**Cleaning, disinfection, and sterilization are the backbone for preventing the spread of infections. In spite of this, many health care facilities either lack these basic facilities for infection prevention and control (IPC) or their personnel receive insufficient training. The following is a critical overview of the fundamentals for cleaning, disinfection, and sterilization with particular emphasis on reprocessing reusable medical devices.**

**Decontamination**

**renders an item or material safe to handle. The level of microbial contamination is reduced enough that it can be reasonably assumed free of risk of infection transmission.**

**Sterilization, disinfection, and antisepsis are forms of decontamination.**

**Disinfection**

**means to reduce the number of pathogens on an inanimate surface or object using heat, chemicals, or both. Most disinfection procedures have little activity against bacterial spores.**

**Sterilisation**

**is any process that can inactivate all microorganisms in or on an object.**

## Pasteurisation and boiling Semi-critical items

- such as respiratory therapy and anesthesia equipment, can be pasteurised by heating in water.
- All their parts must remain well immersed throughout; holding the heat at about 65-77°C for 30 minutes is sufficient.
- 10 Immersion of heat-resistant items in boiling water for about 10 minutes can substantially reduce the pathogen load, but must never be regarded as sterilisation.
- Pasteurisation and boiling are thus low-tech and chemical free methods (as long as the water is pure).

## Chemical disinfection

**Common chemical disinfectants include alcohols, chlorine and chlorine compounds, glutaraldehyde, ortho-phthalaldehyde, hydrogen peroxide, peracetic acid, phenolics, biguanides, and quaternary ammonium compounds (QAC). Such chemicals can be used alone or in combination. They must be used in accordance with the manufacturer's instructions and only on surfaces with which they are Ideally, commercial products should pass standard tests to support label claims before being sold for use in health care settings. However, requirements for product registration and allowable label claims vary widely from region to region. compatible.**

**Disinfectants are placed into three categories depending on microbicidal activity:**

## High-level disinfectants High-level disinfectants (HLD)

- **are active against vegetative bacteria, viruses (including the non-enveloped ones), fungi, and mycobacteria. They may also have some activity against bacterial spores with extended contact times.**
- **HLDs are used to disinfect heat-sensitive and semi-critical devices such as flexible fibreoptic endoscopes.**
- **Aldehydes (glutaraldehyde and ortho-phthalaldehyde) and oxidisers (e.g., hydrogen peroxide and peracetic acid) are HLDs.**
- **The aldehydes are noncorrosive and safe for use on most devices. However, they can fix organic materials, therefore it is particularly important to remove any embedded microbes prior to disinfection. Unless properly formulated and carefully used.**
- **oxidisers can be corrosive. However, they can be faster-acting, nonfixative and safer for the environment than aldehydes.**
- **HLDs typically require 10-45 minutes contact time for disinfection, depending on the temperature.**
- **After disinfection, items require thorough rinsing with sterile or filtered water to remove any chemical residues; they must then be dried with an alcohol rinse or by blowing clean and fi ltered air through the device's channels prior to safe storage.**

## Intermediate-level disinfectants

**Disinfectant active against vegetative bacteria, mycobacteria, fungi and most viruses. They may fail to kill spores, even after prolonged exposure.**

## Low-level disinfectants

**Low-level disinfectants (LLD) are active against vegetative bacteria (except mycobacteria), some fungi, and only enveloped viruses. In many cases, washing with unmedicated soap and water would be sufficient in place of LLD.**

## Steam sterilisation

- Steam is the most reliable means of sterilisation.
- It is non-toxic (when generated from water free of volatile chemicals).
- has broad-spectrum microbicidal activity, and good penetrating ability.
- while being cheap and easy to monitor for efficacy.
- Sterilisation requires direct contact of an item with steam at a required temperature and pressure for a specified time.
- Autoclaves are specially designed chambers in which steam under pressure produces high temperatures. They are based on the same principle as pressure-cookers.

## Microwaves

Exposure of water-containing items to microwaves generates heat due to friction from rapid rotation of water molecules. Thus far this process has only been used for disinfecting soft contact lenses

## Dry-heat sterilisation

- Hot-air ovens are used for dry-heat sterilisation.
- They can reach high temperatures and should be equipped with a fan for even distribution of heat.
- Preheating is essential before starting the sterilisation cycle.
- Hot air ovens are simpler in design and safer for use than autoclaves and are suitable for sterilisation of glassware, metallic items, powders, and anhydrous materials (oil and grease).
- Sterilisation takes two hours at 160°C, or one hour at 180°C.
- Plastics, rubber, paper, and cloth must not be placed in them to avoid the risk of fires.

## Ethylene oxide

- Ethylene oxide (EO) is used to sterilise items that are sensitive to heat, pressure, or moisture.
- EO is a colourless gas that is flammable, explosive, and toxic to humans.
- Two EO gas mixtures are available, one with hydrochlorofluorocarbons (HCFC) the other a mixture of 8.5% EO and 91.5% carbon dioxide; the latter mixture is less expensive.

## Hydrogen peroxide gas

- plasma Gas plasmas are generated in an enclosed chamber under deep vacuum using radio frequency or microwave energy to excite hydrogen peroxide gas molecules and produce charged particles, many of which are highly reactive free radicals.
- Gas-plasma can be used to sterilise heat- and moisture-sensitive items, such as some plastics, electrical/electronic devices, and corrosion-susceptible metal alloys.

## Filtration

A simple means of removing microbes from air or heat-sensitive liquids is by passage through membrane or cartridge filters. This process retains physical microorganisms based on their size, without killing them unless the filter matrix is impregnated with or exposed to a microbicidal agent. High efficiency particulate air (HEPA) filters are frequently used to remove microbial contamination from air in surgical theatres, microbiology laboratories, and for sterile manufacturing of pharmaceuticals. Their use in hospital wards and waiting rooms is also increasing to reduce the risk of spread of airborne pathogens. HEPA filters must be checked for integrity after installation and have a scheduled maintenance programme. Cartridge filters may be used on air-supply lines to remove microbial contamination. Membrane and cartridge filters with a nominal pore diameter of 0.2 μm are quite commonly used in the manufacture of a variety of heat-sensitive biologicals and injectables. Such filters cannot remove viruses due to their much smaller size. Cartridge filters are also common on taps for potable water and inside automatic endoscope reprocessors to protect processed devices from recontamination with bacteria in rinse water. Liquids passed through such filters are oft en referred to as ‘sterile’, although this is not strictly true.

## Ultraviolet Radiation

**Recent advances in ultraviolet (UV) lamp technology make the microbicidal potential of short-wave UV radiation viable for a variety of uses. UV lamps are increasing popular for disinfection of water and wastewater. UV-based devices are also being marketed for the disinfection of air in hospitals and clinics to reduce the spread of airborne pathogens. Devices are now being marketed for the disinfection of environmental surfaces in hospitals as well. UV radiation does not add any chemicals to the water and air being treated, except for the generation of low levels of ozone. However, it cannot penetrate through dirt, and items require direct exposure to the radiation. Such lamps require regular cleaning and periodic replacement; they can still emit visible light even after the UV radiation has diminished.**