Sterilization in Operative Dentistry

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Is a term referring to any process that eliminates (removes) or kills all forms of microbial life, including the resistant bacterial spores using physical or chemical means. Sterilization in dentistry is a very important and crucial aspect of providing successful dental treatments. Since most instruments contact mucosa and/or penetrate oral tissues, it is essential that reused instruments be thoroughly cleaned and sterilized by accepted methods that can be routinely tested and monitored.

DISINFECTION:

A much lesser term of sterilization and indicate procedure offering variable measures of control of infection, in this way we not going to kill all living microorganism may viruses kept survive.

Classification of sterilization

♦ PHYSICAL METHODS
♦ CHEMICAL METHODS
♦ COMBINATION OF BOTH

Physical methods	*Chemical methods*
Moist heat	Alcohols
Dry heat	Aldehydes
Filtration	Halogens
Radiation	Phenols

Methods of sterilization

There are five accepted methods of sterilization:

1. Steam pressure sterilization (autoclave)
2. Chemical vapor pressure sterilization (chemi-clave)
3. Dry heat sterilization (dryclave)
4. Ethylene oxide sterilization

1. STEAM PRESSURE STERILIZATION (AUTOCLAVING)

Sterilization with steam under pressure is performed in a steam autoclave. For a light load of instruments, the time required at 250° F (121° C) is a minimum of 15 minutes at 15 psi pressure.

Time for wrapped instruments can be reduced to 3 minutes if the temperature is raised to approximately 273° F (134° C) to give 20 psi of pressure. Time required for the sterilizer to reach the correct temperature is not included.

Instruments which are sterilized by using autoclave is

Handpieces, orthodontic pliers, impression trays, and surgical instruments.

Advantages of autoclaves

1- Autoclaving is the most rapid and effective method for sterilizing cloth surgical packs and towel packs.

2- Economical

3- Good penetration on all surfaces.

4- Short procedure time

5- Easily monitored

Disadvantages of autoclaves

1- Items sensitive to the elevated temperature cannot be autoclaved.

2- Autoclaving tends to rust carbon steel instruments and burs.

3- Steam appears to corrode the steel neck and shank portions of some diamond instruments and carbide burs.

4- Dulling of unprotected cutting edges.

2. CHEMICAL VAPOR PRESSURE STERILIZATION (CHEMICLAVING)

- Sterilization by chemical vapor under pressure is performed in a Chemiclave.
- Chemical vapor pressure sterilizers operate at 270° F (131° C) and 20 lbs pressure.
- They are similar to steam sterilizers and have a cycle time of about half an hour.
- Like ethylene oxide sterilizers, they must be used with a prescribed chemical by

the manufacture.

- **Instruments which are sterilized by using chemiclave is:**
  - ❑Periodontal, restorative and endodontic instruments
  - ❑ Carbon steel and other corrosion sensitive burs and pliers

Advantages of Chemiclaves

Carbon steel and other corrosion-sensitive burs, instruments, and pliers are said to be sterilized without rust or corrosion.

Disadvantages of Chemiclaves

1- Items sensitive to the elevated temperature will be damaged.
2- Instruments must be lightly packaged in bags obtained from the sterilizer manufacturer.
3- Towels and heavy cloth wrappings of surgical instruments may not be penetrated to provide sterilization.

3-DRY HEAT STERILIZATION (hot air ovens)

It is the most widely used method of sterilization by dry heat. Dry heat sterilization is readily achieved at temperatures above 320° F (160° C) for 1-2 hours. The oven is electrically heated and is fitted with a fan to ensure adequate and even distribution of hat air in the chamber. It is also fitted with a thermostat that maintains the chamber air at a chosen temperature.

Instruments which are sterilized by using hot air oven are :

❑ Endodontic instruments
❑ Condensers
❑ Hand instruments
❑ Orthodontic pliers
❑ Surgical instruments
❑ Burs

Advantages of dry heat

1- Carbon steel instruments and burs do not rust, corrode, or lose their temper or cutting edges if they are well dried before processing.
2- Economical.
3- Easily monitored.

Disadvantages of dry heat

1- High temperatures may damage more heat-sensitive items, such as rubber or plastic goods.

2- Sterilization cycles are prolonged at the lower temperatures.

3- Heavy loads of instruments, crowding of packs, and heavy wrapping easily defeat sterilization.

4-Hot air is bad conductor of heat hence it has less penetrating power.

4 - Ethylene Oxide sterilization

Ethylene oxide sterilization is the best method for sterilizing complex, heat sensitive instruments and delicate materials like rotary handpiece. Ethylene oxide is a gas at a temperature below 100°C. It is highly explosive and inflammable. It is highly penetrative, non-corrosive agent with a bactericidal action. It is used for the sterilization of towels, metal and plastic instruments.

LIQUID STERILANTS/HIGH-LEVEL DISINFECTANTS

. Sterilants used for high-level disinfection of items for reuse are glutaraldehydes at 2% to 3% concentrations; it kills bactereial spores in 6-10 hours.

· Greater dilutions are not encouraged for repeated use.

· Placing wet items into disinfectant trays dilutes the solution.

· Glutaraldehydes are irritating, sensitizing to skin and respiratory passages, and can be toxic as indicated in manufacturers' safety data sheets.Keep trays tightly covered in a well-vented area.

· *Do not use 2% glutaraldehyde solutions to wipe counters or equipment* (e.g., dental unit and chair).

Infection control program in minimum dental office

1.Sterilization of instruments

2.Comprehensive medical history

3.Hepatitis B vaccine to prevent any cross infection

4.Antiseptic and mouthwash

5.Disposal mask and gloves

6.Protective eye glass

7.Rubber dam

8.Surface cleaning and cover tray

9.Needle and sharp instrument safety

DENTAL INSTRUMENTS CLASSIFICATION

based on risk of transmission and need of sterilization
-CRITICAL
-SEMI-CRITICAL
-NON-CRITICAL

Category	Definitions	Dental instrument or item	Type of sterilization
Critical	Penetrate soft tissue, contact bone, enters into or contacts the blood stream	Surgical instruments, periodontal scalers, scalpel blades, surgical dental burs.	HEAT STERILIZE between uses or use sterile single-use, DISPOSABLE devices
Semicritical	Contact mucous membranes or non intact skin, will not penetrate tissue, contact bone, enter into or contact blood stream.	Dental mouth mirror, amalgam condenser, reusable dental impression trays, dental handpieces	HEAT STERILIZE or HIGH-LEVEL DISINFECT
Noncritical	Contact intact skin	Radiograph head\cone, blood pressure cuff, facebow	Clean and disinfect using a LOW TO INTERMEDIATE LEVEL DISINFECTANT

Stages for instrument sterilization

►Presoaking - Placing the instrument in a presoak solution until time is available for full cleaning prevents drying and begins to dissolve or soften the debris. Presoak solutions used are detergents

►Cleaning - Clean instruments in an ultrasonic cleaner (preferred), instrument washer, or by hand while wearing proper protection. Ultrasonic cleaners are safest and most efficient ways to clean instruments, ultrasonic cleaning is 9 times more effective than hand cleaning ,it provides fast and thorough cleaning without damage to instruments.

►Packaging - Place instruments in a sealed package or pouch, unless you're going to use them immediately after sterilization.

►Sterilization- Sterilize instruments using steam autoclaving, dry-heat, or chemical vapor machines.

►Drying or cooling- Store Instruments in a Dry, Protected Area

CLEANING AND DISINFECTION OF DENTAL UNIT AND ENVIRONMENTAL SURFACES

- Countertops and dental unit surfaces that may have become contaminated with patient material should be cleaned with disposable toweling, using an appropriate cleaning agent and water as necessary.

-Surfaces then should be disinfected with a suitable chemical germicide. Including: phenolics, iodophors, and chlorine-containing compounds.

-A fresh solution of sodium hypochlorite (household bleach) prepared daily is an inexpensive and effective intermediate-level germicide. Concentration (1/4 cup of bleach to 1 gallon of water) is effective on environmental surfaces that have been cleaned of visible contamination. Caution should be exercised, since chlorine solutions are corrosive to metals, especially aluminum.

DISINFECTION OF THE DENTAL LABORATORY

Laboratory materials and other items that have been used in the mouth (e.g., impressions, bite registrations, fixed and removable prostheses, orthodontic appliances) should be cleaned and disinfected before and after being manipulated in the laboratory, whether an on-site or remote location and before placement in the patient's mouth.

STERILISATION OF HANDPIECES

After each patient use,

► run any handpiece that is connected to the dental air/water system, to discharge water and/or air for at least 30 seconds

► Leave the bur in place while you clean the outside of the handpiece with detergent and warm water.

►Sterilize in an autoclave.

►If recommended by the manufacturer, lubricate the handpiece with pressurized oil until clean oil appears from handpiece.

Some dental instruments have components that are heat sensitive or are permanently attached to dental unit water lines. Some items may not enter the patient's oral cavity, but are likely to become contaminated with oral fluids during treatment procedures, including, for example, handles or dental unit attachments of saliva

ejectors, high-speed air evacuators, and air/water syringes. These components should be covered with disposable covers that are changed after each use or, if the surface permits, carefully cleaned and then treated with a chemical germicide having at least an intermediate level of activity.

DISPOSAL OF WASTE MATERIALS

►Blood, suctioned fluids, or other liquid waste may be poured carefully into a drain connected to a sanitary sewer system.

►Disposable needles, scalpels, or other sharp items should be placed intact into puncture-resistant containers before disposal.

►Solid waste contaminated with blood or other body fluids should be placed in sealed, sturdy impervious bags to prevent leakage of the contained