Kingdom Monera

- Kingdom Monera includes bacteria and blue-green algae. These are the simplest of all living organisms (prokaryotes).
- There are three sub-classifications in the kingdom Monera:

1- Phylum: Schizophyta (Bacteria).

2- Phylum: Cyanophyta (Blue-green algae or cyanobacteria).

3- Phylum: Prochlorophyta.

Prokaryotic cells

Prokaryotic cells are said to be the most primitive cells, as they are believed to be the only basis of life millions of years ago. Prokaryotic cells do not have a definite nucleus or any other membrane-bound organelles, whereas eukaryotic cells have complex structures as they have a definite nucleus, which is enclosed by a nuclear membrane. Organisms having the prokaryotic cells are called prokaryotes, they are unicellular. Prokaryotes have the nucleus, but it isn't in that definite shape or doesn't have complex functions of DNA storage as eukaryotes have. The nuclear membrane does not cover the chromatin within and spreads inside the cytoplasm. The majority of prokaryotic DNA is found in a central region of the cell called the nucleoid, and it typically consists of a single large loop called a circular chromosome.

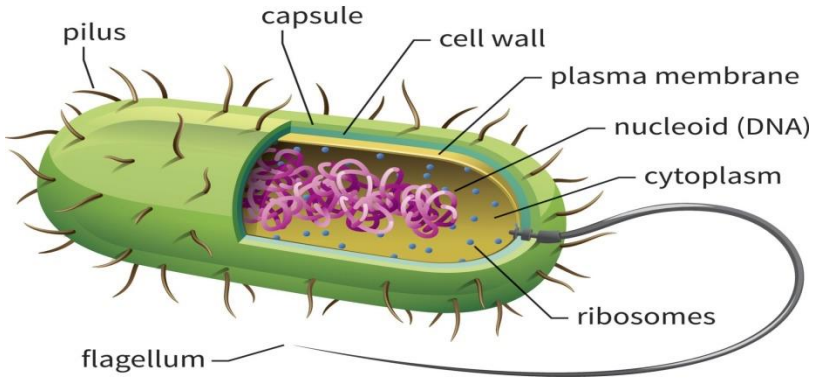
Prokaryotic cells have various shapes; the four basic shapes of bacteria are:

- Cocci – spherical

- Bacilli – rod-shaped - Spirochete – spiral-shaped - Vibrio – comma-shaped

Types of bacteria

Prokaryotic cell structure



1- Cell wall: Most bacteria are, however, surrounded by a rigid cell wall made out of peptidoglycan, a polymer composed of linked carbohydrates and small proteins. The cell wall provides an extra layer of protection, helps the cell maintain its shape, and prevents dehydration. Many bacteria also have an outermost layer of carbohydrates called the capsule, the capsule is sticky and helps the cell attach to

surfaces in its environment. Bacteria are grouped according to cell wall:
a. Gram-positive bacteria: have simple, thick cell walls. Their cell walls are composed of large amount of peptidoglycan.

b. Gram-negative bacteria: bacteria have less peptidoglycan and are more complex.

2 - Cell membrane: Surrounds the cell's cytoplasm and regulates the flow of substances in and out of the cell.

3 – Flagella: Some bacteria also have a specialized structures found on the cell surface, which may help them move, stick to surfaces, or even exchange genetic material with other bacteria. Flagella are whip-like structures that act as rotary motors to help bacteria move.

4 – Cytoplasm: A gel-like substance composed mainly of water that also contains enzymes, salts, cell components, and various organic molecules.

5 – Ribosome: Cell structures responsible for protein production.

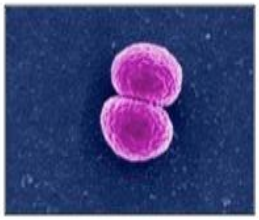
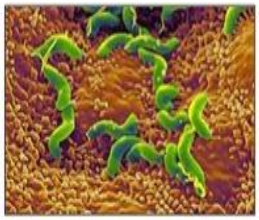
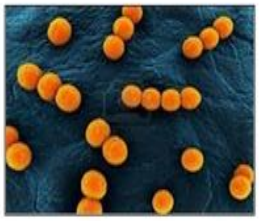
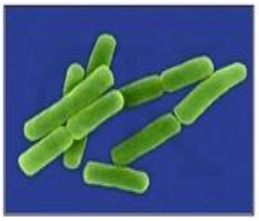
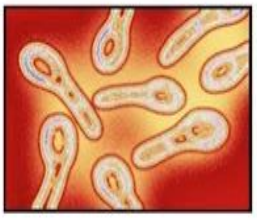
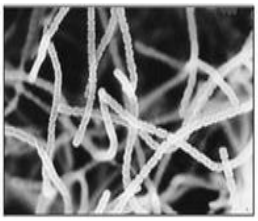
6 – Nucleoid: Area of the cytoplasm that contains the prokaryote's single DNA molecule.

7 - Plasmid: Is a small ring of DNA that carries addition genes.

8 - Glycocalyx (only in some types of prokaryotes): A glycoproteinpolysaccharide covering that surrounds the cell membranes.

Comparison of Prokaryotic and Eukaryotic Cells

	PROKARYOTES	EUKARYOTES
Organisms	Monera: Eubacteria and Archebacteria	Protists, Fungi, Plants and Animals
Level of organization	single celled	single celled (protists mostly) or multicellular usually with tissues and organs
Typical cell size	small (1 -10 microns)	large (10 - 100 microns)
Cell wall	almost all have cell walls (murein)	fungi and plants (cellulose and chitin); none in animals
Organelles	usually none	many different ones with specialized functions
Metabolism	anaerobic and aerobic; diverse	mostly aerobic
Genetic material	single circular double stranded DNA	complex chromosomes usually in pairs; each with a single double stranded DNA molecule and associated proteins contained in a nucleus
Mode of division	binary fission mostly; budding	mitosis and meiosis using a spindle; followed by cytokinesis

Circular (Coccus)	Rod-shaped (Bacillus)	Curved Forms	Other Shapes
 Diplo- (in pairs)	 Coccobacilli (oval)	 Vibrio (curved rod)	 Helicobacter (helical)
 Strepto- (in chains)	 Streptobacilli	 Spirilla (coil)	 Corynebacterium (club)
 Staphylo- (in clusters)	 Mycobacteria	 Spirochete (spiral)	 Streptomyces (filaments)

The Viruses

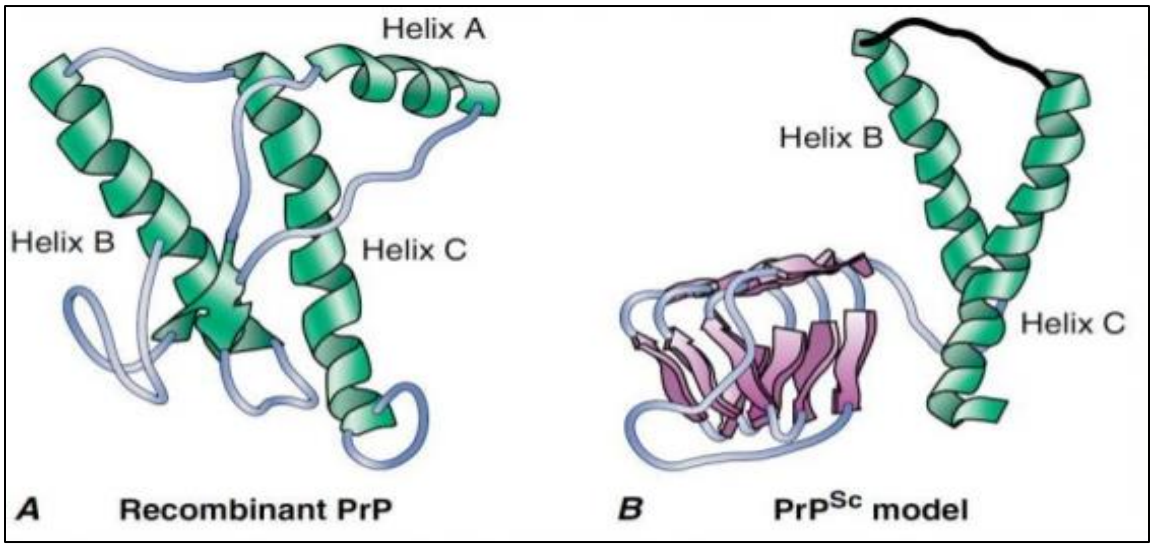
- ✓ A virus is a small infectious agent that replicates only inside the living cells of other organisms.
- ✓ Viruses can infect all types of life forms, from animals and plants to microorganisms, including bacteria.
- ✓ While not inside an infected cell or in the process of infecting a cell, viruses exist in the form of independent particles. These viral particles, also known as virions.
- ✓ Virions, consist of two or three parts: 1- The genetic material made from either DNA or RNA. 2- An envelope of lipids that surrounds the protein coat when they

are outside a cell. The shapes of these virus particles range from simple helical and icosahedral forms for some virus species to complex structures.

Types of viruses:

1- **The Viroid's:** A viroid (an infectious RNA molecule) is similar to a virus but not quite the same thing. It's smaller than a virus and has no capsid. A viroid is a coiled, "naked" RNA molecule that can affect a plant cell. Although RNA (unlike DNA) is single-stranded, the RNA in a viroid coils around itself to become double-stranded for strength.

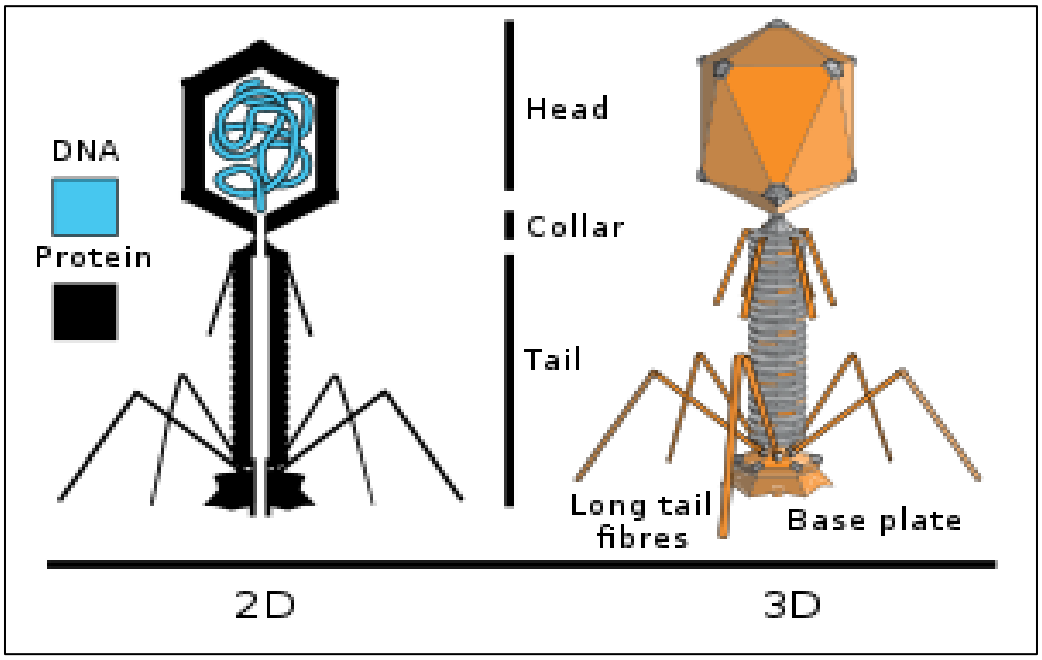
2- **The Prions:** Prions (infectious protein particles) have neither DNA nor RNA to transmit infection. Prions cause a degenerative disease affecting the nervous system, in sheep and goats. Also can cause a few human diseases; some scientists believe that prions may also have a role in Alzheimer's disease.



Prion structure

The Bacteriophages

A bacteriophage, or phage for short, is a virus that infects bacteria. Like other types of viruses, bacteriophages vary a lot in their shape and genetic material. Phage genomes can consist of either DNA or RNA. Bacteriophages, just like other viruses, must infect a host cell in order to reproduce. Some phage's can only reproduce via a lytic lifecycle, in which they burst and kill their host cells. Other phage's can reproduce via a lysogenic lifecycle, in which they don't kill the host cell (and instead are copied along with the host DNA each time the cell divides).



Phage structure