Appendix IX

Disinfection and Sterilization

Disinfection is defined as a process that destroys most but not all pathogenic microorganisms on inanimate objects. Most common disinfection process uses a liquid disinfectant. Activity of a disinfectant depends upon concentration of solution, load of pathogens, water hardness, pH and temperature of solution and presence of organic matter. Many disinfectants are unsafe for use on human tissue including skin.

Sterilization is a process by which all types of organisms including spores are destroyed. It can be achieved by autoclaves, hot air oven, ethylene oxide, low-temperature steam, formaldehyde, sporicidal chemicals and irradiation.

1. **Autoclaves** use steam under pressure has a higher temperature than 100°C. To be effective against viruses and spore forming bacteria need to have steam in direct contact with material. Vacuum has to be created. It is required to autoclave for 3 min at 134°C or 15 min at 121°C. The performance is checked by colour changes on indicator tape. Autoclave is highly effective and inexpensive but unsuitable for heat-sensitive objects.
2. **Hot ovens** are inefficient compared to autoclaves and require temperatures of 160°C for 2 hours or 180°C for 30 min.
3. **Ethylene oxide** is highly-penetrative and active against bacteria, spores and viruses but is also flammable, toxic and expensive. It leaves toxic residue on sterilized items and instruments, therefore, need to be stored for prolonged period before use. It is suitable for heat-sensitive items.
4. **Sporicidal chemicals** often used as disinfectants but can also sterilize instruments, if used for prolonged period. Most bacteria and viruses are killed within 10 minutes but spores can survive several hours. These are inexpensive and suitable for heat-sensitive items. They are toxic and irritants.
    i) **Alcohol** (70% ethyl alcohol and isopropyl alcohol). It is bactericidal, virucidal, tuberculocidal but not sporicidal. It is also effective against cytomegalovirus and human immunodeficiency virus. It should not be used on surgical instruments as it is not sporicidal and is corrosive to stainless steel. It can be used for thermometers, medication vial stoppers, injection sites, hand rub. Due to flammable quality, it should not be used in presence of electrocautery and lasers.
    ii) **Sodium hypochlorite** (household bleach). A fast acting broad-spectrum disinfectant and commonly used for blood spills. It is deactivated in presence

of organic matter so the areas should be cleaned before use. It is very corrosive to steel.

iii) **Formaldehyde** (37% solution of formaldehyde in water). It is bactericidal, fungicidal, tuberculocidal, virucidal and sporicidal. It is used in tissue preservation and disinfection of some equipment. It is also used in tablet form for disinfection of instruments, rubber instruments in some situations. The fumes emitted are very toxic.

iv) **Glutaraldehyde** (2% solution). A widely used high level disinfectant that is sporicidal, bactericidal and virucidal. It is completely safe when used on instruments, endoscopes, anaesthesia equipment. It requires a longer period of exposure for sterilization. It is tuberculocidal in 20 minutes. It gets weakened by repeated dilution and should be replaced after 14 days. It is "activated" by alkali for use as a broad-spectrum disinfectant.

v) **Phenol** (carbolic acid). It is commonly used in detergent form for routine hospital cleaning. It is not sporicidal but is tuberculocidal, virucidal, fungicidal and bactericidal. Its use is restricted for disinfection of non-critical items. It has a noxious odour and can cause skin lesions and respiratory irritation.