

# **STERILIZATION IN ORTHODONTICS**

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# **INTRODUCTION**

## **❖ Sterilization**

It is defined as the process by which an article, surface or medium is freed of all living microorganisms either in the vegetative or spore state.

## **❖ Disinfection**

It means the destruction or removal of all pathogenic organisms, or organisms capable of giving rise to infection.

## ❖ Antisepsis

It is used to indicate the prevention of infection, usually by inhibiting the growth of bacteria in wounds or tissues.

## ❖ Antiseptics

It is a Chemical disinfectants which can be safely applied to skin or mucous membrane and are used to prevent infection by inhibiting the growth of bacteria.

- ❖ **Bactericidal agents** or germicides are those which are able to kill bacteria.
  - ❖ **Bacteriostatic agents** only prevent the multiplication of bacteria which may, however, remain alive.
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- Barrier protection has to be made use of to protect the clinician from any disease that the patient may be suffering from and has the potential of transmitting to the clinician.
  - The barriers routinely used are surgical gloves, mouth masks and eye protection goggles.

There are three possible pathways of cross contamination and each should be handled in a specific way.

## **A. CRITICAL**

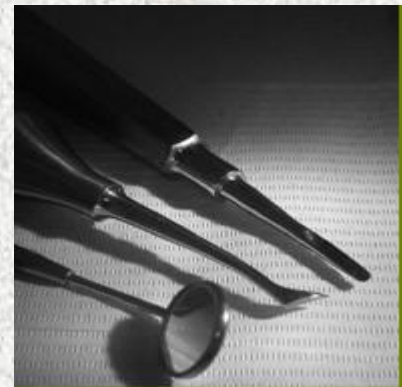
- These include instruments that penetrate the mucosa and must be sterilized.

# B. SEMI-CRITICAL

- This segment include instruments that touch the mucosa but do not penetrate it
- These should be sterilized. .

## Table 1 : Instruments

- Mirrors
- Explorers
- Banding and bonding instruments
- Bands
- Pliers
- Ligature directors



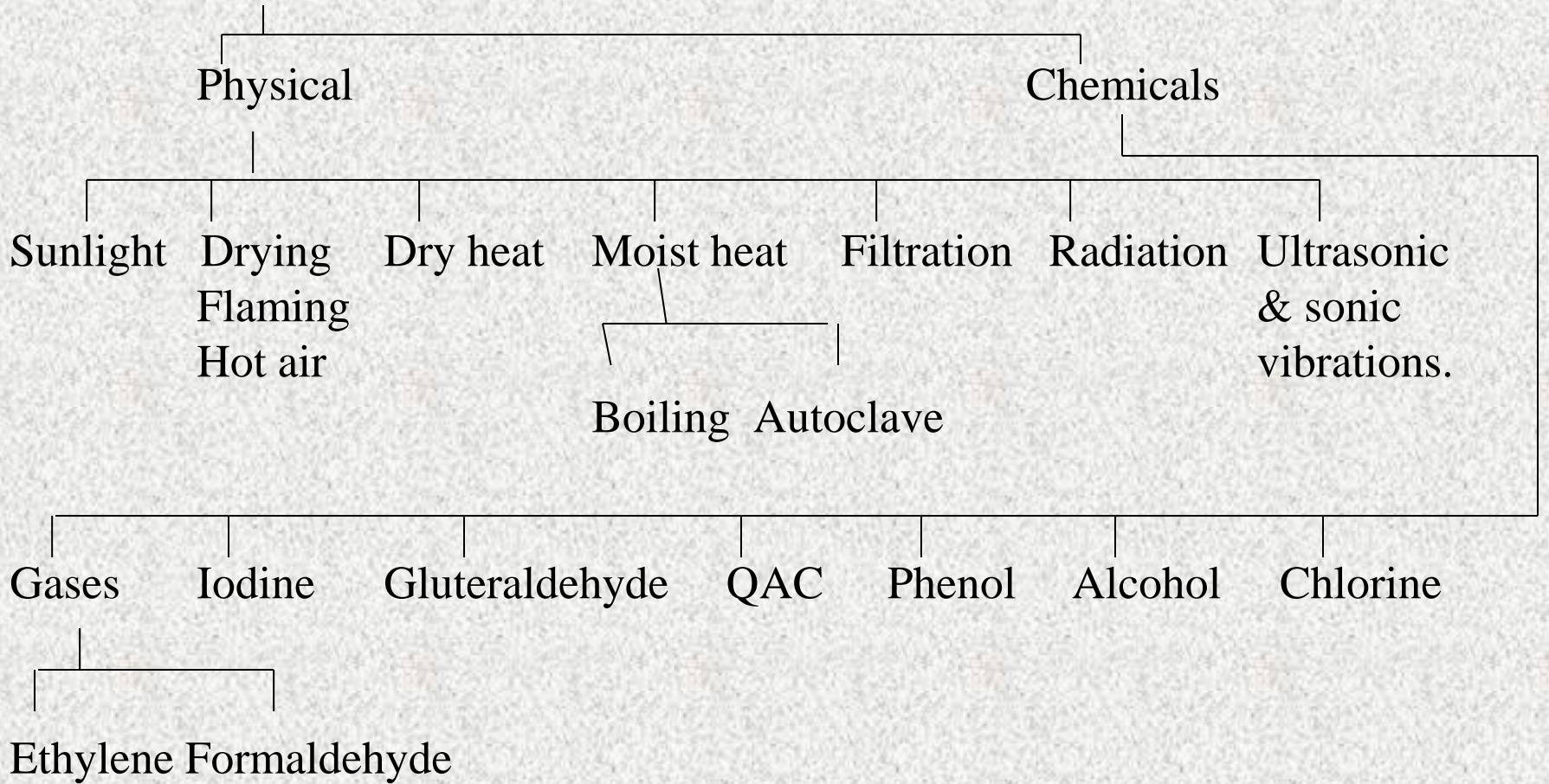
## C. LEAST CRITICAL

- This segment include surfaces touched during treatment
- These should be disinfected.

### **Table 2 : Surfaces that should be disinfected**

- Bracket and band trays
- Air/water syringes
- Saliva ejector handles
- Chair control buttons
- Operatory light handles
- Chair armrests and headrests

Methods -



# STEPS IN STERILIZATION / DISINFECTION

The basic steps remain the same for the two procedures. These includes :

1. *Rinsing* All instruments, irrespective of the instrument should be rinsed/washed thoroughly. This will remove all non-sticky debris from the instrument.

2. ***Debridement*** with ultrasonic cleaner. This will remove all materials including sticky cements or dried blood from the instrument.. The cycle lasts from 2-15 minutes depending upon the ultrasonic cleaner and the type of debris sticking to the instruments.

3. ***Dry thoroughly*** The drying process can be done under bet air or using a sponge followed by drying under the fan.

This step is essential to avoid any damage to the instruments during the next stage of sterilization/disaffection.

# METHODS FOR STERILIZATION

## 1. *Steam pressure*

- Majority clinics make use of autoclaves .
- Which work on this principle. The ideal combinations are 250 °C at 15-psi pressure for 15-minutes or 270 °C at 30-psi pressure for 3 minutes. It is unacceptable for orthodontic pliers because of the severe and corrosion produced at the pliers joints.

## *Chemical*

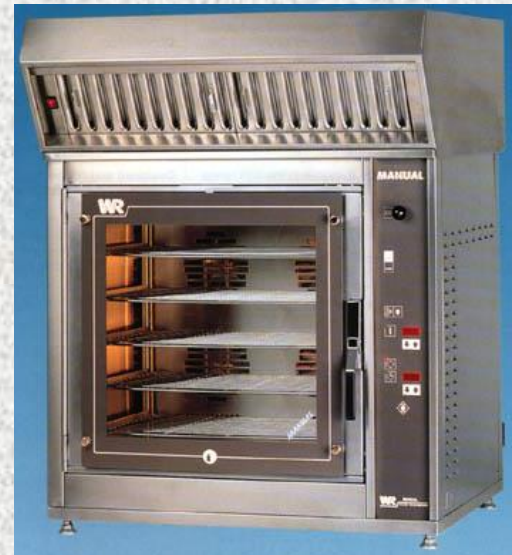
Chemical vapor sterilizers use formaldehyde, alcohol and water at 270 °C at 20 to 40 psi pressure for at least 20 minutes.

## *Dry heat ovens*

This safe and convenient method is still in vogue with clinicians and involves maintaining the temperature at 340 F for 1 hour or 320 F for 2 hours or 250 F for 6 hours or more. Ideal for cutters and other sharp instruments as less chance for damage due to corrosion.



**Autoclave**



**Hot air oven**



**Autoclave**

#### 4. *Boiling water*

- Boiling water is used mainly to sanitize, i.e. the number of microbial contaminants is reduced to safe or relatively safe levels as judged by public health requirements, without the destruction of certain viruses and resistant spores. Immersing instruments in boiling water at 100 °C (212 F) for 30 minutes at sea level will kill most vegetative bacteria.

**An immersion lasting 60 minutes is recommended to compensate for the temperature lag in the load during the initial part of the boiling cycle and changes in altitude. For every 1000 feet increase above sea level, boiling time should be increased by 5 minutes. Boilers of various sizes are available commercially. The method is not recommended for orthodontic instrument as it really does not sterilize and the chances of corrosion are maximum.**

## 5. *Salt or glass bead sterilizers*

- The glass bead sterilizers use small glass beads 1.2 to 1.5 mm in diameter. The heat generated is very high in a very short span of a few seconds. 424 to 450 °F (217-232 °C) for 3 to 15 seconds but not exceeding 482 F (250 °C) is considered sufficient for bands. The larger the instrument the longer the time required. Ideal for chair side sterilization of instruments. A narrow, deep well is preferred to a wide, shallow well. The instruments should be placed deep and near the sides of the well for best results.

## ***Hyperbaric gas (ethylene oxide) sterilization***

**It is ideal for instruments that are prone to corrosion or heat damage. Since the gas by itself is highly toxic and has a tendency to retain in the material sterilized, the sterilized instruments cannot be used immediately and a need exists to allow for the gas to dissipate.**

**Depending upon the temperature, sterilization time varies from 4 to 12 hours. It is 12 hours at room temperature and 4 hours at 56 °C (2 ½ to 5 ½ hours at temperatures ranging from 125 to 135 °F with a relative humidity at 40-80%)**

# Glass bead sterilizer



# METHODS FOR DISINFECTION

## 1. *Cidex (activated glutaraldehyde, 2%)*

- *it* is one of the most commonly used disinfection agents. It acts rapidly, is nonstaining and does not cause rusting. Instruments should be completely immersed in it for 10 minutes for disinfection and for a minimum of 10 hours at a pH of 7.5 to 8.5 to achieve sterilization. The instruments need to be washed thoroughly with sterile water before use.

## ***QAC (quaternary ammonium compound)***

**Exposure to this compound reduces the surface tension between the bacteria and an object, thus disrupting the bacterial cell wall. It is used routinely for disinfection of hand instruments as the metal remains bright and does not show any sign of corrosion. These compounds also have a pleasant odor and a short-time cycle. They become inactive in the presence of soaps and organic matter. These have a limited effectiveness against gram-negative organisms, spores and viruses.**

# Disinfection solution



# Glutaraldehyde solution

### 3. *Phenol*

- Phenol in high concentration is a rapid protoplasmic poison that penetrates the cell wall and precipitates the cell protein. Phenolic solutions are not sporicidal but are tuberculocidal and virucidal. These are good germicidal cleaners for floors, tabletops, etc.

### 4. *Alcohol*

- Alcohol (Fig.36.7) is a moderate disinfectant. It behaves similarly as QAC and disrupts the bacterial cell wall isopropyl-alcohol is generally used in 70 percent aqueous solution and is more effective than ethyl alcohol. Ethyl alcohol (70-95%) is effective against vegetative organisms and tubercle bacilli but both are ineffective against spores. It can cause rusting of metal instruments. Alcohols become ineffective as soon as they evaporate.

## 5. *Chlorine*

- It is used in aqueous solution. Even in minute quantities it is rapidly bactericidal. Its mode of mechanism is still not exactly known. The aqueous solution of chlorine is unstable and has to be changed daily. It has the potential to corrode metals and soften plastics.

## 6. *Iodine and iodophors*

- Iodine is a faster disinfectant than QAC or Chlorine. Free iodine forms salts with the bacterial protein. Thus killing the cell concentrated iodine is mixed with softened or distilled water to form a disinfectant solution.

# HAND DISINFECTION

- Ideally, it is advised to wear gloves. If that is not possible, simply disinfect by washing for at least 20 seconds with 10 percent povidone iodine or 4 percent chlorhexidine gluconate or 4 percent isopropanol.
- Adequate precautions should be in place at all times to prevent infection, and protect both patients and staff. It is essential to train auxiliary staff and form protocols, which should be strictly adhered to, to maintain and implement a safe and realistic infection control program.

# **DISINFECTING THE IMPRESSION**

**Dental stone should be sprinkled on the impression to identify the saliva present. Impression should not be washed under direct water as it may get distorted**

**Glutaldehyde should be sprinkled over the impression and kept in airtight plastic container or bag for 10 minutes. Immersing it in iodophor for 10 minutes is also enough.**

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***THANK YOU***

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