

Chapter 13 - Lesson 1



Sterilization



Maintaining a sterile field of operation reduces the chance of infection.

Introduction

Sterilization is the process of killing all microorganisms (bacterial, viral, and fungal) with the use of either physical or chemical agents. A disinfectant is a chemical substance that kills microorganisms on inanimate objects, such as exam tables and surgical instruments. An antiseptic is a chemical that is applied to a living body to inhibit the growth of microorganisms. Hand sanitizers are antiseptics. Asepsis is the absence of harmful microorganisms in living tissue. Skin can never be completely sterile. The inside of the body contains no bacteria and is referred to as aseptic.

Contamination is what occurs when there is a break in sterility or asepsis. Contamination allows microorganisms to enter a surgical site.

Sterilization of items used to perform surgery is a major factor in maintaining asepsis during surgery.

Brief History of Sterilization

In the late 1860s, Louis Pasteur, a French chemist, proved that bacteria were a cause of disease in humans and animals. He also developed the process of pasteurization which uses heat to kill microorganisms

in milk. His theories led Joseph Lister, an English surgeon, to develop “antiseptic technique” for performing surgery. Aseptic veterinary surgery began to be practiced in the 1940s. The use of surgical gowns, caps, masks, and gloves became routine in the 1960s.

Microorganisms and Infection

Wound infection is a common post-operative complication and dependent on numerous factors. Maintaining a sterile operating field is the factor the veterinarian and veterinary staff has the most control over. A surgical patient will never be completely sterile. There will always be bacteria present. However, a critical number of bacteria are required to cause an infection. This number is 10^5 microorganisms per gram (100,000 organisms/g) of tissue or milliliter of fluid. As long as bacterial numbers do not exceed this number, the normal immune defenses of the body can prevent infection. The goal of asepsis is to prevent the addition of bacteria to the surgical site.

Methods of Sterilization

Exposure to harmful microorganisms can be prevented by utilizing the correct sterilization methods. Though they are invisible to the naked eye, organisms capable of causing infection are everywhere. Sterile bandages, instruments, and equipment are necessary for preventing infection in animals receiving veterinary care.

Steam

The use of steam under pressure is most commonly used by veterinary hospitals to sterilize items. The three factors that dictate the success of steam sterilization are temperature, pressure and exposure time. Increasing pressure of steam in a closed container causes the temperature of the steam to rise. When microbes are exposed to the correct temperature and pressure for the right amount of time, they are destroyed and the items they were on become sterile. The device used for steam sterilization is called an autoclave. The minimum time, temperature, and pressure required to sterilize items is 10 minutes at 275 °F or 15 minutes at 250 °F and 15 pounds per square inch of pressure.



The use of surgical gowns, caps, masks, and gloves inhibits the spread of harmful bacteria.



Heat sterilizer.

Chemical (Gas)

Some items will be destroyed when exposed to the temperatures and pressures required for steam sterilization. These items include plastics, power cables and endoscopes. Ethylene oxide is a gas that can be used to sterilize these types of items. Exposure to the gas at under appropriate conditions results in sterility. Ethylene oxide is flammable, carcinogenic, can cause numerous health problems and is environmentally harmful. Use of it is strictly regulated.

Plasma

A safer method of sterilizing heat-sensitive items is plasma sterilization. This method uses reactive ions, electrons and neutrons to sterilize items in about 45 minutes at temperatures as low as 122 °F.

Ionizing Radiation

Most prepackaged sterile items like surgical gloves and suture packets have been sterilized with ionizing radiation. Exposure of these items to a radioactive source, such as cobalt 60, destroys microorganisms. This process is expensive and limited to commercial use.

Cold Chemical

Cold chemical sterilization is a common and inexpensive method of sterilizing items that cannot be exposed to steam sterilization. The most common chemical used is glutaraldehyde. A 2 % glutaraldehyde solution is noncorrosive to metal and delicate equipment like endoscopes. Immersion times in the solution vary depending on the item. Items should be thoroughly rinsed with sterile water prior to being used on a patient.

Storage of Sterile Equipment

It is important to store sterilized instruments and supplies in a manner that maintains their aseptic condition. Keep them in a dust-free, clean environment until use.



Gas sterilizer.

Antiseptics

Ideal antiseptics used in patient treatment prevent the growth of microorganisms, without necessarily destroying them, and do not harm the patient.

Characteristics of an ideal antiseptic include:

- Active against pathogens
- Non-irritating
- Cleansing
- Cost effective
- Long shelf life
- Safe for patient and handler
- Stable in the presence of organic matter

References

Block, S. S. (1991). *Disinfection, sterilization, and preservation*. Malvern, PA: Lea & Febiger.

Fossum T. W. (2007). *Sterilization and Disinfection, In: Small animal surgery* (pp. 9-10). St. Louis, MO: Mosby Elsevier.

Questions

1. Describe where infectious organisms live.
2. Contrast sterilization and antiseptics.
3. Describe the characteristics of an ideal antiseptic.
4. What are the major methods of sterilization?
5. What factors form the relationship most important in heat sterilization?
6. What is an example of sterilizing a substance at a temperature lower than its boiling point?
7. What commercial technique is used to sterilize heat-sensitive hospital supplies and materials?

Activity

1. Observe and describe the methods being used in the veterinary clinic to:
 - a. Disinfect exam and surgery tables.
 - b. Sterilize syringes, needles, and surgical instruments.
 - c. Apply antiseptics in patient treatment.