# Chapter 2

# Microorganisms: Friend and Foe

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## Microorganisms

• The living organisms around us which are not visible to the naked eye are called microorganisms or microbes.

• They are found in air, water, and the bodies of plants and animals.

• They can survive in ice cold climates to hot springs and deserts to marshy lands.

• They may be unicellular or multicellular.

• Microorganisms are classified into five major groups: Bacteria, Viruses, Fungi, Protozoa, and Algae.

♦ Bacteria:

Bacteria are small, unicellular (single-celled) organisms. Two common bacteria are Lactobacillus and Rhizobium. Lactobacillus help in the formation of curd and Rhizobium helps in nitrogen fixation.

♦ Viruses:

Viruses are much smaller as compared to other microorganisms. They do not have a cellular structure like other microorganisms and they reproduce only insides the cells of the host organisms, which may be a bacterium, a plant, or an animal. Polio, chickenpox, common cold, coughs, and influenza (flu) is caused by viruses.

## Friendly Microorganisms

• Microorganisms play an important role in our lives. Some of them are beneficial and some are harmful and cause diseases.

♦ Making curd:

The bacterium responsible for the formation of curd from milk is Lactobacillus. Curd is prepared from milk. Little curd is mixed into the warm milk and it is left for 8-10 hours. Lactobacillus multiplies in milk and converts it into curd.

♦ Increasing soil fertility:

Rhizobium is a bacteria (present in the root nodules of leguminous plants), it fixes atmospheric nitrogen gas and enriches the fertility of the soil by releasing nitrogen compounds in the soil.

♦ Cleaning the environment:

Some microorganisms like bacteria and fungi decompose the organic matter present in dead plants and animals and convert it into simple substances which mix up with the soil and are again used by the plants for their growth. In this way, they clean the environment.

♦ Recycling of nutrients:

In addition to cleaning the environment, the microorganisms also help in recycling the nutrients (present in dead plants and animals) in nature which can be used as food by green plants.

♦ Making bread:

Yeast (fungi) is a microorganism that is used in the preparation of bread and cake. It reproduces rapidly and produces $CO_2$ during respiration. When yeast is added to the dough after a few hours the dough rises because the yeast cell reproduces and releases carbon $CO_2$ gas which fills the dough and increases its volume. Yeast is used in the baking industry for making bread, pastries, and cakes.

♦ Commercial use of microorganisms:

Microorganisms are used for the manufacture of alcohol, beer, wine, and vinegar on large scale. In this sugar of grains is converted into alcohol by yeast. This process is known as fermentation and was discovered by Louis Pasteur in 1857.

♦ Medicinal use of microorganisms:

Large numbers of antibiotics are produced from bacteria and fungi. Some examples of antibiotics are Penicillin, Streptomycin, and Erythromycin. Penicillin was the first antibiotic discovered by Alexander Fleming in 1929 from a fungus called Penicillium.

Note: The medicines which kill or stop the growth of the disease-causing microorganisms are called antibiotics

♦ Vaccine:

When a microbe enters our body, the body produces antibodies to fight and also remembers how to fight these microbes if they enter again into our body. A vaccine contains the dead or weakened microbes of a disease which are harmless. When these vaccines are introduced into a healthy body, the body fights and kills the microbes by producing antibodies. The antibodies remain in the body and we are protected from that disease-causing microbes forever.

Vaccination is given to protect from several diseases like cholera, tuberculosis, smallpox, and hepatitis.

**Tip:** Antibiotics are microorganisms. They are manufactured by growing specific microorganisms and used to cure a variety of diseases. Large numbers of antibiotics are produced from bacteria and fungi.

## Harmful Microorganisms

• Microorganisms play an important role in our lives. Some of them are beneficial and some are harmful and cause disease in human beings, animals, and plants.

• The disease causing microorganisms are called pathogens.

• The pathogens enter our body through the air, water, food, direct contact with an infected person, and or carried by an animal.

♦ Communicable disease:

The diseases that spread from an infected person to a healthy person through the air, water, food, or physical contact with an infected person are called communicable diseases. Examples of communicable diseases are cholera, common cold, tuberculosis, and chickenpox.

•The disease-causing microbes are carried by some animals and insects, they are called carriers. Houseflies and mosquitoes are carriers of some diseases.

♦ Common diseases spread by mosquito are:

(a) Malaria:

Malaria is caused by a protozoan called Plasmodium. The female Anopheles mosquito carries the parasite of malaria. When a female Anopheles mosquito bites a person suffering from malaria, it sucks the blood of blood which contains the microbes (plasmodium). When this infected Anopheles mosquito bites a healthy person, it transfers the microbes into the body.

(b) Dengue:

The female Aedes mosquito carries the microbes of dengue. Dengue is caused by a virus.

♦ Disease causing microorganisms in animals:

- The foot and mouth disease of cattle is caused by viruses.
- Anthrax is a dangerous disease of animals caused by bacteria

♦ Disease causing microorganisms in plants:

- Citrus canker is a bacterial disease in plants.
- Rust of wheat is a fungal disease.
- The yellow mosaic disease of ladyfinger is caused by a virus.

♦ Food Poisoning:

The microorganisms that grow on food produce toxic substances and makes the food poisonous. The disease caused by the consumption of these poisonous foods is called food poisoning. The major symptoms of food poisoning are vomiting, loose motion (diarrhoea), pain in the abdomen, headache or fever.

## Food Preservation

⇒ The process in which food is prevented from the attack of microbes is called food preservation.

⇒ Methods of Food Preservation are:

- Sun drying
- Heating, cooling/deep-freezing (or refrigeration)
- Addition of common salt/sugar/mustard oil/vinegar
- Use of chemical preservatives such as sodium benzoate, sodium metabisulphite, and citric acid,
- Pasteurization and packing food in air-tight containers.

♦ Pasteurisation:

This method is used for the preservation of milk on large. In this process, the milk is heated to about $70^0$C for 25 to 30 seconds and then suddenly chilled and stored. Heating kills most of the bacteria present in the milk. When the hot milk is cooled suddenly to a low temperature, it prevents the growth of the remaining bacteria in the milk.

## Nitrogen Fixation

• Nitrogen is essential for all living beings.

• The atmosphere contains 78% of the nitrogen in a gaseous form which cannot be utilized by plants or animals.

• Some bacteria (Rhizobium) and blue-green algae present in the soil convert the nitrogen gas of the atmosphere into compounds of nitrogen which is absorbed by the roots of the plants.

• The process of converting nitrogen gas of the atmosphere into compounds of nitrogen is called nitrogen fixation. Lightning also fixes nitrogen.

## Nitrogen Cycle

• The percentage of nitrogen in the atmosphere remains more or less constant.

• The nitrogen gas is converted into compound of nitrogen and utilized by the plants for the synthesis of protein.

• When plants and animals die, bacteria and fungi present in the soil convert the nitrogenous wastes into compounds of nitrogen which is again used by the plants.

• There are some bacteria that convert some part of nitrogenous waste into nitrogen gas which goes back into the atmosphere.

• As a result, the percentage of nitrogen in the atmosphere remains more or less constant.