MICROBES IN HUMAN WELFARE

Microbes are one of the major components of biological systems on this earth. They are present everywhere – in soil, water, air, inside our bodies and that of other animals and plants. They are present even in deep inside the thermal vents at a temperature of 100°C and in the soil, under the layers of snow several metres thick, and in highly acidic environments. Microbes are diverse- protozoa, bacteria, fungi and microscopic plants viruses, viroids as well as prions.

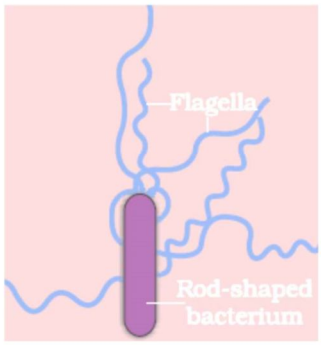


Figure 3 Rod shaped flagellate bacteria

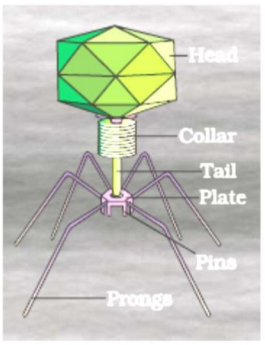


Figure 2 Bacteriophase

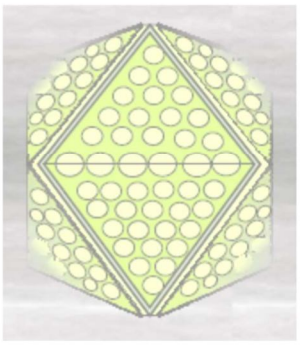


Figure 1 Adenovirus

Microbes like bacteria and many fungi can be grown on nutritive media to form colonies. Microbes may be harmful as well as beneficial. Harmful microbes can cause a large number of diseases in human beings, animals and plants. Beneficial microbes are useful for us in various ways.

Lactic acid bacteria (LAB)

Micro-organisms such as *Lactobacillus* and others commonly called **lactic acid bacteria (LAB)** grow in milk and convert it to curd. During growth, the LAB produce acids that coagulate and partially digest the milk proteins. A small amount of curd added to the fresh milk as inoculum or starter. The

inoculum contain millions of LAB, which at suitable temperatures multiply, and convert milk to curd, which also improves its nutritional quality by increasing vitamin B_{12}. In our stomach, the LAB play very beneficial role in checking disease-causing microbes.

Fermentation

The dough is used for making foods such as *dosa* and *idli*. It is also fermented by bacteria. The puffed-up appearance of dough is due to the production of CO_2 gas.

The dough is also used for making bread. It is fermented by baker's yeast (*Saccharomyces cerevisiae*).

Drinks and Foods

A number of traditional drinks and foods are produced by fermentation by the microbes. A traditional drink of some parts of southern India is made by fermenting sap from palms. Microbes are also used to ferment fish, soyabean and bambooshoots to make foods. Cheese, is one of the oldest food items in which microbes were used. Different varieties of cheese are known by their characteristic texture, flavour and taste, the specificity coming from the microbes used.

Large holes in **'Swiss cheese'** are due to production of a large amount of CO_2 by a bacterium named *Propionibacterium sharmanii*.

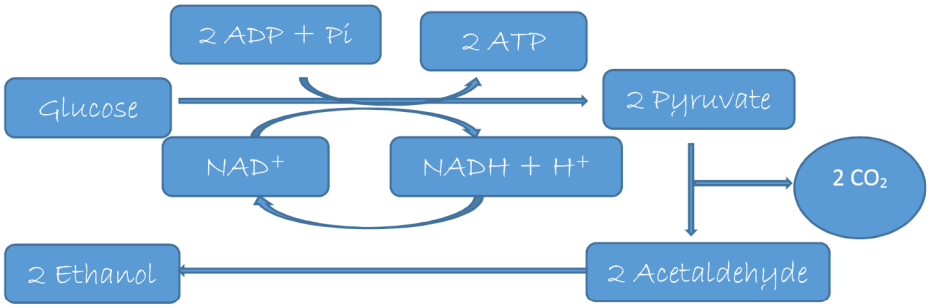
The **'Roquefort cheese'** are ripened by growing a specific fungi on them, which gives them a particular flavour.

Industrial Products

Microbes are used to make a number of products valuable to human beings. Beverages and antibiotics are some examples. Production on an industrial scale, requires growing microbes in very large vessels called **fermentors**

Fermented Beverages

Microbes especially yeasts have been used from time immemorial for the production of beverages like wine, beer, whisky, brandy or rum. For this the yeast *Saccharomyces cerevisiae*, commonly called brewer's yeast, is used for fermenting malted cereals and fruit juices, to produce ethanol.



Depending on the type of the raw material used for fermentation and the type of processing (with or without distillation) different types of alcoholic drinks are obtained.

Wine and beer are produced without distillation whereas whisky, brandy and rum are produced by distillation of the fermented broth.