Introduction

→Those living organisms around us which we cannot be seen with naked eyes are called microorganisms or microbes.

Classification of Microorganisms

Microorganisms are classified into four major groups. These groups are **Bacteria, Fungi, Protozoa and Algae.**

Bacteria

- Single-celled organisms.
- Found in wide range of habitats ranging from glaciers to deserts and hot springs.
- For example: curd bacteria (Lactobacillus), E. Coli bacteria(found in intestine of healthy humans and animals).

Fungi

- Multicellular or unicellular, heterotrophic organisms.
  For example: Penicillium (multicellular), Aspergillus (multicellular), Yeast (unicellular), Bread mould (multicellular).

Protozoa

- These are unicellular, heterotrophic microorganisms.
- Usually found in moist & aquatic habitats.
- For example: Amoeba and Paramecium

Algae

- Unicellular or multicellular autotrophic organisms.
- Contain chlorophyll pigment and carry out photosynthesis.
- For example: Chlamydomonas (unicellular) and Spirogyra (multicellular)

Viruses

Viruses are also microscopic but different from other microorganisms because they reproduce only inside the cells of the host organism, which may be a bacterium, plant or animal.
→ Require host cells to reproduce and complete their life cycle.
→ For example: Influenza virus, polio virus.

Microorganisms- As Friends/Useful Microorganisms

1.Preparation of Curd and Bread

- **Formation of curd (dahi) :** Making of curd is a process in which the lactose (milk sugar) of the milk is converted into lactic acid by the action of bacteria 'Lactobacillus'. Due to the formation of lactic acid ,casein protein in the milk coagulates and hence curd is formed. This curd is further used in the preparation of idli-dosas and bhaturas.

- **In Bread making:** Yeast is added to the uncooked dough to make the dough "rise". The dough rises due to the production of carbon dioxide (because of respiration of yeast) in the dough. The bread is then baked. Heat of baking drives off the carbon dioxide, making the bread porous and light.

2.Commercial use of microorganisms

- In industry The wine and beer (brewery) industries are important industries which make use of the fungus yeast.

- Yeast is grown on natural sugars present in fruit juices and grains like barley and rice. Yeast brings about conversion of sugars into alcohol and carbon dioxide.
- This process of conversion of sugar into alcohol is known as Fermentation.
- Louis Pasteur discovered fermentation in 1857.

3.Medicinal use of microorganisms

- Microbes are being used for the production of both antibiotics and vaccines.

- **Antibiotics :** The medicines which kill or stop the growth of disease causing microorganisms are called Antibiotics. Fungi and bacteria are important microbes producing a variety of antibiotics. In 1929 ,Alexander Fleming discovered the first antibiotic 'Penicillin'.

- **Antibiotics obtained from bacteria** : Streptomycin, Tetracycline, Erythromycin etc.

- **Antibiotics obtained from fungi :** Penicillin.

Some Definitions to Remember:

- Pathogens: Disease-causing microbes are called Pathogens.
- Antibodies: Antibodies are substances our body produces to fight disease-causing microbes.

Vaccines: Vaccines are weakened or dead disease-causing microbes that are injected in our body to trigger the production of antibodies. The body also remembers how to fight with the disease causing microbe if it enters again. These antibodies remain in the body and we are protected from disease-causing microbes forever.

Edward Jenner discovered the vaccine for smallpox in 1798.

4.Increasing soil Fertility

Rhizobium bacteria and blue -green algae are able to fix atmospheric nitrogen to enrich the soil with the nitrogen and increase its fertility. These microbes are also called Biological nitrogen fixers.

5. Cleaning the Environment

Microorganisms (decomposers) help in converting dead plants and animals waste into simpler substances which can be used by plants by the process of decomposition.

Harmful Microorganisms

Some microorganisms cause diseases in human beings, plants and animals. such disease causing microorganisms are called pathogens .

Some definitions to remember:

- Communicable diseases- Microbial diseases that can spread from an infected person to a healthy person through air, water, food or physical contact are called communicable diseases.
  Example: Cholera, common cold, chicken pox, tuberculosis etc.
- Carriers- The disease causing microorganisms (pathogens) are sometimes carried by insects or animals and such insects and animals are called carrier for that disease .
  Example : Female **Anopheles** mosquito is the carrier of plasmodium that causes malaria.
  Female **Aedes** mosquito is the carrier of dengue virus.
  Draw Table 2.1 and 2.2 from Textbook.

FOOD POISONING

Microorganisms that grow on our food sometimes produce toxic substances and make the food poisonous. Consumption of such food can cause serious illness and even death.

FOOD PRESERVATION

Food preservation means preventing the food from the attack of microorganisms.

Methods of Food Preservation

1. **Heat and cold treatment**

- Boiling of milk and liquid food products kills many microorganisms. Similarly low temperature inhibits the growth of microbes.
- **Pasteurisation :** This method was developed by scientist Louis Pasteur. In this the food is heated up to 70°C for 15 to 30 seconds and then suddenly chilled and stored.
- **Low temperature Storage :** Low temperature inhibits the growth of microbes.

2. **Chemical Method**

- Chemicals which are used to check the growth of microbes are called preservatives.
- The commonly used preservatives are sodium benzoate, sodium metabisulfite and potassium metabisulphite.
- This method is employed in the preservation of fruit juices, jams, squashes, fruits, etc.

3. **Preservation by common salt**

- Common salt has been used to preserve meat and fish for ages.
- Concentrated solutions of common salt can kill microorganisms due to dehydration. Salting is also used to preserve amla (Indian gooseberry) and raw mangoes.

4. **Preservation by sugar**

- Sugar reduces the moisture content which inhibits the growth of bacteria. Jams, jellies and squashes are preserved by sugar.

5. **Preservation by oil and vinegar**

- Use of oil and vinegar prevents spoilage of pickles because bacteria cannot live in this environment.
- Vegetables, fruits, fish and meat are often preserved by this method.

6. **Storage and Packing**

- Dry fruits and vegetables are sold in sealed airtight packets to prevent the attack of microbes.

Advantages of food preservation

- This prevents the food from being spoiled by the action of microorganisms.
- It increases the storage period of food materials.
- It helps in obtaining the off-season food materials.
- It makes the transportation of food materials easier

Nitrogen cycle

- Nitrogen is an essential element for all living organisms because it is essential component of proteins, chlorophyll, nucleic acids (DNA, RNA) and vitamins.
- The circulation of nitrogen through the living and nonliving components of the biosphere (air, soil, water, plants and animals) is called the nitrogen cycle.

Steps involved in nitrogen cycle

- Atmospheric nitrogen is fixed into nitrogen compounds by Rhizobium bacteria and Blue green algae. Lightning also breaks nitrogen gas into oxides of nitrogen that dissolves in rain and falls on earth.
- The process of converting nitrogen gas into compounds of nitrogen is called Nitrogen fixation.
- The plants absorb nitrogen compounds from the soil and convert them into plant proteins.
- The plants are eaten up by animals and thus plant proteins are used for making animal proteins.
- When the plants and animals die, bacteria and fungi present in the soil decompose the proteins of dead plants and animals into compounds of nitrogen which is again used by plants.
- There are some bacteria (Dentrifying bacteria) which convert nitrate form of nitrogen into free nitrogen which goes back into the atmosphere.
- As a result the percentage of Nitrogen in atmosphere remains more or less constant.

Draw Nitrogen cycle Pg.No.27