



Sterilization

The complete killing of all forms of living organisms including bacterial spores.

Disinfection:

The Killing of pathogenic microorganisms from objects.

Disinfectant:

A chemical agent used to destroy pathogens on non living objects. .

Antiseptic:

A chemical substance (disinfectant) used to destroy M.O. that is safe to use on living tissues.

Asepsis:

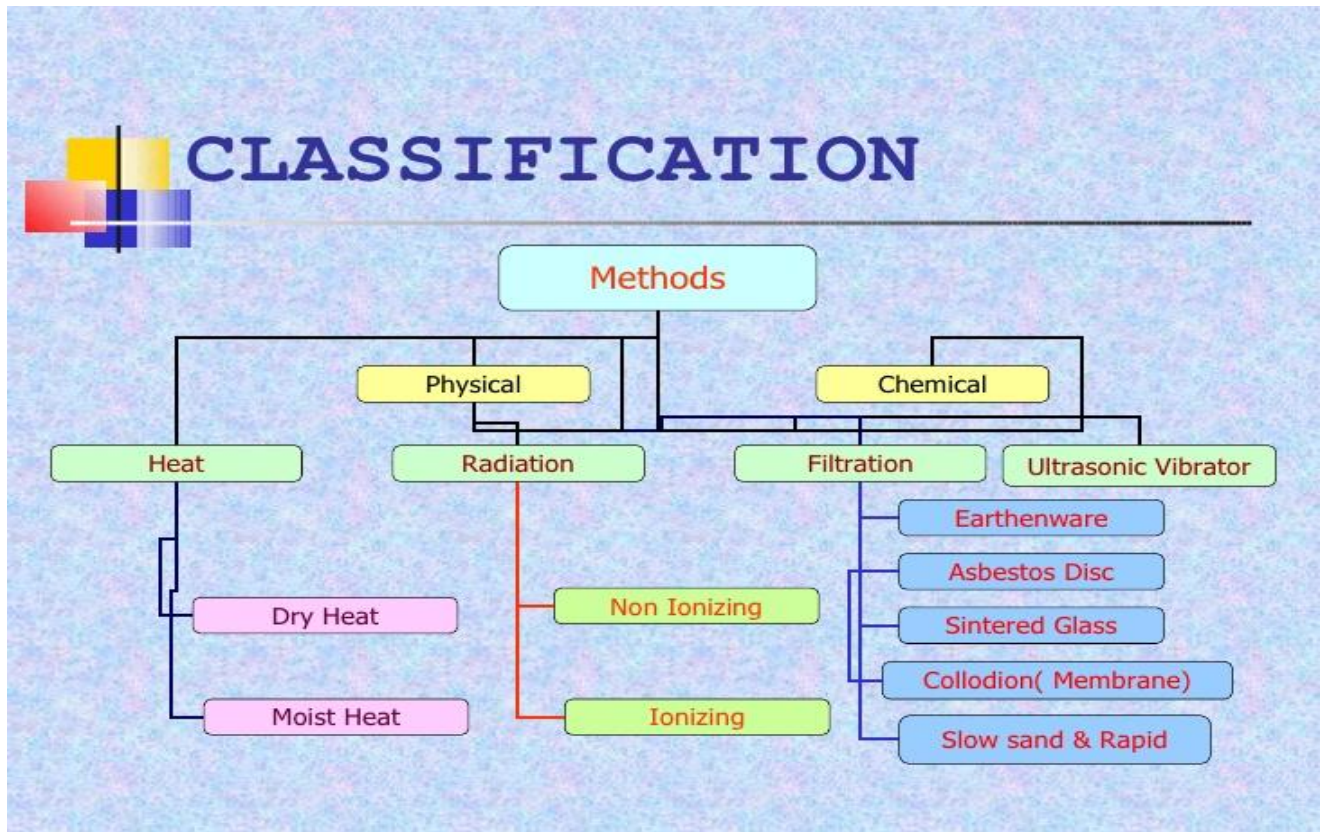
Absence of pathogenic M.O. on living tissues.

Sanitization:

Reduce the No of M.O on objects and from environment to a safe level accepted by public health organization (Sanitary condition) .

Suffixes: Added at the end of words.

- Cidal: is added when **a killing action** is meant ex: Bactericidal.
- Static: Is added when the **organism is inhibited** from multiplication ex. Bacteriostatic.



PHYSICAL METHODS OF CONTROL

Method	Object sterilized
<p>Heat</p> <p>1-Dry Heat :</p> <p>a) Hot Air oven 160°C for 1 1/2 hours -180°C half an hour.</p> <p>b) Incineration : Fire temperature > 300°C .</p>	<p>Glass ware, metals instruments.</p> <p>Destroy not need objects as dead bodies and turn them to ashes.</p>



<p>c) Flaming</p> <p>d) Red hot method –</p> <p>2-Moist Heat : better than dry heat</p> <p><u>Above 100 °C</u></p> <p>a) Autoclave :</p> <p>121°C for 15min -pressure 15 pound /inch²</p> <p><u>Below 100 °C</u></p> <p>a) Vaccine → 60 °C /for1 hr.</p> <p>b) Pasteurization :</p> <p>63 °C for 30min (LTHT)</p> <p>72 °C for 15 Sec (HTST)</p> <p>83 °C → momentary (flash) followed by rapid cooling.</p>	<p>- metal (scissor – scalpel & mouth of test tube & Flask).</p> <p>platinum loop – platinum wire.</p> <p>Surgical dressing, metallic instruments, gowns, any articles not heat sensitive, fluids.</p> <p>Media not contain (milk – gelatin – sugar).</p> <p>Vaccine</p> <p>Kill pathogens in milk and other fluids as juices.</p>
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At 100 °C:

- Boiling for metals and glass syringes
- Tyndallization : 100 °C for half an hour intermittent for 3 successive day for sterilization of media (Sugar , milk gelatin).

2- Filtration :

Physical removal of microorganisms from liquids and air. It does not kill microorganism.

Fluid (Air or liquid) are allowed to pass through fine filters with pores that permit ant passage of fluid but traps M.O filters include cellulose acetate membrane filters.

Cellulose acetate membrane filters made of various pore sizes ranging from 8mm +0 0.25 μm . Pore size of 0.22 μm is effective for removing bacteria, however **some viruses and mycoplasma can pass through it.**

uses: liquids as : Serum , sugar sol, protein

Applications:

- **Sterilize heat sensitive liquids as serum, sugars , drugs and proteins.**
- Separate drugs and proteins.
- Filter air to remove airborne contaminants .



Sartorius – membrane filter – syringe filter – Seitz.

Ultrasonic cleaners : Mechanical cleaning very high frequency sound waves super and ultra sonic . It creates strong .

3-Radiation :

Energy in the form of electromagnetic waves and particles that are transmitted through space.

*** Mode of action:**

Damage to DNA → death or mutation.

Also can form free radicals ($\text{OH}^- + \text{HO}_2$) which are toxic to cells.

Two types of Radiation:

Ionizing radiation **γ-rays , X-rays** with **short (λ) wave length** , high energy **strong penetration power**. Used to sterilize heat sensitive items.

As: Antibiotics, drugs , tissue grafts , vaccines , Rubber gloves, plastic products as petri-dishes, syringes, catheters .. Canned food, Fresh meat , poultry.

Nonionizing : U. V . Light:

Has moderate (λ) , low penetration power used for disinfection of smooth surfaces , air ..

- Reduction of M.O of air in clinics hospitals , industry , food preparation areas. Food storage areas.



Ex. Germicidal Lamp



Chemical Agents used

To control microorganisms.

Antiseptic and disinfectants :

- 1- Alcohols .
- 2- Halogens
- 3- Heavy metal ions " Mercuric compounds silver nitrate eye drops".
- 4- Phenolic compounds .
- 5- Detergents . surface active agents.
- 6- Alkylating agents.
- 7- Dyes.
- 8- Oxidizing agents . Hydrogen peroxide (H_2O_2).
- 9- Acid & Alkalies.

1- Alcohols : (Not effective in presence of organic matter) :

Ethanol + Isopropyl alcohol not effective against bacterial endospore .

Mainly used against vegetative bacteria, fungi and most viruses .

Mode of action : Cytotoxic to microbial cell.

Disruption of cell membrane.

Uses :

- Antiseptic at a concentration 70-75% to disinfect the skin.
- Disinfection of thermometers.



- Disinfection certain surgical instruments.
- Needles and syringes by soaking but not much reliable.

2- Halogens : (Oxidizing agents) :

Chlorine (Cl) , Fluorine (F) , Bromine (Br) Iodine (I) not effective in presence of O.M.

Mode of action : Inactivate enzymes . Oxidize cellular components.

Chlorine :

Used as a disinfectant of water (0.5-1ppm) swimming pools. Used as a gas or liquid form.



- **Bleaching agent** in form of hypochlorite (ClO^-) in 50% solution as **chlorox**.
- Disinfecting hemodialysis material at a concentration soop against hepatitis B virus.

Disadvantages : Corrosive to metals + skin.

Iodine :

5% solution , used as an **antiseptic for wounds**.

- **Tincture iodine** (iodine + 70% alcohol) .
- **Betadine** (providine or iodophore) where surface active agents.
Are added . very effective .

Disinfect : Patient's skin before surgery . Cleaning of wounds.



3-Phenolic Compounds : Bactericidal or bacteriostatic depending on the concentration . But toxic or corrosive to skin gives brown stain.

Action : Coagulate proteins.

- Enzyme inactivation.
- Disruption of cell membrane.

Effective against vegetative bacteria including M. tuberculosis, fungi and enveloped viruses.

- Disinfectant of walls + floors .. (Lysol , gresol) .
- Chlorohexidine : phenol derivative effective against gram (+ve) + (-ve) bacteria added to soaps for hand washing before surgery.
- Hexachlorophene effective against S.aureus but toxic → Brain damage.
- **Effective in presence of O.M.**

Detergents (Surface active agents) :

Organic molecules which dissociate in water into anionic or cationic molecules and these are germicidal. But some are non ionic and these are not germicidal.

Action : - Disrupt cell membrane activity .
 - Bind to organic materials.

Main function is cleaning of surfaces by removing microorganism and organic materials.

- Bactericidal against vegetative bacteria fungi + some viruses (Quaternary ammonium compounds).



Oxidizing agents : e.g. H_2O_2 hydrogen peroxide – $KMnO_4$

(Pot . Permanganate).

M.O.A = oxidation of m.o

Use → antiseptic .

Not act well in the presence of O.M.

(9) Acid & Al Kalies :

M.O . A : Affect the hydrogen ion conc (pH).

N.B. Mycobacterium is extreme resistant to pH change.

e.g.

- Acetic acid – Benzoic acid (Preservative) Lactic acid → Sour milk.
- Boric acid & picric acid → Antiseptic of wound.
- Sodium hydroxide & Potassium hydroxide → use in soaps.