Title: Sterilization of Instruments and supplies for Aseptic Surgery

A. Introduction

Survival surgical procedures on all species must be conducted using aseptic technique which requires the use of sterile instruments and supplies. If the item breaks the mucosal barrier it must be sterile. Many supplies such as gloves, surgical blades, and suture materials are commercially available in sterile, ready-to-use packs. However, it is frequently necessary to sterilize (in-house) items such as surgical instruments, drapes, gauze, gowns, and catheters/devices for implant.

In considering methods for sterilization, it is important to differentiate between sterilization and disinfection. Sterilization kills all viable microorganisms, while disinfection only reduces the number of viable microorganisms. High-level disinfection will kill most vegetative microorganisms, but will not kill the more resistant bacterial spores. Commonly used disinfectants, such as alcohol, iodophors, chlorhexidine, quaternary ammonium and phenolic compounds, are not effective sterilants and, therefore, are not acceptable for the use on items intended to be used in survival surgical procedures.

For items that can withstand high temperature, the preferred sterilization methods are high-pressure/temperature/steam (e.g. autoclave). For items that cannot withstand high temperatures and pressure, plasma hydrogen peroxide or ethylene oxide gas are the preferred sterilization methods. However, cold chemical sterilization may be used effectively for many items.
B. Approved sterilization procedures
1. High-pressure/temperature steam sterilization using an autoclave and appropriate monitoring systems to assure sterility.

2. Dry Heat (e.g. hot glass bead sterilizer). These units only sterilize the tip of instruments. Caution: instruments must be cooled before contacting tissue.

3. Plasma hydrogen peroxide using an approved sterilizer and appropriate monitoring systems to assure sterility and personnel safety.

4. Ethylene oxide* gas sterilization using an approved sterilizer and appropriate monitoring systems to assure sterility and personnel safety. *Note: All materials sterilized by ethylene oxide require safe airing time.

5. Cold chemical sterilization
   a. Effective and proper use of chemical sterilization is dependent on many factors, including:
      • The use of chemicals classified as sterilants. **Those classified as disinfectants are not adequate.**
      • The physical properties of the item(s) being sterilized. It must be clean, relatively smooth, impervious to moisture, and be a shape that permits all surfaces to be exposed to the chemical sterilant. The presence of organic matter reduces activity of all chemical sterilants so all items should be first washed to remove blood and other organic debris.

**Exposure**
   o All surfaces, both interior and exterior, must be exposed to the sterilant. Tubing must be completely filled and the materials to be sterilized must be clean and arranged to assure total immersion.
- The items being sterilized must be exposed (immersed) to the sterilant for the prescribed period of times. Always follow manufacturer’s instructions. To prevent corrosion, instruments should not be "stored" in the sterilant.

- Use of fresh solutions. The sterilant solution must be clean and fresh. Most sterilants come in solutions consisting of two parts that, when combined together, form what is referred to as an activated solution. The shelf life of activated solutions is indicated in the instructions for commercial products. Generally, this is from one to four weeks.

- Rinsing chemically sterilized items prior to use in the surgical procedures. Instruments, implants, and tubing (both inside and out) must be rinsed with sterile saline or sterile water prior to use to avoid tissue damage to the animal.

b. Cold Chemical Sterilants: Many acceptable commercial sterilants are available. Only products classified as sterilants can be used for sterilizing instruments and implants for surgery. To ensure adequate sterilization, these products must be used according to the manufacturer’s recommendations. Using chemical sterilant solutions at higher dilutions and shorter exposure periods than the manufacturer’s recommendations will disinfect but not sterilize instruments. Subsequent removal and handling must be done using aseptic techniques in a sterile field or the items may be re-contaminated.

Alcohol is not a reliable fungicide or virucide and is ineffective against spores. Alcohol is not stable and loses effectiveness through evaporation. As such, alcohol should not be used as a cold sterilant.
c. Examples of Cold Chemical Sterilants.

- Chlorine - Chlorine dioxide (ClO₂ at 1:5 dilution) requires a minimum of 6 hours to achieve sterilization. The shelf life of the activated solution is <14 days.

- Sodium hypchlorite (Alcide 1.37%). A minimum of 6 hours is required for sterilization. The shelf life of the activated solution is 14 days.

- Aldehydes - Examples of aldehydes are Formaldehyde (6%) and Glutaraldehyde (2%). Contact time varies depending on product. Consult manufacturer as most glutaraldehydes require items be soaked for greater than 8 hours for sterilization. Some aldehydes are corrosive and irritating. Consult manufacturer for safety precautions and MSDS information.

- Hydrogen peroxide and hydrogen peroxide combination-based commercial sterilant products

- Peracetic acid and peracetic acid combination-based commercial sterilant products. Automated machines are available for the use of 35% peracetic acid.

References:


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