

Controlling Microbial Growth

The control of microbial growth may involve sterilization, disinfection, antiseptics.

Sterilization and Disinfection

Sterilization: is a process by which an article, surface, or medium is freed of all living microorganisms either in the vegetative or in the spore state.

Disinfection: refers to the use of a chemical agent that destroys or removes all pathogenic organisms or organisms capable of giving rise to infection. This process destroys vegetative pathogens but not bacterial endospores.

Antiseptics: are chemical agents applied directly to the exposed body surfaces (e.g., skin and mucous membranes), wounds, and surgical incisions to destroy or inhibit vegetative pathogens.

Mode of Control of Microbial Growth generally includes:

I. Physical Methods

A. Heat

1. Thermal death point (TDP) – lowest temperature at which all the microorganisms in a liquid will be killed in 10 minutes.
2. Thermal death time (TDT) – the minimum time for all bacteria to be killed.

B. Filtration

1. **Used for liquids sensitive to heat** - filter that has pore sizes small retain microorganisms
2. **HEPA filters** – high-efficiency particulate air filters used in rooms with burn patients.

C. Low Temperatures

1. **Refrigeration** (0 to 7°C) has a Bacteriostatic effect except in the case of **psychrotrophs**, which will alter the appearance and taste of food with time and the food-borne pathogen.
2. **Freezing causes organisms to become dormant**

D. Osmotic Pressure – the use of high concentrations of salts and sugars creates a hypertonic environment and cause water to leave the cell.

F. Radiation

1. **Ionizing** –gamma rays, X rays, or high energy electron beams; used for sterilizing medical supplies and more recently for **food preservation** which improves the quality of food.
2. **Nonionizing radiation** –UV light
3. **Microwaves** – microbes killed indirectly by heat.

II. **Chemical Methods** :using chemical material such as Phenol, Iodine, Chlorine, alcohols.....so on

Method	Mode of Action	Comments	Preferred Use
<p>1. Moist heat</p> <p>a. Boiling</p>	Protein denaturation.	Kills nearly all pathogens within 10 min; less effective on end spores	Dishes
<p>b. Autoclaving</p>	Protein denaturation	121°C & 15 br. pressure; very effective against even endo-spores	Medical uses if items can withstand heat and pressure
<p>2. Pasteurization</p>	Protein denaturation	72 °C for about 15 sec kills all pathogens and most nonpathogens.	Beverages
<p>b. UHT (ultra-high temperature)</p>	Protein denaturation	140 °C for less than a second	Milk
<p>3. Dry heat</p> <p>a. Direct flaming</p>	Burning to ashes	Very effective method of sterilization	Inoculating loops
<p>b. Hot-air sterilization</p>	Oxidation	Effective, but requires 170°C for about 2 hr.	Instruments, glassware, needles