

## Microorganisms

Microorganisms are the living single-celled organisms which can only be seen with the help of a microscope, not with the naked eyes. They can live in a wide variety of habitat around the world.

### Classification of microorganisms

Microorganisms can be classified into five major groups on the basis of their size and shape. These five categories are

1. Viruses
2. Bacteria
3. Algae
4. Fungi
5. Protozoan

### Viruses

Viruses have various shapes like hexagonal, spherical, rod-shaped, polygonal etc. They have a very simple structure in which there is no nucleus, cytoplasm or membrane. They just possess a protein coat and a central core of RNA and DNA. The protein coat made up of regularly packed protein units is called capsid.



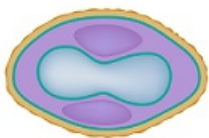
Papillomavirus  
Enterovirus  
Rhinovirus  
Rotavirus



Coronavirus



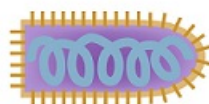
Herpesvirus  
Hepatitis B virus



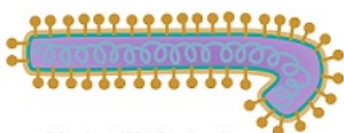
Smallpox virus



Mastadenovirus



Rabies virus



Filovirus (Ebola virus)



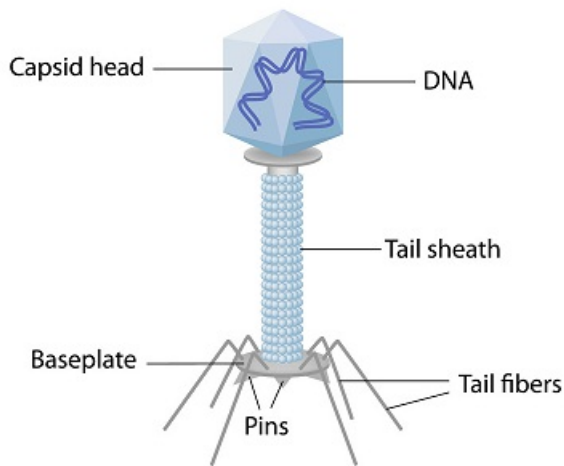
Hepatitis D virus



Hantavirus

Viruses are not free living. They are not even considered living or dead. We consider a virus as a link between the living and nonliving as it does not respire or reproduce on its own. It takes control of the host's body for the process of replication. Without any host cell, it simply lies like a dead organism. Viruses which infect the plants are called plant viruses. Bacteriophages are the viruses which infect the bacteria. The following figure shows a well-labeled diagram of a bacteriophage.

## Structure of a Bacteriophage



### Diseases caused by viruses

Viruses cause a number of diseases in living organisms, so we can say that they are always a parasite. The list of diseases caused by viruses has been shown below

- Influenza
- Cold
- Measles
- Mumps
- Chickenpox
- Rabies
- AIDS
- Poliomyelitis

### Bacteria

Bacteria are the microscopic organisms which possess cell wall which helps them categorize in two groups - Gram Positive bacteria and Gram Negative bacteria on the basis of the stainability of their cell walls.

Bacteria reproduce asexually by Binary fission if the conditions are favorable. Sometimes, under unfavorable conditions, they reproduce by forming an endospore. They show two types of respiration- aerobic and anaerobic.

There are many bacteria which can make their own food by the process of photosynthesis. Such bacteria are

called Photoautotrophic bacteria.

Some bacteria such as oxygenic **cyanobacteria** and anoxygenic green sulfur and green nonsulfur bacteria; these bacteria use energy derived from sunlight and fix carbon dioxide for growth. Other types of bacteria are nonphotosynthetic, obtaining their energy from organic or inorganic compounds in their environment.

### **Some useful bacteria**

Not all bacteria are harmful to us or to plants, instead, some bacteria help us in various ways on a daily basis.

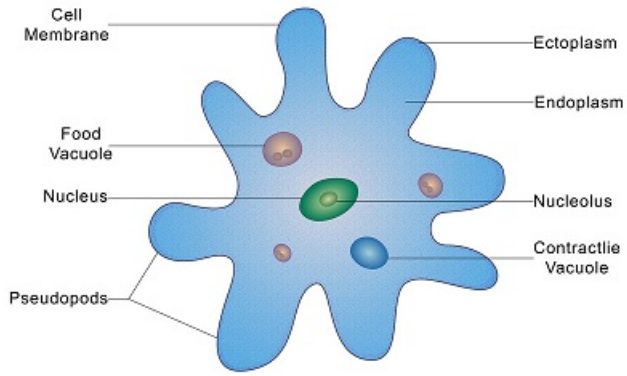
- Many bacteria are found in root nodules of leguminous plants which converts free atmospheric nitrogen into nitrogenous compounds.
- Bacteria *Streptomyces griseus* helps to prepare antibiotics like streptomycin. Chloromycin is prepared from *Streptomyces venezuelae*. Teramycin is prepared with the help of *S. rimosus*.
- Bacterium *Lactobacillus* helps in the conversion of lactose sugar into lactic acid to make curd from the milk.
- Bacterium *Acetobacter acetic* helps in the formation of vinegar from sugar solution.
- Bacteria also help us in the manufacturing of vitamin B complex.

### **Diseases caused by bacteria**

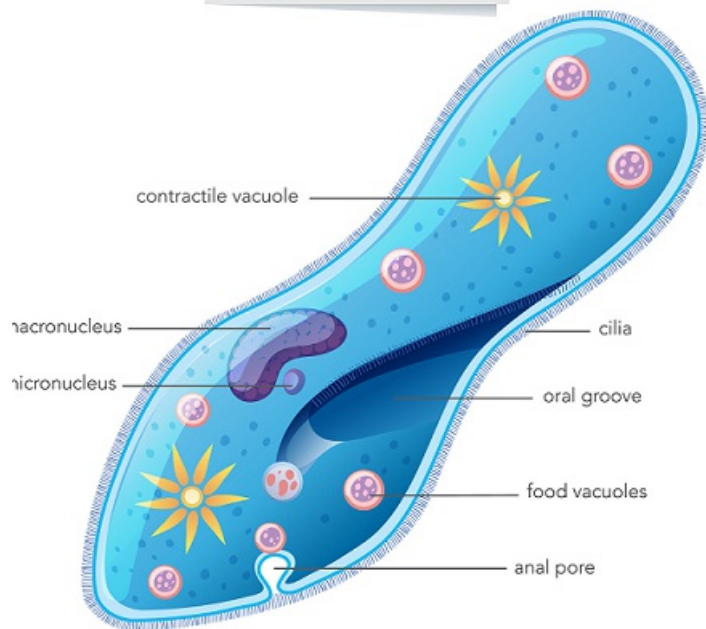
- **Tooth decay- *Streptococcus mutans***
- **Anthrax- *Bacillus anthracis***
- **Tetanus- *Clostridium tetani***
- **Tuberculosis- *Mycobacterium tuberculosis***
- **Cholera- *Vibrio cholerae***
- **Pneumonia- *Streptococcus pneumoniae***

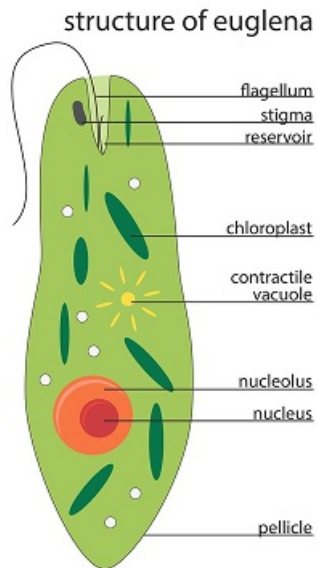
### **Protozoa**

This is a group of single-celled organisms which are considered animals only. Some example of such animals is - *Amoeba*, *Paramecium*, *Trypanosoma*, *Entamoeba*, and *Plasmodium*. Usually, a protozoan cell contains membrane-bound protoplasm and cell organelles like nucleus and mitochondria.



## Paramecium





**An individual protozoan cell is able to carry out all the life processes on its own. They have contractile vacuole for osmoregulation. There are two types of reproduction generally seen found in protozoa i.e asexual and sexual reproduction.**

**Asexual reproduction occurs through binary or multiple fission. Amoeba, Paramecium, and Euglena reproduce through binary fission. Plasmodium and Amoeba can carry out multiple fission as an asexual mode of reproduction.**

**In protozoa, the sexual mode of reproduction is carried out through conjugation.**

**Protozoa which are useful to us**

- 1. Protozoans help in the treatment of waste and sewage as they feed upon fungi and bacteria which decompose organic matter.**
- 2. Protozoan living inside the body of termites digest wood cellulose converting it into sugars.**
- 3. Researchers prefer to experiment on these organisms because of their simple body organization.**

**Protozoans harmful to us**

- 1. Amoebic dysentery- Entamoeba**
- 2. Sleeping sickness- Trypanosoma**
- 3. Malaria- Plasmodium**

#### 4. Diarrhea- *Giardia*

### Fungi

Fungi are the organisms which lack chlorophyll but possess plant characters. They also possess some animal characteristics which made it impossible to classify such organisms in animal or plant kingdom. Earlier fungi were considered in the plant kingdom only but afterward, researchers found that they resemble animals more than the plants. So, they were announced as a different group of organisms after the detailed study. Fungi (multicellular) are made from long, threads like colorless multicellular hyphae. Hyphae, when combined together form an interwoven cottony mass called the mycelium. Fungi are eukaryotic organisms with the cells containing a chitinous cell wall. They are heterotrophic and absorb nutrients from dead and decayed organic matter. Fungi are unicellular, coenocytic or multicellular. The asexual mode of reproduction is facilitated by spore formation. This spore when lands on a favorable area terminates to form a new individual.



### Fungi which are useful to us

1. Edible varieties of mushrooms are very delicious and healthy to eat.
2. Yeast, which is commonly used in a variety of dishes is a rich source of vitamins, carbohydrates, fat, and proteins.
3. Fungi are used to produce antibiotics like penicillin and many more which play a key role to ensure treatment against bacteria.
4. Clavacin which is obtained from *Clavaria* is known to have anticancer properties.
5. Alcoholic drinks are made by a process called fermentation of cereals by yeast.

### Disease-causing fungi

1. Many fungi cause diseases.
2. A type of fungi causes athlete's foot.
3. Fungi are responsible for spoilage of food, clothes, wooden articles etc.

4. They cause many diseases in plants destroying the crops severely. Some example of such diseases is losing smut of wheat, Potato blight.

### **Algae**

It is believed that green algae probably gave rise to plants. Algae are waterphillic organisms found growing in almost water places.

There are different types of algae found in the world. Basically, they are grouped in various categories on the basis of their color.

1. Green algae- Such algae possess chloroplast in their cells. Ex- Chlamydomonas, Volvox, Spirogyra etc.

2. Blue-green algae( cyanobacteria)- such algae possess blue colored pigment along with chloroplast within their cells which gives them blue-green appearance.

Ex- Nostoc, Anabaena, Oscillatoria.

3. Red algae- such algae possess red colored pigment along with blue and green pigments within the cell. Ex- Polysiphonia.

4. Brown algae- such algae contain fucoxanthin, carotene, and xanthophyll in addition to chlorophyll to give a brown color to the plants. Ex- Fucus and Laminaria.

### **Useful Algae**

1. Algae serve as a major source of food for organisms. Chlorella is an alga which contains more protein than the egg.

2. Diatom is a kind of algae which contains silica and is used to make metal polish and toothpaste.

3. Agar which is commonly used in labs for various experiment is obtained from an algae only.