# Disinfection and sterilisation procedures

(This section is targetted towards ophthalmic assistants involved in operation theatre procedure - Editor)

Disinfection is a process in which most, but not necessarily all, pathogenic organisms are destroyed.

### Methods of disinfection

- Physical e.g. boiling (kills vegetative bacteria but not spores)
- Chemical e.g. alcohols
  - Aldehydes
  - Phenolics
  - Halogens

Disinfectants used on living tissue (skin) are called antiseptics.

**Asepsis:** is a technique aimed at preventing infection by eliminating micro-organisms.

### Methods of asepsis

- Following proper hand scrubbing technique prior to surgery
- Proper sterilisation of instruments
- Use of sterilised fluid for surgery
- Proper preparation of the patient's operation site.

## Instrument cleaning and packing for sterilisation

Sterilisation is defined as a process by which an article, surface or medium is made free from all micro-organisms including spores. It is much superior to disinfection.

The goal of sterilisation is to reduce the bacterial load in the operating room and prevent postoperative infections, a dreaded complication of any ophthalmic surgery. For the type of sterilisation the following parameters have to considered

a. Nature of materials to be sterilised
b. Processes used

### The sterilisation method depends on

1. Bio-burden - degree of contamination
2. Bio-resistance - heat or moisture sensitivity and product stability
3. Bioshielding - nature of materials used for packing and their response towards sterilisation
4. Density - factors affecting penetration

| Type of instrument | Level of infection | Categories | Method of disinfection |
|---|---|---|---|
| These come in contact with sterile tissues and blood system e.g. surgical instruments and gloves | Most serious | Critical | Sterilisation<br>Highest level of Disinfection |
| These come in contact with mucous membrane and non intact skin e.g. scissors, cryoprobe, forceps, etc | Moderate | Semi critical | High level disinfection |
| These come in contact with the intact skin e.g. hand hygiene | Mild | Non critical | Aseptic measures |

### Parameters

Two parameters must be considered for all types of sterilisation

- Product associated considerations
  - Bio burden - degree of contamination
  - Bio resistance - heat or moisture sensitivity
  - Bio shielding - characteristics of packaging
  - Density - factors affecting penetration
- Process associated considerations
  - Time
  - Temperature
  - Purity of agent and air
  - Penetration
  - Capacity of steriliser

### Associated processes

- Temperature to achieve sterilisation
- Duration
- Concentration of the agent
- Capacity of steriliser

## Methods of sterilisation

Agents of sterilisation can be classified as

1. Physical agent
2. Chemical agent

### 1. Physical agent

A. Dry heat sterilisation
B. Moist heat sterilisation

#### A. Dry heat (Hot air oven)

Dry heat in the form of hot air is used to sterilise items into which steam or ethylene oxide gas cannot penetrate. E.g. Bulk powder, petroleum products. Death of microbial life by dry heat is caused by physical oxidation or slow burning by coagulating the proteins in the cells. The time for the sterilisation is one hour and the temperature has to be 340°F.

#### Advantages

- Hot air penetrates certain substances that steam or gas cannot penetrate.
- Dry heat can be used in laboratories to sterilise glassware
- Dry heat is a protective method to sterilise delicate instruments
- Instruments that cannot be disassembled can be sterilised in hot air
- Carbon steel does not become corroded or discoloured by dry heat

#### B. Moist heat

#### Boiling

All pathogenic organisms are killed by 15 minutes of boiling at 100°c. The instruments should be cleaned properly in distilled water or clean water before they are placed in the steriliser as blood or pus prevents the organisms from being killed. Protect the tips of delicate instruments with rubber tubing. Put the instruments gently in a tray with holes at the bottom to allow the boiling water to circulate. Allow the instruments to boil for 10 minutes. The lid of the steriliser should not be opened during the period (Fig 1).

*Fig : 1 Boiling of Instruments*

#### Autoclave

This is a safe method of sterilisation. The mechanism is steam under pressure. Steam is water vapor. It gets saturated when it contains a maximum amount of water vapor. Direct saturated steam contact is the basis of the steam sterilisation process (Fig 2).

The steam must penetrate every part of the item to be sterilised for a specified time at the required temperature. Steam kills organisms by coagulation of the cell proteins. The steam will penetrate and kill the organisms. Materials which may be sterilised by autoclave include: linen, instruments, rubber, liquids

etc. The timing of autoclave depends upon the type of materials.

*Fig : 2 - Autoclave*

| | Pressure | Temp | Time |
|---|---|---|---|
| Linen and instruments | 15pounds | $121^0$ c | 30min |
| Rubber items | 15pounds | $121^0$c | 10min |
| Liquids | 15pounds | $121^0$c | 10min |

## Bowie dick test

To check whether the autoclave is functioning correctly, a special test run is done. 30 towels are arranged in a pile. Autoclave tape is placed on the top, middle and bottom towels. The towels are made into a tight pack and the test run performed. The autoclave tape should change colour on all three towels if it is functioning properly.

## Packing of bins for autoclaving

Instruments should be thoroughly cleaned by washing in warm water. A tooth brush can be used to clean delicate instruments. An ultrasonic cleaner can also be used to clean delicate instruments; it is especially useful for unblocking cannulae. Care should be taken not to damage the tips. Rubber tubing should be used to protect the delicate tips of instruments.

Rubber items should not be folded and should be kept separately from metal instruments to prevent damage. Bottles are placed in a bin over a linen cloth.

All the detachable items are disassembled. Oil and lubricants are to be wiped off well because steam or gas will not penetrate. Each set must be separated and put in trays. The trays are placed inside the bin after spreading a towel. Place one towel with autoclave tape on the bottom, middle and top of the bin. The bin is closed and the holes are kept open so that steam can penetrate inside the bin. If the holes are closed, sterilisation will not occur. (Fig.3)

*Fig : 3 - Packing of bins*

- Hinged instruments must be kept open with box unlocked to permit steam contact on all surfaces
- Instrument must be placed in a perforated tray to allow steam penetration
- Sharp and delicate instruments are kept at the top of the tray
- Loose packing and space between items is very important for easy circulation and penetration of steam
- Name of the item, date of sterilisation, date of expiry should be noted on each package
- Do not load liquids with instruments because the sterilisation time is different. Set the correct pressure and timing. Close the door of the autoclave and switch on
- Linen: Gowns are folded in such a way that the inside part faces outside so the surgeons and the OAs put on the gown without touching the outside portion. While folding the eye towels the holes must be visible. Avoid packing items too tightly to enable steam penetration to each layer of the liners.

## Unloading the autoclave

Once the cycle is complete, switch off the autoclave and allow the pressure to come down. Open the door slowly (Fig. 4).

*Fig : 4 - Unloading the autoclave*

- The holes of the bin are to be closed to prevent entry of micro-organisms and avoid contact with unsterile areas. Items are taken out using clean linen to prevent burning of the hands.
- The sterile items are to be stored in their designated place.

## Control measure

A biological test can be done for positive assurance that sterilisation conditions are achieved either by steam pressure, gas sterilisation or hot air oven. One spore strip can be placed at the bottom of the bin and sterilise in a routine cycle. Once the cycle is completed the spore strip is removed and sent to the laboratory for analysis.

## Flash autoclave

### Prevacuum high-speed autoclave

The pre-vacuum high temperature autoclave requires the least time to sterilise a single load. The flash autoclave is an example. This is commonly used to sterilise instruments in between surgeries. All the air is evacuated using a vacuum pump before admitting steam. This causes rapid rise of temperature to 134°c. It permits instant steam penetration. The sterilisation time is reduced to fifteen minutes. The cycle is timed automatically.

### Advantages of steam sterilisation

- The easiest, safest and surest method of sterilisation
- The fastest method
- Less expensive and easily supplied
- Automatically controlled
- Not left with harmful residue

## 2. Chemical agents

Chemical agents destroy micro-organism by protein coagulation and breaching the cell membrane.

### A. Ethylene oxide gas sterilisation (E.T.O)

Ethylene oxide is an effective gas for sterilising instruments and other materials which would otherwise be damaged by hot air, steam or other chemical disinfectants. Vitrophage, cryoprobe, fibrotic light, lenses, sutures are the materials that require gas sterilisation.

After the sterilisation, the articles are kept outside for 24 hrs or 8 hrs in an aerator. This removes the residue of ethylene oxide.

### Preparations for gas sterilisation

- Any lubricant should be removed from instruments as the gas cannot penetrate.
- All items should be cleaned and dried well.
- Detachable items should be disassembled.
- Make sure items are dried thoroughly before packing as water and ethylene oxide form a harmful gas.
- Dennison wrapper or polythene bag can be used for packing. Inspect the bags for damage before packing.
- Before sealing the bag make sure there is no air inside to avoid rupture when vacuum forms in the steriliser.
- Do not use penetrating objects like pins, stapler, paper clips, etc. for sealing as this will damage the pack and contaminate the contents.
- Name of the item, sterilisation date, and expiry date should be written on each pack.
- Items should be loaded in steriliser carefully to allow free circulation and penetration of gas.
- Avoid overloading. There should be space between the chamber ceiling and the top of the packaged items. They should not touch the wall of the steriliser.

**Advantages of E.T.O sterilisation**

a. It causes minimal damage to materials
b. It can sterilise materials that cannot be sterilised by other methods
c. Effective against all organisms
d. Achieves good penetration

**Disadvantages of E.T.O**

- It is a slow and costly method
- It is flammable and toxic

**B. Activated glutaraldehyde**

This is a safe method of sterilisation for heat sensitive items. Complete immersion of instruments in activated glutaraldehyde for eight hours kills all micro-organisms including spores. Rinse and clean the instruments thoroughly in distilled water after sterilising.

**Advantages**

- It is non- corrosive and non- staining
- It is not absorbed by rubber articles or plastic
- It can be reused throughout its effective activation period
- Glutaraldehyde is effective at room temperature

**C. Formaline sterilisation**

Formaline (Fig.5) is used for fumigation of the operation theatre. It destroys all micro-organisms and it is available in liquid and tablet form. Apart from fumigation, formaline is used to sterilise some heat sensitive items. The sterilisation time is 12 to 24 hours. The main disadvantage is that formaline irritates eyes and skin and is also carcinogenic.

*Fig : 5 - Formaline*

**D. Alcohol (70% Isopropyl alcohol)**

This destroys micro-organisms by protein denaturation but does not destroy spores. It is commonly used as a hand disinfectant and evaporates quickly.

**E. Povidone Iodine**

This is used for surface disinfection. 10% povidone iodine is used for hand scrubbing and skin preparation of the patient prior to surgery. 0.5% povidone iodine is used as eye drops prior to surgery.

**F. Dettol (antiseptic)**

Dettol destroys micro-organisms. It is used for floor cleaning in a dilution of 1:40 (1 part of dettol and 40 part of water).

## Maintenance of sterility

**Shelf life**

Items are considered sterile only for a certain length of time. This is known as the shelf life of the item. The older stock must be used first. This can be achieved by placing the older stock in the front and the newer stock behind. The sterility of the item depends upon the type of package, use of dust covers, storing it in closed shelves, number of times it is handled and the condition of the storage area: cleanliness, humidity, temperature.

### Indicators

Sterilisation tape must be used and checked to ensure that item has been exposed to the sterilisation process. Expiry dates or dates of autoclaving should be noted.

### Contamination

The contamination of an item is due to it becoming wet, damaged, and broken or to the expiry of its shelf life. Contamination is more likely with increased handling. The sterile wrapping, i.e. paper, material or plastic, acts as a barrier to the possible entry of micro organisms. If the package is found opened, partly used or damaged by water the contents are no longer sterile. Such items are considered non-sterile regardless of expiry date.

### Handling

Sterile items should be handled only by scrubbed and gloved personnel. This applies to instruments, any intraocular lenses, prosthetic shells, cellulose swabs, etc. An instrument should be passed to the surgeon in such a way that he / she can take on hold of it by its body. Only the tip of the instrument should come into contact with the patient's eye and it should never be touched by the surgeon or scrub nurse.

### Important points to remember

- All items must be labelled with the date of sterilisation.
- All items have an expiry date.
- All items must be inspected before use to ensure that there are no tears, punctures, open seams, moisture, soiling from being dropped on the floor, etc.
- Once a package has been opened, it is no longer considered sterile, whether or not its contents are used.
- Don't store non-sterile items along with sterile items.
- If the sterility of an item cannot be assessed, it must be re-sterilised or discarded.
- In the processing and sterilisation areas, personnel are likely to get burn injuries when operating steam sterilisers or heat sealers and can be exposed to high levels of ETO. Be aware that many areas of a steam steriliser are hot.

### Summary of sterilisation of certain items

| Items | Type of sterilisation |
|---|---|
| Linen | Autoclaving |
| Glass | Autoclaving / Dry heat |
| Heat labile | ETO |
| Heat resistant | Autoclaving |
| Plastic | ETO |
| Sharp instruments | ETO / autoclaving / Chemical |
| Intraocular lens | ETO |
| Sutures | ETO |
| Diathermy, Cautery | Autoclaving / chemical |
| Endoilluminators/probes | ETO |
| Silicone oil, buckles, sponges | Autoclaving |

## Control of airborne infection

### Air in the operation room

The most effective way of preventing airborne infection is having air changes, laminar flow and use of filters in the air conditioners.

The air conditioning system must be designed to minimise air borne bacteria from entering the sterile field. The Air should flow out from Zone 1 to Zone 2 and from Zone 2 to Zone 3. In other words the Air pressure should be highest in Zone 1.

**Air changes:** It is recommended to have 20 air cycles per hour. Fresh air change every 3-4 cycles is recommended. The ventilation in the OT should not allow the outside air to enter the operating room.

**Ventilatory systems:** They help in maintaining the sterile atmosphere in the OT.

**Laminar flow:** The laminar flow can be either vertical or horizontal, though the vertical is more effective. It is usually restricted to an area in the centre of operating room (room within a room) and needs 100% coverage of High Efficiency Particulate Air (HEPA) filters. The air is passed through the HEPA filters from ceiling downwards. Horizontal flow is through the walls and is easier to install. It provides 400 air changes per hour. It is recommended for prosthetic surgeries.

### Precautions to be taken in operation theatre

- Injuries due to slippery floors, cluttered corridors and improper precaution while cleaning instruments should be minimised.
- Height of all the furniture should be as high as the operation theatre table. This is known as the level of sterility.
- A separate breakout or unpacking area should be maintained to hold deliveries until the exterior shipping cartons can be opened and the contents removed in a safe and controlled manner.

Exterior shipping cartons have been exposed to many environments (in warehouses, on docks, in trucks), are usually made of corrugated porous material, and must be considered heavily contaminated and should not be brought into the CSSD.

## Decontamination process

It is carried out prior to any kind of sterilisation. This reduces the contamination of the instruments.

### Transport

The reusable items should be collected and taken to the decontamination area in such a way that avoids the contamination of the personnel or any area of the hospital. The equipment collected should be moved in trolleys or containers.

### Attire

Soiled, reusable medical/surgical items are considered to be contaminated with bacteria and other micro organisms, which can cause illness to the staff. The personnel handling these items should wear protective clothing which includes a scrub dress, mask, cap and gloves. In certain areas, goggles, shoe covers and moisture resistant barriers are desirable.

### Sorting

Surgical instruments differ in configuration from plain surfaces to complicated instruments which include locks, hinges; blind holes etc. depending on the type of cleaning, items are to be sorted out. Contaminated instruments must be handled as little as possible. The sorting could be minimised to separating sharp instruments from blunt and discarding disposables or non-usable.

### Soaking

Certain instruments maybe required to be soaked such as lumens or very blood stained instruments. Rinsing alone would not suffice.

At all times, be alert for hazards such as sticks from needles, scalpels and other sharp instruments and glassware in the decontamination area. Never reach into liquid to retrieve items.

### Washing

The detergent should be used as specified by the manufacturer or a disinfectant like chlorhexidine can be used. The items can be washed in an ultrasonic cleaner and manually cleaned.

### Manual cleaning

All the items are to be cleaned with disinfectant like chlorhexidine or povidone iodine prior to sterilisation. Four bowls, one with disinfectant and the three with clean distilled water are used for cleaning purposes. The tray of used instruments is emptied out into a bowl of disinfectant. Using soft brush, debris deposited is removed from the instruments. This is followed by three rinses with distilled water thoroughly. For hinged instruments such as scissors etc. a lubricant is used after the final rinse. Care should be taken to remove the excess lubricant or else steam would not penetrate.

### Ultrasonic cleaner

It is used for cleaning instruments which are contaminated with lot of blood and cannulated instruments. The instruments must be completely immersed in cleaning solution. The tank should be filled to one inch above the top of the instruments tray. Suitable detergent, as specified by the manufacturer, is added. The temperature of the water further enhances the action of the detergent. The instruments should not overlap when immersed in the water. This is to be followed by manual cleaning.

## Sterilisation of phacoemulsification Instruments

Failure to perform cleaning procedure after each surgery may result in patient injury. The drip is removed from the drip chamber. The irrigation tubing is disconnected from it. The irrigation aspiration tube is disconnected from the handpiece. The handpieces are unplugged from the console. The tubing are flushed with saline solution before switching off the machine and the saline collected in a bin.

### Cleaning of the components

All cleaning procedures must be done immediately after each surgical procedure; otherwise, tissue debris and salts from the saline irrigating solution may collect and cause permanent damage.

### Ultrasonic handpiece

The handpiece is wiped with a soft non abrasive cloth and distilled or sterile water to remove residual tissue

Both the irrigation and aspiration ports are flushed twice with a20 cc syringe filled with warm distilled or sterile water. It is repeated with air.

### Irrigation and aspiration handpiece

Clean the hand pieces, tips and sleeve with gauze piece dipped in isopropyl alcohol or any antiseptic.

Thoroughly flush all the handpieces, components and tips with distilled or sterile water.

Disassemble irrigation and aspiration handpiece and remove tip from the handpiece.

Tips and sleeve are usually disposable ones. But they can be reused if properly sterilised. The tip should be connected to a syringe and flushed with water. Similarly, the sleeve is also flushed with water. All are then packed into trays for steam sterilisation. Care should be taken to wrap the tubing and handpieces separately in a cloth i.e. the metal components should not come in contact with the wire.

#### Sterility of OT

The sterility of the theatre is checked microbiologically. Monthly cultures are taken by open plate technique to check for the growth of bacteria and fungus. In this method blood agar plates and saboraud dextrose agar plates are opened on the front and back tables of the operation rooms for half an hour. The plates are then incubated for 24-48 hrs. If the colony count is less than 20, then the theatre is considered sterile and satisfactory.

Sterilisation procedures and maintaining a sterile environment is a team effort and every member including the surgeon, theatre staff and housekeeping must contribute to the achievement of a sterile environment. One small lapse in the chain can lead to disastrous results. Sterilisation is an ongoing procedure with day-to-day monitoring.

### Key points to remember

1. Do not overload the autoclave as steam cannot penetrate a dense chamber
2. Ensure that holes of all bins are open
3. Set the correct pressure and timing
4. While unloading, close the holes of the bins immediately to prevent microorganisms from entering. Avoid any contact with unsterile areas
5. All areas and equipment in the operation theatre should be cleaned thoroughly on a regular basis

### Students exercise

#### Answer the following

1. What is the definition of sterilisation?
2. Describe how to achieve asepsis in OT
3. What are the different methods of sterilisation?
4. Explain in detail about the autoclave method
5. What are the advantages and disadvantages of E.T.O. sterilisation?
6. Explain how to pack the bins for autoclaving

## Scrubbing, gowning, gloving procedure

### Definition

Surgical scrubbing is the process of removing as many micro-organisms as possible from the hands and arms by following a standard hand- wash technique before starting any surgical procedure. The aim of scrubbing is:

- To minimize cross infection
- To provide a sterile field

### Materials needed for hand scrub

- Anti microbial agents like soap, chlorhexidine 4% or povidone Iodine 10%
- Sterile water in a sterile container
- Timer

### Preparation prior to scrub

- Adjust the theatre attire
- Inspect hands for cuts and abrasions
- Remove jewelry like rings, wrist watch, etc.
- Remove fingernail polish
- Clip the nails whenever necessary

### Procedure of surgical scrub

- Wet the hands and arms using sterile water.
- Apply soap and scrub each side for two minutes. This preliminary wash removes any hand cream or oil on the surface of the skin.
- Take a sterile nail brush. The brush is used only on the fingernails. Take care that the nails are thoroughly cleaned.
- Rinse the hands with sterile water by draining water from fingers to elbow
- Take 5ml of hibiscrub and scrub the same way as before, taking two minutes for each arm.
- Rinse the hands the same way as mentioned above
- Reapply another 5 ml of hibiscrub and repeat.

- Avoid touching any unsterile area with your hands (Fig.6 & Fig. 6a).

*Fig : 6 - Washing the hands*

*Fig : 6a - Drying the arm*

## Dry your hands as follows

- The palm is dried with a sterile towel and then each finger
- Next dry the arms from the wrist to elbow.
- The surface of the towel which dries the arms should not contact the hands
- The towel is then dropped into the appropriate receptacle

## Gowning procedure

1. Pick up sterile gown at the neckline / shoulders, lift straight up and hold away from the body
2. Allow gown to unfold completely. Do not shake.
3. Slip both hands into arm holes through sleeves by raising and spreading arms
4. Keep hands inside gown at the cuff, wait for circulating OA to tie gown before gloving. (Fig.7).

*Fig : 7 - Gowning*

## Gloving is done as open or closed procedure

### Closed gloving procedure

1. Pick up sterile glove with cuff sleeve covered. Place sterile glove palm side down over the cuff of the gown.
2. Grasp the cuff of the glove and bring it over the gown cuff completely.
3. Slide the hand into the glove as the cuff is drawn over the wrist. Repeat step1 through 3 for the opposite hand.

### Open gloving procedure

1. Pick up the glove by its inside cuff with one hand. Avoid touching wrapper with bare hands.
2. Slide glove onto the opposite hand, with cuff down.
3. Using the partially gloved hand, slide fingers into the outer side of the opposite glove cuff.
4. Slide the hand into the glove and unroll the cuff. Avoid touching the bare arm.

*Fig : 8 - Opening the glove*

5. With the gloved hand, slide the fingers under the outside edge of the opposite cuff and unroll it using the same technique (Fig.8 & Fig.8a)

*Fig : 8a - Sliding the hand inside the glove*

### Student exercise

1. What is meant by surgical scrub?
2. Explain the procedure of surgical scrub. What are the materials needed for hand scrub?
3. Explain the gowning procedure.
4. Explain the open and closed gloving techniques.

#### Demonstration

1. Demonstrate the technique of hand – washing.
2. Prepare posters to illustrate hand washing.
3. Demonstrate the gowning and gloving procedure and have each student practice gowning and gloving.

## Cleaning of the operation room

### Daily cleaning of the operation room

After completing the day's schedule, cleaning is done in all areas of the operation room. The purpose is:

- To destroy microorganisms as quickly as possible.
- To protect operation room personnel from coming in contact with known or unknown infectious materials.
- To prevent cross contamination.

### Areas that require daily cleaning

- Walls
- Overhead lamp and fan
- Floors & Doors
- Operation theatre tables
- Microscopes

### Materials required for operation room cleaning

- Soft broom
- Dust pan
- Brush
- Detergent
- Antiseptic agent
- Mopping cloth
- Bucket

#### Procedure

- The floor is swept first
- Equipment such as electro surgical units should be checked and cleaned well.
- Ceiling and wall mounted fixtures are cleaned.
- Cabinets and doors are cleaned, especially around the handles or push plates.
- Walls of the scrub sink need special attention and cleaning.
- Transportation carts and wheels must be cleaned.
- Waste buckets are cleaned well and disinfected.
- Furniture is thoroughly scrubbed and cleaned with chemical disinfectant.
- Floor is always mopped last. A clean mop is used to mop the floor.
- Keep two buckets for mopping the floor, one with plain water and the other with chemical disinfectant (e.g. Dettol 1: 4 0 dilution in water)
- First dip the mop cloth in dettol, wring out water and mop the floor. Clean the mopping cloth in plain water, wring out and again, dip in dettol water, and mop the floor in same manner.

### Weekly cleaning of operating room

- Remove all the furniture and equipment from the operating room suite.
- Clean and replace air conditioner filters. (Remove the A.C. filter, remove the dust and wash the filter, dip in antiseptic solution, dry it and replace).
- Regular cleaning of all sterilisers must be done as recommended by the manufactures.
- Floors through out the operating room suite should be machine scrubbed periodically to remove accumulated deposits.

- Washing the walls and floors in the operation room suite once a week is very important.
- Clean and arrange all the equipment and furniture in their proper places after washing operation room.
- Mop the floor as mentioned above.

### Operation room fumigation

Equal quantities of formaline and distilled water are added into the fumigator as required according to the size of the operation room. For a room of 7 X 6 cubic meters size, 50 ml formaline is used with equal amount of distilled water. The solution is poured into the machine and a fan placed above the machine rotates. That leads to the evaporation of formaline.

This machine is electrically operated and the procedure takes half an hour. Formaline kills microorganisms by coagulation of protein cells. It is sporicidal within twelve hours. The operation room must be kept closed for at least twelve hours after fumigation.

#### Advantages of fumigation

- Significant reduction of bacteria in the environment
- Effective decontamination of exposed surfaces

#### Ultra violet lighting

U.V. Lamp (Ultraviolet light) is another method of sterilising the operation room. After completely cleaning the operation room as mentioned above, switch on the U.V. light for twelve hours. After this time switch off the light before entering into the O.T. to protect the eyes of the operation room personnel.

## Infection control practice for operation room

The five main categories of factors involved in surgical infection control have been classified in to four D'S"

### Discipline

- Surgeons techniques
- Touch contamination
- Attire and preparation
- Support services
- Sterilisation techniques
- Maintenance and repair
- Standards and policies
- Infection control
- Infection report

### Defense mechanism

- Type of patient and age
- Elderly patient
- Patient with high risk diseases
- Premature babies
- Drugs
- Antibiotics
- Irrigating solutions
- Skin preparation

### Design

- Surgical suite
- Demarcation of aseptic area
- Ceiling design
- Ventilation material and traffic pattern

#### Devices

- Caps and mask
- Gloves
- Clothing
- Drapes
- Anaesthesia equipment
- Sterilisation devices
- Steam and gas

### Summary

A good surgery can be spoiled by infection. Infection increases the cost both for the patients and the hospital. OAs must have cooperation with all other hospital staff involved in patient care. With all these efforts OAs can provide an infection free environment and quality care for surgical patients.

### Student exercise

1. Why do we clean the operating room daily?
2. What is the procedure involved in cleaning the operating room?
3. Write in detail about operating room fumigation.

**Sterilisation protocol at a glance**

| Area | Procedures | Accepted Practice |
|---|---|---|
| No.of standard surgical sets | One surgeon with one OT table: 4 sets<br>One surgeon with two OT tables : 7 sets<br>One junior surgeon with one OT table: 2sets | |
| Cleaning procedures | Manual cleaning | Use four bowls. First wash with the disinfectant and clean with a soft toothbrush. Then followed by three washes with distilled water. |
| Blunt instruments | Prior to surgery | Steam sterilisation |
| | Between cases | Flash autoclave |
| Sharp instruments | Prior to surgery | Steam sterilisation, ethylene oxide sterilisation |
| | Between cases | Flash autoclave |
| Heat labile instruments | Cryoprobe, vitrectomy cutter and cautery | Formalin chamber/ ethylene oxide |
| Linen | Surgeons dress, Aprons | Steam sterilisation |
| | Drape sheets | Disposable |
| Hand washing | Prior to surgery | Hand scrubbing with povidone iodine scrub or chlorhexidine for 5 minutes. |
| | Between cases | isopropyl alcohol |
| Surgical supplies | Irrigation Solution | Steam sterilisation before opening the seal. |
| Theater sterilisation/ Disinfections | Floor | Chlorhexidine, lysol |
| | Fumigation of OT | Formaldehyde |
| | Air conditioners | Filters to be removed and washed with soap & water weekly. |
| | Walls | Washed with water and disinfectant weekly. |
| | Theatre trolleys | Disinfectant |
| Patient | Dress for OT | Sterile dress if provided by the hospital, shoe covers & cap |
| | Disinfection of the Conj. Sac | Povidone iodine |
| Sutures | Prior to surgery | ETO (if the pack has been opened but only once) |
| | Between cases | Cidex (this method is not recommended) |