**Sterilization**

**Sterilization Techniques for Surgical Materials and Instruments**

Two general categories of sterilization methods can be grouped under:

1. Physical sterilization

* Thermal
* Filtration
* Radiation

1. Chemical sterilization

* Germicidal solution like beta propiolactone
* Ethylene oxide

1. Physical sterilization
2. **Thermal**

Steam sterilization is the most commonly employed method of sterilization of instruments and equipment.

**Different types of autoclaves are:**

* Pressure steam sterilizer.
* Vacuum stream sterilizer.

**Points to be considered:**

* Instrument packs are positioned vertically (on edge) and longitudinally in autoclave.
* A 13 minutes sterilizing cycle (exposure to saturated stem at 121C) is a safe minimum required.
* Large linen packs require 30 minutes at 121C.
* Once sterilized, sterile packs should be stored in closed cabinets. All packs should be dated.
* Sharp instruments: scissors, needles, surgical instruments can be sterilized by this method.

**Dry heat sterilization**

* Dry heat destroys microorganisms primarily by oxidation process.
* It used to sterilize those materials for which moist heat cannot be used either due to deleterious effects on the material or material being impermeable to steam eg. glass surgicals etc.
* Slow process and long exposure time at a high temperature is required as spores are relatively resistance to dry heat.

**Methods**

* Direct exposure of instrument to flame not reliable.
* Hot air oven most common method.
* An exposure to dry heat at a temperature of 160C for 60 minutes will achieve sterilization equal to that of moist heat at 121C for 30 min at 15 lbs pressure.

Temperature time combination for dry heat sterilization

* 120C for 8 hours.
* 140C for 2.5 hours.
* 160C for 60 minutes.
* 170C for 40 minutes.
* Exposure time relates to the time after specific temperature has been achieved and don’t include heating lags.
* Clean gowns, paper wrapped material, swabs, 120C for 8 hours.
* Stainless steel, lens and glass ware 160C for 60 minutes.

1. **Filtration** is used in air conditioning system to remove particles as small as 0.3 µm in diameter.
2. **Radiation** ultraviolet light is used for surface sterilization. Ionizing radiations, beta and cathode rays are used to sterilize heat sensitive prepackaged surgical materials as surgical mask to produce two-fold effects.
3. **Chemical agent**

An ideal chemical agent should have following properties:

* Kill all pathogenic microorganism.
* Work effectively in short period of time.
* Exert residual action.
* Not corrode dry or stain.
* Be stable, odorless and non-toxic.
* Be effective in presence of organic matter.
* Not be inactivated by other concurrently used chemicals.

1. **Agents in solution form**

**Alcohol**

* Ethyl alcohol (70%), isopropyl alcohol (90%) are commonly used.
* Presence of water easily denatures the protein.
* 70% alcohol is more germicidal than absolute alcohol
* Sterilization can be done by immensities continuously as needles.

**Aldehyde**

**Formaldehyde:**

* Available as formalin 37% solution of formaldehyde and water.
* Used as gas for fumigation.
* Irritant to skin and mucous membranes
* Oxidizing agent as halogens.
* Inorganic iodine compounds.
* Organic iodine compounds.
* Surfactants as soaps, detergents.
* Phenolic derivatives as carbolic acid.

1. **Chemical sterilization by gases**

**Ethylene oxide** acts by inactivating the DNA molecules in the microbial cells thus preventing cell reproduction.

1. Ethylene oxide, formaldehyde and beta propiolatone are generally used.
2. Sharp edged instruments as scalpel blades and hypodermic needles.

Commonly used disinfectants in veterinary practice

|  |  |  |
| --- | --- | --- |
| Agent | Disinfectant properties | Antiseptic properties |
| Ethyl alcohol 70% | Good | Very Good |
| Iodine compounds | Good | Good |
| Chlorine compounds | Good | Fair |
| Glutaraldehyde 2% | Good | None |

Commonly used antiseptic in veterinary practice

|  |  |
| --- | --- |
| Antiseptic | Examples |
| Povidone iodine | 10% = Betadine |
| Chlorhexidine | 4% = Betasept |
| Alcohol | 70% |