on their genetic and phenotypic characteristics.

## MORPHOLOGY & STRUCTURE OF BACTERIA

### MORPHOLOGY OF BACTERIA

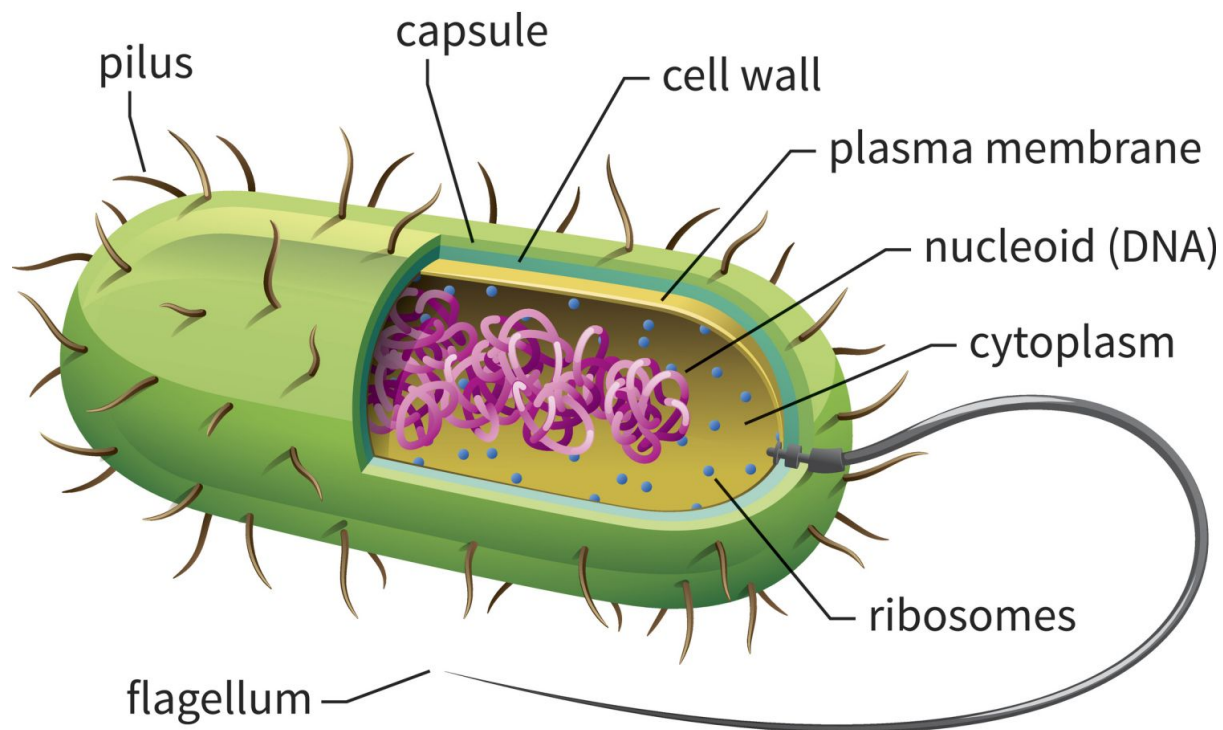
Bacteria are a diverse group of microorganisms that come in various shapes and sizes. Their morphology refers to their physical characteristics, including shape, size, and arrangement. Here are some common bacterial morphologies:

1. **Cocci (singular: coccus):**
  - Cocci are spherical or round-shaped bacteria.
  - They can occur singly, in pairs (diplococci), in chains (streptococci), in clusters (staphylococci), or in groups of four (tetrads).
2. **Bacilli (singular: bacillus):**
  - Bacilli are rod-shaped bacteria.
  - They can be long or short and may have rounded or squared ends.
3. **Spirilla (singular: spirillum) and Spirochetes (singular: spirochete):**
  - Spirilla are spiral-shaped bacteria with a rigid helical shape.
  - Spirochetes are also spiral-shaped but have a more flexible, corkscrew-like structure.
4. **Vibrios (singular: vibrio):**
  - Vibrios are curved or comma-shaped bacteria.
5. **Coccobacilli (singular: coccobacillus):**
  - Coccobacilli are oval or ovoid-shaped bacteria that are intermediate between cocci and bacilli.

6. **Filamentous Bacteria:**
  - These bacteria form long, thread-like chains or filaments.
7. **Pleomorphic Bacteria:**
  - Pleomorphic bacteria do not have a fixed shape and can vary in shape and size.
8. **Stalked Bacteria:**
  - These bacteria have an extension or stalk-like structure that can be used for attachment or reproduction.
9. **Branching Filamentous Bacteria:**
  - These bacteria have a branching, filamentous structure.

## STRUCTURE OF BACTERIA

Bacteria are single-celled microorganisms with relatively simple structures compared to eukaryotic cells (cells with a nucleus and membrane-bound organelles). The basic structure of a bacterial cell includes the following components:



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1. **Cell Envelope:**
  - **Cell Wall:** Most bacteria have a rigid cell wall that surrounds the cell membrane. The composition of the cell wall can vary. Gram-positive bacteria have a thick layer of peptidoglycan, while Gram-negative bacteria have a thinner layer of peptidoglycan and an additional outer membrane containing lipopolysaccharides.
  - **Cell Membrane (Plasma Membrane):** The cell membrane is a phospholipid bilayer that encloses the cytoplasm. It is semi-permeable and controls the passage of molecules into and out of the cell. It also plays a role in energy production (respiration) and transport processes.
2. **Cytoplasm:**
  - The cytoplasm is a gel-like substance within the cell envelope where various cellular structures and metabolic processes occur. It contains enzymes, ribosomes, and the bacterial chromosome (a single, circular DNA molecule) in a region called the nucleoid.
3. **Ribosomes:**
  - Bacterial ribosomes are responsible for protein synthesis. They consist of ribosomal RNA (rRNA) and proteins and are found in the cytoplasm.
4. **Flagella:**
  - Some bacteria have whip-like appendages called flagella that enable them to move. Flagella rotate to propel the bacterium through its environment.
5. **Pili (Fimbriae):**
  - Pili are hair-like appendages that help bacteria adhere to surfaces and other cells. Some pili are involved in bacterial conjugation, a process of transferring genetic material between cells.
6. **Capsule:**
  - Some bacteria have a protective capsule outside the cell wall. It helps protect the bacterium from the host's immune system and enhances its ability to adhere to surfaces.
7. **Endospores:**
  - Certain bacteria can form endospores, which are highly resistant, dormant structures. Endospores can withstand harsh conditions, such as extreme heat, radiation, and desiccation, and can later germinate into a new bacterial cell.
8. **Cytoplasmic Inclusions:**
  - Bacterial cells can contain various cytoplasmic inclusions, such as granules for storing energy reserves (e.g., glycogen or polyphosphate granules) or other compounds.
9. **Plasmids:**
  - Plasmids are small, circular DNA molecules separate from the chromosomal DNA. They often carry genes for specific functions, such as antibiotic resistance.
10. **Mesosomes (In Some Bacteria):**
  - Mesosomes are invaginations of the cell membrane that play a role in cell division and membrane-associated functions.

## University Library Reference-

- [https://www.thoughtco.com/thmb/P6pbXEdLAig-xQdF4jmAwatyE4=/1500x1000/filters:no\\_upscale\(\):max\\_bytes\(150000\):strip\\_icc\(\)/bacteria\\_cell\\_drawing-5786db0a5f9b5831b54f017c.jpg](https://www.thoughtco.com/thmb/P6pbXEdLAig-xQdF4jmAwatyE4=/1500x1000/filters:no_upscale():max_bytes(150000):strip_icc()/bacteria_cell_drawing-5786db0a5f9b5831b54f017c.jpg)
- **Suggestions to secure good marks to answer in exam-**
  - Do the classification with formula & example.
  - Explain the answers with key point & Diagram
- **Questions to check the understanding level of students-**
  - Discuss about types of bacteria according to their shape.
  - Describe the structure of bacteria with lable diagram.
- **Academic Day ends with-**

National song ‘Vande- Mataram’

Next topic: Nutritional requirement & growth characteristics of bacteria