

Types of Cells

Lec. 6

Cell is the basic structural and, fundamental unit of life. Various types of cells perform different functions.

Based on cellular structure, there are two types of cells:

Prokaryotes and **Eukaryotes**

What is a Prokaryotic Cell?

Prokaryotic cells are single celled microorganisms known to be the earliest on earth. Prokaryotes include Bacteria and Archaea. The photosynthetic prokaryotes include cyanobacteria that perform photosynthesis.

Characteristics of Prokaryotic Cell

Prokaryotic cells have different characteristic features as mentioned below:

1. They lack a nuclear membrane.
2. Mitochondria, Golgi bodies, chloroplast, and lysosomes are absent.
3. The genetic material is present on a single chromosome.
4. The cell wall is made up of carbohydrates and amino acids.
5. The plasma membrane acts as the mitochondrial membrane carrying respiratory enzymes.
6. They divide asexually by binary fission. The sexual mode of reproduction involves conjugation.

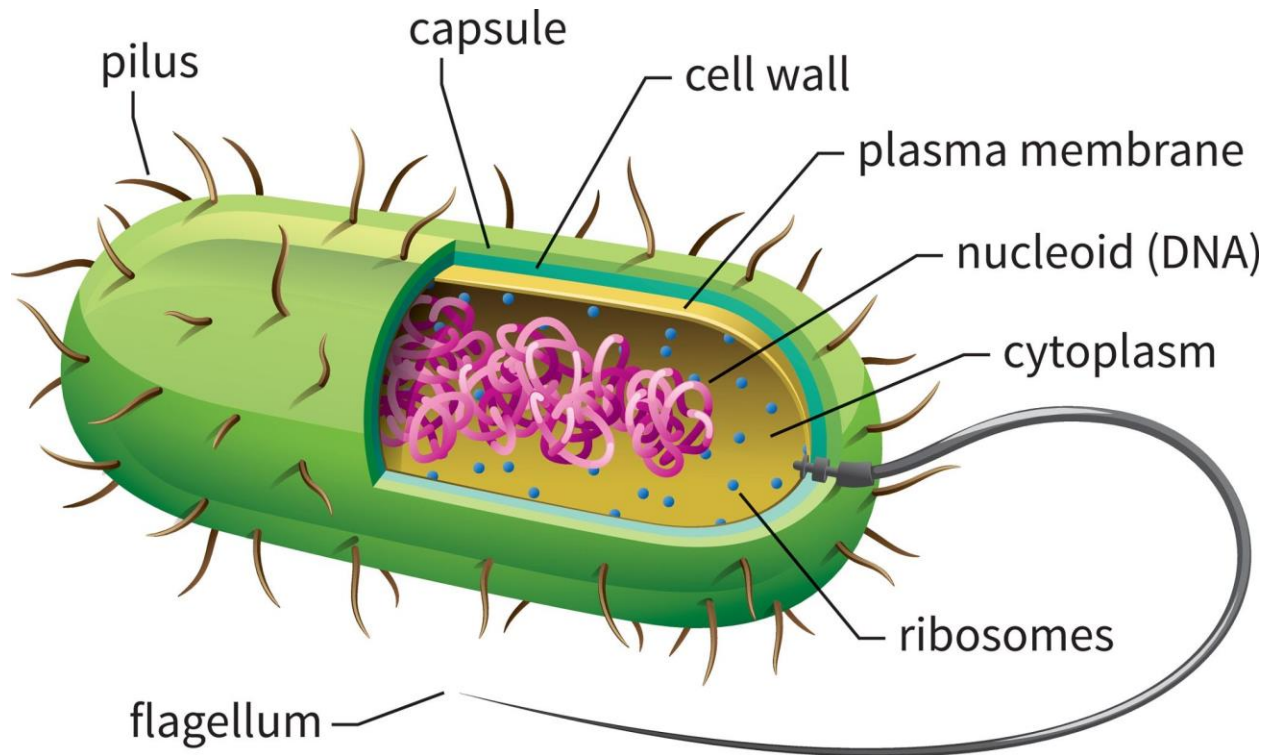
Examples of Prokaryotic Cells

1- Bacterial Cells

These are unicellular organisms found everywhere on earth from soil to the human body.

They have different shapes and structures. The cell wall is composed of peptidoglycan that provides structure to the cell wall. Bacteria have some unique structures such as **pili**, **flagella** and **capsule**.

They also possess extrachromosomal DNA known as **plasmids**.



2- Blue-green algae (Cyanobacteria)

Cyanobacteria are a group of photosynthetic bacteria, some of which are nitrogen-fixing, that live in a wide variety of moist soils and water either freely or in a symbiotic relationship with plants or lichen-forming fungi.

They range from unicellular to filamentous and include colonial species. Each individual cell (each single cyanobacterium) typically has a thick, gelatinous cell wall. They lack flagella. Many of the multicellular filamentous forms are capable of a waving motion

Eukaryotic Cell

Eukaryotes are organisms made up of cells that possess a membrane-bound nucleus (that holds DNA in the form of chromosomes) as well as membrane-bound organelles. Eukaryotic organisms may be multicellular or single-celled organisms.

All animals are eukaryotes. Other eukaryotes include plants, fungi, and protozoans. They are large cells, have cytoplasmic organelles like mitochondria golgi complex, endoplasmic reticulum etc. The nuclear envelope is present and the genetic

material in the form of chromosomes consist of DNA and histone protein, the cells are dividing by mitosis or meiosis division .

A comparison showing the shared and unique features of prokaryotes and eukaryotes

All cells, whether prokaryotic or eukaryotic, share these four features:

1. DNA
2. Plasma membrane
3. Cytoplasm
4. Ribosomes

Prokaryote and eukaryote: key differences

	Prokaryote	Eukaryote
Nucleus	Absent	Present
Membrane-bound organelles	Absent	Present
Cell structure	Unicellular	Mostly multicellular; some unicellular
Cell size	Smaller (0.1-5 μm)	Larger (10-100 μm)
Complexity	Simpler	More complex
DNA Form	Circular	Linear
Ribosomes	Smaller(70S) consist of a 50S large subunit and a 30S small subunit	Larger(80S) consist of a 60S large subunit and a 40S small subunit

Viruses

Viruses are microscopic parasites, generally much smaller than bacteria.

How much smaller are most viruses in comparison to bacteria?

With a diameter of 220 nanometers, the measles virus is about 8 times smaller than *E.coli* bacteria. At 45 nm, the hepatitis virus is about 40 times smaller than *E.coli*.

They lack the capacity to live and reproduce outside of a host body, they contain the key elements that make up all living organisms: the nucleic acids, **DNA or RNA** (any given virus can only have one or the other).

A minimal virus is a parasite that requires replication (making more copies of itself) in a host cell. When a virus is completely assembled and capable of infection, it is known as a **virion**.

The structure of a simple virion comprises of an inner nucleic acid core surrounded by an outer casing of proteins known as the **capsid**. Capsids protect viral nucleic acids from being chewed up and destroyed by special host cell enzymes called **nucleases**. The DNA or RNA found in the core of the virus can be single stranded or double stranded. It constitutes the genome or the sum total of a virus's genetic information. Viral genomes are generally small in size, coding only for essential proteins such as capsid proteins, enzymes, and proteins necessary for replication within a host cell.

