



MICROBIOLOGY

Single Celled Organism

- A unicellular organism, also known as a single-celled organism, is an organism that consists of only one cell.
- Unicellular (one celled) organisms are good models for membrane transport, because they need to perform many functions with one cell, rather than many types of cells
- In single-celled organisms, all life processes are carried out in just one cell.



Classification

Two groups on basis of presence and absence of nucleus.

- Prokaryotes: organism which do not have well defined nucleus and genetic material lies scattered in cytoplasm.
- Eukaryotes: organism which have well defined nucleus and genetic material lies in cell enclosed by nuclear membrane.

Prokaryotes

- It can be divided as:-
 - a) Archaeobacteria/ Extremophiles :- Have capability to survive under extreme condition.
 - b) Eubacteria :- Unicellular bacteria are categorized under this head.

Eukaryotes

It can be divided as:-

- Protozoa:- Unicellular Eukaryotes.
- Protistia:- Multicellular organism and is further subdivided on the basis of mode of nutrition and movement.
 - a) Fungi
 - b) Plantae
 - c) Animalia

Strains

- A population of organism which is considered of having descended from a single organism which can vary in structure or metabolism.
- It is of 3 types:-
 - a) Biovars:- Differ in biochemical or physiological characteristics.
 - b) Morphovars:- Vary in morphology (deals with the form of living organisms).
 - c) Serovars:- Vary in antigenic properties.

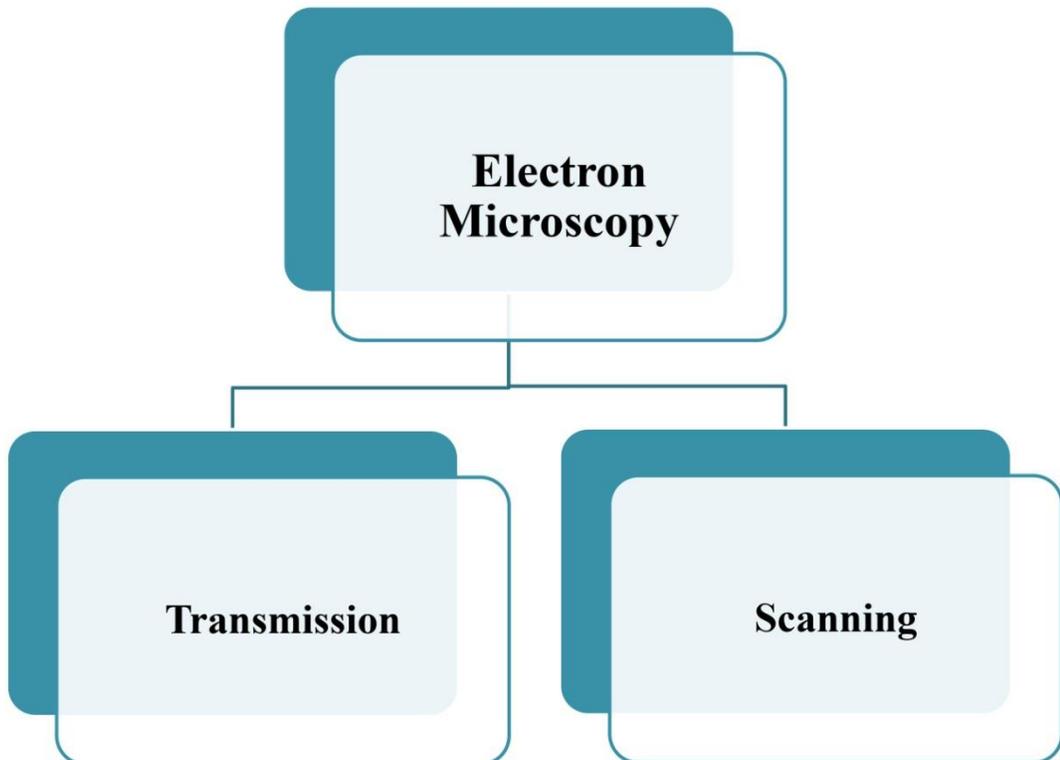
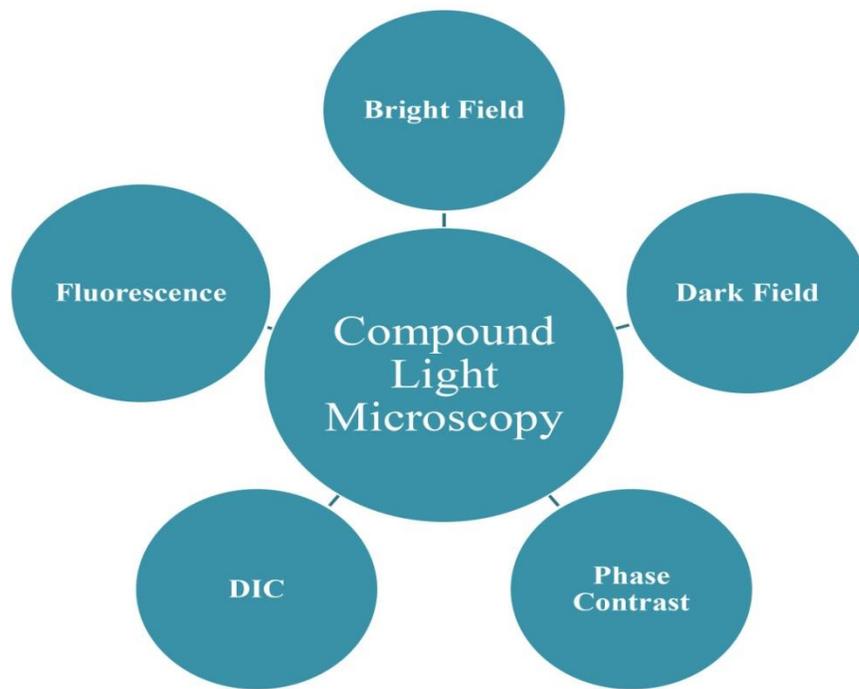


Microscopy

- **Microscopy** is the technical field of using microscopes to view objects and areas of objects that cannot be seen with the naked eye (objects that are not within the resolution range of the normal eye).

Types of Microscopes

- It can be further divided into following types:-
 - a) **Light Microscopy**:- Uses visible light to observe a specimen.
 - b) **Electron Microscope**:- it uses beam of electron while using electromagnets to focus the electron beam.



Sterilization

- The process of killing or removing bacteria and all other forms of living micro-organisms and their spores from preparation.
- Essential concept in the preparation of sterile pharmaceutical products.



Importance of Sterilization

Medical Sterilization

- **Prevents the Growth of Diseases:** In any medical tool/device used, bacteria comes onto it. If left unchecked or not disinfected properly, it is highly likely that bacteria will grow.
- **Prevents the Spread of Diseases:-** If surgical equipment is not properly sterilized, patients treated are exposed to a disease the previous patient had.
- **Prevents Double Surgeries:-** If unsterilized equipment is used, it can cause an infection leading to another surgery later on in order to remove it. This is costly and can cause many life-threatening complications.

Method of Sterilization

THREE METHOD :-

- Physical method
 - a) Dry heat sterilization:- Damages microbes by oxidizing molecules.
 - b) Moist heat sterilization:- By disrupting bonds.
 - c) Sterilization by radiation (gamma radiation)
- Chemical method
 - a) Gaseous sterilization
 - b) Sterilization by disinfectant
- Mechanical method
 - Pass through bacteria-proof filter

Physical method

ADVANTAGE

- No significance rise in temperature
- Continuous process due to short exposure time.

DISADVANTAGE

- May lead to color change.
- Solubility of preparation leading to decomposition of certain materials.



Chemical method

Advantage:

- It has penetration power quite useful for sterilizing surgical instruments (such as catheter, needles, plastics, disposables)

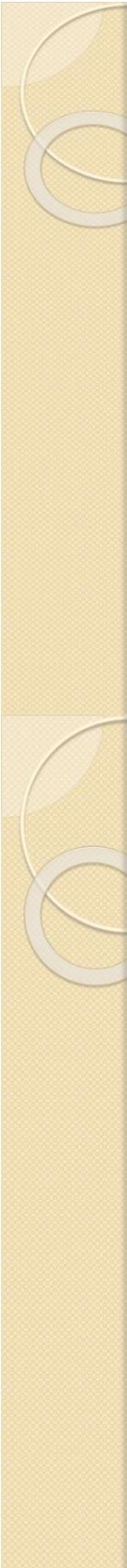
Disadvantages:

- Very slow sterilization process
- Very costly equipment

Effects of Sterilization

There are 3 effects:

- Gamma radiation sterilization of medical device is common but irradiation effect at 2.5 mega rad on a bone replacement material when started and modified property when investigated by Creep test.
- Irradiation increase Creep resistance of material with the formation of crosslink and then increase in crystallite respectively.
- Biodegradable materials sterilized by gamma radiation may be associated with some advance effect.



Microbial Cultures

- Identification and growth of micro organism requires an artificial medium containing nutrients and other physical growth parameters is called culture medium

Types of Culture Media

It can be divided into two types:-

- On the basis of consistency
- On the basis of composition or nutritional factor
- On the basis of use or application



Microbial Ecology

- Study of microbes with living & non living environment around it.
- It can be differentiated into two types:-
 - a) Microbial Interaction
 - b) Interaction of these organism with each other and with the non living physical environment.