



FACULTY OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF BIOTECHNOLOGY

Microbiology

- ❖ Microbiology is a fascinating field that explores life down to the tiniest level.
- ❖ Did you know that your body contains more bacteria cells than human cells? It's true.
- ❖ Microbes are essential to our everyday lives, from the food we eat to the very internal systems that keep us alive.
- ❖ These microbes include bacteria, algae, fungi, viruses, and nematodes. Without microbes, life on Earth would not survive. It's amazing to think that all life is so dependent on these microscopic creatures, but their impact on our future is even more astonishing.
- ❖ Microbes are the tools that allow us to engineer hardier crops, create better medicines, and fuel our technology in sustainable ways. Microbes may just help us save the world.

What is Microbiology?

- ❖ Microbiology is the study of living organisms of microscopic size, which include bacteria, fungi, algae, protozoa and viruses (infectious agent at the borderline of life).
- ❖ It is concerned with their form, structure, reproduction, physiology, metabolism, and classification.
- ❖ It includes the the study of their distribution in nature, their relationship to each other and to other living organisms, their effect on human beings and other animals and plants, their abilities to make chemical and physical changes in our environment and their reaction to chemical and physical agents.

Different faces of microorganisms: The good, the bad and the ugly

- ❖ Microorganisms can perform myriads of functions.
- ❖ They can be beneficial to human kinds as they can be used to ferment food (Yogurt and cheese), in making of alcoholic beverages (wine & beer), in making of important therapeutic biochemicals (penicillin), and in the processing of industrial and domestic wastes.
- ❖ Microorganism can cause disease, spoil food leading to mild health hazard which can be cured with timely medical intervention.
- ❖ Microorganism can cause fatal diseases such as AIDS, Ebola etc.

Early history of microbiology:

- ❖ Among others, the Roman philosopher Lucretius (about 98–55 B.C.) and the physician Girolamo Fracastoro (1478–1553) suggested that disease was caused by invisible living creatures.
- ❖ The earliest microscopic observations appear to have been made between 1625 and 1630 on bees and weevils by the Italian Francesco Stelluti, using a microscope probably supplied by Galileo.
- ❖ However, the first person to observe and describe microorganisms accurately was the amateur microscopist Antony van Leeuwenhoek (1632–1723) of Delft, Holland.
- ❖ He is reputed to have observed strands of fungi among the specimens of cells he viewed. In the 1670s and the decades thereafter, a Dutch merchant named **Anton van Leeuwenhoek** made careful observations of microscopic organisms, which he called **animalcules**.
- ❖ Until his death in 1723, van Leeuwenhoek revealed the microscopic world to scientists of the day and is regarded as one of the first to provide accurate descriptions of protozoa, fungi, and bacteria.

❖ After van Leeuwenhoek died, the study of microbiology did not develop rapidly because microscopes were rare and the interest in microorganisms was not high. In those years, scientists debated the theory of **spontaneous generation**, which stated that microorganisms arise from lifeless matter such as beef broth.

❖ This theory was disputed by **Francesco Redi**, who showed that fly maggots do not arise from decaying meat (as others believed) if the meat is covered to prevent the entry of flies.

❖ An English cleric named **John Needham** advanced spontaneous generation, but **Lazzaro Spallanzani** disputed the theory by showing that boiled broth would not give rise to microscopic forms of life.

Louis Pasteur and the germ theory

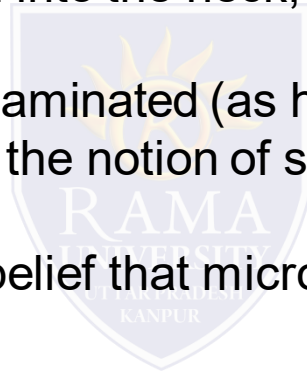
Louis Pasteur worked in the middle and late 1800s.

He performed numerous experiments to discover why wine and dairy products became sour, and he found that bacteria were to blame.

Pasteur called attention to the importance of microorganisms in everyday life and stirred scientists to think that if bacteria could make the wine “sick,” then perhaps they could cause human illness.



- ❖ Pasteur had to disprove spontaneous generation to sustain his theory, and he therefore devised a series of **swan-necked flasks** filled with broth.
- ❖ He left the flasks of broth open to the air, but the flasks had a curve in the neck so that microorganisms would fall into the neck, not the broth.
- ❖ The flasks did not become contaminated (as he predicted they would not), and Pasteur's experiments put to rest the notion of spontaneous generation.
- ❖ His work also encouraged the belief that microorganisms were in the air and could cause disease.
- ❖ Pasteur postulated the **germ theory of disease**, which states that microorganisms are the causes of infectious disease.



Pasteur's attempts to prove the germ theory were unsuccessful.

However, the German scientist **Robert Koch** provided the proof by cultivating anthrax bacteria apart from any other type of organism.

He then injected pure cultures of the bacilli into mice and showed that the bacilli invariably caused anthrax.

The procedures used by Koch came to be known as **Koch's postulates**.

They provided a set of principles whereby other microorganisms could be related to other diseases.

