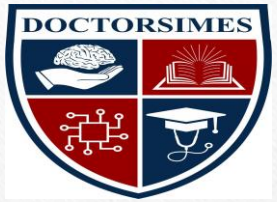


Structure of Bacteria

Presented by: Dr. Uswa Fazal

Fsc part(1)

Introduction to Bacteria.

- **Unicellular Organisms:** Bacteria are simple, single-celled organisms.
- **Size Comparison:** Typically range from 1 to 5 micrometers, smaller than eukaryotic cells.
- **Prokaryotic Characteristics:** Lack membrane-bound organelles, distinguishing them from eukaryotes.

Structural Components of Bacterial Cells-

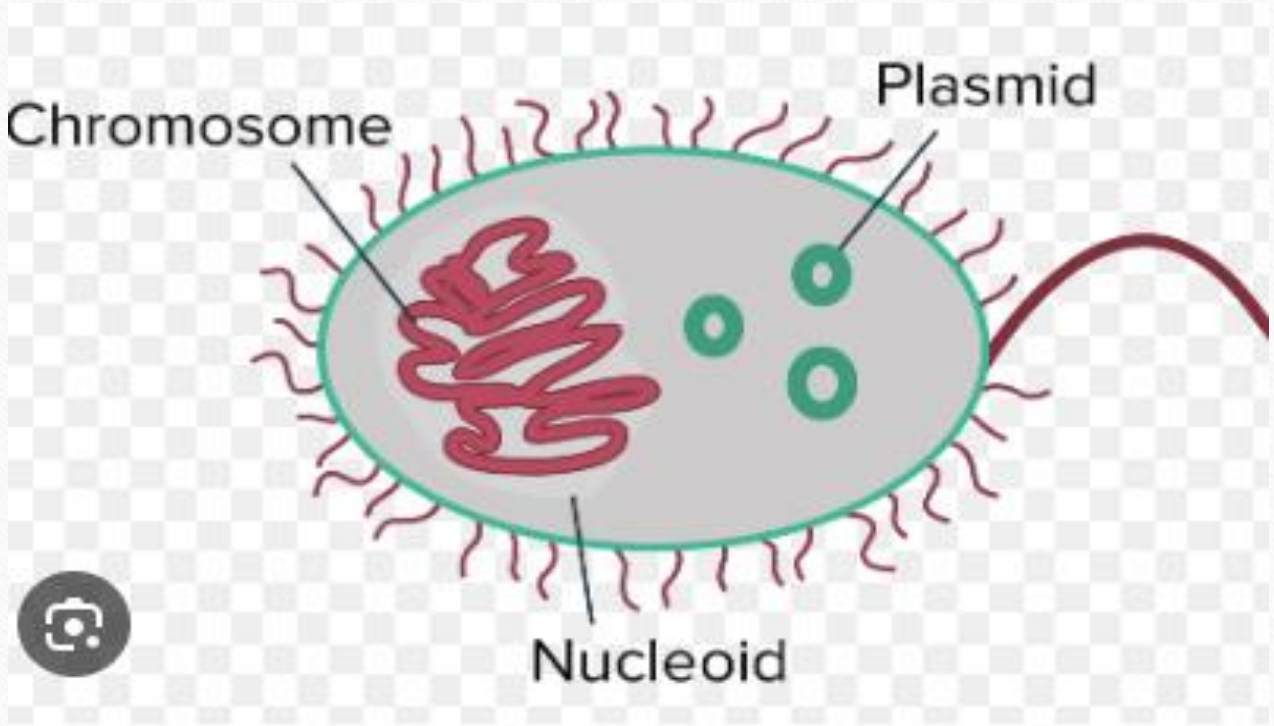
- **Key Components**

1. Nucleoid
2. Cytoplasmic Membrane
3. Cell Wall
4. Ribosome
5. Flagella
6. Capsule
7. Fimbriae or Pili
8. Spores

The Nucleoid

- **Importance of the Nucleoid:** Critical for housing genetic material essential for cell function and replication

Nucleoid



Location and Definition of the Nucleoid

- **Nucleoid Region:**
  - No membrane-bound nucleus in bacteria.
  - Chromosome localized within the cytoplasm.

Composition of the Nucleoid

- **Genetic Material Structure:**
  - Contains a single circular chromosome.
  - Consists of double-stranded DNA.
- **Organization:**
  - Highly compacted to maximize space within the cell.

Replication and Cell Division

❖ **Bacterial Replication Process:**

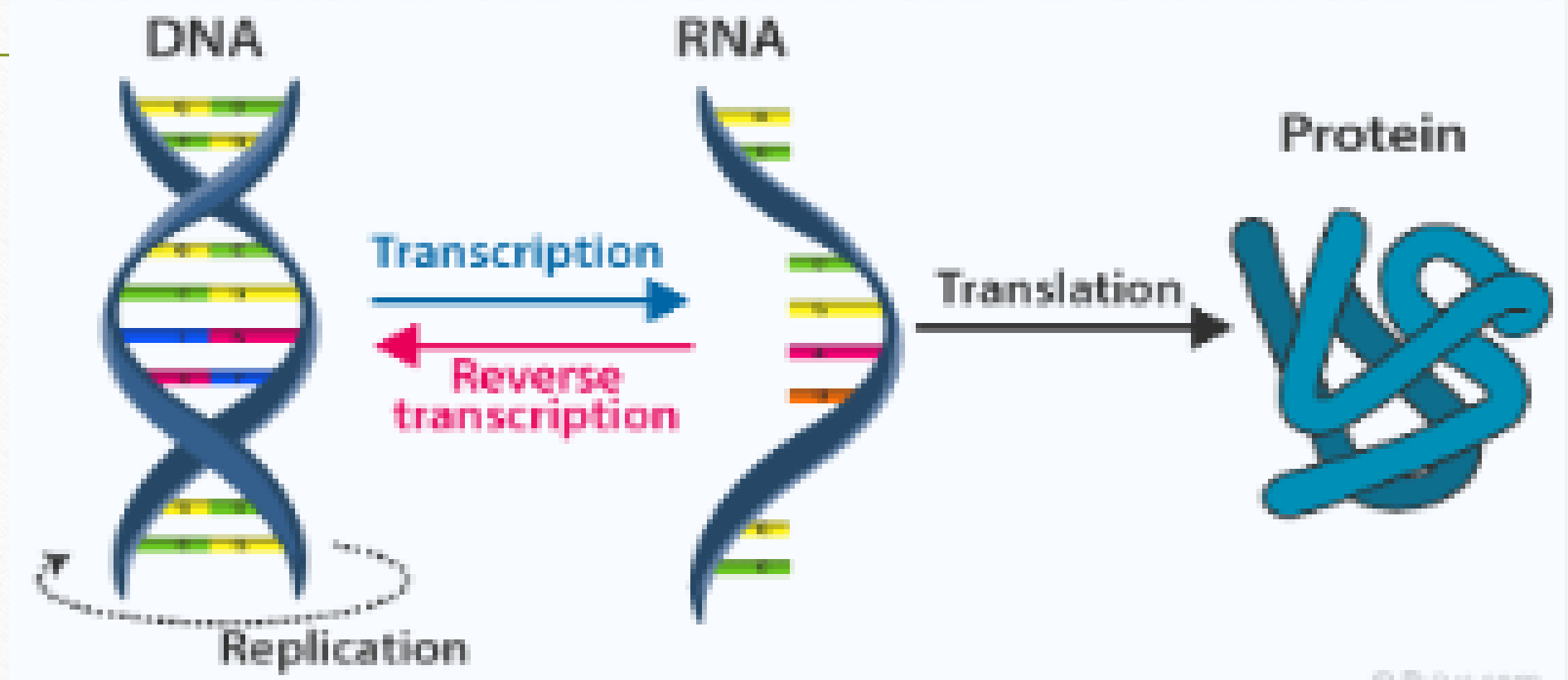
- Chromosome replication results in two identical DNA molecules.
- Each bacterium inherits one copy of replicated DNA.
- Bidirectional Replication
- Begins at a specific origin site.
- Proceeds in both directions to create two copies.

Transcription and Gene Expression

Transcription in the Nucleoid

- **RNA Synthesis:** RNA polymerase synthesizes messenger RNA (mRNA) using DNA as a template.
- **Gene Translation:** mRNA is translated into proteins.
- **DNA Organization:** Accessibility of DNA influences gene expression and regulation

Central Dogma

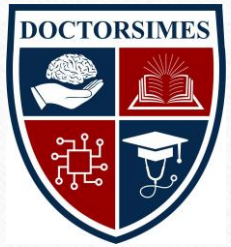


Dynamic nature of nucleoid

- **Responsive Structure :**
  - The nucleoid adapts to various cellular processes.
  - Impact of DNA Supercoiling .
  - Changes affect nucleoid structure and function.
- **Rearrangements during the bacterial cell cycle:**
  - Occurs in replication, transcription, and cell division phases

Role in Bacterial Physiology and Adaptation

- **Central Role of the Nucleoid**
  - Provides genetic basis for cellular functions and growth.
  - Genetic Information Storage.
  - Essential for producing proteins.
  - Environmental Adaptation.
  - Enables bacteria to adjust to stress and nutrient availability.



Thank You :)