

Recommended use of heat to control bacterial growth

Treatment	Temperature	Effectiveness
Incineration	> 500°	Vaporizes organic material on nonflammable surfaces but may destroy many substances in the process
Boiling	100°	30 minutes of boiling kills microbial pathogens and vegetative forms of bacteria but my not kill bacterial endospores
Intermittent Boiling	100°	Three 30 minute intervals of boiling, followed by periods of cooling kills bacterial endospores
Autoclave and pressure cooker (steam pressure)	121°/15 minutes at 15 PSI	Kills all forms of life including bacterial endospores. The substance being sterilized must be maintained at the effective Temp for the full time.
Dry heat (hot air oven)	160°/2 hours	For materials that must remain dry and which are not destroyed at Temp between 121°and 170°. Good for glassware, metal, not plastic or rubber items.
Dry heat (hot air oven)	170°/1 hour	Same as above. Note increasing Temp by 10° shortens the sterilizing time by 50%
Pasteurization (batch method)	63°/30 min	Kills most vegetative bacterial cells including pathogens such as streptococci, staphylococci and Mycobacterium tuberculosis
Pasteurization (Flash method)	72°/15 seconds	Effect on bacterial cells similar to batch method; for milk, this method is more conducive to industry and has fewer undesirable effects on quality or taste

Chemical Disinfectants

Chemical Agent	Mode of Action	Example
Phenolics	Very toxic, disrupt cell membranes and denature proteins	Phenol, cresol, hexachlorophene
Alcohols	Disrupt membranes and denature proteins	Ethanol, methanol, isopropanol
Aldehydes (alkylating agents)	Very effective, denature proteins	Formaldehyde, glutaraldehyde
Oxidizing agents	Very toxic to humans, oxidize molecules within cells, generate oxygen gas	Ozone, peroxide
Halogens	Negatively affected by presence of organic matter, oxidize cell components, disrupt membrane	Iodine, chlorine, Fluorine
Heavy metals	inactivated by organic compounds, combine with sulfhydryl groups, denature proteins	Silver, mercury (very toxic) copper, zinc, selenium, arsenic
Surface-acting agents	Vary in degree, can simply reduce surface tension allowing organism to be washed away, or may disrupt membranes and denature proteins	Soaps, detergents (including quaternary ammonium salts), surfactants
Organic acids	Inhibit fungal metabolism (used as food preservative)	Benzoic acid, propionic acid, sorbic acid
Gases	Denature proteins	Ethylene oxide (very toxic), vapors from formaldehyde, methyl bromide
Antiseptic dyes	Block cell wall synthesis, interfere with DNA replication	Acriflavine, crystal violet