Sterilization Process

- Sterilization process may be defined as any process that removes , kills or deactivate all forms of life and all other biological agents like bacteria , fungi etc .
- Sterilization may be achieved by following methods

1.Physical Methods 2. Filtration or Mechanical Methods

3.Radiation Methods 4. Chemical Methods

5.Ultrasonic Methods

1.Physical Methods :-In Physical methods various physical agents like moist heat, dry heat and flame are used to sterilized lab wares and culture media .

- **Moist heat sterilization** : It is carried out in autoclave or simple pressure cooker . Moist heat at 121^{o} C and atmospheric pressure of 15 psi for 20-30 min.
- **Dry heat sterilization** : It is achieved by an electronic oven .Dried glass wares like , Petri dishes, pipettes are dry heat sterilized at 160^{o} to 180^{o}C for 30min.to $1^{1/2}$ hrs. in an oven.
- **Flame** : During lab exercises , glass rod or inoculation loops are flame sterilized by Bunsen burner or spirit lamp.
- **Pasteurization** : It is same as sterilization . The purpose of pasteurization is to reduce the population of bacteria a liquid such as milk. Milk pasteurization involves heating the milk at 62^{0}-72^{0}C for 30 min

2.Filteration or Mechanical Methods : Filtration methods are used to sterlize some heat- sensitive solutions such as stock solutions of amino acids , vitamin and antibiotics etc.

3.Radiation : Radiant energy of UV light is useful for controlling microorganisms. UV light has wavelength b/w 100-400 nm. With the energy at 265 nm is ,most destructive to bacteria .

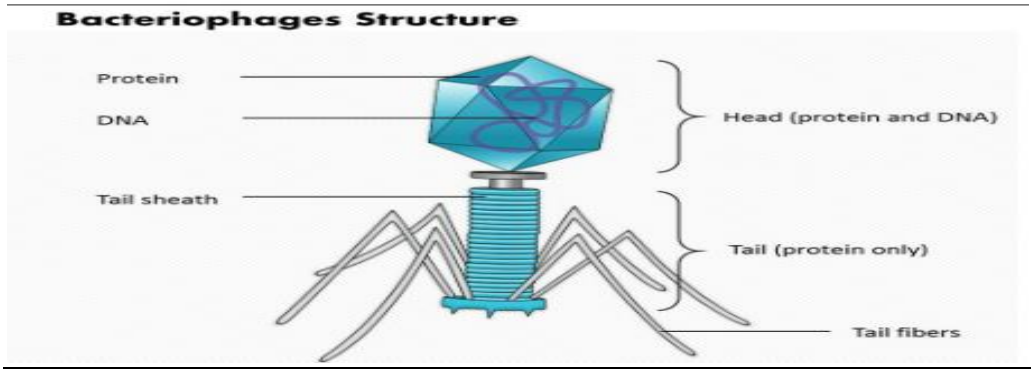
4.Chemical Methods : Various chemicals are used as sterilization agents in a microbiology laboratory eg. Ethanol is used for surface sterilization of working area of Laminar Air Flow and working hands. $HgCl_2$ (1-2%) is used for surface sterilization of seeds etc .

5.Ultraarsonic methods : Ultrasonic vibrations are high – frequency sound waves beyond the range of the human ears . Many research laboratories use ultrasonic probes for cell disruption and as clearing agent .

BACTERIOPHAGE

- A bacteriophage is a Virus that Infects a bacterial cell and reproduces inside it .
- It is made up of two words Bacterio means Bacteria and Phage refers to eater.
- The Discovery of bacteriophage one Century ago by the French – Canadian Felix d' Herelle.
- They are mostly found on Land , in water, within any form of life harboring their target.
- Actually , William To wart first discovered in 1915.
- Bacteriophage have either DNA OR RNA their genetic material.

- Bacteriophage are virus that infects bacteria but they are harmless to humans but sometimes they cause Various human chronic disease Particularly Parkinson disease & obesity.
- Bacillus megaterium phage G is the largest bacteriophage which has a head of 160nm in diameter .
- The Scientific name of bacteriophage is duplodnaviria virus .
- Sewage is a rich source of bacteriophage which infects bacteria like E- coli.



Algae

- The algae are all those chlorophyll bearing organisms which are thalloid i.e having no true roots , stem and leaves.

Occurrence

- Algae are mainly aquatic freshwater or marine and found in moist places but algae are found in variety of habitats which can be as follows.
  1. Aquatic Algae They can be freshwater or marine
     - **Freshwater forms** :- Freshwater formsare found in water of low salinity such as ponds, lakes & river. Eg- chlamydomonas , volvox
     - **Marine forms** : The algae found in sea water of high salinity are called marine algae.

     Eg- Chlorophyceae(Ulva), Phaeophyceae(focus) and Rhodophyceae(Gelidium).
  2. **Terrestrial Algae :** Algae growing on moist soil surface , stones and rocks are called terrestrial algae . The Algae growing on surface of soil are called saphophyte
     eg- Euglena
  3. **Lithophytic Algae** : Algae growing on moist surface of rocks and stones are called Lithophytic Algae eg- nostoc
  4. **Halophytic Algae** : The Algae Growing in water of high concentration of salts in salt lakes called halophytic algae Eg- Dunaliella
  5. **Thermophytic Algae** : The Algae grow in water of high temperature where other plants cannot grow . the blue green algae eg- Oscillatoria terebriforms .
  6. **Cryophytic Algae** : Algae growing on snow and ice are called cryophytic algae. These algae impart special colours to snow due to their pigments .eg – Haemotococcus nivalis (red snow algae).
  7. **Epiphytic Algae** : The Algae growing on other larger algae , bryophytes and angiosperms are called epiphytic eg- Oedogonium.
  8. **Epizoic Algae**: The Algae grow on animals like snails , fishes and aquatic animal are called epizoic .
  9. **Endophytic algae** : Algae growing inside other plants are called endophytic algae .

10. **Endozoic Algae** : Algae found inside other plants(Hydra) are called endozoic algae.
11. **Parasitic Algae** : Algae are also found growing as parasite on plants and animals.
12. **Symbiotic Algae** : some algae of Cyanophyceae and Chlorophyceae are found in symbiotic association with other plants .

Fungi

- The Fungi are nucleated , spor bearing achlorophyllous organisms which generally reproduce sexually & filamentous branched somatic structures are typically surrounded by cell walls containing cellulose or chitin or both.
- The study of fungi is called Mycology
- Father of Modern Mycology – **Anton De Bary** & Father of Indian mycology – **E.J Butler** .

General Characters

- Fungi are achlorophyllous , non photosynthetic and heterotrophic in nature . The fungi may be parasite or saprophyte
- The plant body of fungi manily consist of branched and filamentous hyphae which form net like structure called mycelium.
- The cell wall is made of chitin a fungal cellulose polymer of n-acetyl glucosamine except Oomycetes in which cellulose and glucose are present in cell wall.
- The reserve food material is in form of oils , fats and glycongen the starch is absent .
- The mode of reproduction are vegetative , asexual and sexual.
- Fungi exhibit progressive simplicity in sexual reproducation there is reduction of sexuality in higher forms.
- The fungi are cosmopolitan in distribution , most of the fungi are terrestrial but some are aquatic eg- Phycomycetes.

Lichens

- A lichen is not a single organism but a symbiosis among different organisms like fungus and a cyanobacterium or algae. Cyanobacteria are also referred to as blue-green algae despite the fact of being distinct from algae.
- The fungi component is usually an ascomycete called mycobiont & the non fungal partner or alga is called the phycobiont.
- About 20,000 species of lichens are known worldwide.

General Characters of Lichens

- Lichens posses thallophytic plant body , irregularly shaped and often deeply pigmented .
- They are symbiotic organisms of algal and fungal component
- The colouration is due to the pigmentation of algal partner.
- The algal partner belongs to either blue – green algae like Nostoc
- They grow in areas where either fungi or algae could not survive alone like rocks ,rooftops trees and newly exposed soil.
- They occur worldwide and can grow in the extremes of temperature and heat .
- They grow very slowly , secrete specific acid known as lichen acid that breakdown rocks.
- They accumulate nutrients needed for plant growth.

- They are sensitive to air pollution especially sulphur dioxide therefore absent in and around large cities .

Disease

- Plant disease is a physiological disorder or structural abnormality that is harmful to the plant.

It is two types as following

1. **Biotic or infectious plant disease**
   - These disease are caused by any biotic or living organism.
   - Disease cause by fungi
   - Disease cause by bacteria or mycoplasma
   - Disease cause by parasitic angiosperms and green algae
   - Disease cause by viruses, viroids
   - Disease cause by nematodes
   - Disease cause by protozoa
2. **Abiotic or non infectious plant disease**
   - Disease cause by higher fluctuation in temperature
   - Disease cause by unfavourable climatic condition like relative humidity , rain and snow , wind air pollution .
   - Disease cause by unfavourable soil condition such as lack or excess soil moisture etc.
   - Disease cause by nutrient deficiency and mineral toxicity.
   - Disease cause by chemical or mechanical injury.
   - Disease cause by improper culture practices.

Early Blight of Potato

Disease : Early Blight

Host : Potato (Solanum tuberosum)

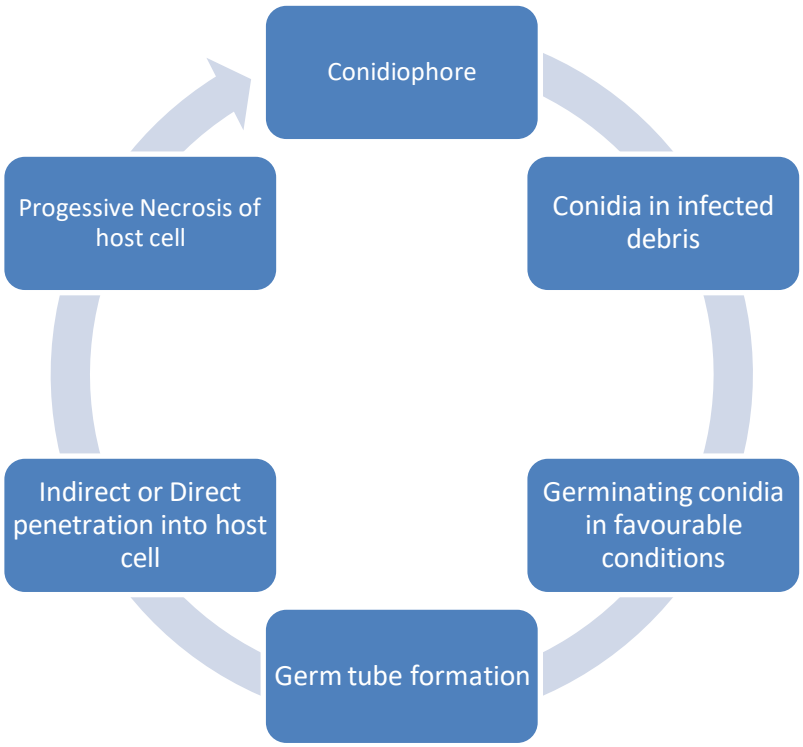
Pathogen : Alternari solarni

Early Blight of potato is a common foliage disease of potatoes. It is of common occurrence both in cold as well as in warm regions in India .

Symptoms : The symptoms appears on leaves in the foem of small , oval scattered , pale brown to adrk spots of 3-4 nm in diameter

Causal organism : Early bright of potatoes is caused by fungus Alternaria Solani a form species of Deuteromycetes.

Disease Cycle



Control Measures : Weakly spray of Bordeaux mixture and Dithane M- 45 are also very effective fungicides against early blight.

Biofertilizers

- Biofertilizers can be defined as biological products containing living microorganisms , that when applied to the soil ,seed or plant surfaces , promote growth by several mechanisms such as by increasing the nutrients supply , increasing biomass or root area and increasing nutrient uptake capacity of the palnt .

Types of Biofertilizers

- Symbiotic nitrogen fixing bacteria eg- Rhizobium
- Non Symbiotic nitrogen fixing bacteria eg- Azotobacter
- Algal biofertilizers eg- Nostoc
- Phosphate – solublizing bacteria eg- Bacillus
- Mycorrhizae