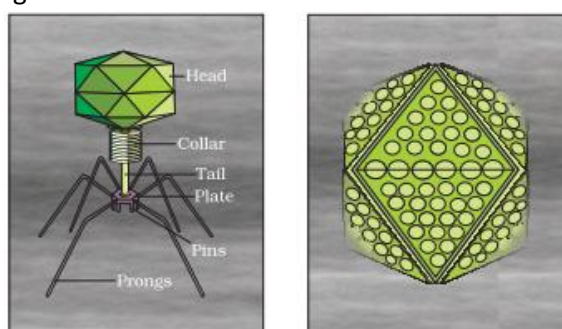


CHAPTER-10

MICROBES IN HUMAN WELFARE

Microbes are present everywhere – in soil, water, air, inside our bodies and that of other animals and plants. They are present even at sites where no other life-form could possibly exist—sites such as deep inside the geysers (thermal vents) where the temperature may be as **high as 100°C**, deep in the soil, under the layers of snow several metres thick, and in highly acidic environments. Microbes are diverse—protozoa, bacteria, fungi and microscopic plant viruses, viroids and also prions that are proteinacious infectious agents



A bacteriophage;

Adenovirus which causes respiratory infections;

Microbes like bacteria and many fungi can be grown on nutritive media to form colonies, that can be seen with the naked eyes.

1. Microbes in Household products

- **LACTIC ACID BACTERIA (LAB)**
- Micro-organisms such as **Lactobacillus** and others commonly called **Lactic acid bacteria (LAB)** grow in milk and convert it into **curd**.
- During the growth, LAB produces acids that coagulate and partially digest the milk proteins. A small amount of curd added to the fresh milk as **inoculum** or **starter** contains millions of LAB, which at suitable temperature multiply and convert milk into curd.
- LAB also improves nutritional quality by increasing **vitamin B₁₂ (Cyanocobalamin)**.
- In our stomach LAB check the disease causing microbes.
- ✓ The **dough**, which is used for making dosa and idli is also fermented by bacteria. The puffed-up appearance of dough is due to the production of **carbon dioxide**



- ✓ The dough, which is used for making bread, is fermented using **baker's yeast- Saccharomyces cerevisiae**
- ✓ **Toddy** is made by **fermenting sap from palms**
- ✓ Various microbes are also used to ferment fish, soyabean and bamboo shoots to make food.
- ✓ Large holes in '**swiss cheese**' are due to production of a large amount of **CO₂** by a bacterium **Propionibacterium sharmanii**.
- ✓ The '**Roquefort cheese**' are ripened by growing a specific **fungi** on them, which gives them a particular flavor

2. Microbes for the production of acids and Alcohol

Some microbes are used for the commercial and industrial production of certain chemicals like **organic acids, alcohol and enzymes**

| | | |
|---|-------|-------------------|
| <i>Aspergillus niger</i> (Fungus) | ----- | Citric acid |
| <i>Acetobacter aceti</i> (Bacteria) | ----- | Acetic acid |
| <i>Clostridium butylicum</i> (Bacteria) | --- | Butyric acid |
| <i>Lactobacillus</i> (Bacteria) | ----- | Lactic acid |
| <i>Saccharomyces cerevisiae</i> | ----- | Ethanol (Alcohol) |

3. Microbes for the production of Enzymes

- **Lipase** are used in Detergent formulations for removing oily stains in laundry
- Bottled fruit juices bought from market are clearer as compared to those made at home. This is because the bottled juices are clarified by the use of **Pectinase and Protease**

4. Microbes used as Bioactive molecule

Bioactive molecules are substance that can be acted on a living organism or an extract from a living organism. It can be extracted from micro organism. Bio active molecules are secondary metabolites

- **Streptokinase** produced by the bacterium *Streptococcus* and modified by genetic engineering is used as a '**CLOT BUSTER**' for **removing clots from blood vessels** of patients who have undergone myocardial infarction leading to heart attack

- **Trichoderma polysporum (fungus)** produces **Cyclosporin A**. It is used as a **immunosuppressive agent** in organ transplantation
- **Monascus purpureus (Yeast)** Produce **Statins**. It is used as **blood cholesterol lowering agent**. Statin act on enzyme responsible for synthesis of cholesterol.

7. Microbes as Bio control agents

- **Biocontrol:** It refers to the use of **biological methods** for controlling plant diseases and pests. Biocontrol measures **greatly reduce our dependence on toxic chemicals and pesticides**.
Eg: (1)-The beetle with red and black marking-) Ladybird and dragonflies are useful to get rid of **aphids and mosquitoes** respectively
Eg:(2)-Introduction of **Bacillus thuringiensis (Bt)** is used to control **butterfly caterpillar** is an example for microbial Biocontrol. These are available in sachet as dried spores which are mixed with water and sprayed onto vulnerable plants such as Brassicas and fruit trees, where these are eaten by insect larvae. The bacterial disease will kill the caterpillars but leave the other insects unharmed.
Eg: (3)-Using genetic engineering skills, scientist introduced B.thuringiensis toxin gene into plants.Such plants are resistant to attack by insect pests. **Eg:Bt-Cotton**
Eg: (4)-**Trichoderma** (Free living fungi present in the root ecosystem) used in the treatment of plant diseases.
Eg(5) Baculoviruses (Genus:Nucleopolyhedrovirus) are viruses that attack the insects and other arthropods. The virus has no harmful effect on plants and animals such as Mammals, Birds, Fishes or even on non-target insects. These viruses play a vital role for conserving the beneficial insects in Integrated pest management (IPM) programme.



navas9895@gmail.com