

# INTRODUCTION TO MICROBIOLOGY

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# MICROBIOLOGY

Microbiology is the study of living organisms of microscopic size which includes:

1. Bacteria
2. Fungi
3. Algae
4. Protozoa
5. Viruses

- The term **microbiology** was introduced by a french Chemist **Louis Pasteur**, who demonstrated that fermentation was caused by the growth of bacteria and yeast. He is known as **father of microbiology**.
- These microorganism cannot be seen by naked eyes, they are only seen under the microscope.
- Microorganisms are present everywhere on earth, including human beings, animals, plants, soil, water, food and atmosphere.
- Microorganisms may be beneficial or harmful to human beings.

# Branches of microbiology

## 1. Pure Science

- Bacteriology (study of bacteria)
- Mycology (study of fungi)
- Protozoology (study of protozoa)
- Algology (study of algae)
- Parasitology (study of parasites)
- Genetics (study of heredity and variation)
- Immunology (study of mechanism involved in the development of resistance by body to infectious diseases)

# Branches of microbiology

## **2. Applied science**

- Medical microbiology
- Pharmaceutical microbiology
- Industrial microbiology
- Food microbiology
- Soil microbiology
- Agriculture microbiology
- Aquatic microbiology
- Air microbiology
- Epidemiology

## **Medical microbiology**

- It deals with the study of causative agents of infectious diseases in human beings.
- Medical microbiology has close links with other disciplines such as pathology, clinical medicine, pharmacology and therapeutics.

## **Pharmaceutical microbiology**

- It deals with the study of microorganisms which are responsible for the production of antibiotics, enzymes, vaccines, vitamins and other pharmaceuticals substances.
- It also includes the method of sterilization and disinfection, microbiological testing of pharmaceuticals, sterile product preparation and diagnosis of disease and treatment.

## **Industrial microbiology**

- It is the study of industrially useful microorganisms in the production of alcoholic beverages, vitamins, amino acids, enzymes, antibiotics and other drugs.
- It also includes fermentation techniques for the production of different compounds.

## **Food microbiology**

- It deals with the interaction of microorganisms and food in the relation to food processing, food spoilage, food borne diseases, their prevention and includes preparation and preservation of food products.
- It is the study of soil microbes and interaction amongs the soil microorganisms.

## **Agricultural microbiology**

- It is the study of relationships of microorganisms and crops with an emphasis on the control of the plant diseases and improvement of yield.

## **Aquatic microbiology**

- Aquatic microbiology is the study of microorganisms and their activity in the fresh and marine water including lakes, rivers, bays, estuaries and seas.
- It also includes water purification, microbiological examination and biological degradation of waste.

## **Air microbiology**

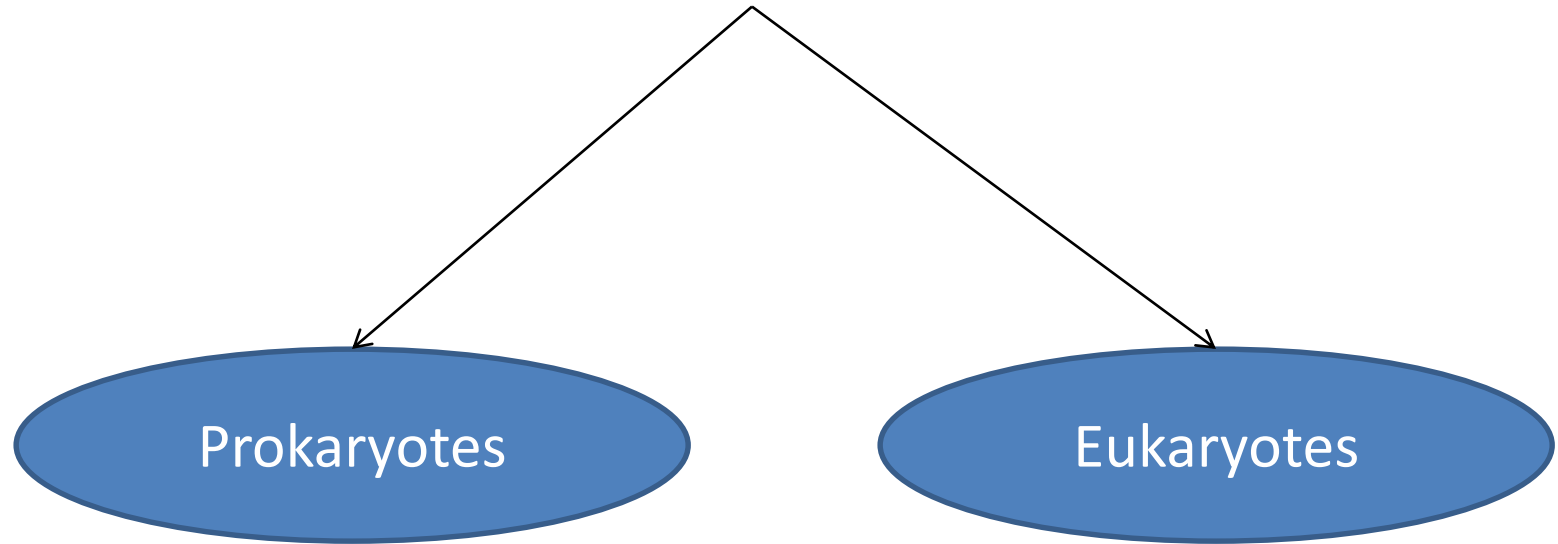
- It deals with the role of aerospora in contamination and spoilage of food.
- It also deals with the spreading of plant and animal diseases through air.



# **Epidemiology**

- It is concerned with the monitoring, control and spread of diseases in communities.

# Classification of microorganisms

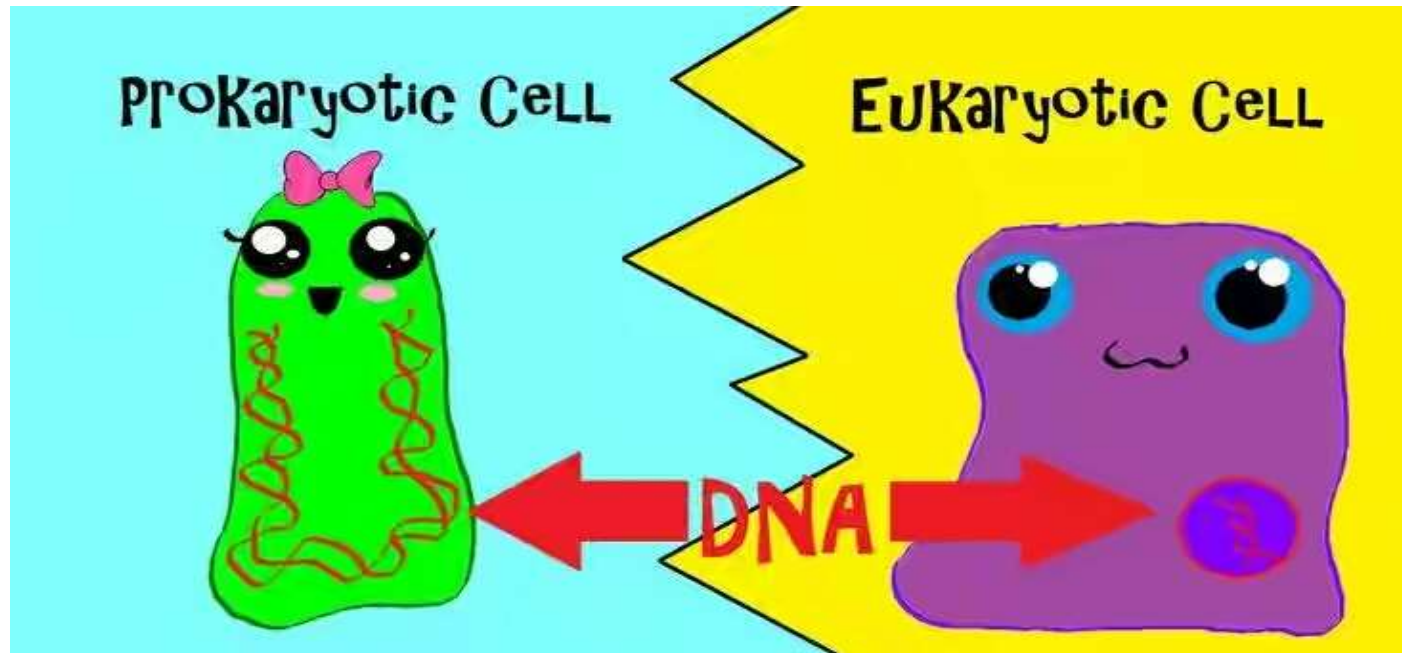


## Prokaryotic cells

- Genetic material is not enclosed by the nuclear membrane.
- Absence of nuclear membrane

## Eukaryotic cells

- Genetic material is enclosed by the nuclear membrane.
- Presence of nuclear membrane.



# Scope and Importance of microbiology

1. Production of antibiotic Eg: penicillin from penicillium.
2. Production of enzymes , vaccines, biosurfactants,alcoholic and other pharmaceutical product.
3. Diagnosis of disease and treatment Eg: ELISA, Widal test.
4. Treatment of industrial waste and material
5. Plant growth promotion
6. Sterile product preparation
7. Sterilization ( process of killing microorganisms). Eg: moist heat sterilization, dry heat sterilization, and membrane filtration.
8. Steroid biotransformation. Eg: progesterone, testosterone.
9. Identification of microorganisms. Eg: morphological, cultural or microscopic study.
10. Testing of Pharmaceuticals products and raw materials.

# History of microbiology

# Louis Pasteur(1822 – 1895)



- Frenchman trained as a chemist.
- Discovered isomers of tartaric acid.
- Discovered the process of fermentation and developed a method of “pasteurization” to reduce microbial contamination of wine and beer.
- Developed anthrax and rabies vaccines.

# Germ Theory of Disease

## ➤ **Agostino Bassi**

Silkworm disease caused by a fungus (1835)

## ➤ **Ignaz Semmelweis**

Invisible agent caused sepsis (1841)

## ➤ **Richard Petri**

Designed a special plate to hold a solid culture. This plate has great significance in microbiology and is referred as petri plate.

## ➤ **Joseph Lister**

- Introduced concept of sterile surgical field
- Use of antiseptics followed
- Developed limiting dilution technique
- He is known as father of antiseptic surgery.

# Robert Koch (1843 – 1910)

- German physician (and Pasteur's rival)
- Studied the disease anthrax
- Developed a method to identify the etiologic agent.
- First utilized to identify *Bacillus anthracis* as etiologic agent of anthrax (1877)
- Developed staining technique.
- Developed a set of postulates



# Koch's postulates

- The microorganism must be present in the diseased host, and absent for the healthy.
- Microbe must be isolated and grown in a pure culture.
- Isolated microbe must cause disease when inoculated into healthy laboratory host.
- Must re-isolate the microbe from the diseased laboratory host.

# Discovery of Chemotherapeutic agents

- **Paul Ehrlich** is known as **father of chemotherapy**. In 1930 he introduced drug Salvarsan for the treatment of syphilis.
- In 1929 **Sir Alexander Fleming** accidentally discovered a substance produced by penicillium notatum. He extracted from the fungus a compound which he called **penicillin** that could destroy several pathogenic bacteria.
- In 1944 **S.A Waksman** discovered another antibiotic **streptomycin**.

Thank you