

Lec. : 1

Microbiology

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# Introduction to Microbiology



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# **Introduction .**

**Microbiology** is the science that study of Microorganisms, which are very small in size and unicellular structure or multicellular organisms . Usually requires to examine a magnification tool is the Microscope. This includes eukaryotes such as fungi, and prokaryotes such as bacteria and certain algae. Viruses, though not strictly classed as living organisms, are also studied. In reality it is likely that only about 1% of all of the microbial species have been studied, and although microbes were first observed over three hundred years ago, the field of microbiology can be said to be in its infancy relative to older biological disciplines.

## **Microorganisms or Microbes .**

These microscopic organisms commonly called " Germs , Viruses , agents , .." but not all causes disease and many Microorganisms are useful or essential for human life such as Microorganisms produce Antibiotics agents or Human growth Hormones insulin or Vitamins and many types of Microbes product or process food such as cheese , Alcoholic beverages and bread .

Some organisms are large though - Helminthes - worms and Sub groups of Microbes that we will study includes :-

Bacteria , Archaea , Fungi , Protozoan's , Algae , Viruses , Multi-cellular animal parasites - Helminthes .

## **Why Do we Study Microorganisms ?**

we study Microorganisms science for :-

1- Because bacteria or viruses and fungi are the leading cause of death or very dangers diseases such as septicemia and bacteremia or different type of Infections in the history of mankind .

2- Some Microorganisms Benefit man are involved in the production of food or are direct edible.

3- The presence of bacteria (Normal Flora) in our bodies inhibits the growth of potentially pathogenic bacteria to helping to keep us healthy .

4- Biotechnological advances in agriculture also require the help of Microorganisms to form Transgenic Plant with increased yield , reduced vulnerability to environmental and pathogenic stresses and improved tests.

5- Some Microorganisms Benefit man by Modern Biotechnological is often associated with the use of genetically altered Microorganisms such as *E. coli* or Yeast for the production of substances like synthetic insulin or antibiotics .

6- Microorganisms or Microbes are involved in cycling vital elements such as carbon and nitrogen , breaking down wastes and dead organisms into simpler substances plants can use in photosynthesis . and other species are at the base of the food chain especially in aquatic ecosystems even pathogens have a role in controlling the populations of their host species .

## **Fields of Microbiology .**

Microbiology science can be contact with different branch of sciences include :-

1- Basic Research or Microbe - Centered .

Discip lines	Subjects of study
Bacteriology	Bacteria and Archeae
Phycology	Algea
Mycology	Fungi
Protozoology	Protozoa
Parasitology	protozoa and parasitic animals
Virology	Viruses

2- Process - Centered .

Disciplines	Subjects of study
Microbial metabolism	Biochemistry that include chemical reactions in cells.
Microbial genetics	Functions of DNA and RNA.
Environmental Microbial	Relationships between microbes and among microbes with other organisms and their environment .

3- Applied Medical Microbiology.

Disciplines	Subjects of study
Serology	Antibodies in blood serum , particularly as an indicator of infection.
Immunology	Body's defenses against specific disease .
Epidemiology	Frequency , distribution and spread of disease .
Etiology	Causes of disease .
Infection Control	Hygiene in health care setting and control of nonsocial infections .
Chemotherapy	Development and use of drugs and to treat infectious disease .

#### 4- Applied Environmental Microbiology.

Disciplines	Subjects of study
Bioremediation	Use of microbes to remove pollutants.
Public Health Microbiology	Sewage treatment , water purification and control of that spread disease .
Agricultural Microbiology	Use of microbes to control insect pests .

#### 5- Industrial Microbiology (Biotechnology).

Disciplines	Subjects of study
Recombinant DNA technology	Alteration of microbial genes and synthesize products.
Pharmaceutical Microbiology	Manufacture of vaccines and antibiotics .
Food technology	Reduction harmful microbes in food and drink .

### Discovery and origins of microbiology .

Bacteria and micro-organisms were first observed by Antonio van Leeuwenhoek in 1676 using a single-lens microscope of his own design. In doing so Leeuwenhoek made one of the most important discoveries in biology and initiated the scientific fields of bacteriology and microbiology.



The name "bacterium" was introduced much later, by Ehrenberg in 1828, derived from the Greek, and meaning "small stick". While Van Leeuwenhoek is often cited as the first microbiologist, the first recorded microbiological observation, that of the fruiting bodies of molds, was actually made earlier in 1665 by Robert Hooke.

- Louis Pasteur (1822–1895) and Robert Koch (1843–1914) are considered to be the founders of medical microbiology. Pasteur is most famous for his series of experiments designed to disprove the then widely-held theory of **spontaneous generation** , as well as designing methods for food preservation (Pasteurization) and vaccines against several diseases such as anthrax, fowl cholera and rabies .



Koch is best known for his contributions to the germ theory of disease, proving that specific diseases were caused by specific pathogenic microorganisms. He developed a series of criteria that have become known as the Koch's Postulates. Koch was one of the first scientists to focus on the isolation of bacteria in pure culture resulting in his description of several bacteria including *Mycobacterium tuberculosis*, the causative agent of tuberculosis.

While Pasteur and Koch are often considered the founders of microbiology, Beginning with Pasteur's work discoveries included the relationship between microbes , fermentation and Pasteurization .

Pasteur showed that microbes are responsible for fermentation . Fermentation is the conversation of sugar to alcohol to make beer and wine . Bacteria that use alcohol and produce acetic acid spoil wine by it to vinegar (acetic acid). Pasteur demonstrated that these spoilage bacteria could be killed by heat that was not hot enough to evaporate the alcohol in wine. This application of a high heat for a short time is called Pasteurization .

## **Characteristics of Bacteria .**

1- All bacteria have two names ; firstly their generic (genus) name, e.g. *Staphylococcus*, then their specific (species) name, e.g. *S. aureus* .

Special additions to this universal scheme may include:-

2- A third name to distinguish several varieties within one species, e.g. *Acinetobaeter calcoaceticus* var *anitratu*s .

3- A common, non-scientific, historical name, e.g. pneumococcus for *Streptococcus pneumoniae*, gonococcus for *Neisseria gonorrhoeae*, meningococcus for *Neisseria meningitidis* .

4- A serological group name, e.g. *Streptococcus pyogenes* is also called 'the group A streptococcus' .

5- A toxin profile name, e.g. *Clostridium perfringens* type A .

Bacteria are fundamentally different from all other living things in being prokaryotes, distinguished by :-

- DNA in a double-stranded loop, not within a nuclear membrane .
- Small Ribosome's free in the cytoplasm, no Endoplasmic Reticulum .
- The absence of mitochondria or other membrane-enclosed organelles .
- A complex peptidoglycan -protein cell wall layer .