Microorganisms groups in Ecosystems

Microorganisms fall into two main groups:

1-**Prokaryotes**: eubacteria, archaea, and viruses which have genetic matter is not surrounded by a nuclear membrane.

2- **Eukaryotes**: includes fungi, microscopic algae, and protozoa. which have genetic matter surrounded by a distinct nuclear membrane (nucleus).

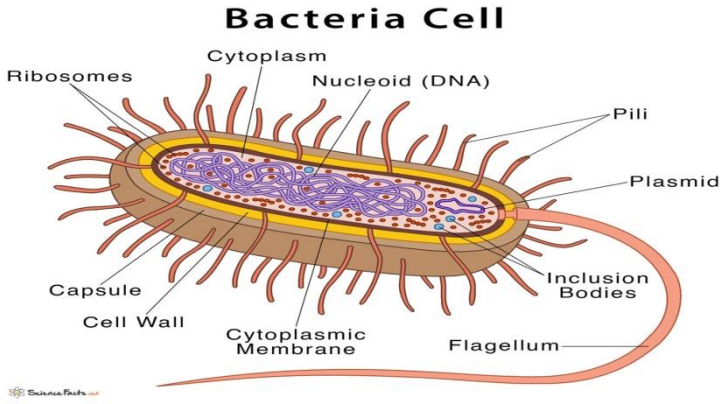
1-Eubacteria and Archaebacteria:

- smallest among micro organisms. Their cell sizes range between 0.1-0.5 µm
- present in different shapes, **cocci**, **bacilli**, and **spiral**.
- in the soil present another shape of true bacteria called **Actinomycetes**, which form branched filaments similar to fungus called Hyphae, but it is a bacterium because cells are prokaryotic and cell wall is similar to structure of the cell wall of bacteria and form spores. Its most important genus is **Streptomyces** and the other genus is **Frankia** which fixes nitrogen .
- The genetic matter is represented by the chromosome (DNA) and circular fragments of DNA outside the chromosome called plasmids in the cytoplasm.
- The bacterial cell is surrounded by envelope, inner layer is the plasma membrane, and the outer layer is the cell wall
- in Gram-positive bacteria cell wall consists of a thick layer of peptidoglycan + teichoic acid, such as **Bacillus,Clostridium**

- in Gram-negative bacteria, cell wall consists of a thin layer of peptidoglycan + the outer membrane.such as **E.coli , Salmonella, pseudomonas**
- Some bacteria move by flagella (used in swimming motility) and Pilli that help in twitching motility.
- some soil bacteria, such as **Bacillus** and **Clostridium** form **(**spores) when lack of nutrients, especially carbon and nitrogen
- **Bacteria are divided according to the method of nutrition into two main categories:**

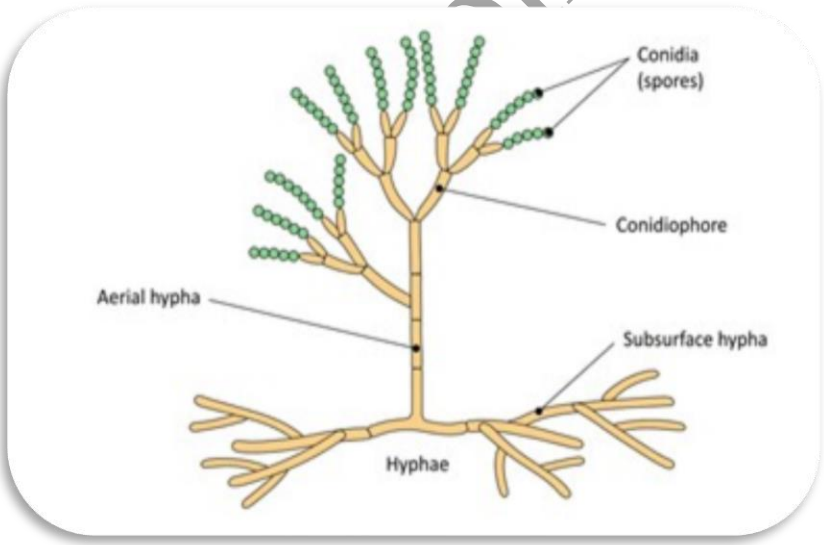
1- Autotrophic, which uses light or inorganic compounds (nitrates, sulfates, hydrogen) as a source of energy, and uses CO2 as a source of carbon. Such as cyanobacteria, purple sulfur bacteria, and green sulfur bacteria

2 -Heterotrophic: which uses light or organic compounds as a source of energy and organic materials as a source of carbon. Such as purple non-sulfur bacteria and green non-sulfur bacteria



2-Microfungi:

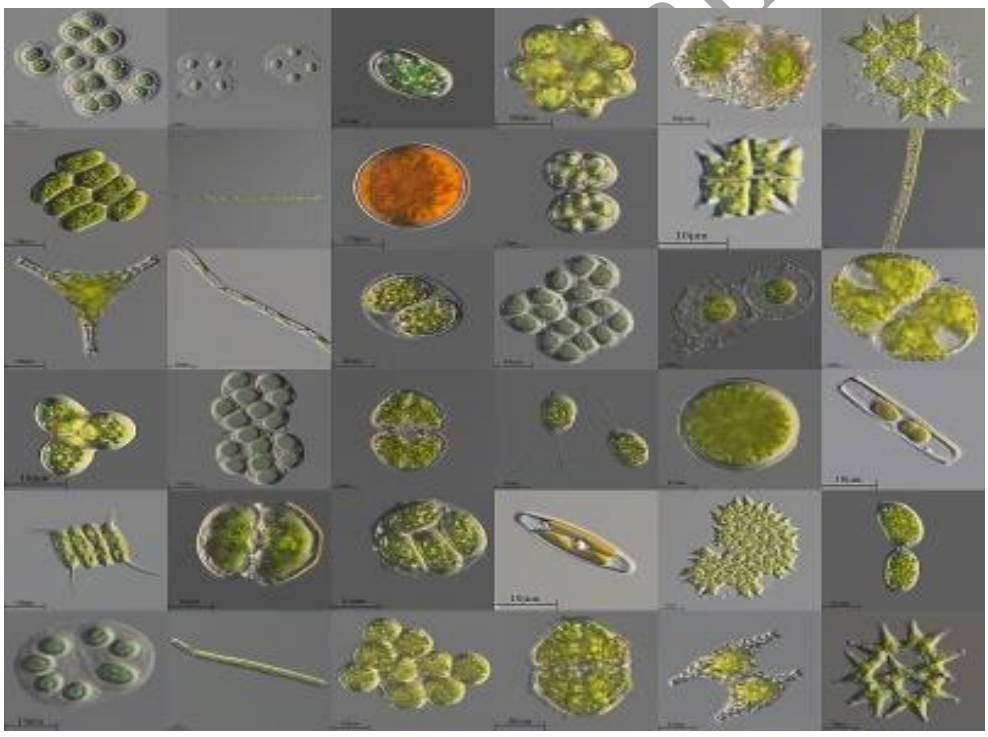
- fungi either unicellular such as yeasts, or multicellular such as molds,
- fungi body known as mycelium, composed of branched filaments called hyphae.
- hyphae either divided by septae or no.
- fungi cell contains a nucleus, and surrounded with plasma membrane and cell wall composed of Chitin and cellulose
- fungi are found on or near the surface of the soil because most of them are obligate aerobes.
- fungi are heterotrophic (do not contain chlorophyll) and produce enzymes that decompose organic matter in the soil.
- fungi play a major role in the environment as free living called decomposers or symbionts or may be found inside plant parts called Endophytes



Shape (2-2) Fungus mycelium

3-Microalgae

- **algae** are unicellular or multicellular algae
- found in aquatic environments in freshwater or seas, floating in the water column or in sediments.
- algae are primary producer in the ecosystem because they are autotrophs make their food by photosynthesis (fixing CO_2 gas and producing Organic substance carbohydrates and release oxygen), so they are responsible for half the volume of oxygen in the atmosphere.
- Both microalgae and cyanobacteria in marine aquatic systems are called phytoplankton



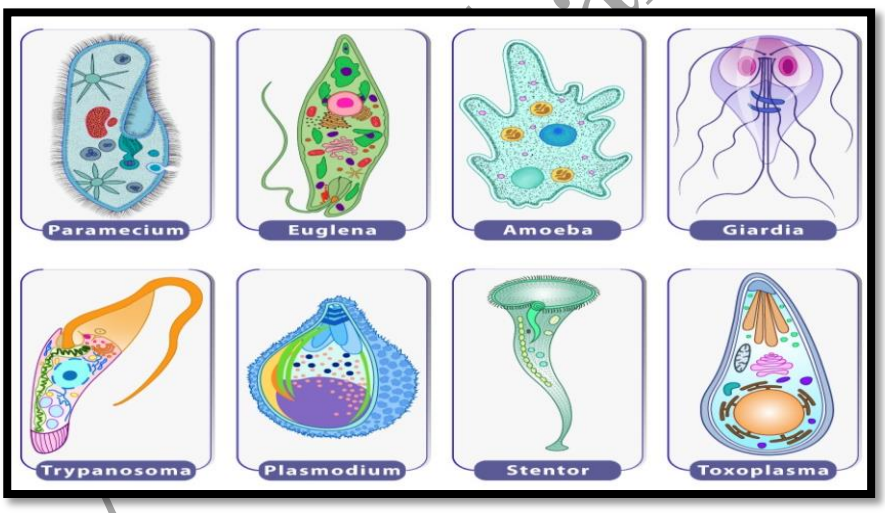
4-Protozoa :

- Single-celled eukaryotic microorganisms, and lack a cell wall.
- protozoa classified on the basis of movement organelles. Some have cilia, some have flagella, and others have pseudopoda or do not have movement organs.
- Most of the protozoa are present in Aquatic environments,
- Protozoa is heterotrophic either :

  1-free-living feed on organic particles and bacteria by ingesting or spreading through cell membrane.

2-Pathogens such as the genera **as *Entamoeba histolytica*** cause Amoebic dysentery

3- Endosymbionts, such as **Paramecium** coexist within green algae **Chlorella**,



shape (2-3) different types of protozoa

5- **Viruses** very small particles, their size ranges from (20) to (300) nanometers

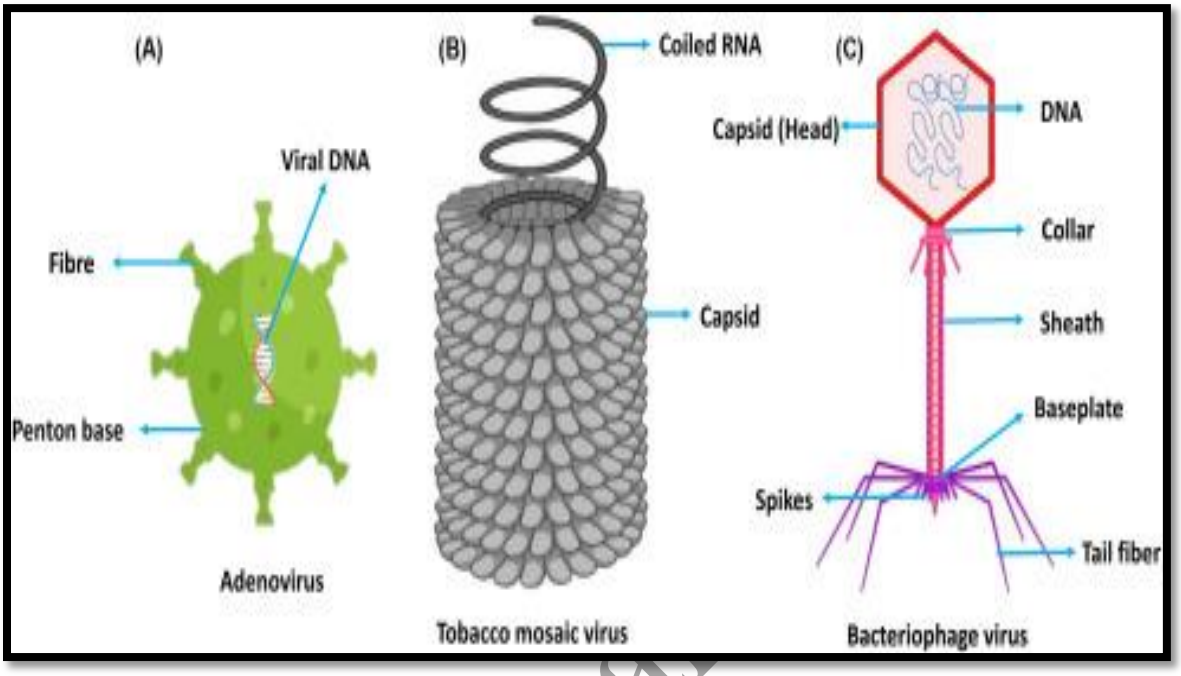
- viruses are intracellular parasitic organisms that reproduce inside living cells to multiply, but not multiply outside the cells.
- The way of multiply by Assembly of its components not by binary fission as in bacteria and some other microorganisms
- Viruses cannot be seen with optical microscope
- Viruses contains only one type of nucleic acid, either DNA or RNA

Viruses are specialized for different living organisms, and are divided into:

1-**Animal viruses**: They cause diseases in humans , spherical in shape, such as measles, mumps, smallpox, influenza, hepatitis, and yellow fever .

2-**Plant viruses**: They infect plants, cylindrical in shape , cause damage to agricultural crops such as tobacco, tomatoes, and potatoes.

3-**Bacteriophages**: infect bacteria and enter the bacteria cell and multiply inside it, shape is complex because combines the two previous forms. such as the TMV virus.



Shape (2-5) shape of viruses