

What are Microbes?

- **Microbes (Microorganisms)** are tiny living things not seen without a microscope.
- Types include: **bacteria, fungi, viruses, protozoa, and algae.**
- Microbes are found everywhere: soil, water, air, and even inside our bodies.
- Some microbes help us (*useful*), while others cause harm (*harmful*).

Useful Microbes

1. In Food

- **Lactobacillus**: Converts milk into curd (yogurt).
- **Yeast**: Used in baking (makes bread, cake rise) and to ferment idli/dosa batter.
- **Fungi (Penicillium)**: Used to make cheese and antibiotics.

2. In Agriculture

- **Rhizobium**: Lives in root nodules of leguminous plants (like peas, beans), fixes nitrogen in soil, increases soil fertility.
- **Azotobacter**: Free-living bacteria in soil, also fix nitrogen.

3. In Medicine

- **Penicillium**: Source of first antibiotic, penicillin, used to kill harmful bacteria.
- **Streptomyces, Actinomycetes**: Also used to make antibiotics.

4. In Industry

- **Yeast and Bacteria**: Used for making alcohol and vinegar by fermentation.
- **Alcanivorax**: Bacteria used to clean oil spills in water.
- **Trichoderma**: Used in biocontrol to protect plants from diseases.

5. In Cleaning the Environment

- Decompose waste and recycle nutrients in ecosystems.
- Some bacteria help treat sewage water.

Harmful Microbes

1. Cause Diseases

- **Bacteria**

- *Salmonella typhi*: Causes typhoid.
- *Vibrio cholerae*: Causes cholera.
- *Clostridium*: Causes food poisoning, tetanus.
- **Viruses**
- *Influenza virus*: Causes flu.
- *HIV*: Causes AIDS.
- *Polio virus*: Causes polio.
- **Fungi**
- *Ringworm*: Skin infection.
- **Protozoa**
- *Plasmodium*: Causes malaria.

2. Spoil Food

- Fungi and bacteria spoil pickles, jam, bread, etc.
- Fungi make food poisonous by producing **mycotoxins**.

3. Other Harms

- Some bacteria cause decay and rot in plants, fruits, and vegetables.
- Fungi and bacteria can damage clothes, leather, and paper.

Key Terms

- **Antibiotic**: Medicine that kills or stops growth of bacteria (e.g., penicillin).
- **Mycotoxin**: Poison produced by some fungi in spoiled food.
- **Pathogen**: Any microbe that causes disease.

Short Q&A Hints

- **Example of Useful Microbes in Food**: Lactobacillus, Yeast.
- **Example of Harmful Microbes**: Salmonella (typhoid), Plasmodium (malaria).
- **Why is Rhizobium useful?** Fixes nitrogen, helps plants grow.
- **What is fermentation?** It is the conversion of sugar to alcohol or acid by microbes such as bacteria or yeast.
- **How are antibiotics produced?** Some bacteria and fungi naturally make antibiotics, which are collected and processed as medicines.