## ASEPSIS

•General principals of asepsis were accepted after Joseph Lister (Father of antiseptic surgery) studied prevention of wound infection(1865-1891).

### DEFINITIONS

•CLEANING - It is a process which removes visible contamination but does not necessarily destroy micro organisms. It is necessary prerequisite for effective disinfection or sterilization.

• **ASEPSIS** -Term used to describe methods which prevent contamination of wounds and other sites, by ensuring that only sterile object and fluids come into contact with them.

**DISINFECTION** - it is a process which reduces the number of viable microorganisms to an acceptable level but may not inactive some viruses and bacterial spores.

**STERLIZATION** - it is the process of destruction or removal of all microorganisms from article, surface or medium, including spores.

# To achieve sterilization of any instrument three definite stages are to be completed-

- □ Pre sterilization cleaning
- □ Sterilization process
- □ Aseptic storage

#### **PRESTERILIZATION CLEANING**

Removal of the organic matters, blood and saliva which provide protective barrier for microorganisms and prevents its destruction.

There are three methods for cleaning

- -Manual
- -Ultrasonic
- -Mechanical washing

## MANUAL CLEANING

- Simplest and the cheapest method, but time consuming and difficult to achieve.
- Heavy duty gloves and glasses must be worn to protect needle stick injury and to protect eye.
- Material used for manual cleaning
  - -Soaps
  - -Detergents

### **ULTRASONIC CLEANING**



**Principle**- conversion of electrical energy into vibratory sound waves which pass through a soap solution containing the instrument.

Used mainly for burs, bone files, bone cutter, artery forceps, saw etc.

### **MECHANICAL WASHING**



**<u>Principle</u>**- High-pressure jets of water with or without a detergent which removes debris from instrument.

Small instrument like burs, blade are not suitable for this type of cleaning.

### **Classification of the method of sterilization**

- A. PHYSICAL
- Heat

   a) Dry
   b) Moist
- 2. Irradiation
- **B. CHEMICAL** 
  - a) Gasb) Liquid antiseptics

## A. <u>DRY HEAT</u>

- Killing is due to :
  - Dehydration and oxidation of organisms
- Protein denaturation
- Toxic effects of elevated levels of electrolytes

## Hot air oven :

It is used to sterilize items, which do not get damaged by high temp. such as laboratory glass, instruments with sharp cutting edges, scissors, clamps



<u>**Temp. & Time</u>**: The sterilization is complete if these two factors are achieved throughout the load.</u>

Temperature	Time(Min)
180°C	60

#### B. <u>Moist heat</u>

Causes denaturation and coagulation of proteins.

#### **AUTOCLAVE** :

Steam is the effective means of sterilization, because of its

**1.** High penetrating capacity.

**2.** It gives of large amount of heat to surface with which it comes in contact.

3. To achieve sterility, a holding time of at least 30 minutes at 120 ° C or 20 minutes at 132 °C at 1,1 above atmospheric pressure is required.



### **Sterilization control of the moist heat**

**Physical Indicator-** an alloy designed to melt only after being subjected to relevant holding time.

**Chemical indicator-** Strips or tapes that change color once the correct conditions have been met.

**Bacteriological test** – detection of bacterial clumps on the instrument after its streilization

### **IRRADIATION**

- Radiation used of two types
- 1. Ionizing radiation, e.g., X-rays, gamma rays, and high speed electrons .
- 2. Non-ionizing radiation, e.g. ultraviolet light, and infrared light.
  - These forms of radiation can be used to kill or inactivate microorganisms.

### 1. Ionizing Radiation

X-rays, gamma rays are highly lethal to DNA and other vital constituents.

They have high penetration power.

There is no appreciable increase in temperature, thus referred to as **cold sterilization**.

Commercial plants use gamma radiation for sterilizing plastics, syringes, swabs, catheters etc.

### 2. Non-ionizing radiation

Two types of non-ionizing radiations are used for sterilization:-

### A. Ultraviolet -

Short range UV(UVC) is considered "germicidal UV".

UV will destroy micro-organismal DNA.

Used mainly for air purification and water purification in hospitals.

### **B.** Infrared –

It is most commonly used to purify air, such as in the operating room. Infrared is effective, however, it has no penetrating ability.

#### **ETHYLENE OXIDE STERILIZATION (ETO)**

- Used almost exclusively to sterilize medical products that cannot be steam sterilized or sensitive to radiation.
- *Mechanism of action:* It destroys micro-organisms by alkylation and cause denaturation of nucleic acids of micro-organisms.
- Plastics, rubber & photographic equipments can be sterilized by this method.
- Also used for mass sterilization of disposable items, plastic syringes,needles,catheters,blades etc..



#### **B.** CHEMICAL

- 1. Phenol Derivatives: Phenol, Cresol, Resorcinol, Chloroxylenol
- 2. Oxidizing agents :Pot.Permanganate, Hydrogen Peroxide, Benzoyol Peroxide
- 3. Halogens : Iodine, Chlorine
- 4. Biguanide : Chlorhexidine
- 5. Alcohols : Ethanol, Isopropanol.
- 6. Aldehydes : Formaldehyde
- 7. Acids : Boric acid, acetic acid
- 8. Metallic salts; Silver Nitrate, Zince Sulfate,

# <u>Mechanism of action of chemical</u> <u>disinfectants</u> :

Mechanism of action is nonspecific and complex:

- 1. Cell membrane injury.
- 2. Coagulation and Denaturation.