Ministery of Higher education and scientific research

University of Tikrit

College of science

Department of Biology

Lab. of Practical Microbiology (1)

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مدرس المادة .: بشرى علي كاظم

Sterilization التعقيم

The process by which all forms of microbial life, including bacterial spores are destroyed and killed.

Sterilization procedures involve the use of heat, radiation, chemicals, or physical removal of cells.

Applications of sterilization

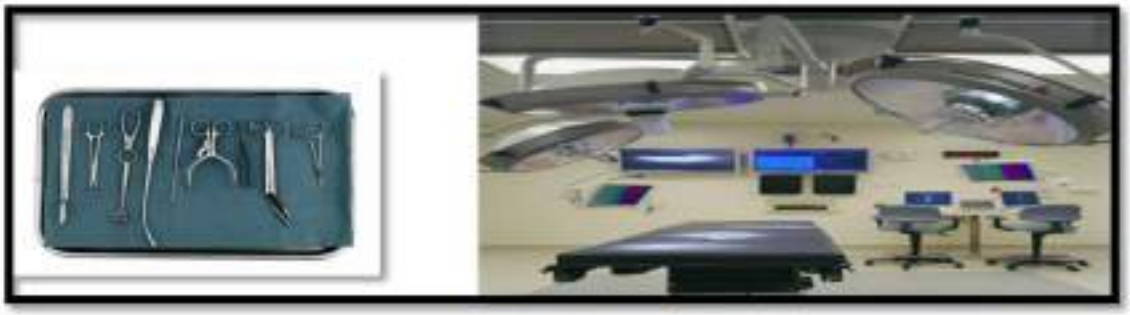
The microorganisms should be controlled in some cases such as: prevention, treatment, and in industrial and research uses.

1-Bacteriological purposes:

Sterilization is the most important step of microbiological technique for studying different species of bacteria, fungi and other microorganisms preparing of culture media, vaccines, serum, and toxins.

2-Surgical purposes:

For sterilize all equipments and instruments such as scalps, hypodermic needles and artificial pacemakers used in surgery, and operation room including air, and furniture should be sterilized to prevent spreading the microorganisms and prevent contamination.



3- Industrial purposes:

Food, drugs (manufacture of pharmaceuticals), culture media used in production of antibiotics, and fermentation, should be sterilized before consumption by the humans. Sterilization also prevents any changes in content of industrial production as cans.

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Methods of sterilization:

There are different methods of sterilization depend on the nature and type of material that sterilize; so that sterilization can be classified into two methods:

I) Physical sterilization II) Chemical methods

I) Physical sterilization:

A- Heat:

Is a typical method used for sterilization all equipments and materials that not affected by heating, and this method kill the microbial cell by oxidation or denaturation of protein. This method can be classified into:

1. Dry heat

1.1 Incineration:

This method is used in treating infectious waste, and sterilization of cultural loop.

1.2 Oven:

(160 °c – 180 °c for 1.5 – 3 hours), which is used for sterilization glass petridishs, pipettes, powder, and oil.

2. Moist heat:

It is used to sterilize biohazard trash heat-stable objects, by using Autoclave (Steam under saturated pressure 15 psi), two common sterilization temperatures are used:

- **121°c for 15 min: sterilization of media, liquid, instruments.**
- **132°c for 30–60: sterilization of infectious medical wastes.**

Although heating provides the most reliable way to rid objects of all transmissible agents, it is not always appropriate, because it will damage heat-sensitive materials such as biological materials, fiber optics, etc.

B-Filtration:

Is the method of choice which used to sterilize liquids that heat labile such as : antibiotics, solutions, toxic chemicals, radioisotopes, enzymes, vaccines, and carbohydrates, by pulling the solution through a cellulose acetate or cellulose nitrate membrane.

Filtration of air is accomplished by using High Efficiency Particulate Air (HEPA) filters to remove any particles larger than 0.3 µm used in operation room, safety cabinets.

C- Radiation:

such as Gamma rays, X-rays, and Ultra violet UV light. Which are used in operation room to sterilizing the air and surfaces of any objects in it, also radiation used in sterilization disposable equipments such as: Plastic syringes, catheters, or gloves, before use them.

II) Chemical methods:

Chemicals are also used for sterilization.

- **Ethylene Oxide**

Ethylene oxide (EO or EtO) gas is commonly used to sterilize objects sensitive to temperatures greater than 60°c such as plastics, optics and electrics.

- **Ozone**

Ozone is used in industrial settings to sterilize water and air, as well as a disinfectant for surfaces. It has the benefit of being able to oxidize most organic matter. On the other hand, it is a toxic and unstable gas that must be produced on-site, so it is not practical to use in many settings.

- **Glutaraldehyde and Formaldehyde**

Glutaraldehyde and formaldehyde solutions (also used as fixatives) are accepted liquid sterilizing agents, provided that the immersion time is sufficiently long. To kill all spores in a clear liquid.

- **Hydrogen Peroxide**

Hydrogen peroxide is a another chemical sterilizing agent. It is relatively non-toxic once diluted to low concentrations (although a dangerous oxidizer at high concentrations).

Finally it is very important to understanding the difference between the sterilization and disinfection.

- **Disinfectant:**

is a chemical agent that is used to disinfect non-living objects.

- **Antiseptic:**

is chemical agent applied on living tissues(skin).

- **Antibiotic:**

chemical agent used to destroy or inhibit pathogenic microorganisms within the human body.