

Method of sterilization and control of microbial :-

Clinical microbiologists are concerned mainly with procedures for the sterilization of culture media, reagents and equipment before their use in the lab. For the effective sterilize surface and equipment after use and the disinfection of contaminated material before their safe disposal from the Lab.

Sterilization :-

The process that mean complete destruction of all forms of microbial life (vegetative and spore) and this process is irreversible of living cells by using physical method.

Methods of sterilization :-

- 1- Heating
 - Dry heat
 - Moist heat
- * Heating acts by denaturing cell proteins

nucleic acids & by disrupting cell membrane.

2- Filtration.

3- Radiation

4- Gaseous sterilization.

- Dry heat

① Red heat (flaming) -

It's application in the sterilization of inoculate wires and loops, which be held almost vertically above burner until red hot along their length at up to the tip of their metal holder, also steril in this method, forceps, slides, mouth of tubes of bottles.

② Incineration -

Use in burned the contaminated material a clothes of patients with serious disease like T.B.

③ Hot air sterilization (oven) -

Heating by exposing to hot air, is a method for sterilizing substances that tolerate the high temperature required ($160-180^{\circ}\text{C}$) for 2-3 h.

It can be used for glass substances like pipe tubes, flask, glass syringes, cylinders, metal instruments, also for non-aqueous materials / powder, oil, ointment, also for surgical and dental tools, but this method is longer and less convenient than autoclaving.

- Moist heating -

Microorganisms and their spores are killed at lower temperature by moist heat than by dry heat. Moist heat must be used for the sterilization of culture and other liquid required to retain the content of water.

Moist heat by :-

① Pasteurization -

Disinfection by moist heat at temperature below 100°C is termed pasteurization, this method is sufficient to kill vegetative bacteria but not spores, and used to disinfect serum or other body fluids containing protein, HIV in serum may require 25 min.

at 56°C for inactivation. Milk may also be pasteurized at $63-66^{\circ}\text{C}$ for 20-30 min. for killing the micro. like Brucella, Mycobacterium, but not spores of Bacillus sp.

② Tyndallization -

It may be achieved by free-steaming, on each of three successive days, steaming temperature does not exceed 100°C for (5-15) min. is used to disinfect selective heat-labile fluid like hormones, vitamin, sugar solution, antibiotics, serum and some heat-labile culture such as (DCA) Dextro-cholate citrate Agar.

Spores that survive in initial heating may be expected to germinate in the media while it is held at room temp. during the following day and the resulting vegetative bacteria will be killed when the media is re-heated.

③ Boiling at 100°C -

Heating in boiling water at 100°C for 5 min. is sufficient to kill all vegetative bacteria

also used to sterilized water and milk in houses, in hospitals used for sterilized the surgical instrument but not glass syring.

④ Steaming under pressure (autoclave)-

Autoclaving provides moist heat at temp. above 100°C about 121°C for 15 min. at pressure 15 bar by exposing the load to saturated at pressure greater than
Autoclaving at correct temp. is lethal to bacteria, viruses, fungi, protozoa and used for sterilizing culture media and spoil the culture of M.O. in glasses Petridishes.

2- Filtration :-

Aqueous liquids, including solution of liable substances may be sterilized by forced passage through a filter of porosity small enough retain any microorganisms contained in them, it's used for sugar solution, serum, enzyme and antibiotics.

3- Radiation :-

Ionizing radiation usually Gamma radiation emitted from radioactive element, Co^{60} , reliable means of sterilizing plastic & other material that would be damaged by heat.

Ultra-violet lamps are used inside of biological safety cabinets to decontaminate their surface at end of the day.

4- Gaseous Sterilizing :-

Like ethylene oxide use for medical & surgical articles that can not withstand autoclaving, ~~also~~ H_2O_2 also.

Disinfectant and Antiseptics :-

A wide variety of chemical agents display antimicrobial activity to some degree, it's of two general classes :-

① Those that are useful for destroying micro. in environment (disinfectants) or

on skin (antiseptic).

② Those that may be administered to patients for treatment of infectious disease (antimicrobial agents).

Disinfection:-

The process that killing most of microorganism in vegetative form & some of spore form mainly pathogenic micro. by using chemical materials, do not use it living tissue because it's very toxic like formaline, phenolic compound.

Antiseptic:-

The process that killing of microorganisms in vegetative form & can use it on life tissue like skin, ear, etc. but we can not use it inside the body because it's stimulant, like deitol or alcohol.

* Both method killing microorganisms by either,

- ① Protein denaturation.
- ② Oxidation.
- ③ Solvent of lipid.

* The purpose from using disinfectant and antiseptics

- ① Decontamination of material before reused or disposal like formaline or dieldal.
- ② Decontamination of beds, floors, walls of hospital by using formaline steam.
- ③ Disinfection of skin by using antiseptics by using alcohol or dieldal.

* Factors that effects on efficiency of disinfectant :-

- ① Concentration of disinfectant.
- ② concentration of micro. (high or low).
- ③ Time of exposure (long or short).
- ④ species of micro. (Resist to or sensitive)
- ⑤ Temp. (low or high).
- ⑥ pH of environment (high or low).