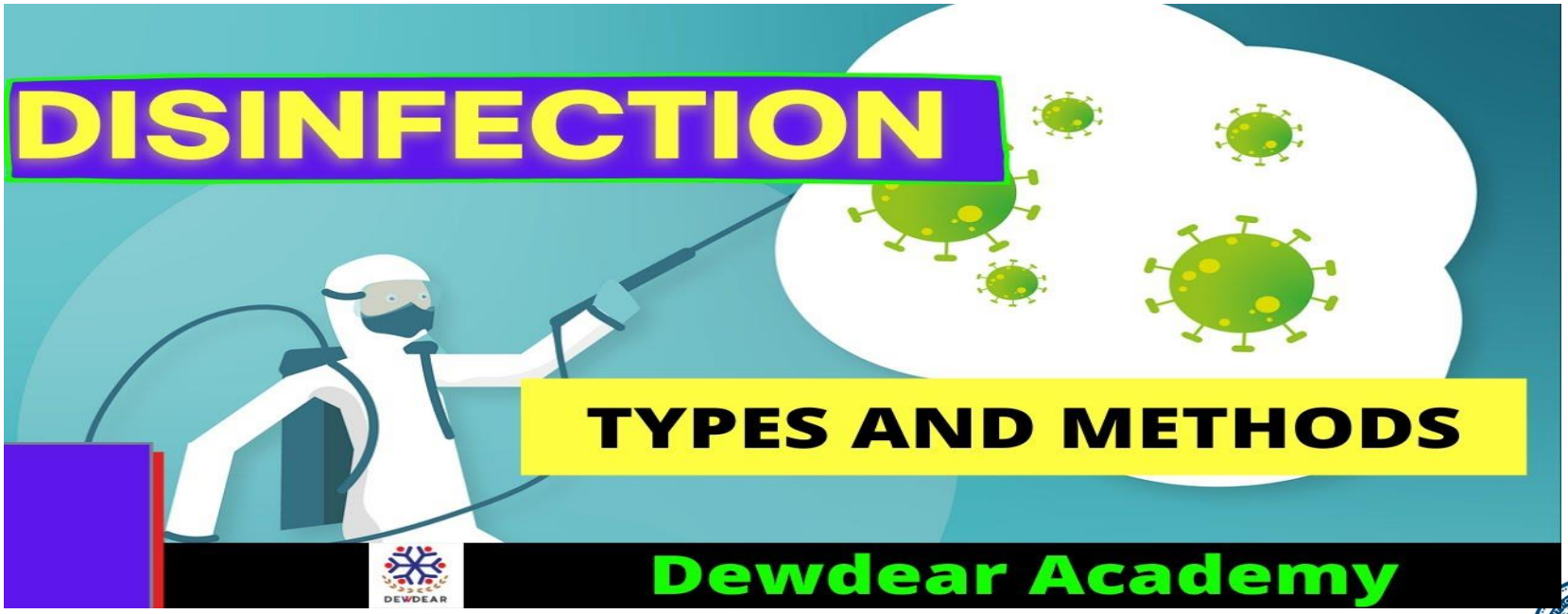
Sterilization

Asst .Prof .Dr. Bara′ Hamid



➢**Sterilization: is the killing or removal of all microorganisms, including bacterial spores, which are highly resistant.**

➢**Disinfection:** is the killing of most, but not all microorganisms, mainly the pathogenic ones. For adequate disinfection, pathogens must be killed but some organisms and bacterial spores may survive.

➢Disinfectants vary in their tissue-damaging from the corrosive phenol-containing compounds, which should be used only on inanimate objects, to less toxic materials such as **ethanol** and **iodine** which can be used on skin surface.

➢Chemicals used to kill microorganisms on the surface of skin and mucous membrane are called **antiseptics**.

Classification of sterilizing agents:

1-physical agents:

A. heat

B. Filtration

C. Radiation.

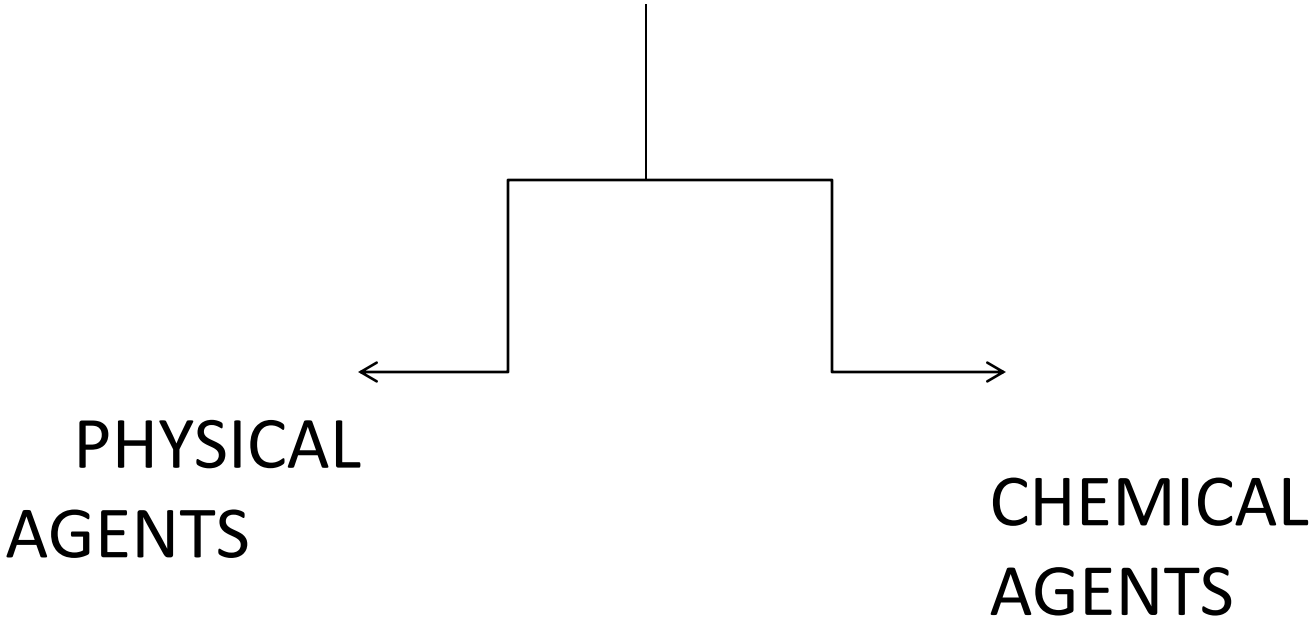
2- Chemical agents.

Of all the **physical agents** that exert antimicrobial effects, **heat** is the most effective. It is an excellent sterilizing agent when applied in appropriate intensity for an adequate period of time, for it effectively stops cellular activates. Depending on whether it is moist or dry, heat can coagulate cellular proteins or oxidize cell components.

STERILIZATION METHODS

- VARIOUS METHODS EMPLOYED

- CLASSIFICATION



physical mean of sterilization.

1-Heat: Glassware and medium are routinely sterilized by heat. The method depends on the effective oxidation of the microorganisms by carbonization or the coagulation of the protoplasm.

A. Dry Heat:

1. Direct flame: whenever rapid and repeated sterilization is required, the simplest method is direct flaming. This Type of sterilization is used for metal instruments such as platinum wire loop, forceps and scissors etc.

Bunsen burner is commonly used for sterilization by dry heat (direct flame).

2. Hot air: All dry glassware and metal instrument are usually sterilized by this method. Generally, the instruments are left in a Hot Air Oven on a temperature of 160-180ºC for one hour.

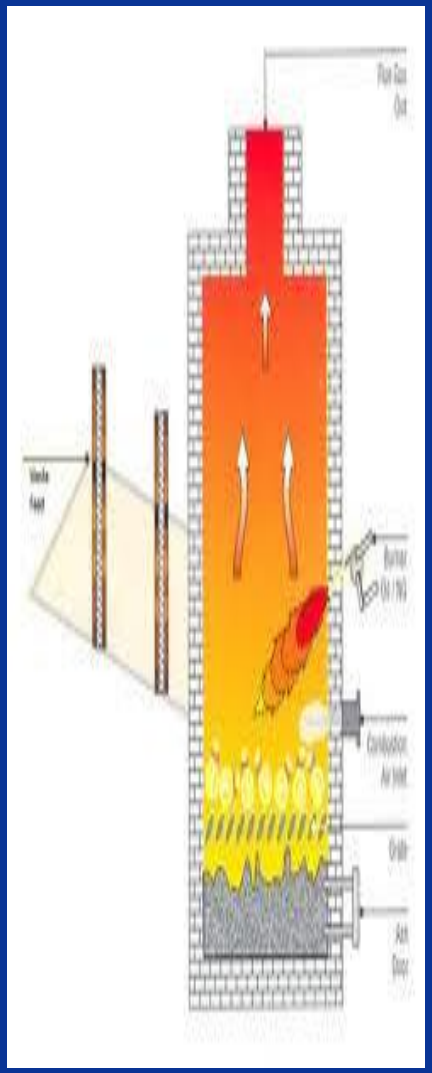
3. Incineration: The use of electrically heated or gas-fired incineration filled with forced air blower units provide an excellent means of rapidly destroying articles such as solid dressings, pathological material, and bedding.

FLAMING

- A simple & effective method.
- Loops or wires, needle , glass slides, cover slips
- Instruments held on a Bunsen flame till red-hot.

flaming

incinerator



B-moist heat:-

1.pasteurization: uses heat 63℃ at 30℃ minutes.

The organisms such as Brucella or Salmonella and tubercle bacilli which contribute to milk born-disease are readily killed by this process. The alternative method raises the temperature of milk to 72 ℃ (161 ° F) for 15-20 seconds and is referred to as the **flash process**.

N.T: bacterial spores are not killed by this method.

2.Boiling water: A temperature at 100℃ will kill all non-sporing or vegetative organisms within 10 minutes. Most spores will be killed in 30 minutes at this temperature, but some spores will resist boiling for several hours. The addition of **2% sodium carbonate** increases the disinfecting power of the water, and spores resistant to boiling water for 10 hours have been killed in 30 minutes by this addition.

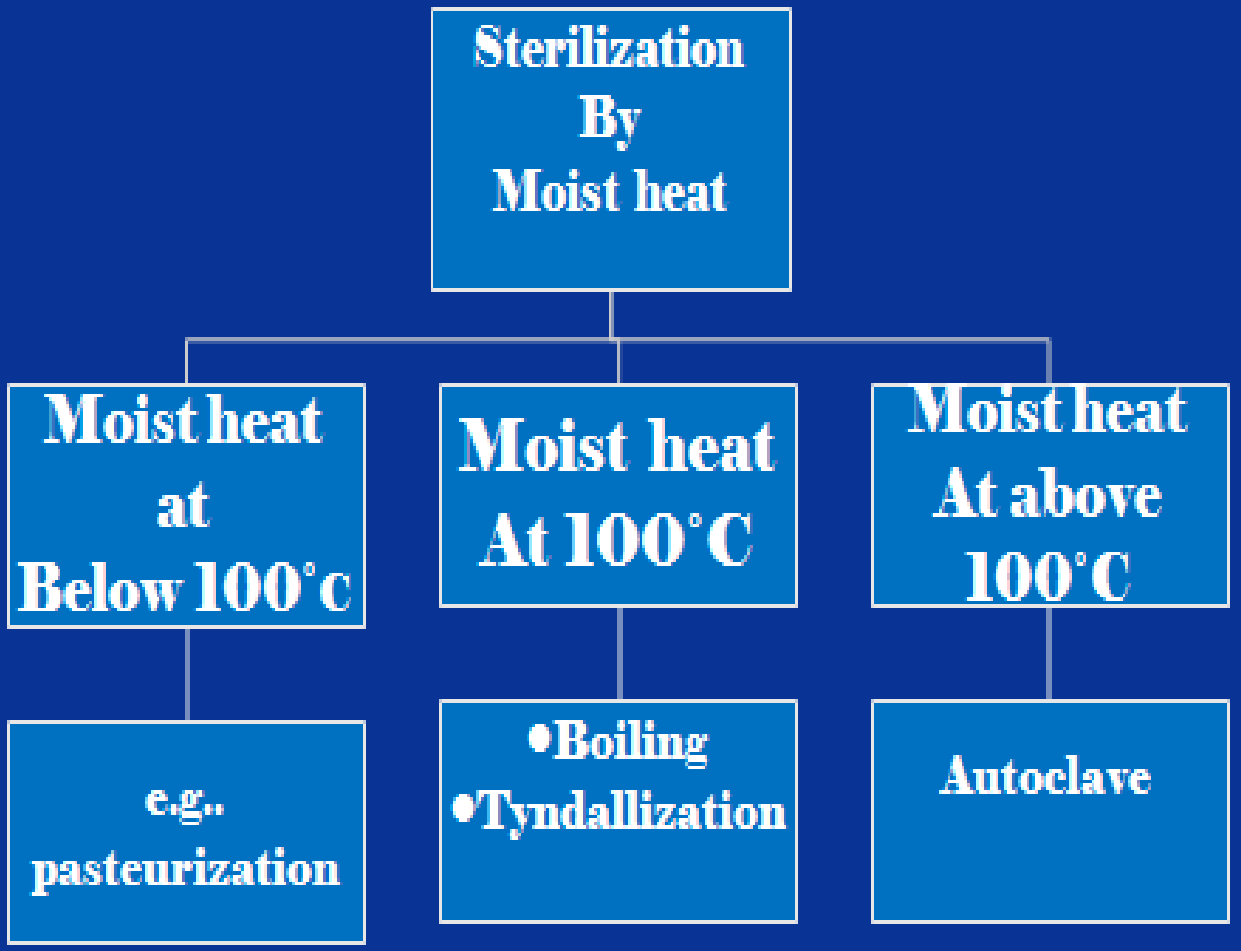
This method is suitable for infected instruments or small pieces of infected glassware and also for instruments (such as animal autopsy).

3.Steam at 100°C:the process of sterilization by intermittent steaming (or boiling) is called Tyndallization.

4.Steam under pressure (high pressure steam): The autoclave or pressure cooker is the instruments used for high pressure steam sterilization. Then steam is placed under pressure in an autoclave.

Bacteriological media, surgical instruments are sterilized in the autoclave at 121℃ (15 Ibs) for 15 minutes.

MOIST HEAT


Sterilization By Moist heat
Moist heat at Below 100°C
Moist heat At 100°C
Moist heat At above 100°C
e.g., pasteurization
•Boiling
•Tyndallization
Autoclave

Autoclaving (**At a temperature above 100C°**)

- Steam under increased pressure, this is called (autoclaving) Under autoclave conditions, pressurize steam KILLS bacterial spore, vegetative cells and other microbial forms.

-

2.Filtration:

The principle of this method is to pass the material to be sterilized through special bacterial filters which hold back any bacteria present; the filtrate is thus obtained bacteria free.

This method is used for the sterilization of **fluids** that do not withstand heating, e.g. sera, Plasma, Vitamins and antibiotic solutions.

Several kinds of bacterial filters are available. The kinds which are most used are the **chamborlain** and **Daulton filters** which are made of unglazed porcelain, the **Mandler Fillters ,Seitz filters**, etc. .

Either **positive pressure** on the liquid to be filtered should be exerted or **negative pressure** by sucking from the filtrate container on the filtration in order to enhance the process.

3.Radiation:

It is employed commercially for the sterilization of large amount of pre-packed disposable items such as plastic syringes and Catheters that are unable to withstand heat. It is done by applying **ultra-violet rays**, this process induces thymine dimmer of DNA and this interferes with replication of Micro-organism.

Chemical mean of sterilization.

1-Alcohols Etyhl alcohol, Isoporopylalcohol (70% aqueous solution):

uses:

Antiseptic to sterilize the thermometer, the skin before injection vein puncture.

2-Phenols:

Uses:

sterilization of surgical instruments, bathroom, hospital floor.

Chlorohexidin ; as skin disinfectants.

3-Heavy metal ions (metallic salt); (Mercury, siliver nitrate):

Uses:

Mercuric salt e.g Methiolate used as preservation for sera, bacterial and viral vaccine.

Silver salt e.g AgNO3 (1%) used as eye drop for newborn infants to prevent infections by *Neisseria gonorrhea*.

4-Oxidizing agent.

H_2O_2

Uses: mainly, for disinfection of contaminated wounds.

5- Halogens : chlorine and hypochlorite, iodine

Uses: to disinfect the swimming pools and water supplies: Hypochlorite as bleaching powder.

6-Akalyting agents

a. Formaldehyde. **used** in the sterilization of instruments, lab and surgical theatre, clothing, books by fumigation.

b -Ethylene oxide **used** to sterilize heat sensitive objective such as plastic Petri dishes, tubes, syringes, pipettes.

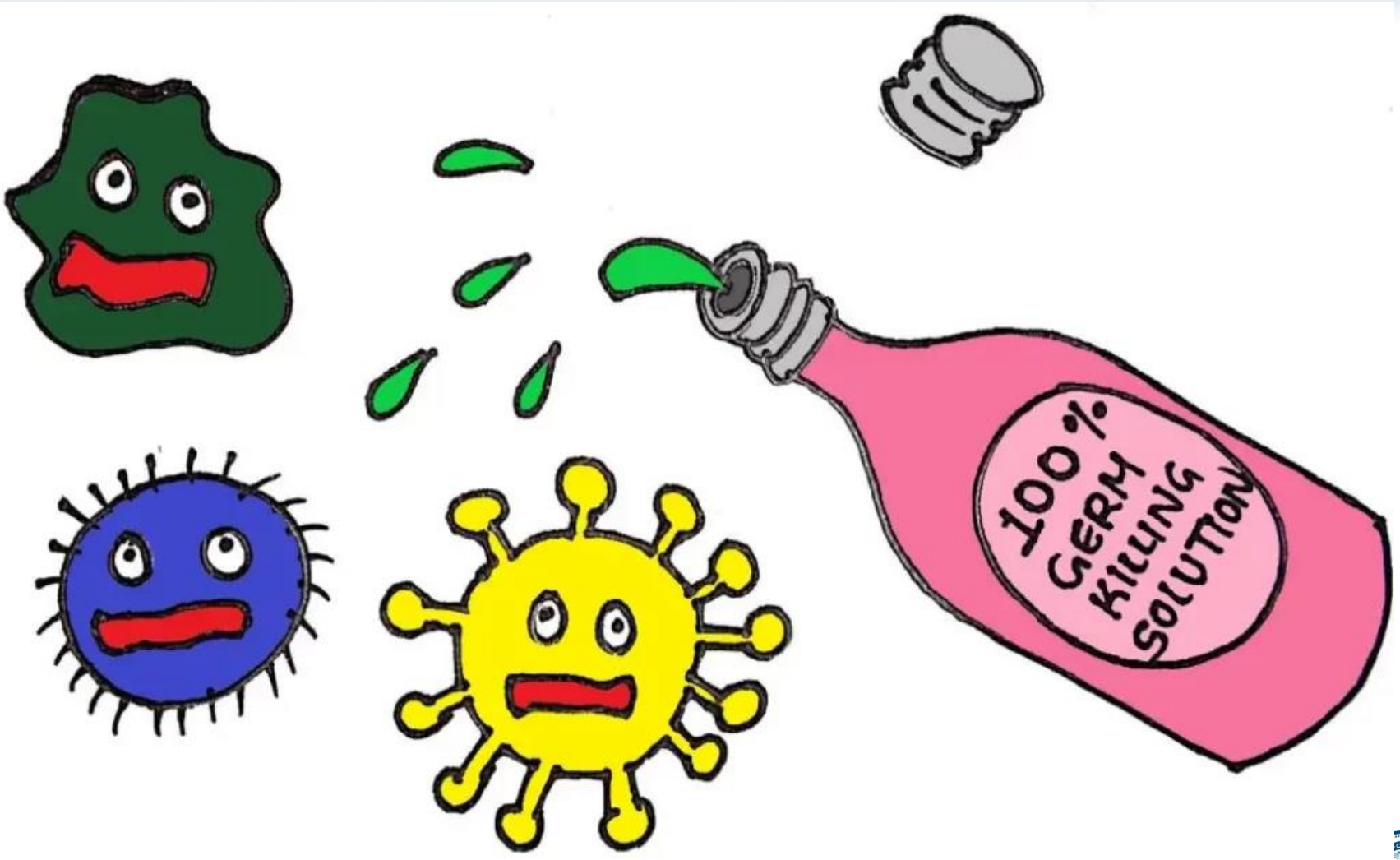
7-Detergents:

*Soaps to clean the skin.

*quaternary Compounds used as antiseptic and disinfectant.

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.


100 %
GERM
KILLING
SOLUTION