Sterilization & disinfection

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Objective

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1. To know the terminology: sterilization, disinfectant, disinfection and antiseptic.
2. To know the differences between physical methods and chemical methods.
3. To know the different between dry heat and moist heat.
4. Autoclaves and how to monitor it and what it is used for.
5. Factors influencing activity of disinfectants.

❖ Definitions:

1. **Sterilization**: complete killing of all microorganisms (even the spores). (تعقيم)
2. **Disinfections:** killing or removing of harmful microorganisms.(تطهير)
3. **Disinfectant:** chemical substance used for achieving disinfection.(مطهرات)
4. **Antiseptic:** disinfectant used on living tissue.

➢ Methods of sterilization:

Physical:

- ***Heat***: the most important method

	Dry heat	Moist heat
Mechanisms of killing	Destroying their oxidative processes	Denaturing of protein
Time frame	Hot air oven expose items to 160 °C for 1 hour.	in the autoclave At 121 or 134 C for 10 or 15 minute
The equipment	Hot air oven	• Autoclaves 1. Boiling
used for	Used to sterilize items that are lacking water	Items must be steam permeable. Cannot be used for items that are lacking water.

- ***Autoclaves:*** It is the standard sterilization method in hospitals and it works under the same principle as the pressure cooker where water boiling leads to increase in pressure, which increases the permeability.

  - Monitoring of autoclaves: it is monitored
    1. Physically: by measuring the temperature. (Every day)
    2. Chemically: by the Autoclave tape or Browne's tube. (Every day)
    3. Biologically: a spore is added during sterilization process and then cultured for 4-5 days then if it lived that means that the machine is not working insufficiently.(Once in a year)

- ***Pasteurization:*** used to inactivated harmful organisms in milk like Tuberculosis, Typhoid fever, Q fever and Brucellosis. It is divided in to:

    1. Flash methods: 74^{o} for 3-5 sec
    2. Conventional methods: 62^{o} for 30 min

➢ Radiation:

- U.V light: Used in operating rooms and tuberculosis labs.
- Ionizing radiation: Gamma radiation, used for sterilization of plastic syringes(المحاقن البلاستيكيه), gloves, specimens' containers.(حاويات العينات), Used mainly in industrial facilities.

* Autoclaving is common in the moist heat method
* For chemical methods, Ethylene Oxide is liquid and Gluteraldhyde is gas
* Not all spore forming bacteria pathogenic
* For filtration way it's filter for bacteria not for spores or viruses
* we use Antiseptic for human ,not disinfectant

➢ Filtration (الترشيح):

Thus filtration does not technically sterilize items. It removes most bacteria but not viruses and some small bacteria e.g. Chlamydias & Mycoplasmas may pass through.

- ✓ **ex**: membrane filter
- ✓ **Main use**: for heat labile substances e.g. sera & antibiotics.

Chemical: useful for sensitive heat materials.

a. Ethylene Oxide chamber: 55-60°C and exposure period 4-6 hours.
b. Activated Alkaline Gluteraldhyde: 20 min If the organism is mycobacteria (the cause of tuberculosis or if spores present then immersion period is 2-3 hours.)
(لتنظيف المناظير في الحالات المستعجله)

Factors influencing activity of disinfectants:

1. Temperature.
2. Concentration.
3. May be inactivated by:
   a. Dirt
   b. Organic matter: Blood
   c. Non organic: water
4. Time: Disinfectants need time to work.
5. Range of Action:
   a. Chlorhexidine less active against Gram negative bacteria than Gram positive cocci.
   b. Hypochlorites and Gluteraldehyde are more active against hepatitis viruses than most other disinfectants

Summary:

Physical methods for sterilization:

a. Heat: dry and moist.
b. Radiation: U.V light and Ionizing radiation.
c. Filtration

Chemical methods for sterilization: Ethylene Oxide chamber and Activated Alkaline Gluteraldhyde.