

Lesson at a Glance

- **Microorganisms.** The living organisms which are very minute and *cannot* be seen by naked (unaided) eyes are known as *microorganisms* or *microbes*.
- Microorganisms are classified into five major groups:
 - Bacteria
 - Fungi
 - Algae
 - Protozoa
 - Viruses
- **Friendly Microorganisms**
 - Bacteria are used in making of curd, cheese, pickles and many other food items:
Specific bacteria *Lactobacillus* cause the formation of curd from milk. That is why a little quantity of curd (which includes *Lactobacillus*) is added to milk for making curd.
 - They are used in cleaning up of environment.
- **Decomposition of waste material:** The most useful bacterial activity is decomposition of dead bodies of plants, and animals, wastes from kitchen, lavatory, sewage etc. Some bacteria decompose organic matter like faecal material, urine, fallen leaves, dead animal and plant bodies. In the process of decaying, bacteria get their food and energy and release inorganic materials such as carbon dioxide, nitrates, phosphates, etc. These materials are reutilised by green-plants in the synthesis of food. Thus, bacteria which cause decomposition and decay of organic matter help in recycling of the matter and also cleaning up of environment.

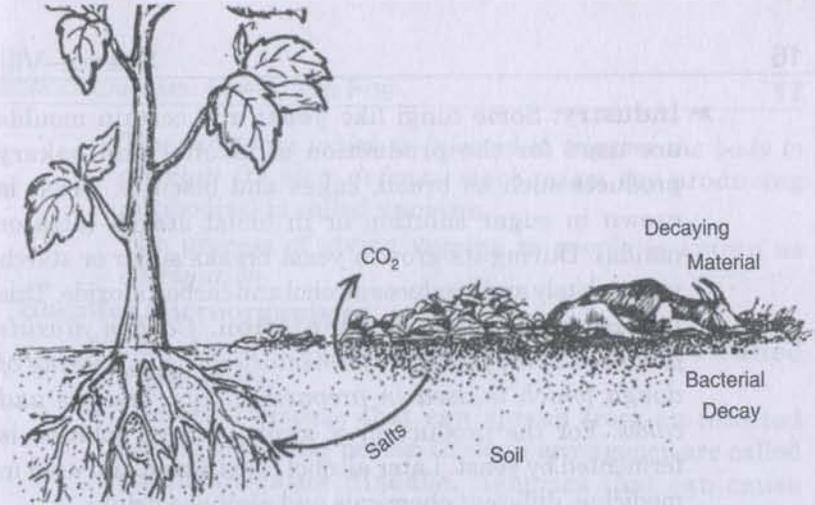


Fig. 2.1 Diagrammatic representation of decomposition.

- In agriculture, microorganisms, such as bacteria, are used to increase soil fertility by *fixing free atmospheric nitrogen*.

The *Rhizobium* bacteria found in nodules of legume plants are useful for them, they fix atmospheric nitrogen which otherwise is not possible for plants to get. Thus they make nitrogenous fertiliser available to legume plants. In return, legume plant roots provide shelter and nutrients like water and minerals to these bacteria.

Blue green algae are also able to fix free atmospheric nitrogen to increase the fertility of the soil.

These microbes are commonly called *biological nitrogen fixers*.

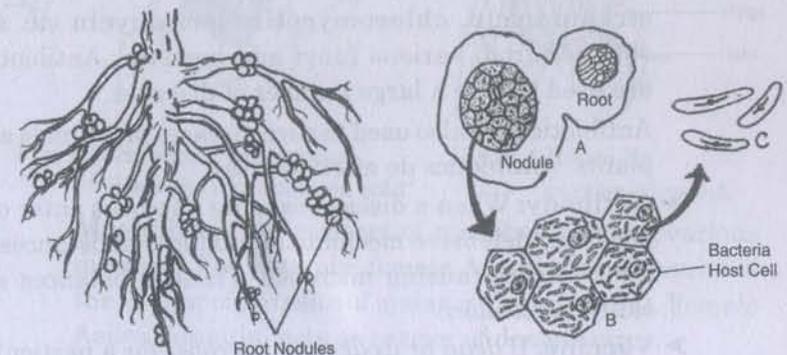


Fig. 2.2(a) Roots of legume plant. (b) Sections of the root nodule.

► **Industry:** Some fungi like **yeast** and certain moulds are used for the production of alcohol and bakery products such as bread, cakes and biscuits. Yeast is grown in sugar solution or in moist starch (atta or maida). During its growth yeast breaks sugar or starch incompletely and produces alcohol and carbon dioxide. This process is known as **fermentation**. *Carbon dioxide produced in the process of fermentation causes frothing of dough which is used in preparing loafs, biscuits and cakes.* For the production of alcohol, sugar solution is fermented by yeast. Later alcohol is extracted and used in medicine, different chemicals and alcoholic drinks.

Louis Pasteur discovered fermentation in 1857.

► **Antibiotic Medicines:** You must have used antibiotics many a times in the form of capsules, ointments or injection. Actually, some fungi like *penicillium* produce chemical substances called **antibiotics**. Antibiotics reduce bacterial growth or kill the disease causing microorganisms. **Alexander Flemming**, a British scientist, was the first to discover that *Penicillium* mould produces an antibiotic called **Penicillin**. He detected penicillin just by chance, when he observed penicillin grown in his culture of bacteria (*Staphyococcus*), prevented the growth of bacteria in the culture. That was a great discovery. Now, several antibiotics such as **streptomycin, chloromycetin, terramycin** etc. are obtained from various fungi and bacteria. Antibiotics are used to cure a large number of diseases.

Antibiotics are also used to cure diseases of animals and plants. Antibiotics do affect viruses.

► **Antibody:** When a disease-causing microbes enter our body, our defensive mechanism produces substances to fight disease-causing microbes. These substances are called **antibodies**.

► **Vaccine:** If *dead or weakened microbes* for a particular disease are introduced in a healthy body, the body produces suitable antibodies. These antibodies remain in the body for a long time and protect us from that disease causing microbes.

The *substance which is injected to triggers the body to develop its own defence mechanism (by producing antibodies)* is called **vaccine**.

The process of giving vaccine to people is known as **vaccination**.

• Harmful Microorganisms

- The disease-causing microorganisms are called **Pathogens**.
- Microbial disease that can spread from an infected person to healthy person through any agency are called **communicable disease**. Agencies that can cause spread of communicable diseases may be *air, contaminated food, water and other drinks, use of utensil and cloth of infected person and physical contact*.
- Flies carry the disease-causing microbes from excreta (faecal matter, spit etc.) of the diseased person to the foods or drinks of a healthy persons. In this way, flies and some other insects like cockroaches act as carriers of microbes. These **carriers of disease-causing microbes are also called vectors**.

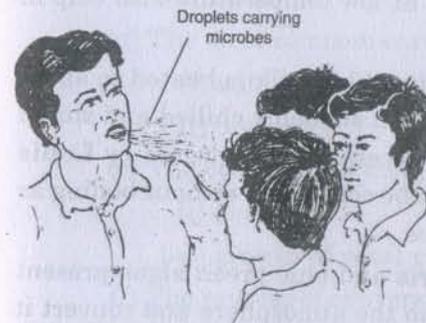


Fig. 2.3 Sneezing can spread diseases like common cold.

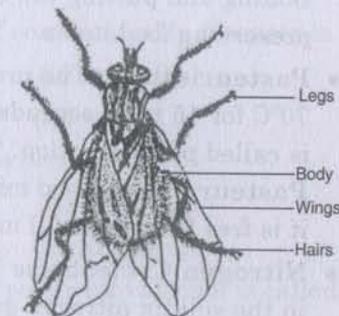


Fig. 2.4 House-fly carrier of germs.

Mosquitoes are carriers of microbes of many various diseases. For example, female **Anopheles** mosquito is the carrier of parasite of malaria (*Plasmodium*). Female **Aedes** mosquito acts as carrier of dengue virus.

- Microbes also cause diseases in animals, such as anthrax in cattle by bacterium *Bacillus anthracis*, and plants like citrus canker by bacteria in citrus fruits.

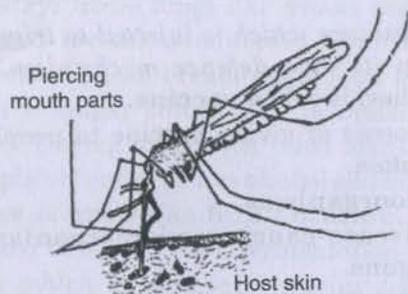


Fig. 2.5 Female *Anopheles* mosquito.

- **Food Poisoning:** Some microorganisms that grow on our food may produce *toxic substances*. The toxin make the food poisonous causing serious illness and even death.
- **Food Preservation:** Microbes such as bacteria and fungus spoil our raw or cooked food. To save the food from the attack of microorganisms we use some chemicals called **preservatives**. Common preservatives used are *common salt, sugar, edible oils, vinegar, sodium benzoate* and *sodium metabisulphite*. Boiling and putting the things at low temperature also help in preserving food items.
- **Pasteurisation:** The process in which milk is heated to about 70°C for 15 to 30 seconds and then suddenly chilled and stored is called *pasteurisation*. This process was discovered by **Louis Pasteur**. Pasteurised milk can be consumed without boiling as it is free from harmful microbes.
- **Nitrogen Cycle:** Some bacteria and blue green algae present in the soil fix nitrogen gas from the atmosphere and convert it into nitrogenous compounds. On the other hand, certain bacteria convert compounds of nitrogen present in the soil into free nitrogen gas which is released to the atmosphere. Due to this nitrogen cycle, the percentage of nitrogen in the atmosphere remains more or less constant.

■ TEXTBOOK QUESTIONS SOLVED ■

Q. 1. Fill in the blanks:

- (a) Microorganisms can be seen with the help of a _____.

- (b) Blue green algae fix _____ directly from air to enhance fertility of soil.
 (c) Alcohol is produced with the help of _____.
 (d) Cholera is caused by _____.

Ans. (a) microscope (b) atmospheric nitrogen
 (c) yeast (d) bacteria.

Q. 2. Tick (✓) the correct answer:

- (a) Yeast is used in the production of
 (i) sugar (ii) alcohol
 (iii) hydrochloric acid (iv) oxygen.
- (b) The following is an antibiotic
 (i) sodium bicarbonate (ii) streptomycin
 (iii) alcohol (iv) yeast.
- (c) Carrier of malaria-causing protozoan is
 (i) female *Anopheles* mosquito
 (ii) cockroach (iii) housefly
 (iv) butterfly.
- (d) The most common carrier of communicable diseases is
 (i) ant (ii) housefly
 (iii) dragonfly (iv) spider.
- (e) The bread or idli dough rises because of
 (i) heat (ii) grinding
 (iii) growth of yeast cells (iv) kneading.
- (f) The process of conversion of sugar into alcohol is called
 (i) nitrogen fixation (ii) moulding
 (iii) fermentation (iv) infection

Ans. (a) (ii) alcohol
 (b) (ii) Streptomycin
 (c) (i) female *Anopheles* mosquito
 (d) (ii) housefly
 (e) (iii) growth of yeast cells
 (f) (iii) fermentation.

Q. 3. Match the organisms in Column A with their action in Column B.

Column A	Column B
(i) Bacteria	(a) Fixing nitrogen
(ii) <i>Rhizobium</i>	(b) Setting of curd
(iii) <i>Lactobacillus</i>	(c) Baking of bread
(iv) Yeast	(d) Causing malaria
(v) A protozoan	(e) Causing cholera
(vi) A virus	(f) Causing AIDS
	(g) Producing antibodies

Ans.

Column A	Column B
(i) Bacteria	(e) Causing cholera
(ii) <i>Rhizobium</i>	(a) Fixing nitrogen
(iii) <i>Lactobacillus</i>	(b) Setting of curd
(iv) Yeast	(c) Baking of bread
(v) A protozoan	(d) Causes malaria
(vi) A virus	(f) Causing AIDS

Q. 4. Can microorganisms be seen with the naked eyes? If not how can they be seen?

Ans. Microorganisms cannot be seen with naked eyes. They can be seen with the help of a microscope.

Q. 5. What are the major groups of microorganisms?

Ans. There are following four major groups of microorganisms:

- (i) Bacteria
- (ii) Fungi
- (iii) Protozoa
- (iv) Algae.

In addition viruses are also considered as fifth group of microorganisms.

Q. 6. Name the microorganisms which can fix atmospheric nitrogen in the soil.

Ans. Bacteria like *Rhizobium* and *Azotobacter* and blue green algae can fix atmospheric nitrogen in soil.

Q. 7. Write 10 points on the usefulness of microorganisms in our lives.

Ans. Uses of microorganisms:

- (i) Microorganisms help in the preparation of curd, bread, cake etc.
- (ii) They are used to produce alcohol at large scale.
- (iii) Yeast is used to prepare vinegar.
- (iv) Microorganisms are used to make wines.
- (v) They act as cleaning agent and decompose the waste products into manure.
- (vi) They destroy the plant and animal dead bodies by decomposing them.
- (vii) They increase soil fertility by fixing nitrogen of atmosphere.
- (viii) They are used in making medicines like antibiotics and vaccines.
- (ix) They are used as preservatives for food items.
- (x) They help in various metabolic activities in our body.

Q. 8. Write a short paragraph on the harms caused by microorganisms.

Ans. Microorganisms are also very harmful to us. They cause a number of diseases in human as well as in other animals. Common cold, Tuberculosis, Measles, Chicken Pox, Polio, Cholera, Typhoid, Hepatitis B, Malaria, are some common human diseases caused by microorganisms. Anthrax is a serious disease in animals caused by microbes.

They also make food items unfit for use by food poisoning. They also spoil clothes and leather products. They also cause diseases in plants like blights in potatoes, sugarcane, oranges etc. They also reduce the crop production.

Q. 9. *What are antibiotics? What precautions must be taken while taking antibiotics?*

Ans. The medicines which kill or stop the growth of microorganisms in our body are called antibiotics. These are very useful to us as they prevent us from the effects of microorganisms. Antibiotics are made from bacteria and fungi. The penicillin is the first antibiotics which is discovered by Alexander Fleming in 1929. These days a number of antibiotics are used to cure various human and animal diseases. Streptomycin, Tetracycline, Erythromycin etc. are some common antibiotics.

Precautions: We should take antibiotics only by the advice of a qualified doctor. Antibiotics should only be taken when needed. Otherwise, they may be harmful and become less effective in future.