

Sterilization and Disinfection



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Definitions

- **Sterilization:** Removal or killing of all forms of living microorganisms including bacteria and their spores.
- **Disinfection:** Removal or killing of harmful microorganisms (not necessarily all microorganisms).
- **Bactericidal:** A substance that kills bacteria.
- **Bacteriostatic:** A substance that inhibits growth of bacteria
- **Disinfectant:** Chemicals used for sterilization of inanimate objects. They are toxic to the living tissues and cells.
- **Antiseptics:** Chemicals used for lowering down of microbial load on living surfaces like skin, mouth etc. They are non toxic to the living tissues and cells.

Methods of sterilization:

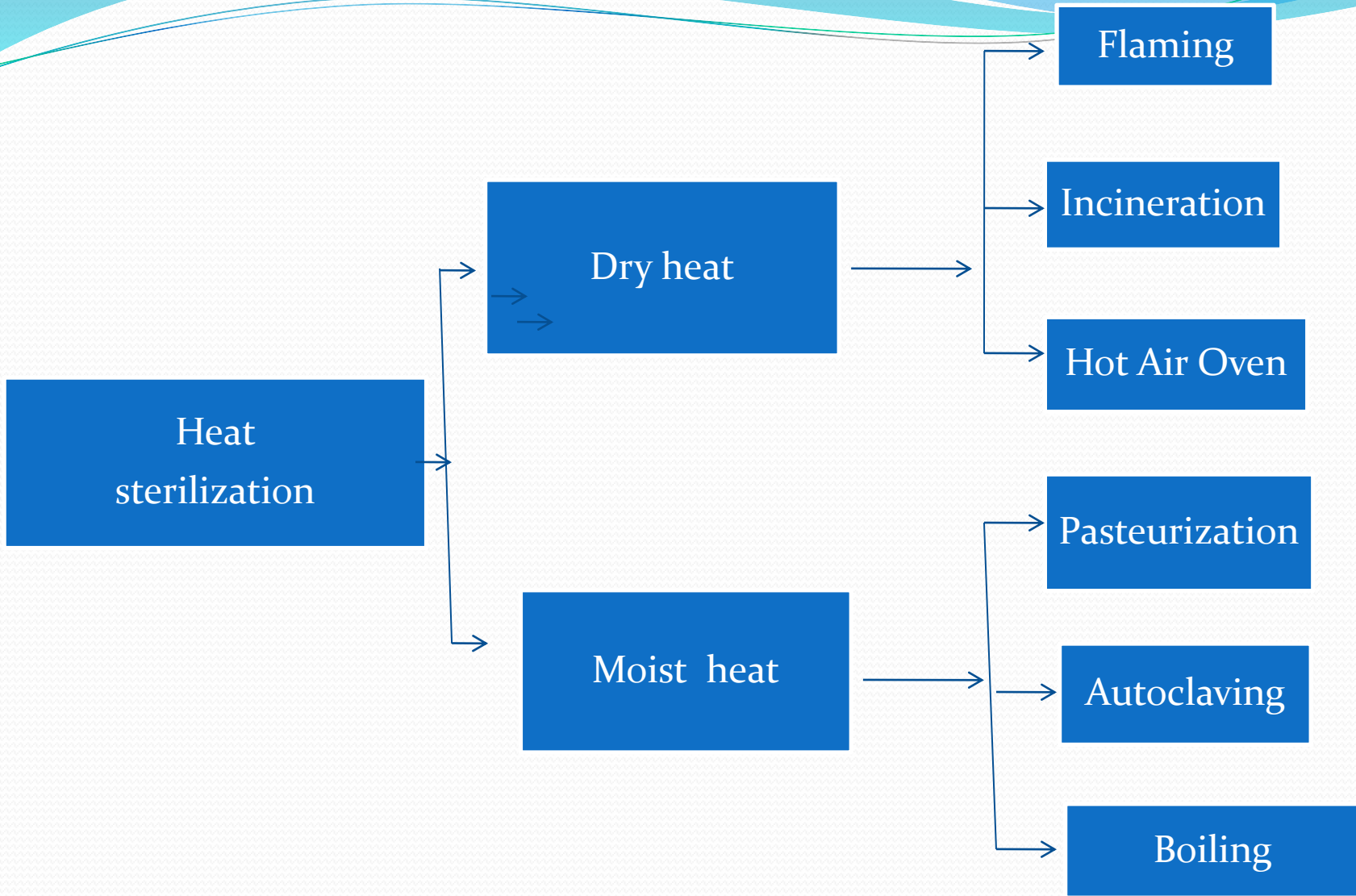
- There are two methods of sterilization:
 - A- Physical methods:
 - 1. Heat
 - Dry Heat
 - Moist Heat
 - 2. Filtration
 - 3. Irradiation
 - B- Chemical methods

A. Sterilization by heat

- Heat is the **most reliable, easy and inexpensive method of sterilization.**
- •The objects and materials that **can withstand high temperatures** can be sterilized.
- •It can be :
 - Dry heat or
 - Moist Heat

Sterilization by heat

- Heat Sterilization
 - **Dry Heat**
 - Flaming
 - Incineration
 - Hot Air Oven
 - **Moist Heat**
 - Pasteurization (below 100 °C)
 - Boiling (at 100 °C)
 - Autoclaving (above 100 °C)





DRY HEAT

1. Flaming


- **Principal:** Passing the object through the flame of Bunsen burner without heating to redness.
- **Used for Sterilization of:**
 - bacteriological loop
 - glass slides
 - mouth of culture tubes.

2. Incineration

- **Principal:** Infective materials is converted to ash by complete burning.
- **Used for:**
 - Destruction of contaminated disposable **waste** materials.

3. Hot air oven

- **Principal:** Articles to be sterilized are exposed to high temperature in an electrically heated instrument called Hot air oven.
- **Holding time:**
 - 160°C for two hour
 - 180°C for one hour
- **Used for Sterilization of:**
 - All glasses: test tubes, Petri dishes, flasks, pipettes.
 - Instruments: as forceps, scalpels, scissors
 - Dry material in sealed containers as fat, oils, powder.



MOIST HEAT

1. Pasteurization (Below 100)

- **Principal:** Pasteurization is a process of heating a liquid to a specific temperature for a definite length of time and then cooling it immediately.
- **Used for:**
 - Pasteurization is commonly used in milk processing.

2. Boiling (At 100 °C)

- **Principal:** Boiling in water for fifteen minutes will kill most vegetative bacteria and inactivate viruses.
- Boiling is ineffective against many bacterial and fungal **spores.**
- **Used for:**
- Reusable glass syringes

3. Autoclaving

- **Principal:** When the pressure is increased inside a closed container, the temperature at which water boils exceeds 100°C .
- •If atmospheric pressure is **doubled**, the **temperature of the steam reaches 121°C** .
- **Killing effect is based on latent heat of condensation.**
- •Autoclaving is the most **reliable method of sterilization**,
- **It kills all kinds of bacteria and spores.**

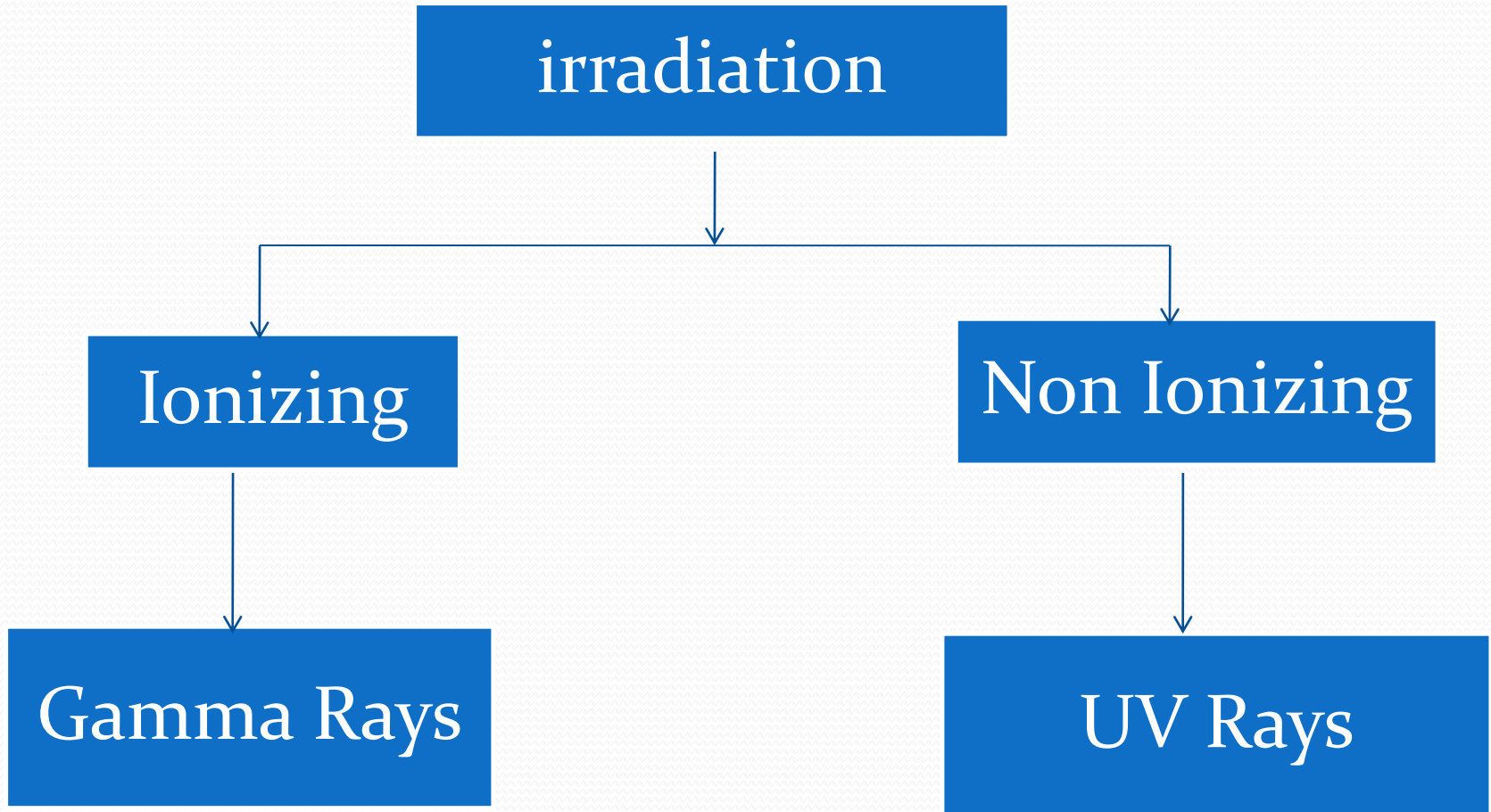
Autoclaving

- **Time & Temperature of sterilization:**
 - 15 lbs pressure for 15 min (Temperature 121 °C).
- **Used for sterilization of:**
- All articles that are destroyed by direct (dry) Heat
 - Culture media.
 - Liquid material.
 - Surgical supply e.g. dressing, and surgical instruments.

Filtration

- Removal of bacteria from fluids by passing them through filters with pores so small that bacteria are arrested.
- **Used for sterilization of:**
 - Tissue culture media.
 - Liquids that would be damaged by heat as **sera, antibiotic solutions and vaccines.**

Sterilization by irradiation



Ultraviolet radiation

- *Used for.*
 - Sterilization of environment
 - The interiors of laminar air flow/ Biological safety cabinets.
 - Operating theatres.
 - Limited Sterilizing ability due to poor penetration power.

Gamma rays

- •Used for sterilization of an article not stand heat:
 - Disposable glass wares
 - Rubber catheters
 - Gloves
 - Plastic (Disposable) syringes.
- More effective than UV Rays.

Chemical sterilization

- Use of chemicals for making objects bacteria free:
 - **Disinfection:**
 - Phenol and its derivatives e.g. Dettol.
 - Halogens e.g. Chlorine.
 - Aldehydes e.g. glutaraldehyde (Cidex), Formalin.
 - Quaternary Ammonium Compounds (Cationic detergents).
 - **Antisepsis:**
 - Alcohols e.g. ethyl alcohol.
 - Tincture iodine



THANK YOU