

Lab 2 : Sterilization

Sterilization and **disinfection** are the basic components of hospital infection control activities. A physical or chemical process that completely destroys or removes all microbial life, including spores. (from surface, article & culture media).

- **Disinfection** : It is killing or removing of harmful microorganisms.
- **Disinfectant** : Products used to kill microorganisms on inanimate objects or surfaces.
- **Decontamination**: is the process of removal of pathogenic microorganisms from objects so that they are safe to handle.
- **Cleaning**: is defined as removal of visible soil (e.g., organic and inorganic materials) from the surfaces and objects. Technically, it achieves minimum reduction of ≥ 1 log CFU of microorganisms.
- **Antisepsis**: is a process of removal of germs from the skin. When it is related to the patient's skin, it means disinfection of living tissue or skin. When it is related to the health care worker, it means reduction or removal of transient microbe from the skin.
- **Germicide**: It is the agent that destroys germs. It includes both antiseptics and disinfectants. The type of microorganism is identified from the prefix (e.g., virucide, fungicide, bactericide, sporicide, and tuberculocide).

❖ Method of Sterilization :

1- Physical Methods:

- A. Heat (**Dry heat** & **Moist heat**)
- B. Radiation (**Non-ionizing radiations** & Ionizing radiations).
- C. Filtration (Bacterial filtration)

2- Chemical Methods : Phenols , Alcohols , Halogens , Heavy metals , Soap & detergents , Gaseous agents

A – Sterilization by Heat: Most of common methods

1 - Dry heat

- ❖ **Flaming**; Simplest method is exposing the item to be sterilization to the naked flame e.g. **Bunsen burner** for sterilization bacteriological **loops**.
- ❖ **Short time flaming**; The tools to be sterilized are passed for a short period without reaching the degree of redness, as in the case of flaming the opening of **tubes, flasks and pipettes**.



- ❖ **Hot air oven**; expose to 160 c for 1 hour. It has the chamber with source of heat plus a fan to circulate air for even distribution of heat in chamber. (used for metals, Glassware).

2- Moist heat; Uses hot water. Moist heat kills microorganisms by denaturing proteins.

- A. Boiling common spatially in domestic circumstances.
- B. Tyndallization; named after Jon Tyndall. Lengthy process designed to reduce the level of activity of sporulating bacteria which the simple boiling method cannot get rid of it.

A- Tyndallization Define; The process involves boiling for period (typically 20 minutes) at atmospheric pressure, Colling, incubating for a day: boiling cooling, incubating for a day: boiling, cooling, incubation for a day and finally boiling again.

The three incubation periods are allow heat resistant spores surviving the previous boiling period to germinate to from the heat – sensitive vegetative (growing) stage, which can be killed by the next boiling step.



Mahmood Yaseen Mukhlif
Practical Microbiology – 2nd stage
Department of Medical Laboratory Technology



B- Pasteurization; It aims to reduce the number of viable pathogens on liquids so they are unlikely to cause disease. It used heat temperatures sufficient to inactivate harmful organism in milk.

- 72 C for 15-20 seconds (Flash method)
- 62 C for 30 minutes (Holders methods)

C-Autoclaving; Standard sterilization method in hospitals. The Autoclave works under the same principle as the pressure cooker where boils at increased atmospheric pressure i.e. because of increased pressure the boiling point of water is > **100C**.

Radiation

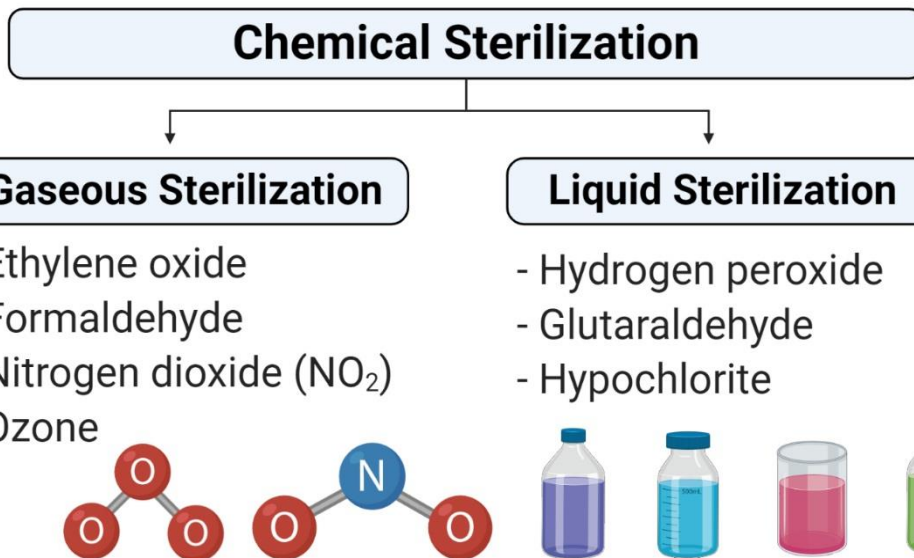
1 – Non –Ionizing radiation; U.V. light, has limited sterilization power because of poor penetration into most materials.

2 - Ionizing radiation; Gamma radiation, used mainly in industrial facilities e.g. Sterilization of disposable plastic syringes, gloves, specimen's containers and petri dishes.

- ❖ **Filtration**; May be done under either negative or positive pressure. Best known example is the membrane filter made from cellulose acetate. Generally, removes small bacteria.

2 – Chemical Methods

The effect of chemical agents is either killing bacteria or inhibiting their growth.



Types of Chemical Methods

❖ Phenol and phenolic

phenols break down the cytoplasmic membranes of the bacterium, which leads to the cell contents leaking out at low concentration and cause protein clotting in high concentrations.

❖ Alcohol

its mechanism of action is to change the nature of the protein inside the cell, in addition to dissolving fatty substances in the bacterial cell membrane.

❖ Halogens

An example chlorine and iodine, its mechanism of action is the oxidation of the proteins of the bacterial cell and thus it is death.

❖ Heavy Metals

An example Mercury & Silver, its mechanism of action is to inhibit protein and thus the death of the germ cell.

❖ Soaps and Detergents

An example Quaternary ammonium compounds, its mechanism of action is attacking the cell membrane of bacteria and dissolving lipids.

❖ Gaseous agents

An example Formaldehyde and Ethylene oxide, its mechanism of action is breaking down nuclear material.

classification of Sterilization

