

8. Useful and Harmful Microbes

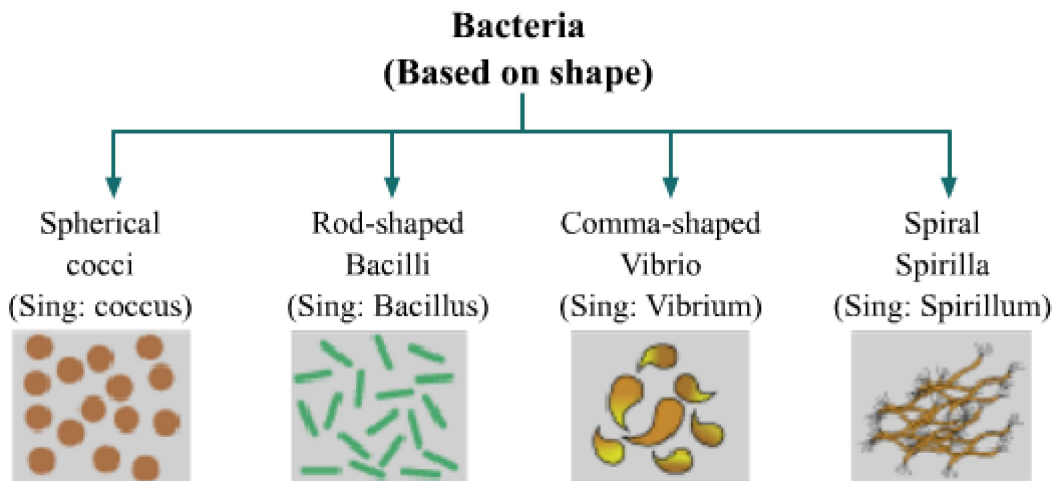
- **Microorganism**

- The living organisms that cannot be seen with unaided eye are called microorganisms.
- The study of microorganisms is called microbiology.
- They are cosmopolitan in distribution and found everywhere around us.
- All the tiny organisms around us like in air and soil do not fall into the category of microbes.
- Antony Van Leewenhoek observed bacteria for the first time using his self built microscope.

- Microorganisms are classified into four major groups- bacteria, fungi, protozoa and some algae.

Shapes of bacteria:

Bacteria are of different shapes. They can be classified in four groups based on their shape.



Important Scientists

- Robert Koch ((1843-1910)
 - Robert Koch developed the germ theory of disease that established the microbial cause of disease.
 - He identified anthrax disease.
 - He developed agar growth medium.
- Louis Pasteur (1822-1895)
 - He disapproved the theory of spontaneous generation of life. He proved this by his famous experiment known as swan neck flask experiment.
 - He developed the method of pasteurization.
 - He also contributed to the development of vaccines.

- **Importance of microorganisms**

- **In food industry**

- *Lactobacillus* bacteria promote the conversion of milk into curd.
- Yeast is used in preparation of breads, pastries and cakes.

- **In beverage industry**

- Yeast is used for commercial production of alcohol, wine and vinegar (acetic acid).
- Yeast acts on sugar and converts it into alcohol by the process of fermentation. Louis Pasteur discovered fermentation.

- **In increasing soil fertility**



- Blue green algae and *Rhizobium* bacteria are called biological nitrogen fixers.
- They fix free atmospheric nitrogen to enhance soil fertility.
- **In cleaning the environment**
 - Microorganisms (decomposers) help in converting dead waste of plants and animals into simpler substances by the process of **decomposition**.
- **Nitrogen cycle:** It involves circulation of nitrogen through living and non-living components of nature.
 - Nitrogen gas comprises 78% of the atmosphere.
 - First process of nitrogen cycle is **fixation of nitrogen** gas into nitrogenous compounds caused by bacterium *Rhizobium* and lightning.
 - Nitrogen compounds in soil are taken up by the plants through roots and used up in synthesis of plant proteins. Animals obtain nitrogen by feeding on plants.
 - Waste of plants and animals are converted to nitrogenous compounds by the action of bacteria and fungi in the soil.
 - Some bacteria convert nitrogenous compounds back to nitrogen to maintain atmospheric levels of nitrogen.
- **In medicine production**
 - Medicines produced by certain microorganisms to kill or stop the growth of other disease-causing microorganisms are called **antibiotics**.
 - Antibiotics are obtained from bacteria and fungi.
 - They are classified as narrow-spectrum and broad-spectrum antibiotics.
 - Commonly used antibiotics are streptomycin, tetracycline, and erythromycin.
 - First antibiotic penicillin was prepared by Alexander Fleming
- **In vaccine production**
 - Protection of the body from the attack of various disease-causing microorganisms through vaccines is known as **vaccination**.
 - Vaccine includes dead or weakened microbes that trigger the production of antibodies in the body.
 - These antibodies help in preventing the attack from disease-causing microorganisms.
 - Vaccination helps in controlling diseases such as cholera, polio, small pox, hepatitis etc.
 - Vaccine for small pox was discovered by Edward Jenner.
- **Serum**
 - Serum is a pale yellow coloured blood component which lacks any blood cell as well as clotting factors.
 - Due to presence of antitoxins/antibodies in serum, it can be used as a preventive measure against bacterial invasions.
 - Few serum compounds have been produced by genetically modified bacteria as well, for example, blood clotting factor VIII (for treatment of Haemophilia A), Factor IX (for treatment of Haemophilia B).

Harmful role of bacteria

1. Bacteria cause a number of diseases in plants, animals and in humans. Some of the diseases caused by bacteria are

Disease	Causative bacterium
Cholera	<i>Vibrio cholerae</i>
Diphtheria	<i>Corynebacterium diphtheria</i>
Diarrhoea	<i>Escherichia coli</i>
Leprosy	<i>Mycobacterium leprae</i>
Tuberculosis	<i>Mycobacterium tuberculosis</i>
Plague	<i>Yersinia pestis</i>
Tetanus	<i>Clostridium tetani</i>
Pneumonia	<i>Streptococcus pneumonia</i>



Typhoid *Salmonella typhi*

Harmful role of fungi

Fungi cause a number of disease in plants, animals and in humans

1. Ringworms: Caused by fungi which belong to genera Microsporum, Trichophyton and Epidermophyton
2. In plants, diseases like white rust of crucifers and wheat, blight of potato and smuts of maize are caused by fungi.
3. Fungi like Mucor and Rhizopus cause food spoilage.