

sterilization & disinfection

Color index

***Important**

***Further explanations**

***Examples**



LECTURE SEVEN

Objectives:

- Define the terms sterilization, disinfectant and antiseptics, disinfectant and antiseptic.
- Classify the different methods of sterilization in physical and chemical method.
- To recall the different physical methods of sterilization.
- Know and realizes heat is the most important method of sterilization and that it should be used where ever that is possible.
- Know the different types of heat sterilization methods.
- Know dry heat as applied in hot air oven and moist heat as applied in autoclaves.
- Know the principles of autoclave function and control method of sterilization process.
- Know the importance of non heat sterilization methods and their use for sterilization of heat sensitive objects.
- Know the difference between antiseptics and disinfectants.
- Classify the disinfectants and antiseptics and know factors affecting their functions.
- Know different applications for different disinfections and antiseptics.

Definitions:

Sterilization: complete killing of all forms of microorganisms including bacteria spores.

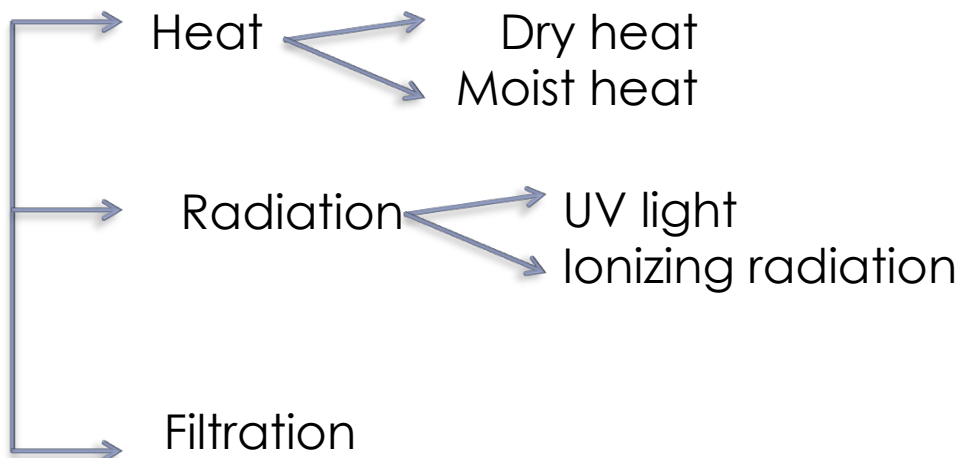
Disinfection: killing or removing of harmful vegetative microorganisms.

Disinfectant: chemical substance used to achieve disinfection “strong toxic”

Antiseptic: disinfectant that can be safely used on living organisms “less strong toxic”

Methods of sterilization:

Physical methods:



Chemical methods:

Some strong chemical substances may be used to achieve sterilization.

E.g.: Gluteraldehyde and ethylene oxide.

Achieving Sterilization means getting rid of all kind of microorganisms and spores

Physical Methods:

1-RADIATION : FOR HEAT SENSITIVE OBJECTS

Sterilization is achieved by strong penetration

1- U.V. light:

Has limited sterilizing power because of poor penetration into most materials.

Generally used in irradiation of air in certain areas such as **operating rooms and tuberculosis labs.**

2- Ionizing radiation:

Has greater energy than U.V light, therefore it is more effective. **e.g. Gamma radiation.**

Used mainly in industrial facilities **e.g. sterilization of disposable plastic syringes, gloves, specimens containers and Petri dishes.**

Physical Methods:

2-FILTRATION :

- May be done under **either negative or positive pressure.**
- E.g.: membrane filter made from cellulose acetate.

- Generally removes **most** bacteria but NOT viruses and some small bacteria.
- E.g. Chlamydia & Mycoplasma may pass through.

- Main use: **for heat labile substances .**
- E.g. sera, antibiotics

STERILIZATION BY HEAT : MOST COMMON METHOD

Dry heat:



Kills microorganisms by destroying their **oxidative processes**

Used to sterilize items that are lacking water. e.g. **Metals, Glassware, Oils, Waxes**

Hot air oven: expose items to 160 °C for 1 hour

- 1) Has electric element in chamber as source of heat
- 2) Fan to circulate air “oven without fan is dangerous”

Moist heat:



“most important and most sufficient way of sterilization.”

Kills microorganisms by **denaturing proteins**.

Uses hot water.

Autoclaving – standard sterilization method in hospitals at **> 100°C** “due to increased atmosphere pressure”.

The autoclaving is a tough double walled chamber in which air is replaced by **pure saturated steam** under pressure.

1- **Temp. > 100°C** therefore spores killed.

2- Condensation of steam generates extra heat.

3- The usual temp. is **121°C** at pressure of 15pps. At exposure time of only **15 mins**.

***Note: that autoclavable items must be steam permeable. Cannot be used for items that are lacking water.**

Advantages of autoclave

Monitoring of autoclave

Physical: use of thermocouple to measure accurately the temperature.

Chemical: it consists of heat sensitive chemical that changes color at the right temperature and exposure time e.g.: a- Autoclave tape b- Browne's tube.

Biological: where a spore bearing organism is added during the sterilization process and then cultured later to ensure that it has been killed.

MOST HEAT : OTHER APPLICATION

Pasteurization: Used heat at temperatures sufficient to inactivate harmful organism in **milk**.

Temp. may be:

- **63-66 C** for **30 minutes** (conventional method)
- **72-73 C** for **3-5 seconds** (flash method)

Boiling: quite common especially in domestic circumstances.



Prevent diseases like:

- Typhoid fever
- Brucellosis
- Tuberculosis
- Q fever

STERILIZATION BY CHEMICAL METHODS

Useful for **heat sensitive materials**

e.g. plastics and lensed instruments endoscopes.

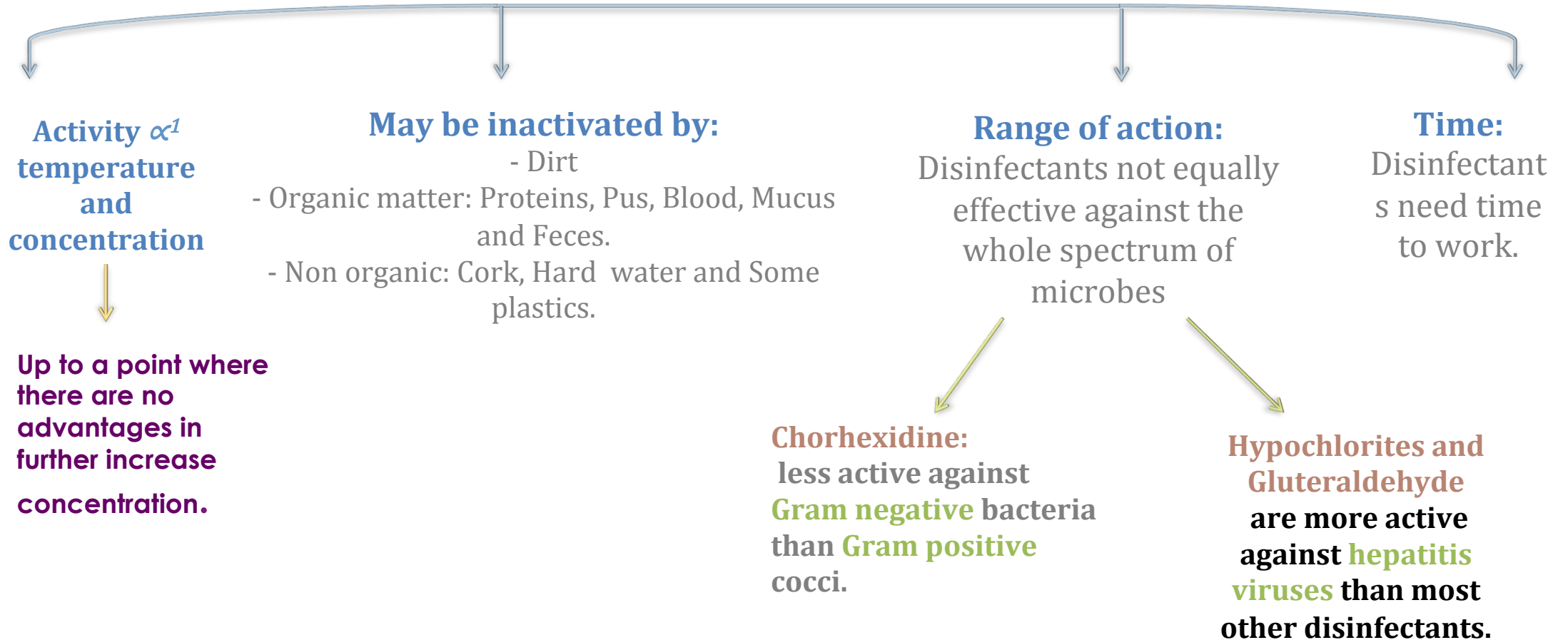
1) Ethylene Oxide Chamber:

- Inactivates microorganisms.
- Ethylene oxide may cause explosion if used pure so it is mixed with an inert gas.
- Requires high humidity and used at relative humidity **50-60%**.
- Temperature: **55-60°C** and exposure period **4-6 hours**.

2) Activated alkaline Gluteraldehyde 2% :

- Immerse item in solution for about **20 minutes**.
- If **mycobacterium tuberculosis** or **spores** present then immersion period **2-3 hours**.

FACTORS INFLUENCING ACTIVITY OF DISINFECTANTS



1: Directly proportional

HOSPITAL DISINFECTION METHODS

Article	Disinfectant
Floors, walls	Phenolics fluids 1-2%
Surfaces tables	Hypochlorite, Alcohol
Skin	
Surgeons' hands	Chlorhexidine, Iodine alcohol
Patient skin	70% Alcohol, Iodine
Endoscopes	Gluteraldehyde 2% (Cidex), subatmospheric steam
Thermometers	70% Alcohol

Important points:

- Any instrument or item used for sterile body site should be sterile.
- Any instrument or item used for non-sterile body site can be disinfected.
- Hand washing is the most important to prevent hospital acquired infection.
- We use antiseptic for human not disinfectant.

MCQ's

- 1..... has limited sterilizing power because of poor penetration into most materials.
a) Ionizing radiations b) Filtration c) **UV light**
- 2..... is used for items that are lacking water
a) Filtration b) **Dry heat** c) Moist heat
- 3. Autoclaves are suitable for items that lack water.
a) T b) **F**
- 4. Sterilization by chemicals is useful for heat sensitive materials
a) **T** b) F

Thank you

قال تعالى:

(يَرْفَعِ اللَّهُ الَّذِينَ آمَنُوا مِنْكُمْ وَالَّذِينَ أُوتُوا الْعِلْمَ دَرَجَاتٍ)

Done by:

-ظاهرة الجهني
-الجوهرة الدهش
-روى العوهلي
-نوف المسعود
-ريما الحماد
-ريما هزازي
-آيه الدايل
-حنان خشيم
-منال الحمدان
-وجدا الهدلان
-الجوهرة العمران
-أمل أفراح
-الهنوف المهنا

-عبد العزيز المانع
-ناصر القحطاني
-محمد الرويتع
-أسامة عبدالقادر
-فراس السويداء
-عبدالعزيز النويبت
-سعيد الناصر