

Microorganisms : Friend And Foe

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INTRODUCTION

We hear that we should drink boiled water or purified water because water contains many disease causing germs. These germs are not visible by naked eyes since they are very small. They can be seen through microscope that is why they are called **micro organisms** or **microbes**.

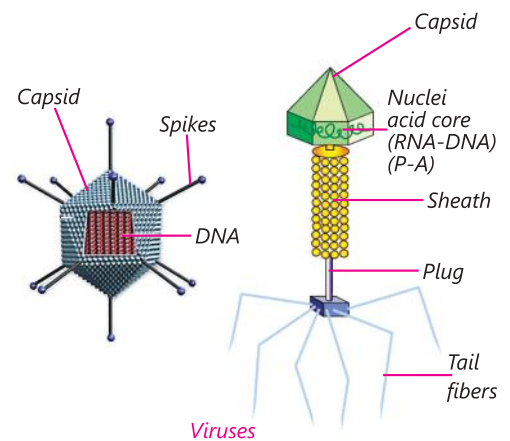
Micro organisms are classified into five major groups :

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

Viruses are also microscopic. They however reproduce only inside the cells of the host organism which may be a bacterium plant or animal. Some of the virus are shown along side.

Common ailments like cold, influenza and most coughs are caused by viruses. Serious diseases like polio and chicken pox are also caused by viruses.

Some diseases like **typhoid** and **tuberculosis** are bacterial diseases. Diseases like dysentery and malaria are caused by **protozoas**.

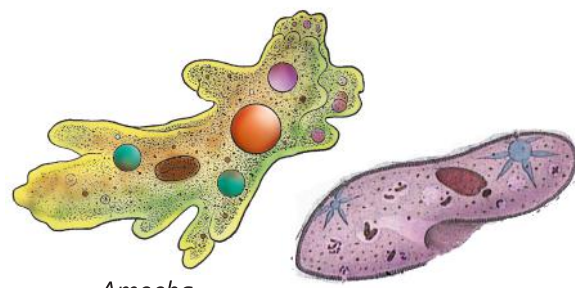


Spiral bacteria



Rod-shaped bacteria

Types of Bacteria

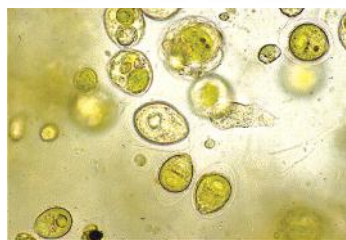


Amoeba

Paramecium

Protozoa

Some micro organisms are single celled like bacteria, some algae and protozoa. Some are multicellular such as algae and fungi. They can survive under all types of environment ranging from very cold climate to hot springs and deserts to marshy lands. They are also found inside the bodies of animals and human beings.



Chlamydomonas



Spirogyra

Algae

Some micro organisms grow on other organisms while others exist freely. Micro organisms like amoeba can live alone while fungi and bacteria may live in colonies.



Bread mould



Penicillium
Fungi



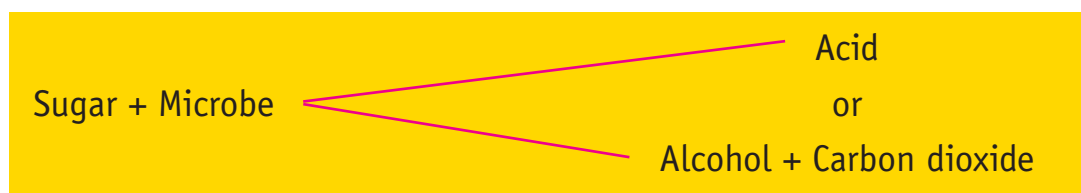
Aspergillus

Micro organisms are causes of many diseases but on other hand some micro organisms are useful to us in many ways. Some help in the preparation of food items such as bread, curd, cheese etc.

Role of Bacteria in the Formation of Curd

Curd is a vital part of our daily diet. Curd is formed when a protein called **casein** present in milk clumps together or **coagulates** to form a solidified mass. Casein coagulation takes place only when the milk is acidic. When we add spoonful curd to milk, it activates the growth of **lactobacillus** acid producing bacterium in the mixture of milk and curd. When casein clumps together it traps fat globules and some of the milky liquid inside the clumps. This leads to formation of moist and nutritious curd.

Let us now see that how milk turns acidic. Milk contains a sugar called **lactose**. Some special types of bacteria such as **lactobacillus** and **streptococci** help in converting the lactose sugar present in milk to lactic acid by the process of fermentation. **Fermentation** is the process in which sugar molecules decompose by micro organisms to produce an acid or an alcohol.



Commercial Use of Micro Organisms

Curding of milk is an important process in the preparation of a variety of dairy products such as cheese and paneer. To increase productivity of curd and cheese manufacturers add a starter culture of bacteria and a substance called **rennet** stomach lining of young to induce lactic acid formation.

Milk is made free from germs by a process known as **pasteurization**. Micro organisms are also used for the large scale production of alcohol, acetic acid and wine. Yeast is used for commercial

production of alcohol, acetic acid and wine. For this purpose yeast is grown on natural sugars present in grains like barley, wheat, rice, gushed fruit juices etc. The smell of alcohol indicates that sugar has been converted into alcohol by yeast. This process of conversion of sugar is known as **fermentation**. You have already read about it.



Some Indian food stuffs like dosa, idli and dhokla are made by the use of process of fermentation for their preparation. The release of carbon dioxide makes idlis and dhoklas soft. Infact tiny holes that are seen in idli, dosa and dhokla are nothing but air spaces created by the escaping carbon dioxide.

Bread, cake, pizza are made by yeast, so yeast is used in the baking industry so it is also called bakers yeast.

Medicinal Use of Micro Organisms

Special kinds of bacteria are used to produce antibiotics such as terramycin and streptomycin. Some bacteria such as **lactobacillus acidophilus**, live in human intestines where they help to digest food, destroy disease causing microbes fight cancer cells and give the body needed vitamins.



Fungi



Algae



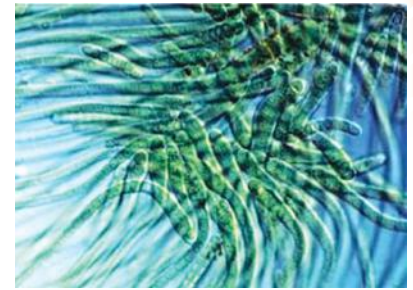
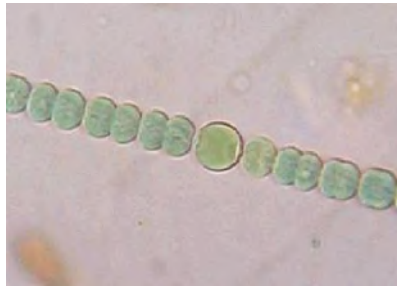
Antibiotics are even mixed with the feed of live stock and poultry to check microbial infection in animals. They are also used to control many plant diseases.

The fungus penicillium notatum is used in the manufacture of penicillin, the first antibiotic to be discovered. Brown algae is a rich source of iodine and potassium. Cell walls of diatoms are natural source of silica, which is an ingredient in toothpastes.

Vaccines are very useful against disease carrying germs that enters in our body. The body also remembers how to fight the microbes if it enters again. So if dead or weakened microbes are introduced in a healthy body, the body fights and kills them by producing suitable antibiotics. The antibodies remain in the body and we are protected from the disease causing microbes. This is how a vaccine works. Several diseases like cholera, smallpox, tuberculosis, hepatitis, tetanus can be prevented by vaccination.

Increasing Soil Fertility

Some bacteria and blue green algae are able to fix nitrogen from the atmosphere to enrich soil with nitrogen and increases its fertility. These microbes are commonly called **biological nitrogen fixer**.



The Nitrogen fixing blue-green algae

Micro organisms decompose dead organic waste of plants and animals converting them into simpler substances. These substances are again used by other plants and animals. These micro organisms can be used to degrade the harmful and smelly substances and thereby clean up the environment.

Harmful Micro Organisms

Micro organisms are harmful in many ways. Some micro organisms spoil the food items.

You must have seen the greenish white spongy layer on bread or chapati when it is left for 4-5 days in moisture. The spongy layer is a form of fungus called the bread mould. Not only fungi, other micro organisms tend to grow on food items resulting in food spoilage microbial growth, especially fungal and bacterial growth can be a big mence as it not only destroys the food causes many food borne diseases.



Bread mould



Spore formation in Rhizopus. When the spores are dispersed, they may land on the food source and germinate

A moderately warm conditions with air and moisture are the main causes of growth of microbes. Microbes such as bread mould reproduce by the helps of spores.

We keep food items in refrigerators to avoid the growth of microbes. Since microbes cannot grow in lower temperature.

Sometimes we suffer by food poisoning it is due to the consumption of spoilt food by growth of micro organisms in it. These microbes produce toxic substance in it. These make the food poisonous causing serious illness and even death.

So, preservation food is very essential work to save food from harmful microbes.

When a person suffering from common cold sneezes fine droplets of moisture carrying thousands of viruses are spread in the air. The virus may enter the body of a healthy person while breathing.

There are some insects and animals which act as carriers of disease causing microbes. Housefly sits on the garbage and animal excreta. Pathogens stick to their bodies. When these flies sit on uncovered food they may transfer the pathogens.

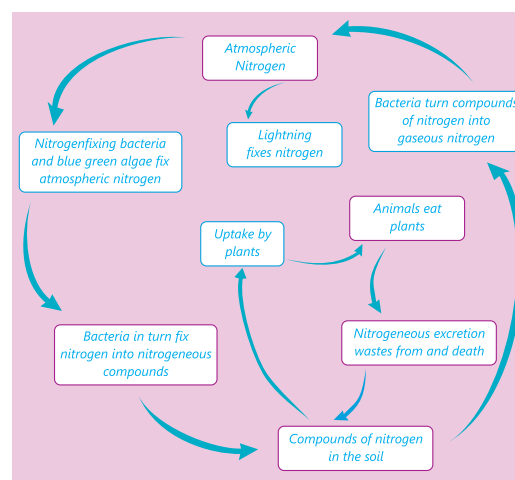
This contaminated food is the cause of disease. Female mosquito carries the parasite of malaria. Female Aedes mosquito acts as carrier of dengue virus. All mosquitoes breed in water. So, we should change water of coolers, and check the places where water can be stored. Water should be kept in closed container.

Some common human diseases caused by micro organism

DISEASE	MICRO ORGANISM	MODE OF TRANSMISSION	PRECAUTIONS
Polio	Virus	Air/water	Keep the patient in complete isolation. Keep the patient on separate bed. Vaccination should be given at suitable age.
Measles	Virus	Air	
Chickenpox	Virus	Air/contact	
Tuberculosis	Bacteria	Air	
Typhoid	Bacteria	Water	Maintain personal hygiene and consume only properly cooked food, boiled drinking water. Vaccination should be given.
Cholera	Bacteria	Water/Food	
Hepatitis	Virus	Water	Drink purified or boiled water vaccination should be given.

NITROGEN CYCLE

Atmosphere is made up of many gases. The main gas is nitrogen which is 78% of total gas. Nitrogen is one of the essential constituents of all living organisms as part of proteins, chlorophyll, nucleic acids and vitamins. The atmosphere nitrogen cannot be taken directly by plants. Certain bacteria and green algae present in the soil take nitrogen from the atmosphere and convert it into compounds of nitrogen. Once nitrogen is converted into these usable compounds it can be utilised by plants from soil through their roots. Nitrogen is then used for the synthesis of plant proteins and other compounds. Animals feeding on plants get these proteins and other nitrogen compounds.



When plants and animals die, bacteria and fungi present in the soil convert the nitrogenous wastes into nitrogenous compounds to be used by plants again. Certain other bacteria convert some part of them to nitrogen gas which goes back into the atmosphere. So, the percentage of nitrogen in the atmosphere remains constant.

Do You Know ?

Farmers often take advantage of nitrogen-fixing properties of leguminous plants by rotating them with non-leguminous crops so that the soil is continuously enriched by nitrates. The nitrogen-fixing microorganisms produce about 175 million tonnes of nitrogen. This forms about 70% of our total requirement of nitrogenous compounds. The remaining 30% is obtained from chemical fertilizers.



Know the Keywords :

Fermentation : Fermentation is the process in which sugar molecules decompose by micro organisms to produce an acid or an alcohol.

Pasteurization : Boiling food items can kill the growth of microbes. This process was discovered by Louis Pasteur. That's process is called Pasteurization.

Point to Remember

- Germs which can not seen by naked eyes, are called micro organisms or microbes.
- Micro organisms are classified into bacteria, fungi, algae, protozoa and viruses.
- Many diseases are caused by microbes.
- Micro organisms are found in air, water and in the bodies of plants and animals.
- They may be unicellular or multicellular.

EXERCISE TIME

A. Answer the following questions :

1. What are microbes ? How do they enter our body ?
2. How does the bacterium lactobacillus help in curd formation ?
3. What are the major groups of microbes ?
4. Define pasteurization.
5. What is fermentation process ? What are its uses ?
6. What is food poisoning ?
7. What are the conditions required for microbial growth ?
8. Why do we preserve food ? What are the various methods to preserve food ?
9. What is nitrogen cycle ?
10. What are the diseases caused by micro organisms in humans ?

B. Fill in the blanks :

1. Polio is caused by _____.

2. Milk contains a sugar called _____.
3. Alcohol is produced with the help of _____.
4. Cholera is caused by _____.
5. Female _____ acts as carrier of dengue virus.
6. Blue-green algae fix _____ directly from air to enhance fertility of soil.
7. _____ milk is free from germs.
8. Hepatitis is spread by _____.

C. Match the following :

Column 'A'

1. Yeast
2. Bacteria
3. Rhizobium
4. Virus
5. Lactobacillus

Column 'B'

- (i) fixing nitrogen
- (ii) setting of curd
- (iii) baking of bread
- (iv) causes cholera
- (v) causes Aids

D. Tick (✓) the correct option :

1. Which of the following microbes is responsible for converting of milk into curd ?
 (i) yeast (ii) virus (iii) cholera
2. Chemical preservatives act as :
 (i) antioxidants (ii) purifying agents (iii) oxidizing agents
3. Yeast is used in the production of :
 (i) alcohol (ii) oxygen (iii) sugar
4. The bread on idli dough rises because of :
 (i) heat (ii) growth of yeast cells (iii) grinding
5. The process of conversion of sugar into alcohol is called :
 (i) infection (ii) fermentation (iii) moulding
6. Carrier of malaria causing protozoan is :
 (i) housefly (ii) butterfly (iii) female anopheles
7. Which of the following is used to make bread soft and fluffy ?
 (i) agar (ii) yeast (iii) alcohol



Creative Work

- Visit to a milk dairy and collect information on the methods employed during milk production to ensure that freshness of milk is retained when it reaches the consumer.