

Lecture 6



Sterilization & Disinfection

- Additional Notes
- Important
- Explanation
- Examples

OBJECTIVES

- Define the terms:
 - ✓ Sterilization
 - ✓ Disinfection
 - ✓ Disinfectant
 - ✓ Antiseptic
- Know the different methods of sterilization
- know the advantages of Autoclaves
- Know how to monitor Autoclaves
- Know some factors influencing activity of disinfection
- Know the hospital disinfection methods

■ Definitions

- ✓ Sterilization: complete killing of all forms of microorganisms, including bacterial spores.
- ✓ Disinfection: killing or removing of harmful vegetative microorganisms.
- ✓ Disinfectant: chemical substance used to achieve disinfection.
- ✓ Antiseptic: disinfectant that can safely used on living tissues.

■ Methods of sterilization:

- ✓ Physical methods → Heat
- ✓ Chemical methods → Gluteraldehyde & Ethylene oxide

PHYSICAL METHODS: Heat

Heat is the **most important** method of sterilization and is divided into:
Dry heat and **Moist heat**

DRY HEAT

- Kills the microorganisms by destroying their oxidative processes.
- At temperature of 160 °C for 1 hour
- Its equipment is: Hot air oven
- Used to sterilize items that are lacking water. **e.g. Metals, Glassware, Oils, Waxes**

MOIST HEAT

- Kills microorganisms by denaturing proteins.
- In autoclaves at temperature of 121 or 134 °C for 10 or 15 minutes
- Its equipment is: Autoclaves
- Cannot be used for items that are lacking water. Items must be steam permeable.

Moist Heat Applications

- Autoclaves: It is the standard sterilization method in hospitals and it works under the same principle as the pressure cooker where water boils at increased atmosphere pressure.
- Monitoring of autoclaves:
 - ✓ Physical: use of thermocouple to measure accurately the temperature.
 - ✓ Chemical: it consists of heat sensitive chemical that changes color at the right temperature and exposure time.
e.g. Autoclaves tape, Browne's tube
 - ✓ Biological: where a spore bearing organism is added during the sterilization process and then cultured later to ensure that it has been killed. "if it hasn't been killed that means that the machine isn't working"

Moist Heat Applications

- Pasteurization: used to inactivate harmful organisms in milk and to prevent diseases such as:

- ✓ Q fever
- ✓ Brucellosis
- ✓ Tuberculosis
- ✓ Typhoid fever

It is divided into:

- ✓ Flash methods: 74°C for 3-5 seconds
 - ✓ Conventional methods: 62°C for 30 minutes
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- Boiling: it is quite common especially in domestic circumstances.

RADIATION

- UV light: has limited sterilizing power because of poor penetration into most materials.

Generally used in irradiation of air in certain areas such as **operating rooms and tuberculosis labs.**

- Ionizing Radiation: has greater energy than U.V light, therefore it is more effective. **e.g. Gamma radiation.**

It is used mainly in industrial facilities. **e.g. sterilization of disposable plastic syringes, gloves and specimens containers.**

Filtration

- It may be done under either negative or positive pressure.
e.g. membrane filter made of cellulose acetate.
- Even though filtration doesn't technically sterilize items it removes most bacteria but NOT viruses and some small bacteria such as Chlamydias & Mycoplasmas.
- It is mainly used for: heat labile substances
e.g. sera⁽¹⁾, antibiotics

⁽¹⁾Plural of serum

CHEMICAL METHODS

- Chemical methods are useful for heat sensitive materials.
e.g. plastics and lensed endoscope materials.

It is divided into:

- ✓ Ethylene oxide chamber: it may cause explosion if used pure so it is mixed with an inert gas.

It requires high humidity and used at relative humidity 50-60%.
Temperature: 55-66°C and exposure period 4-6 hours.

- ✓ Activated alkaline Gluteraldehyde: Immerse item in solution for about 20 minutes.

If *Mycobacterium tuberculosis* or spores present then immersion period 2-3 hours.

Factors influencing activity of disinfectants

- Temperature
- Concentration
- May be inactivated by:
 - ✓ Dirt
 - ✓ Organic matter: Proteins, Pus, Blood, Mucus and Feces.
 - ✓ Non organic matter: Cork, Hard Water and Some Plastics.
- Time
- Range of action:
 - ✓ Chlorhexidine less active against gram negative bacteria than gram positive cocci.
 - ✓ Hypochlorites and Gluteraldehyde are more active against hepatitis viruses than most other disinfectants.

Important points

- Any instrument or item used for sterile body site should be sterile.
- Any instrument or item used for non-sterile body site can be disinfected
- Hand washing is the most important to prevent hospital acquired infection
- We use antiseptic for human NOT disinfectant.

Quiz

1..... has limited sterilizing power because of poor penetration into most materials.

- a) Ionizing radiations b) Filtration c) UV light

2..... is used for items that are lacking water

- a) Filtration b) Dry heat c) Moist heat

3. Autoclaves are suitable for items that lack water.

- a) T b) F

4. Sterilization by chemicals is useful for heat sensitive materials

- a) T b) F