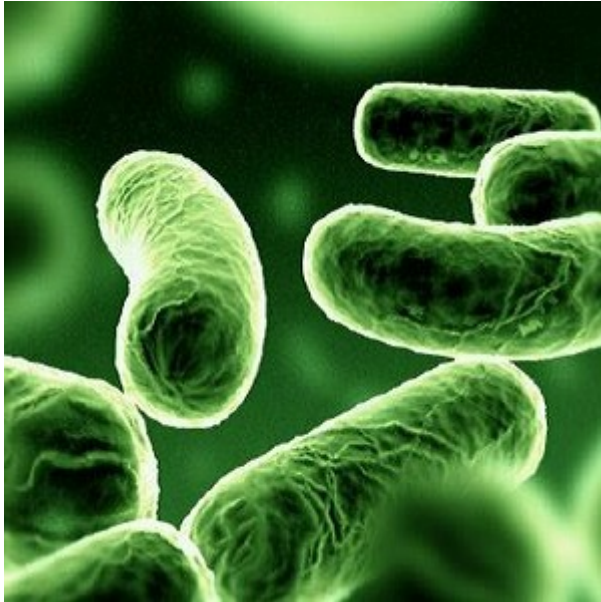


Unit 10:

The simplest living beings



1. Fungi

2. Protoctists

2.1. Protozoa

2.2. Algae

3. Bacteria

4. Viruses

Think and answer?

- What type of organism can you see in the photograph?
- What type of cells are these organisms made up of?
- Why are they included in the microorganisms?
- Can you name other types of microorganisms?

UNIT OBJECTIVES

In this unit you will learn:

- To identify the main characteristics of microorganisms
- To classify the simplest living beings into groups
- To describe the structure of bacteria and viruses
- To describe the way microorganisms perform vital functions
- To describe the main characteristics of Protoctists and Fungi.
- To explain why viruses are not living beings

1. FUNGI KINGDOM

Fungi are **unicellular** or **multicellular** organisms (without real tissues). They have **eukaryotic plant cells**, but their cellular wall is made of **chitin**, not cellulose. These cells are joined together forming threads, called **hyphae**. The vegetative body of fungus is the **mycelium** that is formed by the mass of hyphae. This mycelium lives under the soil.

a) Vital functions

Nutrition

Fungi are **heterotrophs**. They feed on organic matter. There are three types of fungi:

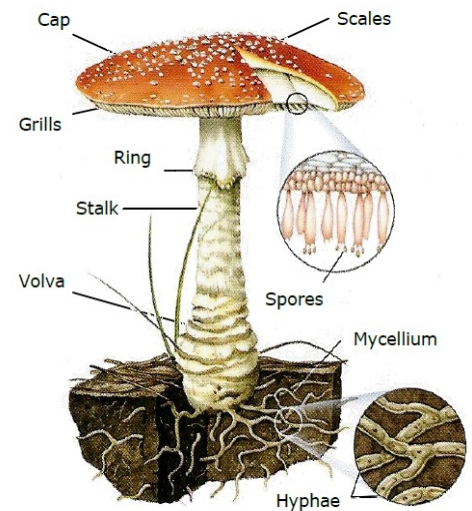
- **Saprophytes**. They feed on decomposed matter.
- **Parasites**. They feed on other living being that is harmed. These fungi produce diseases.
- **Symbionts**. They live with other living being and both obtain benefits.

The most important symbiotic fungi are:

- *Liquens* (formed by a fungus and an alga)
- *Mycorrhizas* (formed by a fungus and a conifer)

Reproduction

They have sexual and asexual reproduction. When they reproduce sexually, they produce **spores**. When a spore germinates, it produces a mycelium that grows and produce a structure called the **fruiting body** (mushroom).



b) Classification

We can classify fungi in three groups, without scientific value:

- **Yeasts**
They are unicellular fungi. Many are parasites, but others are very useful for us. Yeasts perform **fermentation** that transforms certain substances into food such as bread, wine and beer.
- **Moulds**
They are multicellular and microscopic fungi. Many are parasites and others are decomposers, such as bread mould or fruit mould.
- **Mushrooms and toadstools**
They are multicellular. Some are edible (mushrooms) and other poisonous (toadstools)

READING ACTIVITIES

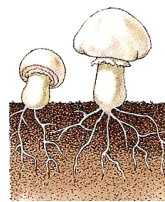
1.1. Relate and order the pictures and the labels that correspond to a fungus life cycle.



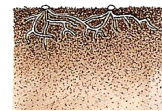
A spore germinates.



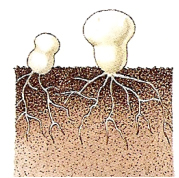
Fruiting body matures and forms spores.



The mycelium begins to grow.



The fruiting body begins to form.



New spores are released.

1.2. Listen and indicate which type of fungi is described (saprophytes, parasites or symbionts)

1.3. Fungi and plants have eukaryotic plant cells. What characteristics allow us to distinguish between them?

2. PROTOCTISTS

The Protocista Kingdom includes a large number of creatures that cannot be classified in other kingdoms.

All the Protocists have **eukaryotic** cells, but they can be:

- autotrophic or heterotrophic
- unicellular or multicellular (without true tissues)

We can differentiate:

- Protocists that are similar to animals (protozoa)
- Protocists that are similar to plants (algae)

This group is so diverse that this kingdom will probably be divided in the future.

2.1. Protozoa

These organisms are **unicellular** and **heterotrophic**.

They have **eukaryotic animal cells**.

They can only be seen under a microscope.

We can find them in the soil or in water (zooplankton). Other ones are parasites and produce diseases.

They have asexual reproduction. This can be by:

- **Bipartition** (dividing the cell mother in two)
- **Sporulation** (producing spores)

They can be classified into four groups, according to the way they move:

- Flagellates.

They move using **flagella**.

E. g. *Trypanosome*. (It is responsible for sleeping sickness and spreads by Tse-tse fly)



- Ciliates.

They move using **cilia** (they are organelles similar to flagella, but much shorter and very numerous)

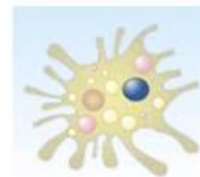
E. g. *Paramecium* (swimmer) and *Vorticella* (live join to the substrate)



- Rizopods

They move using **pseudopodia** (they are extensions of their cytoplasm, that they use to feed too)

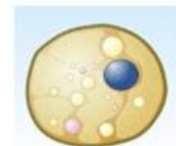
E. g. *Amoeba* and *Entamoeba* (It is responsible for dysentery)



- Sporozoans.

They don't move.

E. g. *Plasmodium* (It is responsible for malaria and spreads by *Anopheles* mosquito)



1.2. ALGAE

This group includes organisms that can be **unicellular** or **multicellular**. They have **eukaryotic plant cells**. All algae are **autotrophic** and do **photosynthesis**.

They can live attached to substrate (**benthonic** algae) or not (**planktonic** algae).

For a long time, they were included in the Plants Kingdom, but today they are in the Protocists, because these organisms don't have true tissues or true organs.

A. MULTICELLULAR ALGAE

Most of them are marines, but some live in fresh water. The largest and most complex marine algae are called *seaweed*.

Multicellular algae do not have true tissues, but they have structures similar to plant organs:

- **Blades** (false "leaves")
- **Stipe** (false "stem") sometimes with floats (the keep up the algae)
- **Holdfast** (false "roots" that hold them to the substrate, but do not absorb nutrients)

They reproduce by **alternation of generations**, that is in one generation they reproduce asexually and in the following generation, they reproduce sexually.

They are classified in three groups according to the **photosynthetic pigments** they have:

- **Green algae**

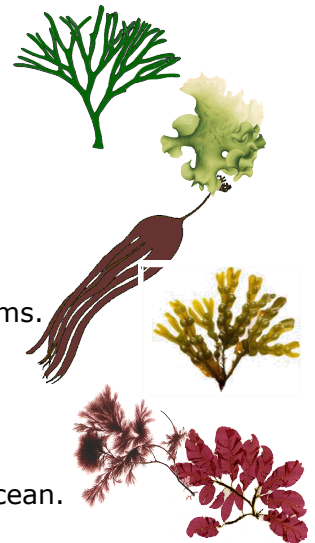
Their most important pigment is *chlorophyll* (green pigment)
 Most part of them live in fresh water.
 There are unicellular and multicellular.
 They live near the surface.
 They seem to be the ancestors of plants.

- **Brown algae**

Their most important pigment gives them brown colour.
 They are marine and multicellular.
 It is the group with the most complex structure and largest forms.
 They live in middle depth water.

- **Red algae**

Their most important pigment gives them a red colour.
 They are unicellular or multicellular, and marines.
 They live attached to the substrate and at great depth in the ocean.

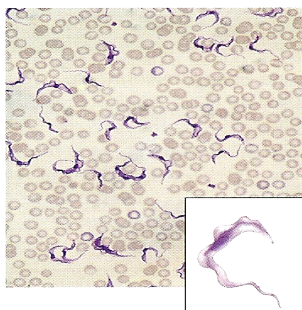


B. UNICELLULAR ALGAE

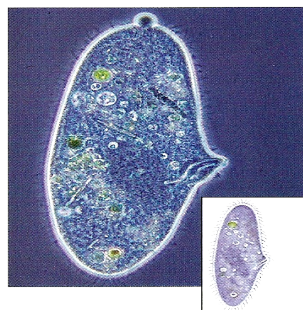
There are several groups of unicellular algae. They formed the **phytoplankton**. They can form **colonies** (group of unicellular organisms that live joined together and look like a multicellular organism, but without true tissues or division of work among the cells).

READING ACTIVITIES

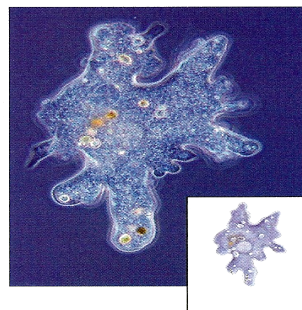
2.1. The following photographs are different types of Protozoa. Complete the charts. What criterion do we follow to classify them?



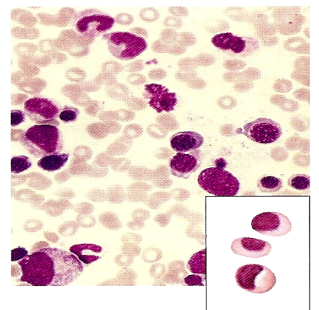
Group:.....
 E. g.



Group:.....
 E. g.



Group:.....
 E. g.



Group:.....
 E. g.

2.2. Algae was classified in the Plant Kingdom for a long time, but now they are included in the Protocista Kingdom. Why?

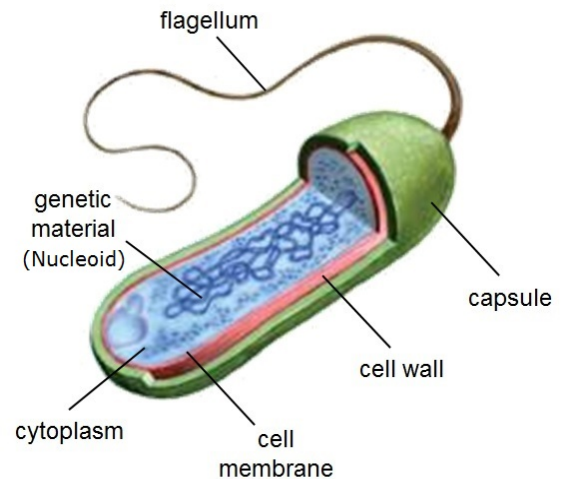
2.3. Listen and indicate what group of Protocists (algae or protozoa) is described in each sentence.

3. BACTERIA

Bacteria are the oldest and simplest form of life. Bacteria appeared more than 3,500 million years ago. All the other living beings have evolved from creatures similar to bacteria.

They are among the smallest living beings. Their size goes from 1 μm to 10 μm . It means that they can only be seen under a microscope.

Bacteria belong to the **Monera Kingdom** and all of them are **unicellular** and **prokaryotes**.



This is the most successful group of living beings. Bacteria are everywhere. The reasons are:

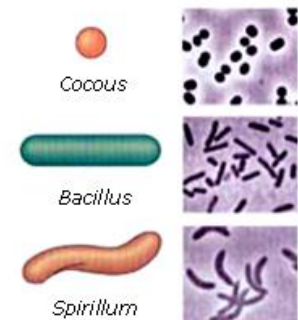
- They have a great diversity of nutrition.
- They reproduce very fast.
- They are adapted to all the environments.
- They are very resistant. Many of them live in extreme conditions, like acidic or extremely salty water and sulfur hot springs.

a) Classification

In the past, bacteria were mainly classified according to their shapes:

- Sphere (**cocci**)
- Rod (**bacilli**)
- Spiral (**spirilla**)
- Comma (**vibrios**)

They usually band together in groups (colonies), although they can be found in singles or forming pairs, chains or clusters of varying number.



Today, it is more usual to classify them following other criteria such as their type of nutrition or the structure of their cellular wall.

b) Vital functions:

Nutrition:

Bacteria can be:

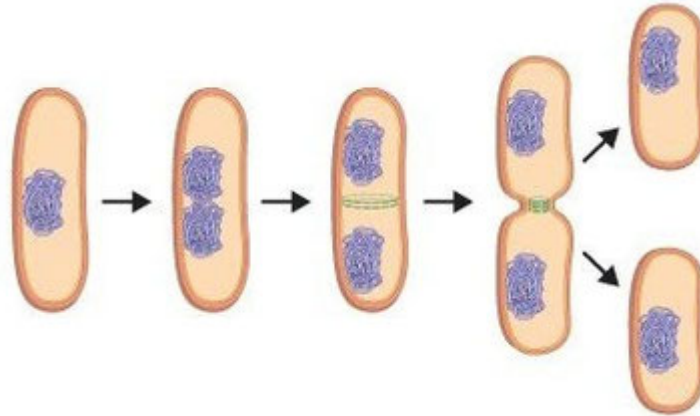
- **Autotrophs**. They make organic matter from inorganic matter.
 - Some bacteria do **photosynthesis** and use solar energy.
 - Other ones do **chemosynthesis** and use energy from chemical reactions.
- **Heterotrophs**. They must consume elaborated organic matter. They can be:
 - **Parasites**: They live in the body of other organisms, harming them. These bacteria produce diseases.
 - **Symbiotic**: They live in the body of other organisms too, but both provide mutual benefit. Very often they cannot live separated.
 - **Saprophytes**. They feed on the wastes of other organisms or the decaying matter.
 - **Decomposers**. They transform the organic matter into inorganic matter that can come back to the ground and can be used by autotrophic organisms.

Interaction:

Bacteria have a simple interaction with their environment. They can feel changes of temperature, salts concentration, light, etc. Their responses can be movement, secretion of substances or reproduction.

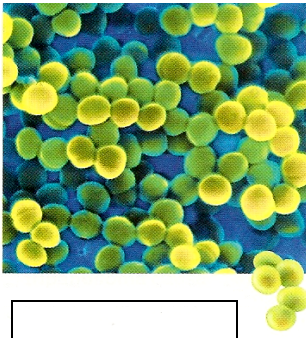
Reproduction:

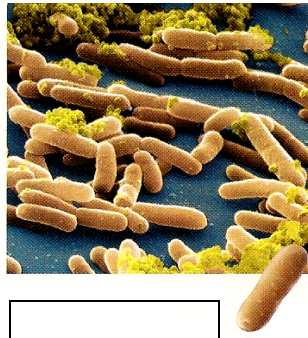
They reproduce asexually. Cell makes a copy of its DNA and then divides into two separate cells. This type of cellular division is known as **binary fission**.

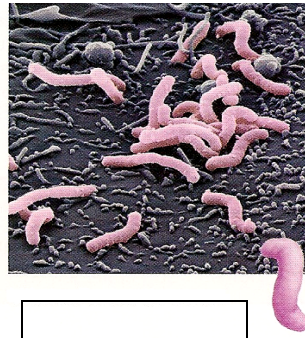
**READING ACTIVITIES**

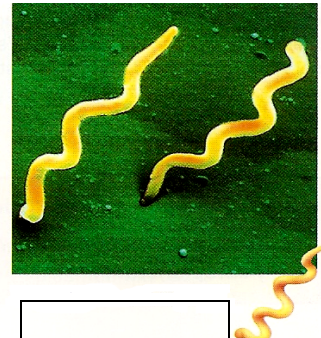
After reading the text, copy and answer the following questions into your notebook:

Remember: you must make complete sentences.

3.1. Classify the following bacteria.







- What criterion have you used to do it?
- How is more common find them?
- Can we classify them in another way? Indicate how we can do it.

3.2. Indicate the main difference between:

- Symbiotic bacteria - Parasite bacteria
- Decomposer bacteria - Saprophyte bacteria.
- Photosynthetic bacteria - Chemosynthetic bacteria.

3.3. Why have bacteria had so much evolutionary success?

3.4. Listen to the description of the Monera Kingdom and indicate if the sentences are true or false.

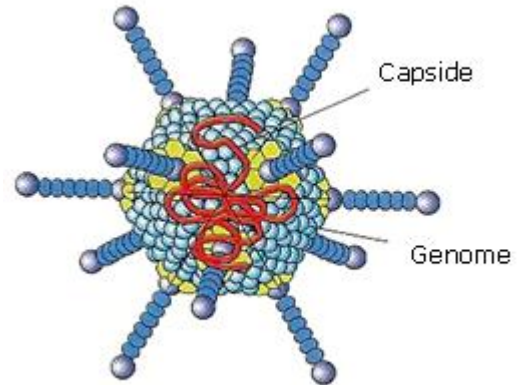
4. VIRUSES

Viruses are the smallest microorganisms.

To see them, an optic microscope is not enough.
We need a much more powerful electronic microscope.

They have a very simple structure:

- A **capsid**. It is a protein coat that can have different shapes (helical, icosahedral, etc.)
- A **genome**. It is a nucleic acid (DNA or RNA). It's the genetic material of the virus.

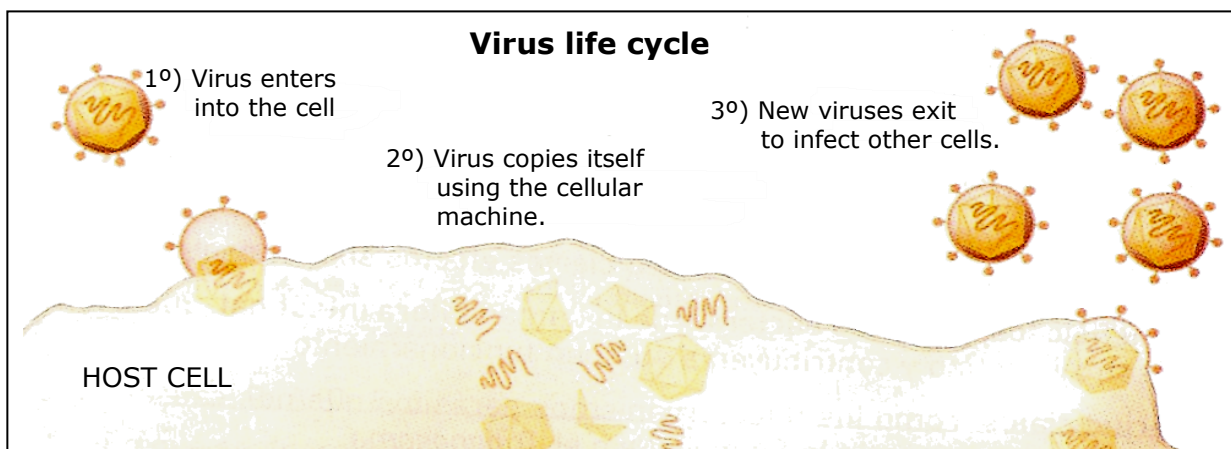


Some of them, have also an *envelope*. That is a cellular membrane that comes from the previous infected cell.

They cannot be considered living beings, because they don't perform all vital functions. Viruses don't feed, don't move by themselves, and don't interact with their environment. They only can reproduce, but they must do it infecting a host cell like a parasite.

A virus attaches itself to a cell. It invades the cell and puts its genetic material into the cell. This genetic material contains instructions, which the cell must follow. The instructions are very simple: make more viruses just like the invader.

The infected cell begins to make viruses, and cannot stop. Sometimes the new viruses fill the cell and make it explode. Other times the virus stays inside the cell for some time.



Viruses can infect every type of cells and all of them are **pathogens** that provoke diseases in infected organism.

Some examples of human viral diseases are cold, influenza, SIDA, measles, mumps, poliomyelitis, viral meningitis, etc.

READING ACTIVITIES

After reading the text, copy and answer the following questions into your notebook:
Remember: you must make complete sentences.

4.1. Answer the following questions about viruses:

- a. Why viruses are not considered living beings?
- b. Is there any beneficial virus? Why?
- c. How many parts can we distinguish in a virus?

4.2. Listen to the description of viruses and complete the text with the missing words.**Viruses**

They are not made up of, which is why they are not considered living things and are therefore not classified in any They infect a host cell in order to All viruses are and are only visible through a powerful electronic

They have a simple structure that consists of:

- A polyhedral or helical A viral envelope, similar to the cell membrane, encloses the capsid in some viruses.
- material which information to reproduce.

Viruses can only replicate inside a cell. When the virus has reproduced in the host cell, the newly reproduced viruses leave the cell and new host cells. A virus outside a host cell is a particle.