

***Sheet no. :2***

***Refer to slide no. :***

***Written by: Linda Morjan***

***Corrected by: Mohammed Gara***

We have talked about:
-cross infection control
-standard precautions and its elements (such as: vaccinations, hand washing, wrapping, protective equipment including mask, gloves, goggles and gown)

Today we will be talking about **sterilization** and **disinfection** of patient care items:

***Sterilization***:

It kills everything. All forms of living microorganisms (including endospores) are killed by this process. The most common method used for sterilization is the **autoclave** (steam under pressure). Autoclave is usually safe for most instruments. Steam under pressure method has a good penetrability, unlike the dry heat which wouldn’t penetrate as good as the autoclave.

We use chemical sterilization method for equipment that can’t withstand high temperature (such as spatula, bowel, and impression)

Autoclave standard cycle: **121co** for **15-20 min**

Autoclave flash cycle: **134co** for **3-6 min**

Dry heat can be used for metals because instruments won’t rust or corrode and the sharp ends of the instrument won’t become dull. So it’s good but the penetration is not as good as in autoclave.

*What happens in the autoclave?*
When the steam hits the pack where the instrument in, the pack is a little cool, it condenses and then releases a latent heat which reaches inside the instrument. So it sterilizes the instrument inside out.

The autoclave is small like the microwave. We have different sizes, but for small clinics small autoclave is fine.
As we said before, autoclave used to sterilize instruments so it kills all microorganisms.

**\*\***Heat is the best way since we can use it for almost all the instruments.

**Chemical sterilization:**

Either gas or liquid

Most common gas used is **ethylene oxide** for **6-10 hours** at certain temperature (not used here in dental clinics, but used in the hospitals). In dental clinics we use liquid as **glutaric acid/aldehyde (cidex)** - **2%** which is very common. Good for plastic and rubber material.

**Radiation:**

We have ultraviolet (**UV**) and infrared **(IR).**
Most of the syringes and anesthesia we get are sterilized by the manufacturer by radiation method. This method is clean, dry, and exposure is full because it comes in all directions (so it's easy to use). However it's not very practical in hospital because you need to have good isolation for the radiation.

***Disinfection:***

A process which doesn't necessarily kill all forms of microorganisms, it’s not completely sterile, and less lethal. Effectiveness of the disinfectants depends on the type of microorganism exists, its quantity and also on the type and condition of the instrument.

Handpiece only comes in contact with mucosa and it doesn’t penetrate, so high level of disinfectant is enough, but usually we sterilize them because chemicals don't go through the handpiece (the pits and the small internal parts- so it depends on the shape of the instrument), that’s why we need most probably to sterilize it.

There are two important factors we should know about which are the duration and temperature. For example: Alcohol (it's fungicidal, veridical, bactericidal, and tuberculocidal) needs a while to effectively perform the features were mentioned in parenthesis. If we increased the exposure time of the alcohol it will kill more microorganisms, so if we increase the duration of exposure the effect will increase. Also there is a relationship between the temperature and the effectiveness of the material, as we increase the temperature the effectiveness will increase and the time will be less, but as we know not all instruments can withstand heat.

We can find that the same material used as sterilant can be used as disinfectant, but differ in concentration and exposure time.
Such as: glutaraldehyde, hydrogen peroxide, formaldehyde and chlorine dioxide.

We have high level disinfectants, intermediate or medium level disinfectants and low level disinfectants. Most widely used medium/intermediate level disinfectant is **alcohol ethanol (70%).**

**\*\***For wax warmer we use **96% alcohol**.

As we know, as we increase the concentration the effectiveness of the material will increase and the effectiveness to denature proteins will increase as well. But it’s not the case in alcohol because once alcohol evaporates it will leave the surface dry, so we need to have water in order for the disinfection to take place, that’s why we use 70%, and if it was more than 70% its effectiveness will be less.

Intermediate level is the most commonly used disinfectant also known as hospital disinfectant; Alcohol is one of them, also we have **hypochlorite (bleach) 5.25% -6.15%** and we should dilute it (1/10 – 1/100).
Hypochlorite is good for most viruses, bacteria and fungus, and is usually used for blood spills. Unfortunately none of them is sporocidal (can't kill spores).

High level disinfectants used for only **10-30 minutes**, they can become sterilant if we use them for hours. We don’t use them for surfaces because it will burn them (floor/ dental chair...), that’s why we always use intermediate level or low level disinfectants.

Environmental protection agency (**EPA**) you will see this written on disinfectants meaning how good this is for the environment. Each material that is used should not affect our environment (the air, the water supply…) and it should be EPA approved.

***\*\****Phenol such as triclosan is one of the most disinfectants used in the tooth paste

-The most resistant for sterilization are **spores**, then the viruses that are not enveloped, fungus, vegetative bacteria (gram +ve and –ve) and finally enveloped viruses.
-The least resistant is **HIV** and **HCV**, so anything that we use will probably kill those viruses.
-The prions are also resistant for sterilization after the spores.

***Instruments:***

Are classified into:
-Critical
-Semi-critical
-Non-critical

 **Critical instruments**:
Penetrate mucous membrane or penetrate the blood stream.
Such as: blades, surgical dental burs, perio-probe… Should be sterilized or disposable (in a special waste).

**Semi-critical instruments:**Get in contact with mucous membrane but don’t penetrate tissue.
Such as: handpiece (as we said before it’s an exception, we don’t do disinfection but rather we do sterilization), matrix band, mirror, tweezers (we do high level disinfection)
We have disposable semi-critical instruments such as amalgam capsule, rubber polishing tips, suction tips (you either discard them in a normal waste or disinfect them with high level disinfection).

**Non-critical instruments:**
get in contact with the skin of the patient.
Such as: the light, the chair, handshake…
You should clean it with soap and water or low level disinfectant.

***Anti-septic agents:***

In order to clean skin or living tissue, you have to use certain disinfectants.
Such as: alcohol, chlorhexidine (which is very important, especially before surgery)

*Practically how do we sterilize our instruments?*

It usually goes through 5 steps:
Receiving🡺 cleaning🡺 preparation & packaging 🡺sterilization finally you store them.

**\*\***Usually there is instrument processing area to control quality and ensure safety, and to wash and pack the instruments. It's near the sink.

**Receiving:**The doctor prefer to use cassette instead of package for the instruments to prevent instruments loss, and it's good for cross infection when you put it on the tray of the dental chair.

**Cleaning:**
Cleaning is important because sometimes we may have remnants of filling on the instrument, or blood, so sterilization effectiveness will be less.
Ultrasonic bath: it cleans the instruments, unfortunately we don’t have it.
We don’t have automated cleaning technologies (ultrasonic cleaner), so we will stick to manual cleaning.
We have small blue box above the sink that contains enzyme to break down organic materials.
You need to wear heavy duty gloves (like the dishwashing ones) if you want to clean sharp instruments, you should also use brush.
You should wear your gown, gloves, mask and glasses during cleaning.
In our clinics usually we don’t do all these steps, it’s already packaged

**Preparation & packaging:**
If you are cleaning critical and semi-critical instruments, you should put them in bags (auto self-sealing/ tape sealing/ heat sealing). It should be sealed to preserve the sterilization. Also it should be penetrable allowing some gas to get in.

*Indicators for sterilization:*-Mechanical way: you should measure the time and temperature by which the instrument is sterilized.
-Color change: easier, change in color due to change in certain features; physically and chemically (the color will depend on the bag, each bag has its own indicator)
-Biological test: the best test, use spores to assess if the machine sterilization is efficient (you don’t do it for each single instrument, it should be done at least once a week to check efficiency).

**Storage:**
Instruments might be stored on shelves or in drawers depending on their use. Most probably there is no expiry date for the stored instruments.
Usually 60 days is the longest period you can store them for otherwise you have to sterilize them again because tearing may take place.
If you noticed a hole or damage in the bag you have to re-sterilize it.

In the next lecture for Dr.Omar we will talk about **medical wastes**.

It’s classified into: **clinical waste**, **hazard waste** and **regular waste.**

-**Regular waste**: non-critical waste, usually in *black bags*
-**Clinical waste**: includes objects with blood on it such as extracted tooth, tissue biopsy, usually in *yellow bags*. The sharp objects you put it in the sharp container (more safe). Clinical waste is usually incinerated.
-**Hazard waste**: for patients who has a disease like HIV or any known problem, we usually put such wastes in *red bags*.

GOOD LUCK ☺