

## **2.2 WHERE DO MICROORGANISMS LIVE?**

Microorganisms are found everywhere in nature like:

- in air, water and soil,
- on the surface of objects and living organisms,
- inside the bodies of animals including humans and
- in dead and decaying organic matter.

They can survive in all types of environment, ranging from ice cold climate to hot springs and dry deserts to marshy places.

## 2.3 USEFUL MICROORGANISMS

Human beings have been using microorganisms for years to produce food items such as curd, bread and cheese. In addition, microorganisms are useful to us in a number of ways. Different uses of microorganisms are listed below:

- (i) In preparation of food items such as curd, bread and cheese
- (ii) In industry to produce alcohol, wine and vinegar (acetic acid)
- (iii) In agriculture to increase soil fertility by nitrogen fixation
- (iv) In preparation of medicines such as antibiotics and vaccines
- (v) For cleaning the environment
- (vi) In sewage treatment
- (vii) As sources of food

## 2.3.1 Preparation of Food Items

### *Bacteria: Making Curd*

Curd is made from milk. You may have seen your mother making curd for you at home. What does she do? She adds a little amount of curd to warm milk at night and leaves the vessel containing milk with curd in a warm place. By morning, the liquid milk turns into semi-solid curd. As the curd is made, it is transferred to a cool place. Over time, the curd turns sour.

Milk contains a sugar called **lactose** (milk sugar). Certain bacteria, of which the bacterium *Lactobacillus* is involved in the formation of curd. It converts the lactose into **lactic acid**.

The process of curd formation from milk is called curdling of milk.

### **Bacteria: Making Cheese**

Dairy products such as cheese and paneer are made by using bacteria (*Lactobacillus* or *Streptococcus*). In addition to bacteria, cheese manufacturers add a substance called rennet (obtained from the stomach lining of young cattle) to increase productivity. Nowadays, alternative sources of rennet ranging from plants, fungi and microbial sources are used as substitute for animal rennet.

### **Yeast: Making Bread and Other Food Items**

- Yeast (a single-celled fungus) plays an important role in the formation of bread, cakes, pastries, idlis, dosas and dhokla.

To make bread, yeast is added to a mixture of flour (wheat or maida) with sugar and warm water. It is kneaded to make a soft dough. The dough is left for about 2–3 hours. You will observe that the dough rises in volume. This happens due to the production of carbon dioxide by the respiration of yeast cells. Bubbles of the gas fill the dough and increase its volume. Baking of the dough drives off the carbon dioxide, making the bread porous and spongy.

- Yeast is also used in the preparation of many food items like idli, dosa and dhokla. The release of carbon dioxide by the yeast cells makes the food items soft. The tiny holes, which you see in case of idli, dosa and dhokla are air spaces created by the escape of carbon dioxide gas.

### **2.3.2 Commercial Use of Microorganisms in the Production of Alcohol, Wine and Vinegar**

- Yeast is used for the production of alcohol, wine and beer on a large-scale. For this, yeast is grown on plant materials that are rich in natural sugars such as grains like barley, wheat and rice and fruit juices.

Yeast cells grow in the absence of oxygen and convert the fruit juices and grains into alcohol