

Fungi
Bacteria

Microbiology

Viruses
Viroids
Prion

Microbiology is a science of studying **micro-organisms** (can't be seen by naked eye) which associated with **human disease**, their **activities** and their **influences** on different aspects of life.

- The organisms are **widely distributed** in nature.
- Some of them are **beneficial** and some are **harmful**.
- Medical microbiology deals with **microbes** that are **harmful**.

Beneficial:

- Food industry:** **Fermentation** of some products : Bread, Wine, Cheese, Yoghurt, Vinegar ...
- Industrial applications:** Bacteria is used in **modern biotechnology** such as : genetic engineering ,insulin, Enzymes, Amino acids, Vitamins, Antibiotics, Vaccines, Pharmaceutical industries....
- Sewage treatment:** **recycling water** .
- Recycling vital elements in the environment of elements:** nitrogen, carbon, oxygen, sulfur, phosphorus .

HEY YOU DROPPED THIS

Harmful:

Food spoilage, Diseases...

FOOD SPOILAGE



Portal of entry :

- Respiratory :** via **inhalation**.
- Alimentary (GIT):** by **ingestion**.
- Genital tract:** **sexual contact**.
- Skin:** **abrasions, bites...**



Others: **Conjunctiva, blood transfusion, injections and organ transplants.**

- Congenital infections :** (**vertical transmission**) .

From the mother to her child

Contribution of the scientists in microbiology

Antony van Leeuwenhoek : (**father of microbiology**)
microscopist who was the first to observe live microorganisms in water mud and saliva.

John Hunter : A surgeon he was the leading authority on venereal diseases (**sexual diseases**) and believed that **Syphilis and Gonorrhoea** were caused by a single pathogen .

Syphilis is caused by the bacterium *Treponema pallidum*.
Gonorrhoea is caused by the bacterium *Neisseria gonorrhoeae*.

Edward Jenner: A physician and scientist who pioneered the concept of vaccines including creating the smallpox vaccine, **the world's first vaccine**.

John Snow: A physician, known for locating source of cholera outbreak in London (thus establishing the disease as water-borne), also he is considered one of the founders of **modern epidemiology**.

Ignaz Semmelweis: physician and scientist, known as early pioneer of antiseptic procedures . "**savior of mothers**" he discovered that the incidence of **Puerperal sepsis** can be prevented if the attending nurses apply hygienic measures.
Hand washing stops infections.

Louis Pasteur: biologist, microbiologist, and chemist.

- Discovered the principle of Fermentation of alcohol by microorganisms.
- Invent a technique of treating milk and wine to stop bacterial contamination, a process called pasteurization.
- Created the first Vaccines of **rabies, Bacillus anthrax.**

Louis Pasteur and the germ theory... He performed experiments to discover why wine and dairy products became sour, he found that bacteria were to blame. He 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. He's attempts to prove the germ theory were **unsuccessful**. However, **Robert Koch** provided the proof by cultivating anthrax bacteria apart from any other type of organism.

Robert Koch: Developed **microbiological media & streak plates for pure culture** .



Germ theory (Koch's postulates):

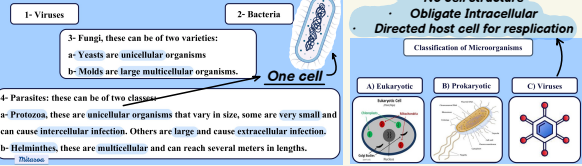
- Microorganism must be present in every case of the disease.
- Organism must be grown in pure culture from the diseased host.
- Inoculation of above into host must give same disease.
- Organism must be recovered from experimentally infected host.

Alexander Fleming : physician and microbiologist, his best known discovery the world's first broadly effective antibiotic (**Penicillin G**) from the mould **Penicillium rubens** in 1928.

Kary Mullis: biochemist invent **Polymerase Chain Reaction (PCR) technique**.

Zur Hausen : virologist ,He has done research on cancer of the cervix, where he discovered the role of **Papilloma viruses**, This research directly made possible the development of a vaccine **HPV**.

** There are four classes of organisms that can cause disease:



Characteristics	Prokaryotic Bacteria	Eukaryotic Fungi- Protozoa - algae
Nucleus	No true nucleus	True Nucleus
Size	(0.05 - 10 μm)	(10 - 100 μm)
Nuclear membrane	No (nucleoid)	Yes (nucleus)
Membrane bound organelles	Absent	Present
Chromosome number	One (circular)	Multiple (linear)
Ribosomes	70S(30S-50S)	80S(40S-60S)
Cell wall	Present EXCEPT mycoplasma	Absent EXCEPT fungi (chitin)
Cell membrane	No sterols EXCEPT in mycoplasma	Has sterols
Division	Binary fission	Mitosis

Viroids: -ssRNA, circular -without protein coat Infect plants -smaller than virus

Prion : (Infectious) -Protein without nucleic acid -Misfolded protein :Alphahelix's is converted into beta pleated sheet -Aggregation of prion in CNS

1.Spongiform in the brain Creutzfeldt-Jakob disease (CJD) in humans 2.Mad cow disease Bovine spongiform encephalopathy (BSE or mad cow disease) seen in cattle,

