GENERAL BIOLOGY

1St. Stage | Lec. 10 & 11 | 2nd. course

STERILIZATION AND ANTIBIOTIC

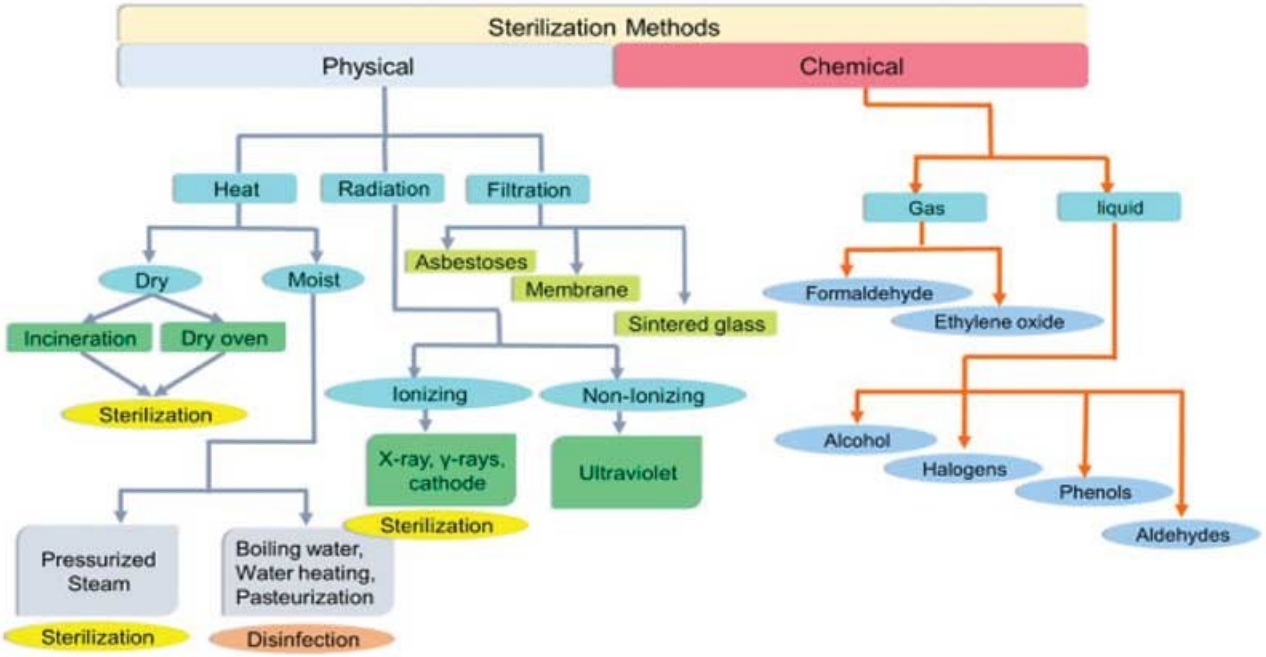
BY
DR. MOHAMMED AL-MURIB

Definition :

Sterilization: Is a process that removes, kills or deactivates all forms of microorganisms, and its important in :

1. Hospital, clinic and surgery operation.
2. food industry.
3. Home, Kindergarten, School and university.
4. public transit station and airport.
5. Restaurant, hotels and supermarket.

Methods of Sterilization



Physical methods of sterilization

Physical methods of sterilization

The Biology Notes

Heat Sterilization

Moist Heat Sterilization

- At temperatures below 100°C
- At a temperature of 100°C
- At temperatures above 100°C

Dry Heat Sterilization

- Red Heat, - Flaming, - Incineration
- Infrared radiation, - Hot air oven

Filtration

- Filtration sterilization of liquids
- Filtration sterilization of gases

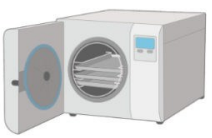
Irradiation

- Ultraviolet (non-ionizing) radiation
- Ionizing Radiation

Sound (sonic) waves

Pressure (Pascalization)

Sunlight (Solar Disinfection)



Physical methods of sterilization

I. Heat

Heat sterilization is the most effective and widely used method of sterilization.

1. Moist heat sterilization

Moist heat sterilization is one of the most effective methods of sterilization where the steam under pressure acts as a bactericidal agent. It had 3 degrees:

above 100°C temperatures Ex: autoclave where the water boils at 121°C at the pressure of 15 psi for 15 min.

At 100°C temperature Ex: boiling water for 30-40 min.

below 100°C temperatures Ex: pasteurization proces of milk use 63°C for 30 min.

Physical methods of sterilization

I. Heat

2. Dry heat sterilization

Dry sterilization is the process of removing microorganisms by applying moisture-free heat which is appropriate for moisture-sensitive substances. Ex: oven dry heat sterilization use temperatures in the range 160–180°C of up to 2 hours.

Physical methods of sterilization

II. Filtration

Filtration is an effective and reasonably economical method used to sterilize heat-sensitive fluids, and air. It is particularly useful for solutions containing toxins, enzymes, drug, serum and sugar solutions.

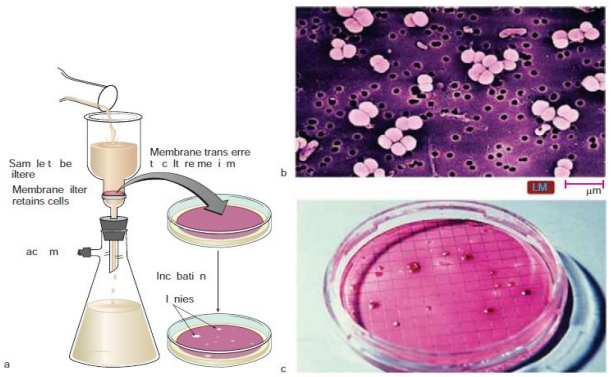


Figure 4.5: (a) Membrane filter apparatus (b) Light microscope image of microorganism filtered through membrane filter (c) Membrane filters showing microbial colonies on culture media

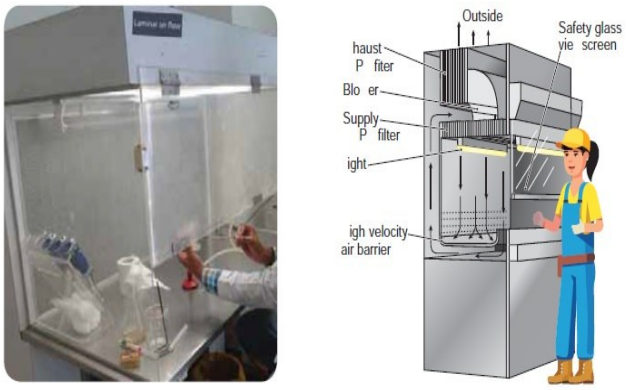


Figure 4.7: Laminar air flow

Physical methods of sterilization

III. Irradiation

Irradiation is the process of exposing surfaces and objects to different kinds of electromagnetic radiation, the major target for these radiations is microbial DNA.

There is two types of **radiation:**

1. **Ultraviolet (non-ionizing) radiation:**

UV radiation used for treatment of manufacturing-grade water.

2. **Ionizing Radiation:**

X-ray and gamma rays are the commonly used ionizing radiation for sterilization, used for sterilized laboratory and surgery instruments and rooms.

IV. Sound (sonic) waves Vibration

Sonic waves can be used as bactericidal agents which employ ultrasound (usually from 20–40 kHz) to vibrate a fluid. Its used for to clean dental instruments.

Physical methods of sterilization

V. Pressure (Pascalization)

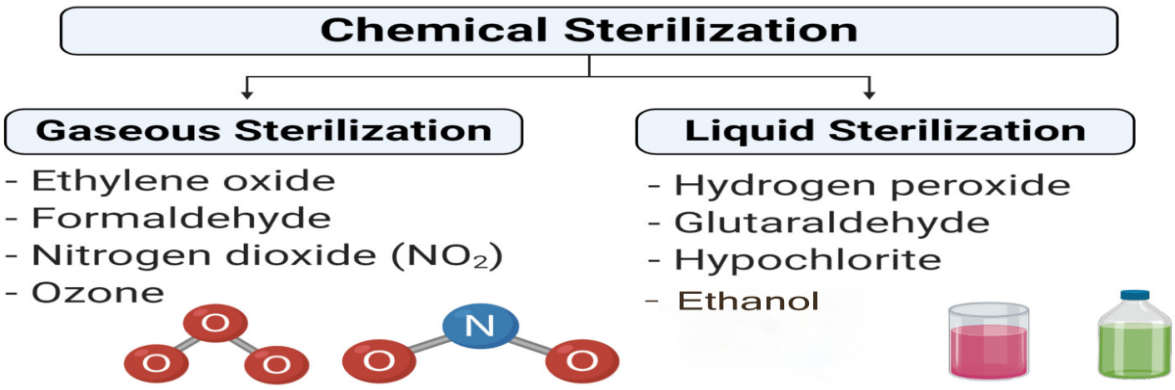
Pascalization or High-Pressure Processing (HPP) is a method employed for preservation and sterilization of food

VI. Sunlight (Solar Disinfection)

Solar disinfection is a process used for the removal of microorganisms with the help of sunlight. This process is commonly used to purify or disinfect drinking water.

Chemical methods of sterilization

Chemical Sterilization is the process of removal of microorganisms by the use of chemical bactericidal agents.



Ozone used for Sterilize drinking water

Ethanol used for Sterilize hands,

ANTIBIOTIC

chemical substance produced by a living organism, that is detrimental to other microorganisms, and it useful in preventing or treating disease include the bacteria and the fungi. Antibiotics commonly produced by :

1.Streptomyces spp.: produce (Tetracyclines, Chloramphenicol, Erythromycin, Kanamycin, Nystatin, Rifampin, Streptomycin,)

2.Micromonospora: produce (Gentamicin)

3.Bacillus:Produce (Bacitracin, polymxins)

4.Fungi: *Penicillium* : produce (pencilin)
Cephalosporium: produce Cephalosporins

Mechanisms action of Antibiotic

Mechanisms of action	Agent
Inhibition of synthesis or damage to cell wall	Penicillins Glycopeptides Cephalosporins Monobactams
Inhibition of synthesis or damage to cytoplasmic membrane	Polymyxins Polyene antifungals
Inhibition of synthesis or metabolism of nucleic acids	Quinolones Rifampin Nitrofurantoins
Protein biosynthesis	Tetracyclines Chloramphenicol Macrolides Lincosamides Aminoglycosides
Modification of energy metabolism	Sulfonamides Trimethoprim Dapsone