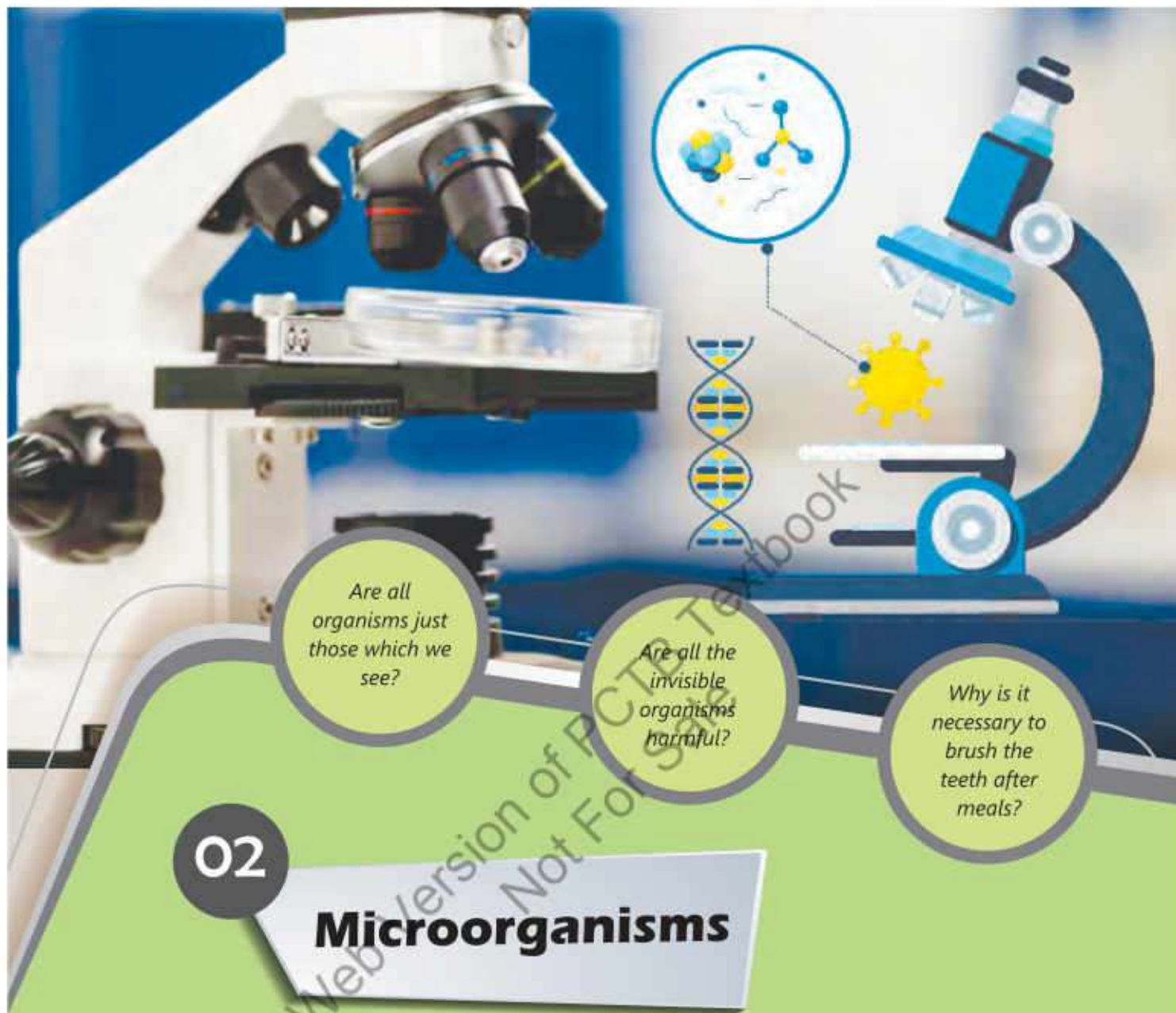




Are all organisms just those which we see?

Are all the invisible organisms harmful?

Why is it necessary to brush the teeth after meals?

02

Microorganisms

Students' Learning Outcomes

After studying this chapter, the students will be able to:

1. Define and describe microorganisms.
2. Identify the main groups of microorganisms and give examples for each.
3. Describe the role of microorganisms in decomposition and discuss its harmful and beneficial effects.
4. Recognize some common diseases caused by microorganisms of each group.
5. Recognize that microorganisms get transmitted into humans and cause infectious diseases.
6. Discuss and deduce advantages and disadvantages (any three) of microorganisms by using some daily life examples.
7. Suggest preventive measures to protect themselves from these infections.

You must have observed dust particles in the beam of light that enters a dark room. Have you ever thought that our eyes cannot see very tiny objects. There are a lot of organisms present in our environment that we cannot see with our eyes. To see such things, we need a special instrument called microscope. The objects that cannot be seen by human eyes are visible as large and clear objects under the microscope.



Activity 2.1

To make a simple microscope you will need a plastic cup, thin plastic sheet, rubber band, scissors and water. With the help of scissors make a hole at the base of the plastic cup so that you may put any tiny object into it. Put the thin plastic sheet over the cup and tie it properly with a rubber band. Put a drop of water over the plastic sheet. Put any tiny object at the base of the cup and observe it. You will see the object many times larger.



Microorganisms

All those tiny organisms that can only be seen under a microscope are called microorganisms. These are present everywhere in our surroundings.



Microorganisms

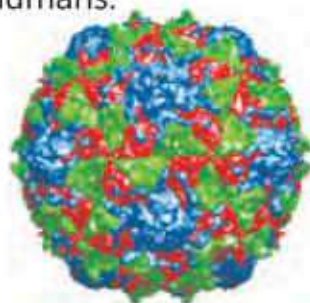
Main Groups of Microorganisms

There are many types of microorganisms. They are divided into various groups on the basis

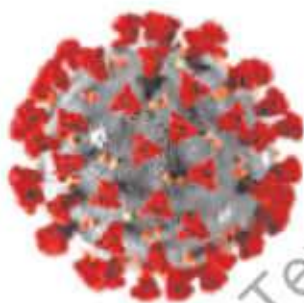
of their size, structure and need of food. Viruses and bacteria are the main groups of microorganisms. Some fungi are very small and they are also included in microorganisms.

1. Viruses

Viruses are very tiny infectious particles. They are the link between living and non-living things. They can reproduce only within an organism. Out of the body of organism, they are non-living. They are very harmful to living organisms. They cause diseases in human beings, animals and plants. For example, they cause hepatitis, polio, COVID-19 and flu in humans.



Poliovirus



COVID-19 virus



Bacteriophage virus

2. Bacteria

Bacteria are single-celled organisms. They are found in every type of environment. They are found in air, water, soil and inside living things. Few bacteria are harmful to organisms. They cause diseases in plants, animals and humans, e.g. pneumonia, tuberculosis and diarrhea, etc. A large number of bacteria are useful for humans. Some bacteria help in the digestion and absorption of food in our small intestine.

Interesting Information

1. The bacteria which are beneficial for us are called useful bacteria. The number of harmful bacteria is very less.
2. The number of bacteria in your body is more than the cells of your body.
3. The number of bacteria in a small spoon of soil is almost equal to the number of people living in the continent Africa.

On the basis of shape, bacteria are divided into three types: round, rod-shaped and spiral.



Round



Rod-shaped



Spiral

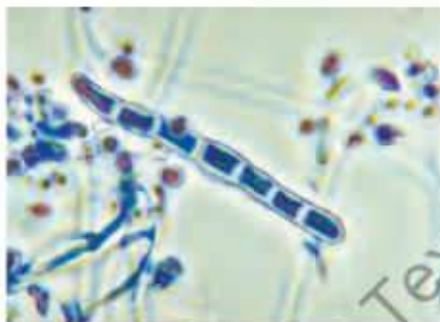
Shapes of bacteria

3. Fungi

Fungi are simple organisms that are neither like plants nor like animals in their characteristics. They cannot make their own food. They often grow on dead organisms or decaying matter. They decompose dead matter into simple materials. They then absorb these simple materials as their food. Some fungi obtain their food from living plants and animals and cause diseases in them e.g. ringworm and athlete's foot are human diseases due to fungi. Yeast, Mold and *Penicillium* are examples of microscopic fungi.

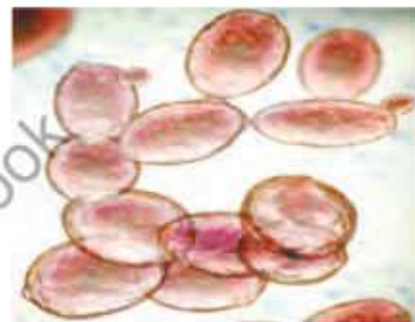


Mold on orange



Fungi that cause athlete's foot

Fungi



Yeast

Interesting Information

Mushrooms are large fungi. Many mushrooms are eaten as food. Some mushrooms are poisonous.



Point to Ponder!

1. Do you think that viruses are living organisms. Why?
2. In what types of environment can bacteria live?

Role of Microorganisms as Decomposers

During decomposition, bacteria and fungi break the organic molecules of food and dead bodies into simple components. The organisms which do decomposition are called decomposers. The rate of decomposition increases with increase in temperature, humidity and oxygen. Sometimes, this process becomes troublesome for us. But this process is also useful to us.

Useful Effects of Decomposition

By decomposition, the complex matter present in the dead bodies of plants and animals break into simple components. During this process, carbon dioxide and nitrogen gases are released back in the environment. The producers e.g. plants use these simple materials again to make their food. In this way, decomposers recycle the matter of abiotic and biotic

components of the environment. If decomposers do not exist, it is impossible to break down dead organisms into their simple components to make these a part of the ecosystem.

Harmful Effects of Decomposition

Microorganisms damage food and wood by the process of decomposition. Because of them milk is spoiled, bread gets mold, fruit and vegetables are decomposed.

Point to Ponder!

What if there were no decomposers in the world?



Harmful effects of decomposition

Diseases Caused by Microorganisms

Many microorganisms are a cause of diseases in plants and animals. The microorganisms that cause diseases in their hosts are called pathogens. The diseases that occur due to them are called infections or infectious diseases. The infectious diseases can spread quickly from one organism to the others.

Hepatitis, Flu, Polio, COVID-19, Measles and Mumps, etc.

Diseases Caused by Bacteria:

Pneumonia, Typhoid, Cholera and Tuberculosis, etc.

Diseases Caused by Fungi:

Ringworm, Athlete's foot, Smut and Rust.



A Polio Patient



Rust



Smut



Athlete's foot



Ringworm

Diseases caused by fungi

Activity 2.2

When a boy came home from school, he felt hungry. He saw raw chicken in the kitchen. He took a piece of chicken, put pepper and salt on it, cooked and ate it while watching TV. At midnight, he got up due to diarrhea, fever and stomach pain. In his school, there was an epidemic of diarrhea. So, his mother met the principal of the school. She asked the principal to investigate the items being sold at the canteen. The principal agreed to find out the reason for the spread of the epidemic in school.

In your opinion why did the boy fall ill?



Spread of infectious Diseases and Transmission to Humans

The five main ways for the transmission of infectious diseases are air, water, food, animals and direct contact.

1. Airborne Diseases:

When a patient of any particular infectious disease coughs, sneezes or talks then some viruses and bacteria are released out of his mouth and dispersed in the air. When a healthy person breathes in this air, these pathogens enter his body and he becomes sick. Such infectious diseases are called airborne diseases e.g. COVID-19, flu and TB.

2. Waterborne Diseases:

The pathogens of some diseases are transmitted through water. Such diseases occur when someone uses polluted water for drinking or in food. Diarrhea, typhoid, some diseases of eyes and skin are waterborne diseases.

3. Food-borne Diseases:

Pathogens of some diseases are present in contaminated food. On eating such types of food, these pathogens enter human body and cause diseases e.g. cholera, hepatitis and typhoid, etc.

4. Animal-borne Diseases:

Some animals also transmit pathogens from one human to the others. For example, when mosquito bites and sucks blood of a patient of malaria or dengue, it takes pathogens from patient. When it bites a healthy person, it transmits those pathogens into him.

5. Transmission of Diseases through Direct Contact:

Some diseases are transmitted by shaking hands or by touching articles used by the

patient. COVID-19, flu and hepatitis are examples of such diseases.

Activity 2.3

Do you want to know how far germs can travel on coughing and sneezing? For this you will need a balloon, tiny pieces of paper or glitters. Put the tiny pieces of papers inside the balloon. Then inflate the balloon and close the mouth of the balloon with two fingers. Now open the mouth of the balloon. What happened?

The pieces of paper scattered out of the balloon. In this manner, the germs spread on coughing or sneezing by the patient.



Useful Role of Microorganisms in Everyday Life

All microorganisms are not harmful. The following are some benefits of microorganisms in everyday life:

1. Making Food Items

Bacteria and Yeasts are used in making food items. Yeasts are used to make bread and cheese while bacteria are used in making yoghurt.



Use of yeast to raise the dough Use of bacteria in making yoghurt

Activity 2.4

1. Take flour in a pot. Mix yeast, sugar and water in it and make a dough.
2. Take same quantity of flour in another pot. Mix only sugar in it and make a dough.
3. Note the quantity of flour in both pots and leave them for an hour.
4. After one hour, observe the quantity of flour in both pots.
5. In which pot, has the dough risen? What is its reason? Why was sugar added along with yeast?



2. Cleaning of Environment

You know that some bacteria can decompose dead bodies. Such bacteria can also be used to decompose toxic materials present in sewage and industrial waste water.



Cleaning of environment

3. Making of Medicines

Many microorganisms are used for making medicines. Fungi and bacteria are used to make antibiotics. These medicines are used to kill or inhibit the growth of disease causing bacteria.

Do you know?

Penicillin was the first antibiotic. It was derived originally from a type of fungi, known as *Penicillium*.



Activity 2.5

1. Take a deep plate and pour water so that one inch of your finger dips into it.
2. Now spray powdered black pepper on it.
3. Dip your finger into it. The black pepper will adhere to your finger.
4. Put a good quantity of soap on your finger. Again dip the finger into water. This time, the black pepper will move away from your finger.
Soap repels the germs in this manner.



Preventing the Infections

Following are the ways to prevent infections:

1. It is essential to wash hands before cooking and eating food and after using toilets.
2. Avoid touching your eyes, nose and mouth, as these are the points for germs to enter your body.

3. Get vaccinated at proper time. It is the important way to prevent many diseases.
4. Stay at home, if you have signs and symptoms of an infection so that you can take rest and prevent others from infection.
5. In case of any injury, cover the wound immediately with bandage and consult a physician.

Point to Ponder!

Can you tell more steps to prevent infection?

Key Points

1. All those tiny organisms that can be seen only under the microscope are called microorganisms.
2. Viruses, bacteria and some fungi are the major groups of microorganisms.
3. Viruses are very tiny infectious particles.
4. Bacteria are single-celled microorganisms found in all types of environment.
5. Fungi are simple unicellular or multicellular organisms.
6. Some microorganisms do decomposition. They break down the complex matters of dead bodies into simple components.
7. The five major sources of the transmission of infectious diseases are air, water, animals, food and direct contact.
8. Many microorganisms are used to make medicines.
9. In order to prevent infections, we should keep ourselves neat and clean and get vaccinated at proper time.
10. Food items of daily use e.g. yoghurt and bread are prepared by using microorganisms.



Weblinks: Use the following weblinks to enhance your knowledge about the topics in this chapter.

Microorganisms	1. https://www.nationalgeographic.org/media/misunderstood-microbes/
Yeast	2. https://kidsdiscover.com/teacherresources/science-of-yeast-for-kids/

Exercise**1. Tick (✓) the correct answer.**

i. Mushrooms belong to which group?

- (a) Viruses (b) Fungi (c) Bacteria (d) Protozoa

- ii. What causes polio?
(a) Protozoa (b) Virus (c) Fungi (d) Bacteria
- iii. *Penicillium* is an example of which group?
(a) Protozoa (b) Fungi (c) Bacteria (d) Viruses
- iv. Food is contaminated due to the presence of _____ in the environment.
(a) Moisture (b) Microorganisms
(c) Air (d) Heat
- v. Which one of the following is not a microorganism?
(a) Bacteria (b) Virus (c) Algae (d) Ant

2. Write short answers.

- i. What is a pathogen? How does it enter in the bodies of organisms?
- ii. Why are some bacteria and fungi called decomposers?
- iii. Write two benefits and two harmful effects of bacteria.
- iv. How does the microorganism yeast work to soften and rise dough of flour?
- v. How does a mosquito transmit disease?

3. Constructed Response Questions:

The soil of forests of hot climate is always hot and moist, whereas the soil of forests of cold climate is cold and dry. Out of these two areas, where the decomposition of fallen leaves will happen more quickly? Explain.



Forest of hot climate



Forest of cold climate

4. Investigate:

- i. "All microorganisms are harmful and cause diseases". Prove that this idea is incorrect.

- ii. Many people use antibacterial soap to kill the bacteria present on their hands. But due to excessive use of soap, the chance of getting infection increases instead of decreasing. Why does it happen?

5. Project:

The effect of quantity of sugar on the release of carbon dioxide from yeast.

Material Required:

- | | | |
|---|------------------|---------------|
| i. Teaspoon | ii. Rubber band | iii. Balloons |
| iv. Marker | v. Yeast | vi. Sugar |
| vii. Transparent bottles of one litre (4 in number) | viii. Warm water | |

Procedure:

- i. Take four transparent plastic bottles and label them as I, II, III and IV. Add a teaspoon of yeast in each bottle.

Bottle	Amount of Sugar (Teaspoons)
I	0
II	1
III	2
IV	3

- ii. Add sugar in each bottle as per given table. Do not add sugar in the first bottle.
- iii. Pour half cup of hot water in each bottle. Immediately, put a balloon at the mouth of each bottle and bind it strongly with rubber band.
- iv. Shake each bottle strongly so that its contents can mix.
- v. Leave all the bottles in this condition for twenty minutes.
- vi. Then observe:
- Which balloon gets inflated the most?
 - In which bottle, was the most carbon dioxide gas produced?

