

## Sterilization and disinfection

**Sterilization: it is a process that kills or removes all living organisms.**

### **Sterilization done by:**

Heat: dry or moist

Ionizing radiation

Filtration

### **1-Heat**

**a- dry heat:** by increasing the temperature.

#### *i) Incineration*

carried out in huge oven with temperature above 100°C, used to destroy dead animals and completely destroying of infectious items and tools.

#### *ii) Bunsen burner (flame)*

used for sterilization of loops and iron needles.

#### *iii) Oven*

temperature 160-180°C for 1-2 hours, used to sterilize metal, glass wares, powder, ointments, oil and sand.

No plastics or heat sensitive material or solutions.

**b- moist heat:** using water.

#### *i) Autoclave*

Temperature 121°C under 15 atm pressure for 15-20 minutes, used for glass wares, media, solutions.

No powder or heat sensitive material or metal.

#### *ii) Boiling*

At 100°C only. It is effective to destroy many organisms but cannot destroy bacterial spores (spore forming bacteria) such as *Bacillus* and some viruses.

### **Indicators to check autoclave and oven:**

#### **a) chemical indicator**

**Autoclave tape:** turns black if autoclave is good.

**Brown's tube (diack):** used to check oven. If it works good it will be turned from white to red.

#### **b) Biological indicator**

**Spore strip:** it is a filter paper soaked with spores of *Bacillus stearotherophilus*.

We put strip in broth and put it in autoclave. After autoclaving finished put it in incubator for 24 hours. If there is turbidity (growth) that means that the autoclave is not good. However, if the tube is clear (no growth) that means that the autoclave is good.

### **2- ionizing radiation**

It is electromagnetic waves (e.g.  $\gamma$ -rays, X-rays) with high energy and strong penetration. Used for plastic ware like petridishes, syringes and pipettes and for heat sensitive materials such as antibiotics, drugs and vaccines.

### 3- Filtration

Used for sterilization of liquid solution which is heat sensitive such as toxin, antisera, I.V fluid, protein and sugar.

**Principle:** we use Millipore filter that allowed fluid passage and prevents bacteria, viruses and particles. Millipore filter is thin membrane with pore size 0.45  $\mu\text{m}$  or smaller (0.22  $\mu\text{m}$ ).

The Millipore filter is attached to flask with arm and attached to vacuum pump (produce negative pressure enough to draw fluid through filter). The filter and receiver flask must be sterile.

**Disinfection:** treatment of material with chemicals in order to reduce the number of organisms. It is done by disinfectant which is chemical substance able to kill or inhibit the growth of an organism. So, it can be either bactericidal or bacteriostatic. Disinfectant can be used for surfaces, skin and hands.

**Bactericidal:** chemical substance that kills the organisms. E.g. phenol (detol) and chlorox(sodium hypochloride).

**Bacteriostatic:** chemical substance that inhibits the growth of organisms. E.g. 70% alcohol swap.

#### **To test the efficacy of disinfectant in the lab, we would do minimum inhibitory concentration (MIC):**

- we get the 8 tubes each containing 1 ml of broth. Add 1ml of disinfectant in the 1<sup>st</sup> tube then make serial dilution through transferring 1 ml from 1<sup>st</sup> tube to the second tube. Then 1 ml from second to third tube and so on until reaching the 7<sup>th</sup> tube. Take 1 ml from the 7<sup>th</sup> tube and discard it. Tube 8 should have no disinfectant as it would be the control tube. Add one drop of organism in all tubes then incubate at 37 °C for 24 hours.
- the last tube shows no growth is the MIC of disinfectant.
- MIC: least concentration of disinfectant that inhibit the growth of an organism.