

كلية المستقبل الجامعة الأهلية

قسم طب الأسنان

المرحلة الثالثة

sterilization and disinfection

Preparation

assistant teacher

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Lesson objectives

After the end of the lecture, the student will be able to:-

- 1-**It is known as sterilization and disinfection .
- 2-** It is known as a chemical methods of sterilization and disinfection. .
- 3-** It is known as a physical methods of sterilization and disinfection .

Sterilization: Destruction of all forms of microbial life including spores.

Disinfection: Destruction of microbes that cause disease; may not be effective in killing spores.

Antiseptis: destruction or

Sterilizing and disinfecting agents are divided into two groups. These are:

1. Chemical methods of sterilization and disinfection .

2. Physical methods of

1-Chemical methods of sterilization and disinfection

These chemical agents destroy any type of microbes without showing any form of selectivity unlike antibiotics. The efficacy of these agents depends on the following factors:


1. Concentration of the agent :There is a relationship between the concentration

of the agent and the time required to kill a given fraction of the microbial population.

2. Time of exposure : Microbes are killed with a reasonable length of time with chemical agents.

3. PH of the medium where action is to take place Hydrogen ion concentration determines degree of ionization of the chemical and bacterial surface charge.

The non-ionized form passes through the bacterial cell membrane more readily than the ionized form.



4. Temperature : Bactericidal potency of the chemical agent increases with an increase in temperature. An increase in 100c doubles the bacterial death rate.

5. Nature of the organism :

- ❖ Species of the bacteria.
- ❖ Growth phase of bacteria in culture.
- ❖ Presence of capsule, spore and other special structures.
- ❖ Number of bacteria in test system.

6. Presence of extraneous materials : Organic materials

like serum, blood or pus

makes chemicals inert that are highly active in their absence.

Classification of chemical methods of sterilization and disinfection.

1. Chemical agents that damage the cell membrane

- ❖ Surface active agents.
- ❖ Phenols.
- ❖ Organic solvents.

2. Chemical agents that denature proteins

- ❖ Acids and alkaline

3. Chemical agents that modify functional groups of proteins and nucleic acids:-

- ❖ Heavy metals.
- ❖ Oxidizing agents.
- ❖ Dyes.
- ❖ Alkylating.

2-Physical methods of sterilization and disinfection.

1. Heat: the most reliable and universally applicable method of sterilization.

❖ **Dry heat** – denatures

Dry heat can be used by the following methods:

a. Incineration : It is an efficient method of sterilization and disposal of contaminated needles, syringes and cover slips at high temperature

b. Red heat : Inoculating wires, loops and points of forceps are sterilized by holding them in the flame of a Bunsen burner until they are red hot.

c. Flaming: Scalpels and neck of flasks, bottles and tubes are exposed for a few seconds, but it is of uncertain efficacy.

d. Hot Air Sterilizer (Oven): it is essential that hot air should circulate between the objects being sterilized and these must be loosely packed and adequate air space to ensure optimum heat transfer. It is done by applying 160 °C for 1 hour. Use:

Sterilizes glassware, oils, greases, lubricants and powders.

Moist heat: It is preferred to dry heat due to more rapid killing. Moist heat can be used by the following methods.

a. Boiling: It is not reliable method of sterilization. It is done by applying 100 c for 30 minutes. Used for sterilizing catheters, dressing and fabrics.

b. Tantalization : Intermittent steaming (Fractional sterilization) Steaming of the material is done at 100 c for 30 minutes on three consecutive days.

c. Pasteurization: It is the process of application of heat at temperature of 62 c for 30 minutes (Holder method) or 72 c for 15 seconds (Flash method) followed by rapid cooling to discourage bacterial growth. Uses:

- ❖ Pasteurization of milk.
- ❖ Preparation of bacterial vaccines.

d. Autoclaving : Steam under pressure It is based on the principle that when water is boiled at increased pressure, hot saturated steam will be formed which penetrates and gives up its latent heat when it condenses on cooler objects. Hot saturated steam in autoclaving acts as an excellent agent for sterilization because of:

1. high temperature
2. High latent heat
3. ability to form water of condensation
4. contraction in volume that occurs during condensation. Uses: Sterilize solid and fluid culture media, gowns, medical and surgical equipment.

Time -Temperature-Pressure level relationship in moist heat sterilization (autoclaving)

- 121 c 15 minutes 15 lb/inch²
- 126 c 10 minutes 20 lb/inch²
- 134 c 3 minutes 30 lb/inch²

e. Freezing: Inactivation of living bacteria by cold. It prevents active multiplication of bacteria by decreasing the metabolic activity of bacteria.

f. Filtration : Mechanical sieving through membrane filters. Uses:

- ❖ Sterilization of thermolabile parental and ophthalmic solutions, sera and plasma.
- ❖ Microbial evaluation of water purity.
- ❖ Viable counting procedures.
- ❖ Determination of viral particle size.

g. Radiation : Ionizing and ultra violet radiation Ionizing radiation includes χ ray, γ ray and β ray. These induce break down of single stranded or sometimes double stranded DNA.. Spore forming bacteria are more resistant to ionizing and ultra violet radiation than vegetative bacteria because of:

1. The spore coat confers protection.
2. DNA is in different state in spores.

Homework

What are the uses of radiation?



Thank you for listening