

STERILIZATION

AND

ASEPSIS

# HISTORY

- The general principles for asepsis were laid down by Hungarian gynecologist, Ignaz in Europe in early 1850's and Oliver Holmes in USA.
- Lister, working on antiseptics, initially used phenol (dilute carbolic acid) for contaminated wounds, later applied it in all surgical wounds, also in operating room by nebulization of the solution.

## Various 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.

**Antisepsis-** It is the procedure or application of an antiseptic solution or an agent which inhibits the growth of microorganisms, while remaining in the contact with them.

- *Antiseptics*-chemical agents applied to living tissues to reduce the number of micro-organisms present by inhibiting their activity or by destruction.
  
- *Asepsis*-methods which prevent contamination of wounds and other sites by ensuring that only sterile objects and fluids come in contact with them and that the risk of air borne contamination is minimized.

- **Sterilization**: Defined as a process that result in the destruction or elimination of all forms of life including bacterial spores.
- **Disinfection** :It is the destruction or removal of infectious or harmful microorganisms from nonliving objects by physical or chemical methods.

- **High-level disinfectants-** Can inactivate resistant bacterial spores and all other microbial forms. For example ethylene oxide gas and immersion glutaraldehyde solutions.
- **Intermediate-level disinfectants-** May inactivate bacterial spores but do not destroy other forms of microbes particularly tubercle bacilli. For example formaldehyde, chlorine comp., iodophores, alcohols, phenolic comp.
- **Low-level disinfectants-** Narrowest antimicrobial range. For example quaternary ammonium comp., soaps, detergents.

*[Spaulding(1972)classification of disinfectants.]*

# CDC & OSHA Dental Guidelines For Sterilization Instruments

( As per May 28,1993)

Depending on their risk of transmitting infection and the need to sterilize them between uses, dental instruments are classified into three categories –

1. Critical,
2. Semi critical
3. Non critical

**Critical.** Surgical and other instruments used to penetrate soft tissues or bones are classified as critical and should be sterilized after each use.



**Forceps, scalpels, bone chisels and burs.**

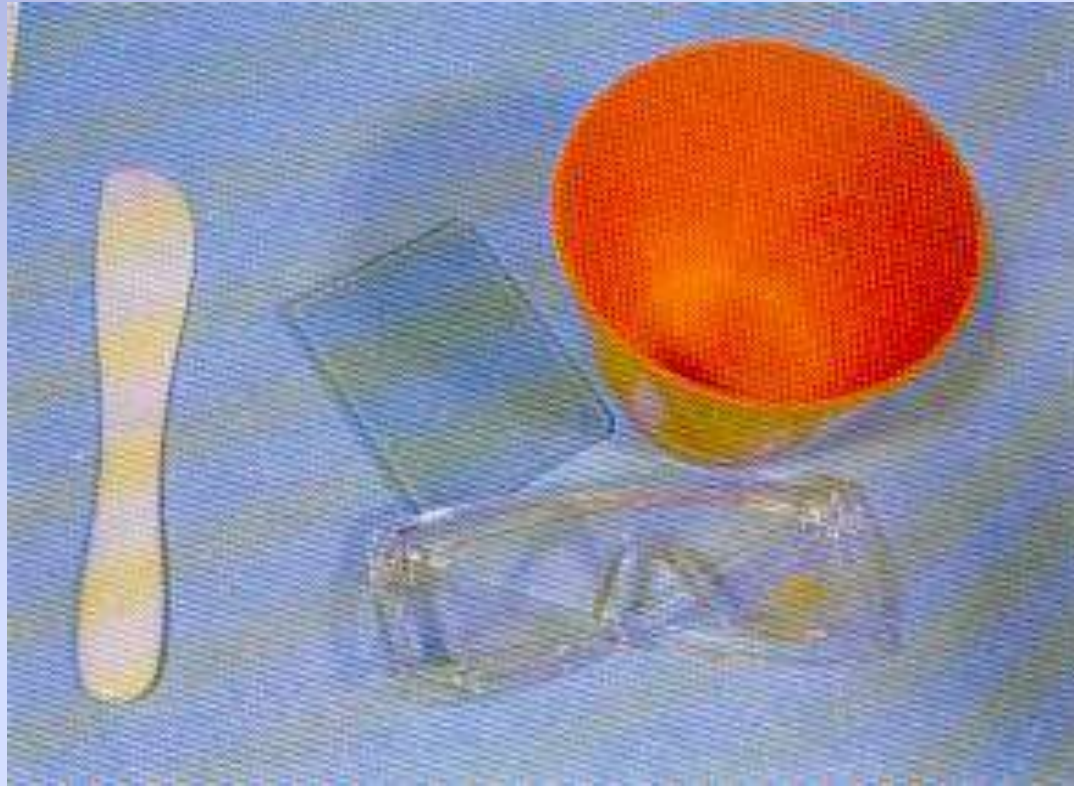
**Semi critical.**- Instruments such as mirrors, retractors that do not penetrate soft tissues or bone but contact oral tissue.

- These devices should be sterilized after each use.
- If, however, sterilization is not feasible because the instrument will be damaged by heat, the instrument should receive, at a minimum, high-level disinfection.



**Non critical.** Instruments or medical devices such as external components of x-ray heads that come into contact only with intact skin are classified as non critical.

- Because these non critical surfaces have a relatively low risk of transmitting infection, they may be reprocessed between patients with intermediate-level or low-level disinfectant .



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

- Pre sterilization cleaning
- Sterilization process
- Aseptic storage

# Presterilization cleaning

## Objective-

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

*There are three methods for cleaning*

1. Manual
2. Ultrasonic
3. Mechanical washing

# MANUAL CLEANING

- It is the simplest and the cheapest method, but time consuming and difficult to achieve.
- One prerequisite is that heavy duty gloves and glasses must be worn to protect needle stick injury and to protect eye.
- Material used for manual cleaning
  1. Soaps
  2. Detergents
  3. Others- Acetone, Ether, Aldehydes, Phenolic comp.

# 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



**Principle**-Squirting of 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.

# STERILIZATION PROCESS

## Classification of the method of sterilization

### A. PHYSICAL

1. Sun Light
2. Drying
  - i. Dry
  - ii Moist
3. Heat
4. Filtration
5. Gas
6. Irradiation
7. Ultra sonic cleaning

- **B. CHEMICAL**

- Phenol Derivatives : Phenol, Cresol, resorcinol, chloroxylenol

- Oxidizing agents :Pot.Permanganate, Hydrogen Peroxide,Benzoyol Peroxide

- Halogens : Iodine, chlorine

- Biguanide : Chlorhexidine

- Quarternary Ammonium (Cationic) : Cetrimide, Zephiran

- Alcohols : Ethanol, Isopropanol
- Aldehydes : Formaldehyde, Glutaraldehyde
- Acids : Boric acid, acetic acid
- Metallic salts ; Silver Nitrate, Zinc Sulfate, Zinc Oxide, calamine,
- Dyes : Gentian violet, proflamine, Acriflamine
- Furan derivatives : Nitro flurazone

# HEAT

Is the most common and one of the most effective methods of sterilization. Factors influencing sterilization by heat are : -

i. Nature of heat

a. Dry

b. Moist

ii. Temperature & time

iii. No of organism present

iv. Whether organism has sporing capacity

v. Type of material from which organism is to be eradicated

## *DRY HEAT*

- Dry heat is less efficient process than moist heat.
- Bacterial spores are more resistant to it. spores may require a temperature of 140 degree centigrade for 3 hours to get killed.

**1. Incineration**

**2. Red heat**

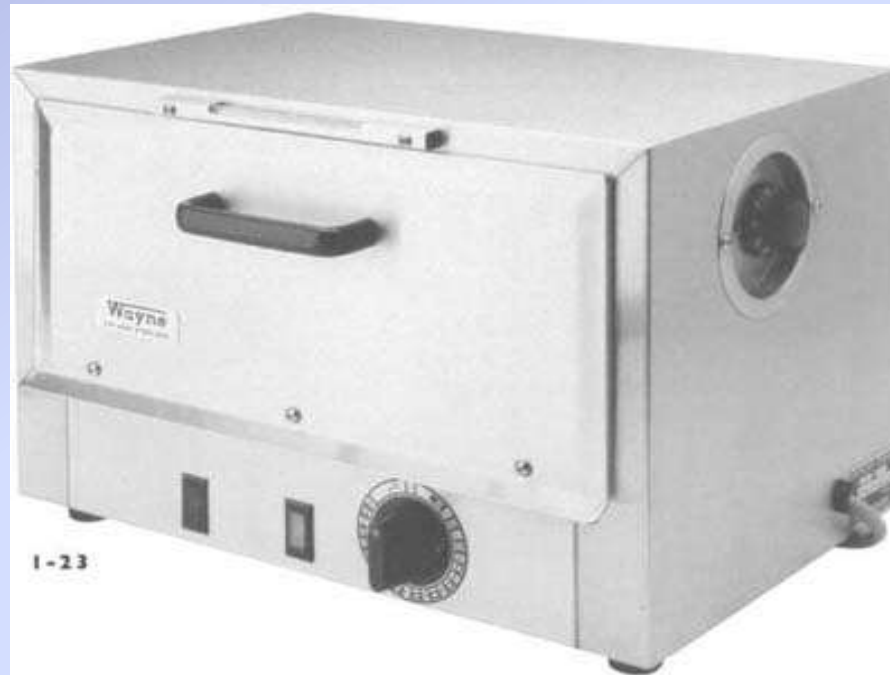
**3. Flaming**

**4. Hot air oven**

**5. Glass bead sterilizer**

**Hot air Oven-** Sterilize items, which do not get damaged by exposure to high temp for long periods.

- Mechanism of action
  1. Protein Denaturation
  2. Oxidative damage



- It is essential that hot air should circulate between the object being sterilized -----Objects loosely packed.
- Packaging Materials-Nylon, Aluminium foil
- Objects To Be Sterilized- Lab glassware's, Scissors, Stainless steel instruments with sharp cutting edges, B-P handles, Dapendish, and Mouth mirrors etc.

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

<b>Temperature</b>	<b>Time(Min)</b>
<b>160°C</b>	<b>120/60</b>
<b>170°C</b>	<b>60</b>
<b>150°C</b>	<b>150</b>
<b>140°C</b>	<b>180</b>

## Sterilization Control of Hot Air Oven :

- The spores of non-toxigenic strain of bacillus subtilis and clostridium tetani are used as a microbiological test of dry heat.



- Brown's test strip available that contain a chemical indicator.



## ADVANTAGES

1. Effective and safe for metal instruments and mirrors.
2. Does not dull cutting edges.
3. Does not rust or corrode metal instruments.

## DISADVANTAGES

1. Long cycle required.
2. Poor penetration of edges.
3. May discolor or char fabric and destroy heat labile items.

## GLASS BEADS STERILIZER :

- The medium used is glass beads.
- The temperature achieved is of 220°C.
- The method employs submersion of small instruments such as Endodontic files, artery forceps, scissors and burs, into the beads; and are sterilized in 10 seconds provided they are clean.
- A warm-up time of at least 20 minutes is recommended to ensure uniform temperatures in these sterilizers.



Other Media That  
Can Be Used-  
Molten metal, Salt.

## **MOIST HEAT**

- Heating in the presence of water kills microorganisms by denaturation and coagulation of proteins.
- Moist heat can be generated by 3 methods
  1. Heating below 100 degree centigrade.
  2. Heating around 100 degree centigrade.
  3. Heating above 100 degree centigrade.

# **1. Temperature below 100 degree centigrade: (Pasteurization)-**

**a. Holder method**

**b. Flash method**

- Some spores are killed below 100 degree centigrade but cannot be relied upon for undertaking sporicidal activities**
- Used for heat sensitive liquid and pharmaceutical products.**

## ***2. Temperature around 100 degree centigrade: (Intermittent Sterilization or Tyndalization)-***

**An example in which steaming of the object is done for 30 minutes on each of the 3 consecutive days.**

**Principle: Spores which survive the heating process would germinate before the next thermal exposure and would then be killed.**

**Agents to be sterilized- Heat sensitive culture media**

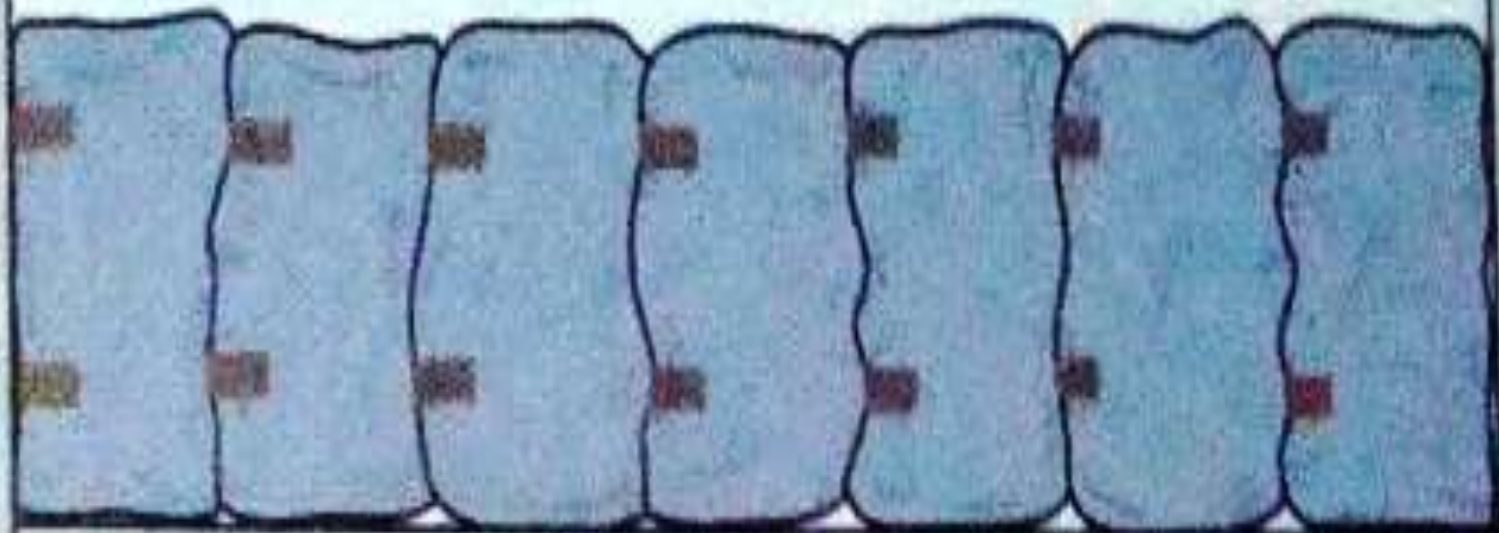
## 3. Temperature above 100 degree Centigrade: Steam Sterilization:

### **Autoclave:**

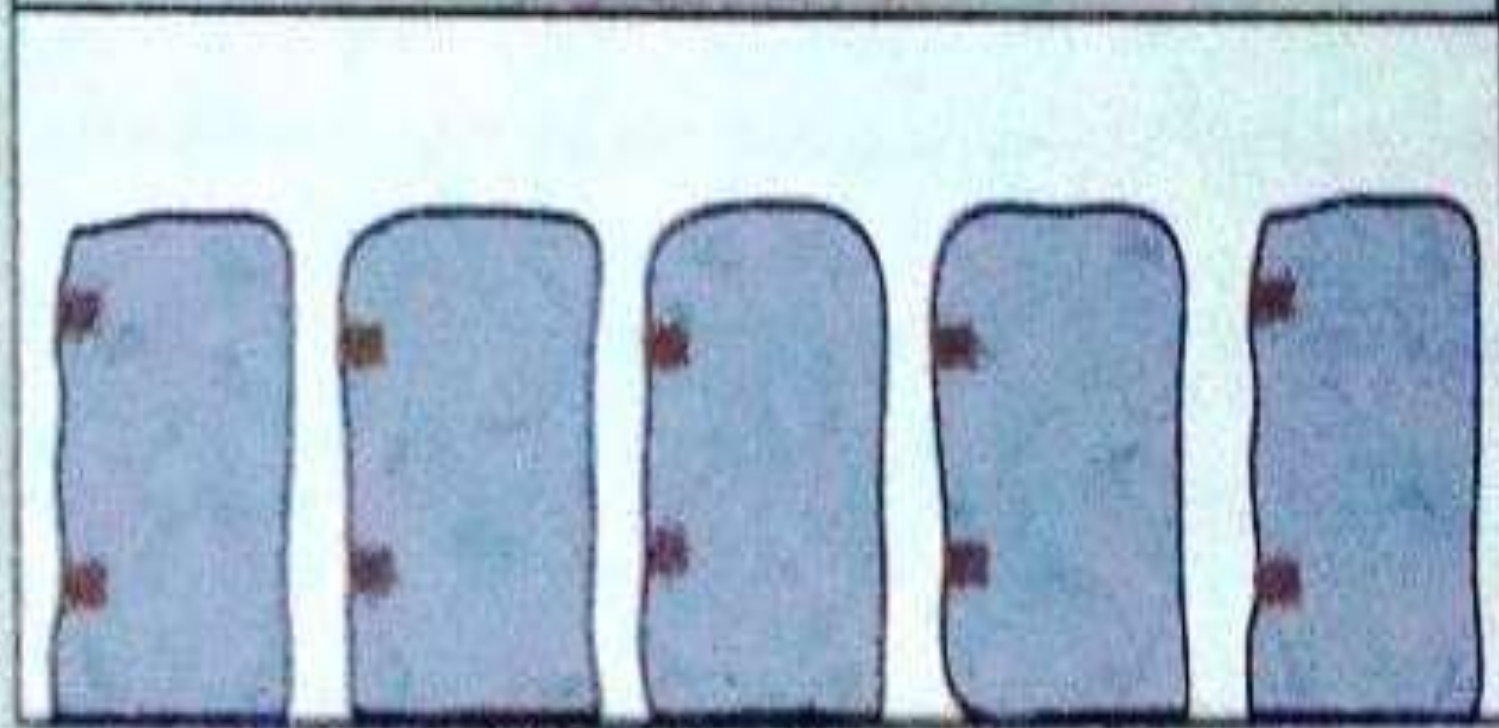
- Most cost effective and safest.
- Causes destruction of microbes by coagulation and denaturation of proteins
  
- Points to ponder :
  - Temperature
  - Pressure
  - Time
  - Quality of steam

## Rules:

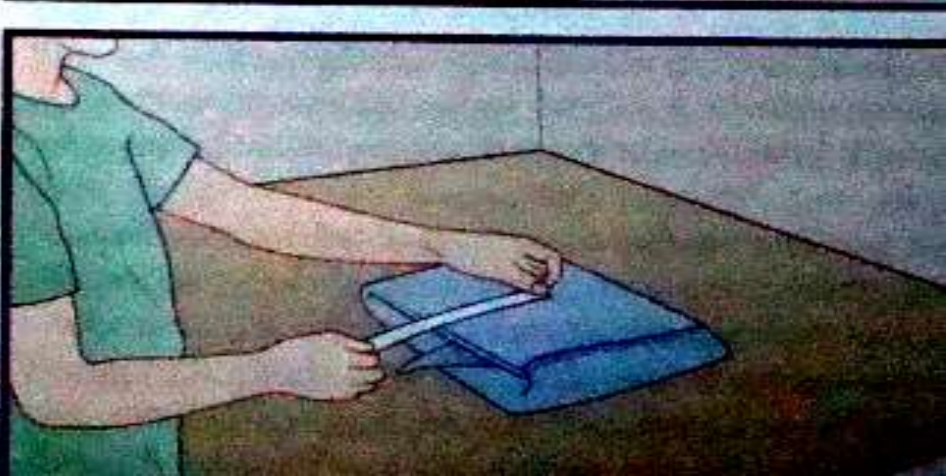
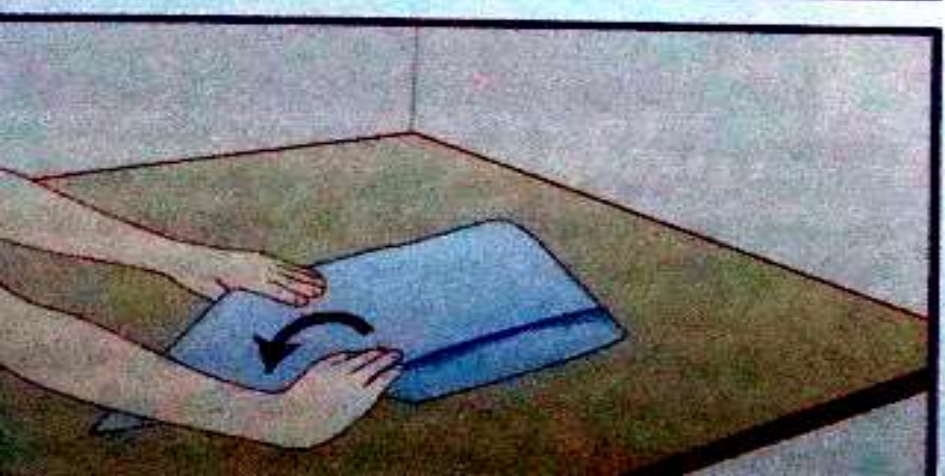
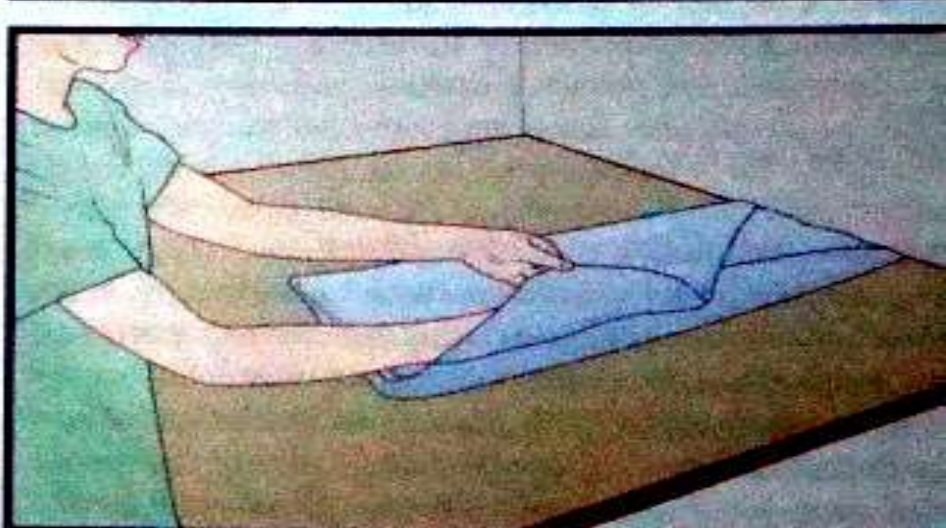
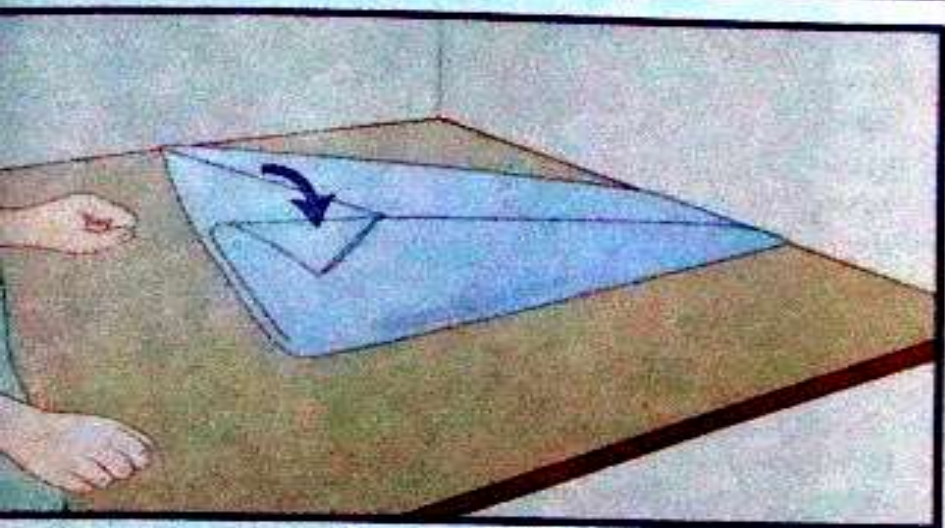
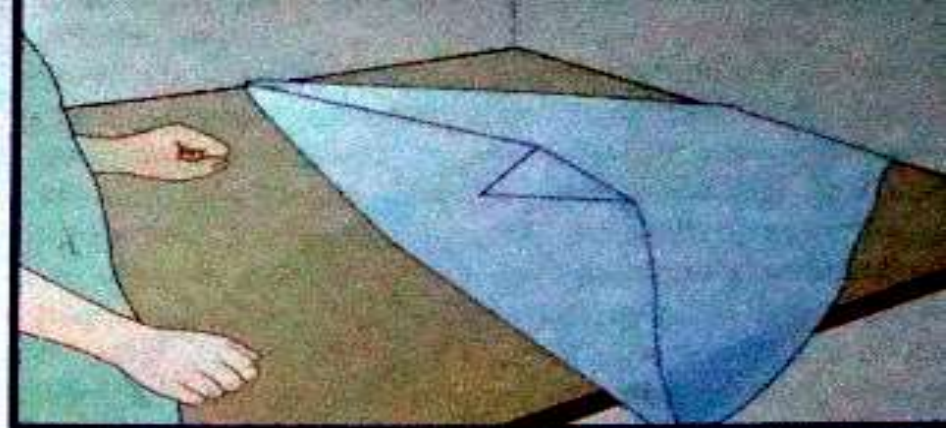
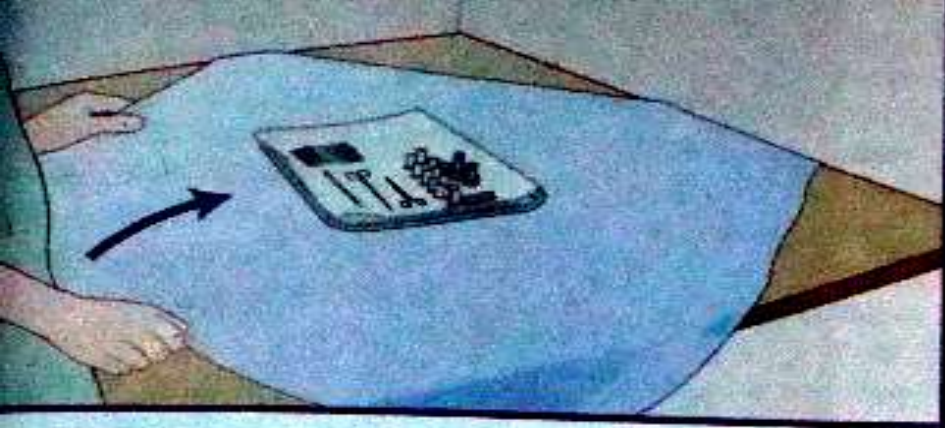
- Articles should be placed in such a way that steam can easily penetrate them.
- Air should be evacuated.
- Wrapping objects in aluminum foil may interfere with steam penetration.
- Always check the pressure gauge before opening the door.
- Packaging material- nylon plastic cloth, paper peel, pouch.



Incorrect



Correct



## Temperature, pressure and time used for various material for autoclaving

Items	Autoclave Setting	
	121 <sup>0</sup> c/15psi	132 <sup>0</sup> c/27psi
Dressing-Wrapped equipment	30mins	15mins
Glass ware	15mins	3mins
Instruments(Metal)	15mins	3mins
Suture material,tubing	20mins	10mins
Linen packs	30mins	10mins
Treatment tray	30mins	15mins

## *Advantages*

1.Short cycle.

2.Good penetration.

3.Wide range of materials can be exposed without destruction.

## *Disadvantages*

1.Corrosion of unprotected carbon steel.

2.Dulling of unprotected cutting edges.

3.Package may remain wet after cycle.

4.May destroy heat sensitive articles.

# Sterilization control of the moist heat :

1. Spores of bacillus stearothermophilus are used as the test organisms. Its spores require and exposure of 12 mins at 121<sup>0</sup>c to be destroyed.



2. Brown's test strip used as chemical indicator of moist heat.



# IRRADIATION

Radiation used for sterilization is 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.

## **Ionizing radiation :**

- **These are effective for heat labile items.**
- **Bellamy (1959) reported that it has great penetrating properties.**
- **Used by industriess to sterilize single use or disposable materials such as needles syringes, swabs, Catheters, plastics.**

## ■ Mechanism of action:

- Lethal action of this radiation is believed to be due to its effect on the DNA of nucleus and on the other vital cell components.
- No appreciable rise in temperature.
- High energy gamma rays from co-60 are used to sterilize such articles
- Spores are more resistant to ionizing radiations than non sporulating bacteria--
  1. Presence of radio protective substance in spores
  2. Spore coat
  3. DNA is in different state in spores

# Non ionizing radiation:

## A. Ultra violet rays

- **Less penetrating power.**
- **Bacterial spores and viruses are more resistant than vegetative bacteria.**
- **UV absorbed by proteins and nucleic acids kills microorganisms by the chemical reactions.**
- **240-280 nm wavelength, efficient in sterilization.**
- **Used for air purification ( operation theater and hospital rooms, entry ways )& Water purification .**
- **Sunlight has got bactericidal activity can even inactivate spores if exposed for prolong time.**

## **B. Infra Red**

- Infra red is less effective and it has no penetrating ability.**
- It is most commonly used to purify air such as in the operating room and preparation of immunizing agents by bacterial and viral attenuation.**

# Filtration:

- Used for drugs, vaccines, culture media etc.
- Bacterial filters not designed to remove viruses.

## Deep filters

- Made up of various materials for example fiberglass, cotton resins, porcelain, diatomaceous earth.

## ***Advantage:***

- Handle large amount of contaminant.
- Retain particles smaller than their normal size rating because of absorption of particles on the filter.

## ***Disadvantages:***

- Release of microorganisms during long process times.
- Retain significant amount of fluid products.

# Membrane filters

## Advantages:

- No release of microorganisms during long process.
- Do not retain the fluid products.

## Disadvantages:

- Tend to get stopped up by excess dirt in the system.
- *Important in the removal of microorganisms and particulate from gasses and air.*
- *Used to purify water and sewage.*

## Examples of common filters:

1. **Unglazed ceramic filters** - large scale clarification of water

2. **Asbestos filters** - high absorbing capacity

Disadvantage: Alkaline the solution

Possibility of carcinogenesis

Example- Seitz filter

3. **Sintered glass filters** -

4. **Membrane filters** - widely used, consist of cellulose ester.  
0.5 to 12  $\mu\text{m}$  pores size

• **Used for antibiotic solutions, sera, carbohydrate solutions.**

*Ser. Marcescens, Ps. Diminuta is the biological test organism.*

# Gas sterilization:

Several gaseous agents have been used successfully to sterilize medical devices, instruments and equipment.

## ➤ Formaldehyde Gas:

- Formaldehyde generated by heating either Para formaldehyde or formalin to release the gaseous formaldehyde.
- Activity depends on condensation on contaminated surfaces.
- Under appropriate conditions of temperature and humidity to be both sporicidal and bactericidal.
- Used as fumigant for rooms and buildings in which massive contamination has occurred, such as mold growth in water, damaged buildings and biological laboratories.

## ➤ Ethylene oxide Gas Sterilization:

•Ethylene oxide has been widely used as a low temperature sterilant since 1950s.

**Mechanism of action:** It destroys micro-organisms by alkylation and cause denaturation nucleic acids of micro-organisms.

-Until 1995 December EO sterilizers were combined with chlorofluorocarbon but due to its effect on ozone layer now it is replaced with carbon dioxide.



- Temperature required for this type of sterilizer is 108<sup>0</sup>c, against bacteria, spores, viruses.
- It is excellent sterilizer for heat sensitive items. Plastics, rubber & photographic equipments can be sterilized by this method.
- Also used for mass sterilization of disposable items, plastic syringes, needles, catheters, blades etc.
- It is highly toxic, inflammable and carcinogenic so should not be used when heat sterilization of an object is possible.

## Advantages and Disadvantages

### Ethylene oxide

1. High Penetration.
2. Does not damage heat labile materials(including rubber).
3. Evaporates without leaving a residue.
4. Suitable for materials that cannot be exposed to moisture.

1. Retained in liquid and rubber material for prolonged intervals.
2. Causes tissue irritation, if not well aerated.
3. Requires special spark shield – explosive in presence of flame or sparks.
4. High cost.

➤ *Sterilization by low temperature steam and Formaldehyde:*

- This method uses a combination of dry saturated steam and formaldehyde to kill bacteria, spores and most viruses.
- Destruction of microorganisms by dual action--by the heat and formaldehyde.



- The required combination of temperature and pressure is 127<sup>0</sup>c to 132<sup>0</sup>c at 20 to 40 psi for 30 mins.
- It is suitable for heat sensitive material and instruments like rubber and plastic material.
- It requires provision of adequate ventilation to expel chemical vapors released from the chamber.

## FUMIGATION OF OPERATION THEATRE

- Fumigation of the operation theatre is achieved by-
  1. Fumigator
  2. Potassium permanganate reaction technique.
- The chemical used in fumigator is 40% formaline.
- Fumigator is set for 30 minutes.

## *Factors influencing the fumigation of the theatre :*

### **1. Relative humidity**

- Higher the humidity (minimum 70%) better the disinfection.
- Water used in fumigator with fumigant helps to achieve and maintain humidity.

### **2. Temperature**

- Required temperature for effective fumigation is 30<sup>0</sup>-40<sup>0</sup>C.

### **3. Formaldehyde levels in the Air in the operation theatre**

- The dose of formaline is usually decided by the size of the room.
- As a rule, 180 ml is used for a room of the size 1000 cubic feet.

# *Aseptic storage*

**Packs should be stored with the following considerations**

Instruments are kept wrapped until ready for use

To reduce the risk of contamination, sterile packs must be handled as little as possible.

Sterilized packs should be allowed to cool before storage; otherwise condensation will occur inside the packs.

- To prevent contamination from rodents, ants, and cockroaches, the store must be subjected to adequate pest control .
- Materials should be stored at least 8” off the floor and 18” from the ceiling.
- Sterile packs must be stored and issued in correct date order. The packs, preferably, are stored in drums which can be locked.
- Preset trays and cassettes, are useful as, the instruments can be organized as per the procedure.

# CHEMICAL METHODS

## Properties of an ideal disinfectant :

### 1. Broad spectrum-

Widest possible antimicrobial spectrum.

### 2. Fast acting-

Rapidly lethal action on all vegetative forms and spores of bacteria, fungi, protozoa and viruses.

### 3. Not affected by physical factors.

### 4. Active in the presence of organic matter such as bloods, sputum and faeces.

5. Compatible with soaps, detergents and other chemicals encountered in use.
6. Non toxic.
7. Surface compatibility.
8. Does not corrode instruments ,metallic surfaces, cloth, rubber, plastic or other materials.
9. Residual effect on treated surfaces.
10. Easy to use, odorless, economical.

## Factors influencing the degree of killing:

### 1.Type of organism--



Bacterial Endospores

Mycobacterium tuberculosis

Small non-lipid virus

Fungi

Medium-sized lipid viruses

Vegetative bacteria

### 2.Bioburden/Microbial load—

### 3.Concentration of disinfectant—

### 4.Presence of organic matter—

## 5. Temperature—

## 6. Contact time— depends on-

- Type of organism
- Bio-burden
- Presence of debris
- Temp.

## 7. Compatibility of disinfectants—

- Quaternary amm. comp. and bleaching agents together may negate the activity of each other.

## Cationic surface acting agents

Quaternary Ammonium Compounds :Benzalkonium chloride (Zephiran)

- Strong surfactant—increases bacterial permeability.
- Also denature intracellular protein.
- Used as an antiseptic and a disinfectant.

## Positive

- Bactericidal against gram positive bacteria.
- Pleasant odour.
- Non irritating.
- Economical.

## Negative

- Less active against gram negative micro organisms.
- Not tuberculocidal, sporicidal or virucidal.
- Easily inactivated by presence of anionic detergents (i.e.soaps) and hard water.
- Inactivated by organic matter (i.e. blood, plaque, saliva, exudate)
- Solutions can be readily contaminated by gram negative bacteria.

## **Anionic surface acting agents**

- Reduces the surface tension leading to emulsification of contaminants which are removed by rinsing.
- Should not be used with cationic surface acting agents because they neutralizes each other.
- Inhibited by the presence of organic substances.
- Examples– Soap and detergent.

## 1. Soap

- Salt of fatty acids.
- Effective at → pH-9 or weakly acidic medium.

## 2. Detergent

- Synthetic compounds.
- Effective at → neutral or slightly acidic pH.
- Some detergents possess antibacterial property-  
ex. Na-lauryl sulphate against strept.pneumoniae.

## *Phenolic Compounds*

- Oldest group of disinfectants used by Joseph Lister in the form of Carboic acid.
- Cytoplasmic poison— intense penetrating power.
- Act by disrupting the cell walls and denaturation of intracellular proteins.
- Examples— phenol, cresol etc.

## Positive

- Broad spectrum anti-microbial activity when used in combination with other chemicals.
- Active in presence of common detergents.
- Certain phenolic derivatives (cresols) are tuberculocidal
- Primarily useful as surface disinfectant for floors, walls, etc.

## Negative

- Not sporicidal
- Irregular virucidal activity and infective against hydrophilic viruses (i.e. hepatitis B virus).
- Inactivated by organic matter and hard water.
- Toxic to epithelial tissues
- Can damage plastics
- Not recommended for routine disinfectant use in dental medicine.

## *Alcohols*

- Organic solvents and protein denaturants.
- 70% alcohol more effective.
- Benefit primarily derived from cleaning action.
- Rapid evaporation.
- More correctly used as antiseptics.
- Example– ethyl alcohol and isopropyl alcohol.

## Alcohols – Positive

- Rapidly bactericidal against most gram positive and gram negative bacteria.
- Tuberculocidal
- Active against many lipophilic organisms.
- Economical and readily available
- Only slightly irritating to hands.

## Alcohols- Negative

- Ineffective against bacterial spores
- Lack of evidence that alcohol's can inactivate matter hydrophilic viruses (i.e. hepatitis B virus).
- Diminished activity in presence of organic matter and tissue debris.
- Bactericidal activity diminishes greatly at concentrations below 60%.
- Deleterious effect on certain materials – rubber dam absorb alcohols; plastics may swell with repeated applications.
- Rapid evaporation rate.
- Highly inflammable-never use with electrocautery or laser.

## **Acids and Alkali**

- These release hydrogen and hydroxyl ions altering the pH of the medium – denature the proteins of the organisms.
- Boric acid- 4% aqueous sol for irrigating eyes and mouthwash.
- 30% boroglycerine- glossitis and stomatitis.
- Acetic acid(1-3% strength)– for burn dressing.

# Agents that destroy or modify functional group of proteins

## Heavy metals

- Soluble salts of silver mercury, arsenic, other metals destroy enzymatic activity by combining with sulfhydryl groups of cysteine residues.
- Organic mercurials such as mesthiolate and mercurochrome are less toxic and useful antiseptic agents
- Silver compounds widely used as antiseptics. E.g. silver nitrate.
- Silver sulfadiazine—for burn dressing.

## **Iodophore Compound**

- Iodine complexed with organic surface acting agents such as polyvinyl pyrrolidone (Betadine)
- Activity depend upon release of free iodine from complex.
- Killing by iodination of proteins and formation of protein salt.
- Dilute solution more effective.(1:2-3 dilution)
- Garaci(1963) reported that iodophore comp build up on skin after successive scubs provide long standing antibacterial activity.

# Disinfectant characteristics of Iodophors:

## POSITIVE

- Broad spectrum disinfectant – especially effective against heavy viral contamination.
- Economical, More effective in dilute solution than in concentrate
- Solutions are easily mixed with water for dilution.(1-2-3)
- Produce few, if any, physical side reactions, less allergenic than tincture of iodine.

- Very highly recommended and very effective as a hard surface disinfectant.
- When use in conjunction with a thorough cleansing procedure, surface disinfection occurs within 3 to 30 minutes depending on the amount of debris and virus present.
- Surfactant carrier in solutions helps to maintain surface moistness and to protect the iodophor during its action.
- Residual biocidal action on hard surfaces continues for some time after surface appears dry.

# NEGATIVE

- Manufacturer's dilution and contact time recommendations must be strictly followed.
- Solution loses activity with age.
- Sporicidal activity requires prolonged exposure.

- Solution may temporarily discolour some light colored surfaces with repeated use over prolonged periods.
- Corrosive to some metals.
- Inactivated by hard water.
- Diluted iodophors may be inactivated by alcohol.

# Chlorines:

## POSITIVE

1. Rapid anti-microbial action
2. Sodium hypochlorite (commercial household bleach) is useful as a broad spectrum bactericidal, virucidal, tuberculocidal surface disinfectant.
3. Economical
4. Effective in dilute solution(1:10 to 1:100 in water)

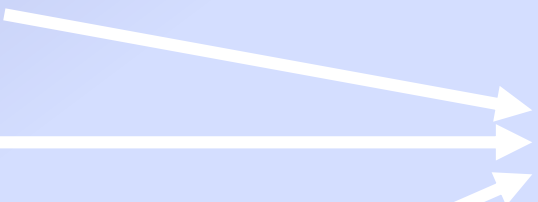
## NEGATIVE

1. Sporocidal effects noted only at high Cl concentration.
2. Prepared solution has limited use life and tends to be unstable (must be prepared daily).
3. Activity diminished by presence of organic means and altered pH.
4. Unpleasant persistent odour.
5. Corrodes metals and damages clothing
6. Irritates skin and eyes
7. Can degrade plastics and rubber coated instruments.

## *Triclosan*

- Chemically chlorinated dioxy diphenylether.
- Acts on cytoplasmic membrane of microbial cell.
- Broad spectrum bacteriostatic with mycobacterial activity, minimal bactericidal effect except *pseudomonas aeruginosa*.
- Used for hygienic and surgical hand scrub, preoperative skin disinfection as well as in soaps and deodorants.

# Hydrogen peroxide

- Liberates nascent oxygen– oxidizes necrotic matter and bacteria.
  - Catalase in tissues speed up decomposition and result in foaming which helps in loosening and removing slough.
  - Poor penetration
  - Transient action
  - Looses potency on storage
- Restricted use.
- 

## **Dyes:**

- **Various dyes not only stain the bacteria but also inhibits their growth**
- 1. **Aniline dyes – Malachite green, Crystal violet.**
- **For Chronic ulcers, Thrush etc.**
- 2. **Acridine dyes – Proflavine, Acryflavine**
- **For burn dressings.**

**Aniline and Acridine -- neutralized by serum and other proteins.**

# Alkylating agents

1. Formaldehyde
  2. Glutaraldehyde
  3. Ethylene oxide
- Exert lethal action upon proteins, leading to inhibition of enzymatic activity.

## **Formaldehyde:**

- Broad spectrum antimicrobial agent used for disinfections at sufficient high concentration at appropriate temperature and humidity both limited sporicidal and bactericidal activity.
- Generated by heating either Para formaldehyde or formalin to release the gaseous formaldehyde used for coagulating and preserving fresh tissues fro microscopic studies.
- Decontamination of sick rooms.
- **Disadvantage:** is hazardous substance, inflammable and irritant to eye skin and respiratory tract.

# Glutaraldehydes:

<u>Positive</u>	<u>Negative</u>
<ul style="list-style-type: none"><li>• <b>Effectivity– all vegetative bacteria including tubercle bacillus, viruses, fungi.</b></li><li>• <b>Broad antimicrobial spectrum within 20-30 minutes.</b></li><li>• <b>Sporicidal after 7-10 hours of exposure at room temperature.</b></li><li>• <b>Non corrosive to stainless steel when used properly.</b></li></ul>	<ul style="list-style-type: none"><li>• <b>Not to be used as antiseptics.</b></li><li>• <b>Not to be used as surface disinfectants</b></li><li>• <b>Induce severe tissue irritation upon prolonged contact</b></li><li>• <b>Allergic to skin and mucous membranes.</b></li></ul>

- **Low surface tension penetrates blood, pus, and organic debris.**

- **Will not degrade rubber and plastic items during prolonged immersion.**

- **2-3.2% glutaraldehydes are best chemical immersion sterilants / disinfectants.**

- **Will discolour nickel coated impression trays and carbon steel burs.**

- **Biologically unverifiable form of chemical sterilization.**

- **Re-use life of activated solutions may vary with exposure to bioburden.**

## Biguanide:

- Chemically called as cationic bisbiguanide compound, commonly used is chlorhexidine
- Broad spectrum, non irritating antiseptic that disrupts bacterial cell membrane and precipitation of cellular contents.
- Active against gram positive and some gram negative organisms but not against spores, fungi virus (except lipophilic virus)
- Immediate antibacterial activity is definitely slower but the residual effects of chlorhexidine, persists on skin for longer period of time that is why used for surgical scrubbing, neonatal bath, mouth wash as a general skin antiseptic

# Preferred methods of sterilization for common use articles

<u>Autoclaving</u>	<u>Hot air oven</u>	<u>Ethylene oxide</u>	<u>Glutaraladehyde</u>	<u>Filtration</u>
Animal cages	Glass ware	Fabric	Endoscope	Antibiotics
	Beakers	Bedding	Cystoscope	Serum
Lab coats	Flasks	Blanket		Vaccines
Cotton	Petridish	Clothing		
Filters	Pipette	Mattresses		
Instruments	Slides	Pillows		
Culture media	Syringes	Disposable instruments		
<u>Rubber</u>	Test tubes	Blades		
Gloves	Glycerin	Knives		
Stopper	Needles	Scalpels		
Tubing	Oils	Scissors		

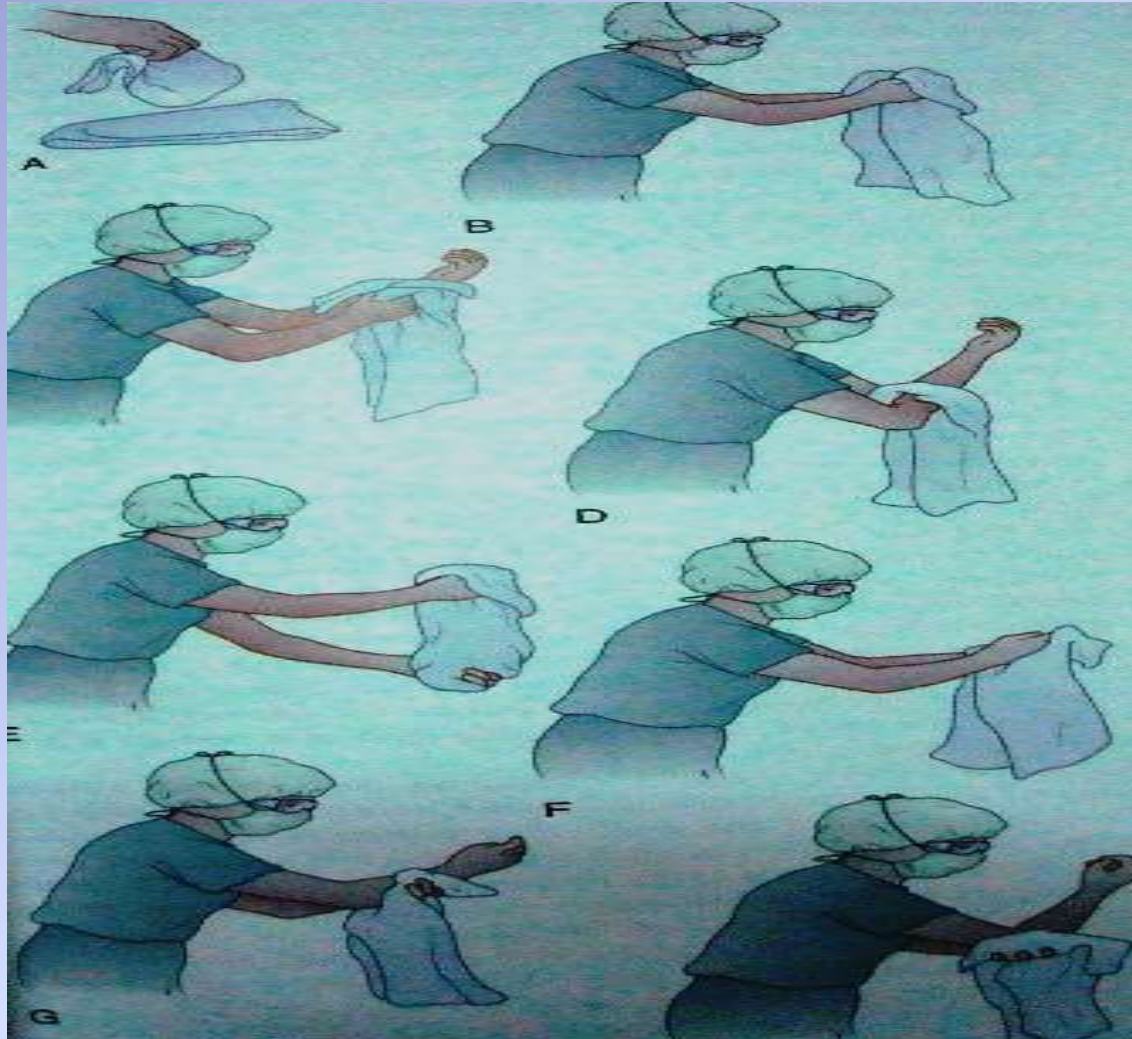
Enamel metal trays		Plastics		
Wire brackets		Rubber Catheters Drains Gloves		
Wood Tongue depressor applicator		Bronchoscope Cystoscope Heart lung machine		
Steel tumbler				

# **SURGICAL SCRUB**

- The surgeon begins his effort at aseptic technique with the hand scrub.
- **Purpose:** To remove superficial contaminants and loose epithelium.
- **Agents Used:** Soap or scrub solution and scrub brush.
- **Time Of Scrubbing:** Acc to Dumphy and Way– 10min.



# DRYING



# **GLOVING**

## 1.SELF –

A. Open

B. Closed

## 2.BY OTHER MEMBER -

# SELF GLOVING—OPEN TECH.

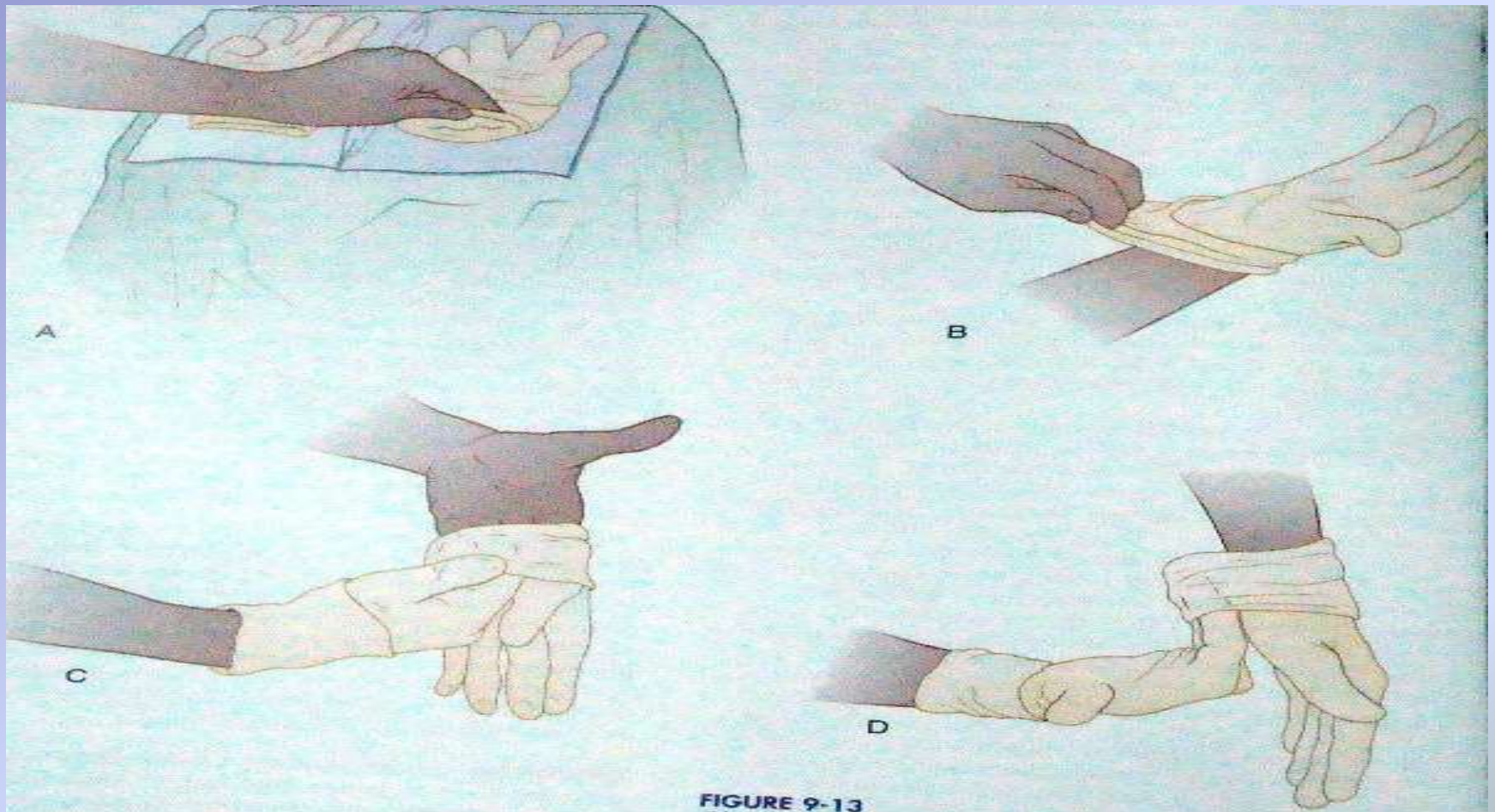
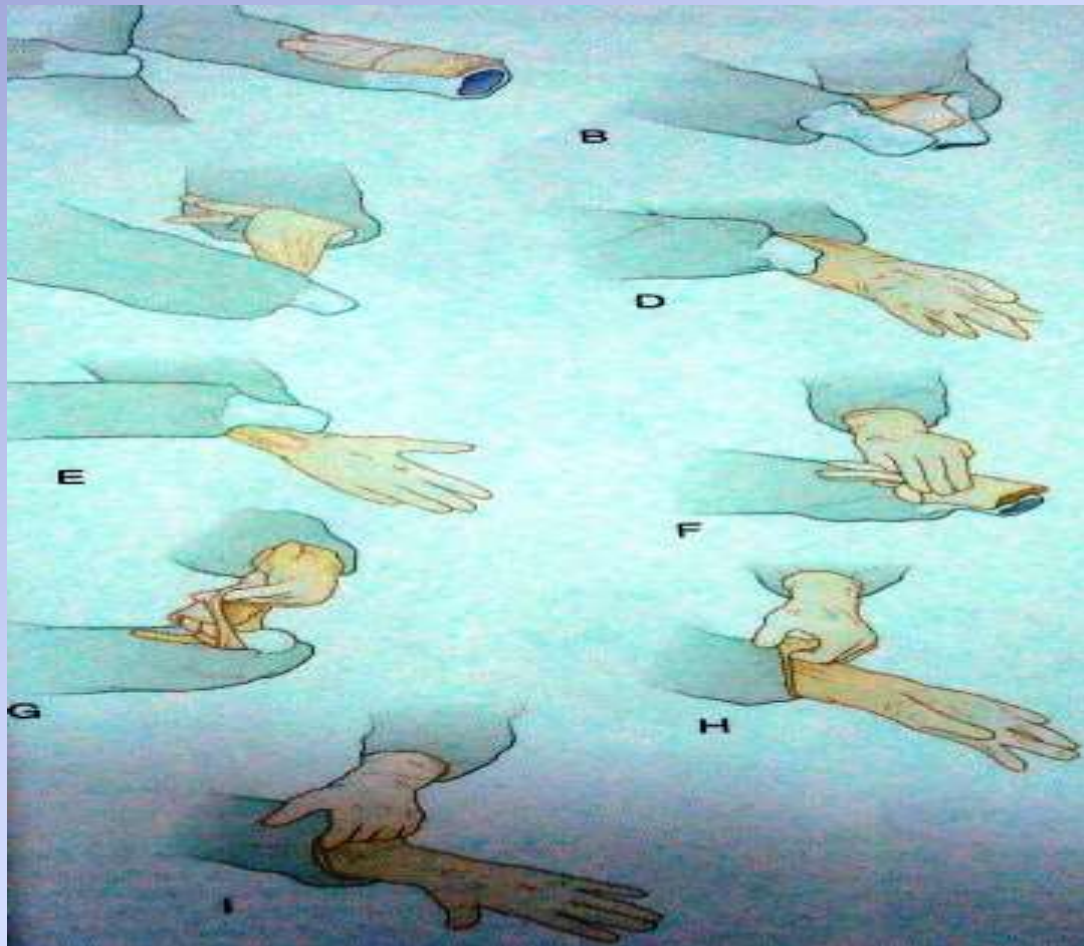
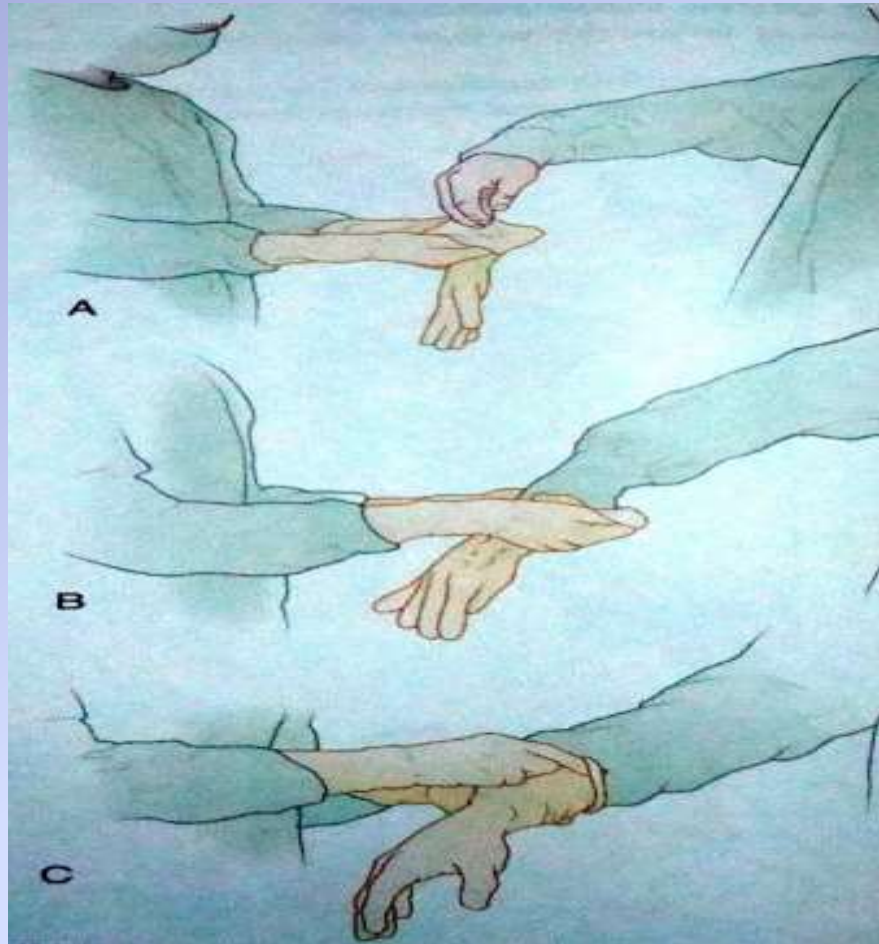


FIGURE 9-13

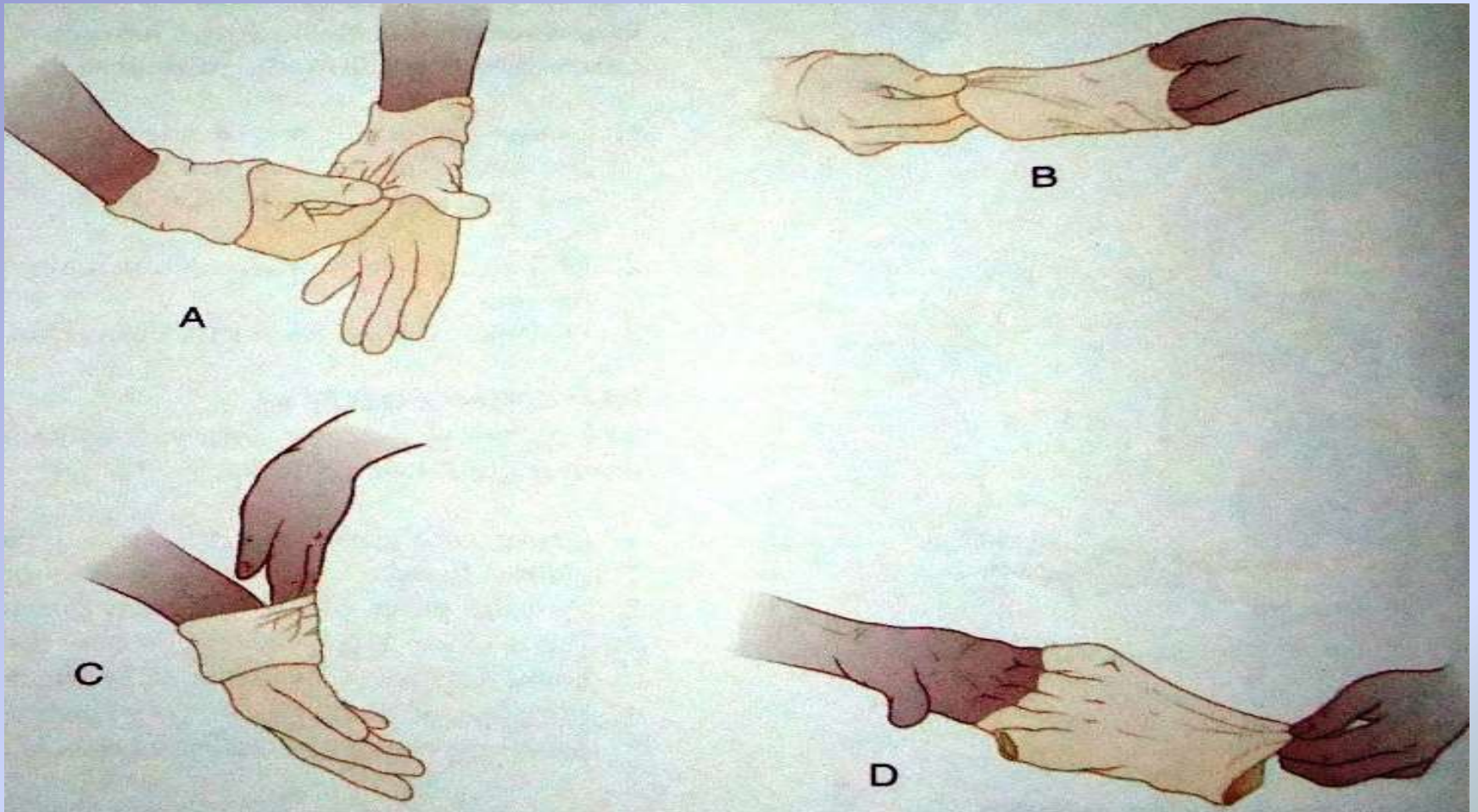
# SELF GLOVING-CLOSED TECH.



# **GLOVING BY OTHER**



# REMOVING GLOVES

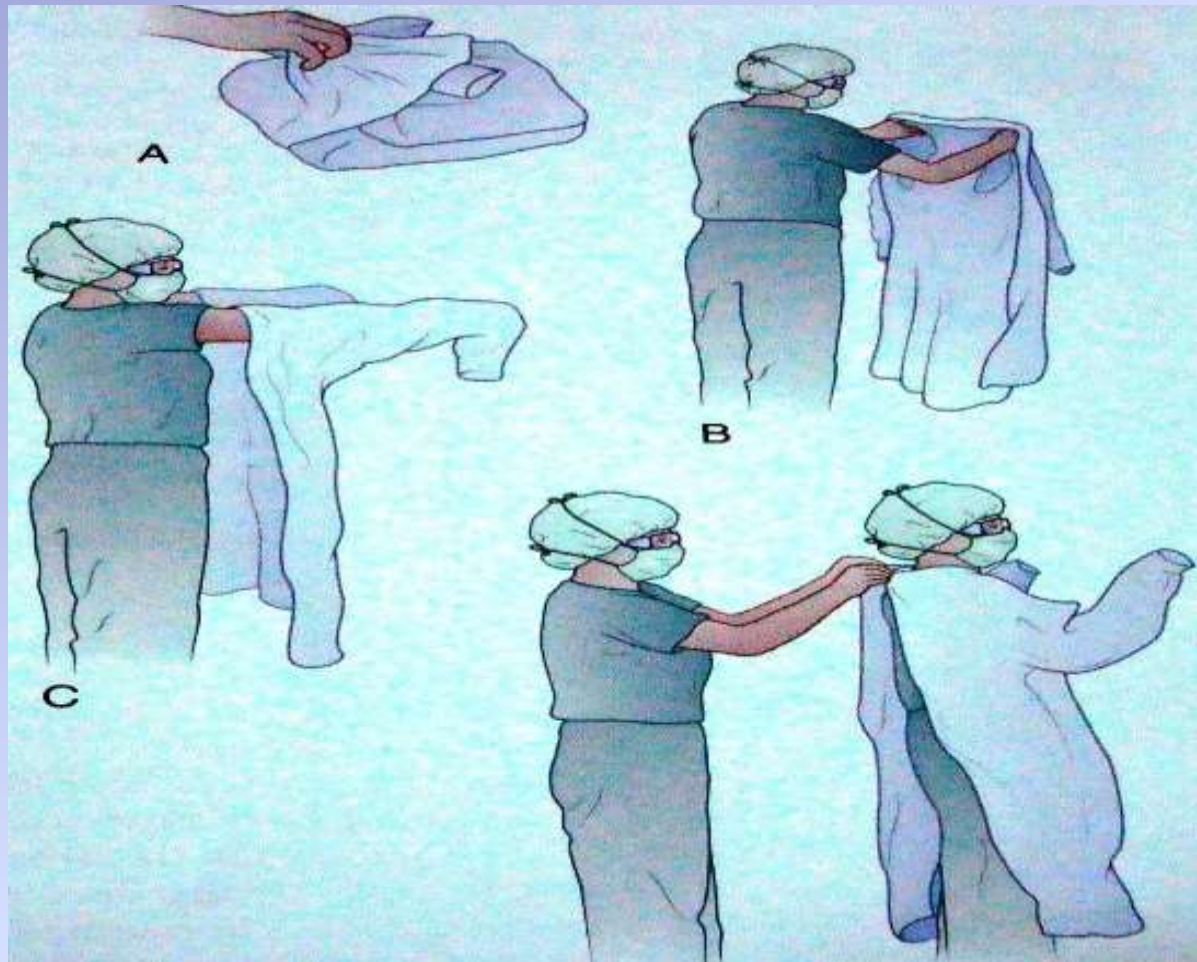


# **GOWNING**

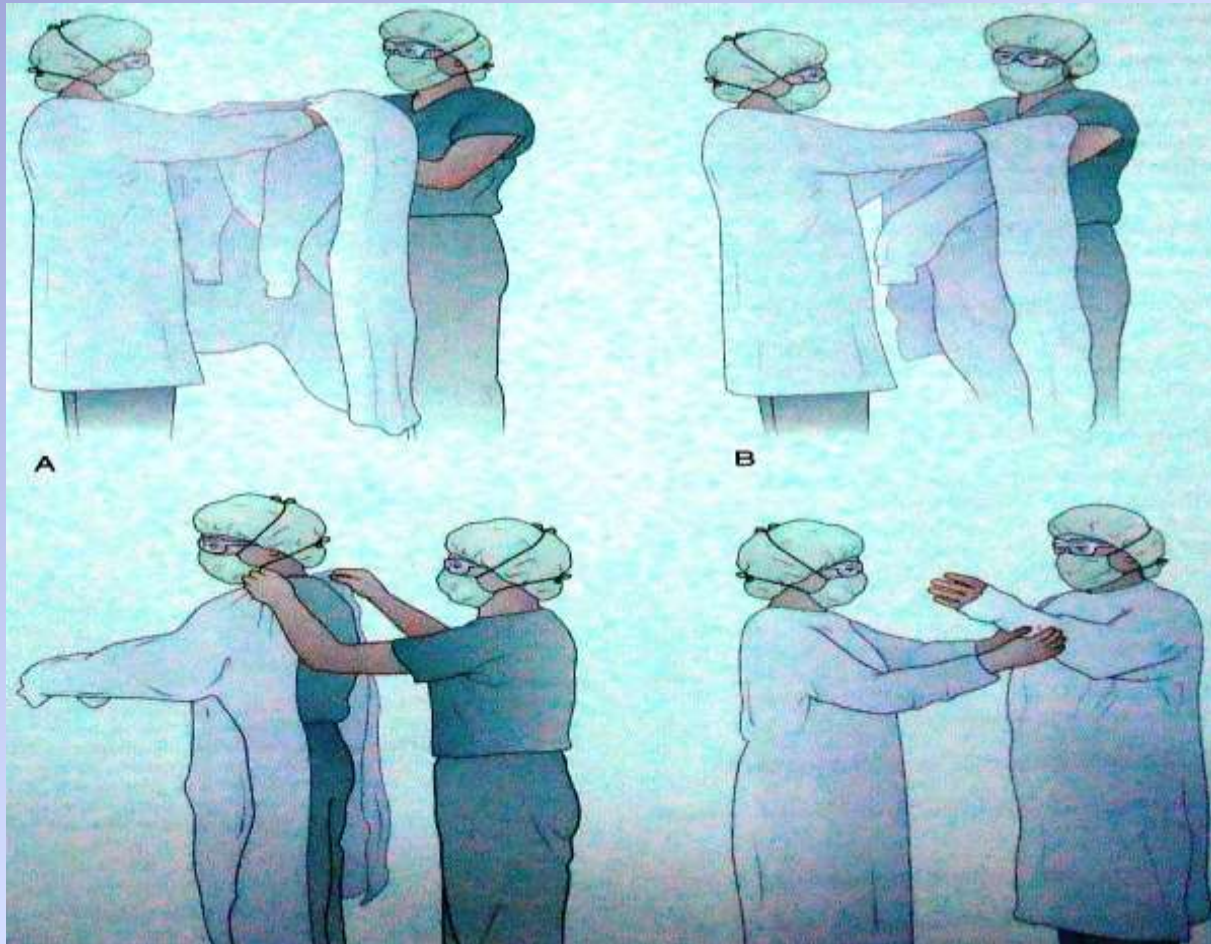
1.SELF

2.BY OTHERS

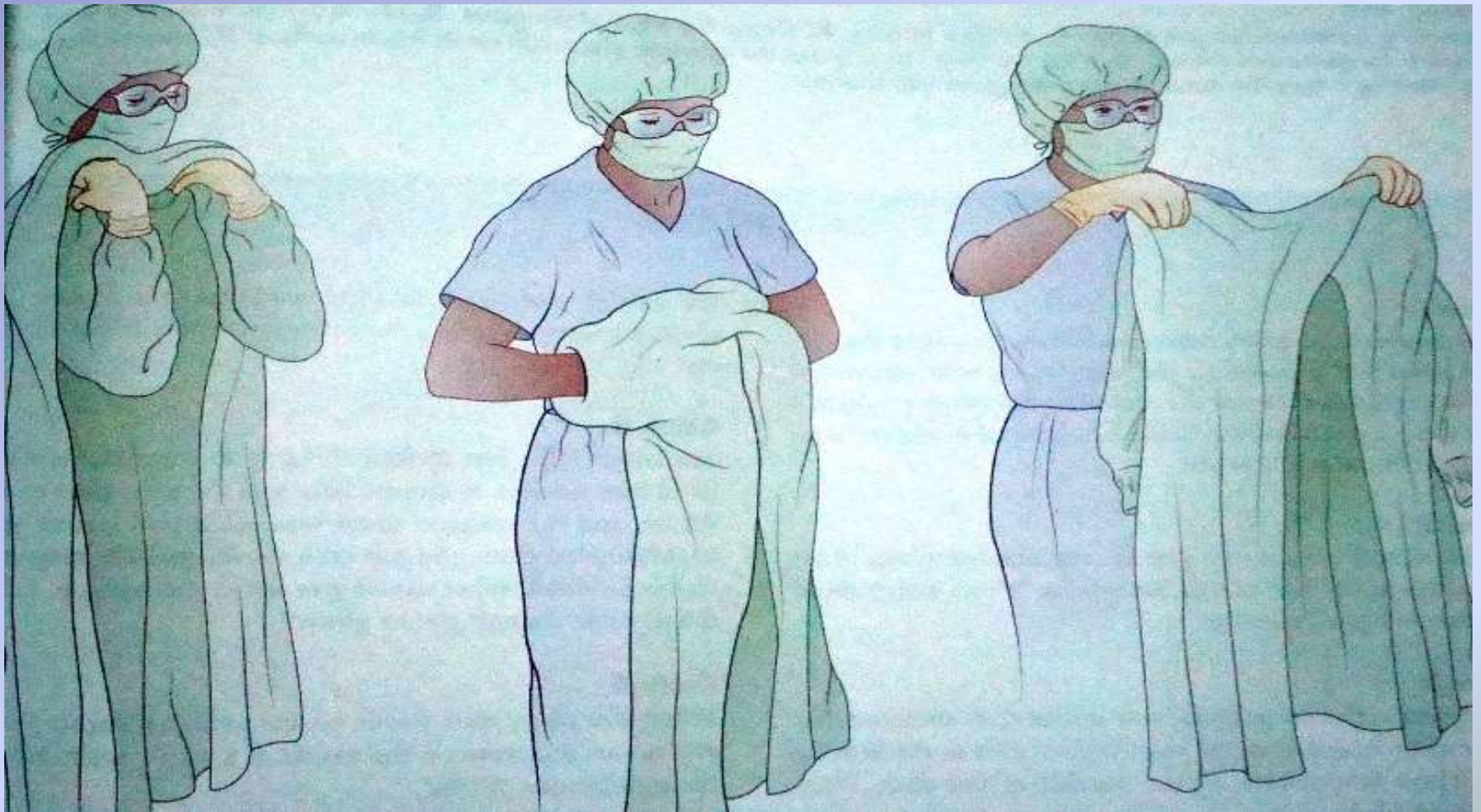
# SELF GOWNING



# GOWNING BY OTHERS



# REMOVING GOWN AFTER SURGERY



**THANK  
YOU**