

SURVIVAL SURGERY IN RODENTS

The intent of this document is to provide guidelines for aseptic surgical procedures in rodents. This procedure is approved by the Creighton University IACUC. Any exemption must be submitted for approval to the Institutional Animal Care and Use Committee, prior to its application.

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Introduction

These guidelines apply to all surgical procedures performed on rodents in which the animals are expected to recover from anesthesia. Prior to performing any survival surgery techniques on rodents, an approved IACUC Protocol must be in place detailing the specific procedure proposed and identifying individuals appropriately trained to perform the scope of work proposed.

The following principles described in the Guide for the Care and Use of Laboratory Animals apply to rodent surgery.

- Appropriate pre-operative and post-operative care of animals in accordance with established veterinary medical and nursing practices are required.
- A dedicated surgical facility is not required.
- All survival surgery will be performed by using aseptic procedures, including masks, sterile gloves, sterile instruments, and aseptic techniques.

The Guide states that it is important for research personnel to be appropriately qualified and trained in all procedures to ensure that good surgical technique is practiced. Good technique includes:

- Asepsis
- Gentle tissue handling
- Minimal dissection of tissue
- Appropriate use of instruments
- Effective hemostasis
- Correct use of suture materials and patterns

Responsibility

The major responsibility for animal protection and monitoring during and after a procedure lies with the PI. Any instances in which a PI or staff member fails to provide veterinary care in accordance with this SOP is considered an infraction by the Creighton University IACUC and may result in suspension of a protocol and/or the privilege of an individual to perform animal research. Serious infractions may result in a loss of the ability to utilize data generated as a result of the study. This SOP applies to any Creighton University faculty, resident, staff, student, or fellow who are involved in rodent survival surgical procedures. It is the responsibility of the PI to ensure that all individuals involved in a procedure on an animal are aware of their duties and responsibilities, the appropriate contact individuals should problems arise during or after a procedure, and that all individuals read and understand this SOP.

Personal Protective Equipment

- Clean gown or lab coat
- Mask
- Surgical gloves
- Head cover

Pre-Operative

- Surgery should be conducted in a disinfected, uncluttered area that promotes asepsis during surgery (see Notes, Table 1).
- Prepare the animal by removing hair from the surgical site. Perform this procedure in an area separate from where the surgery is to be conducted.
- Prepare the surgical site(s) with an appropriate skin disinfectant (see Notes, Table 2).
- Surgeons should wash and dry their hands before aseptically donning sterile surgical gloves.

Operative

- The animal must be maintained in a surgical plane of anesthesia throughout the procedure.
- Begin surgery with sterile instruments and handle instruments aseptically (see Notes, Table 3).
- When using “tips-only” technique, the sterility of the instrument tips must be maintained throughout the procedure.
- Instruments and gloves may be used for a series of similar surgeries provided they are maintained clean and disinfected between animals (see Notes, Table 4).
- Monitor and/or maintain the animal's vital signs, especially heart and respiratory rates.
- Close surgical wounds using appropriate techniques and materials.

Post-Operative

- Move the animal to a warm, dry area and monitor it during recovery. Return the animal to its routine housing only after it has fully recovered from anesthesia.
- Provide analgesics as appropriate and as detailed in your approved IACUC Protocol.
- Generally, remove skin closures 10 to 14 days post-operatively.
- Maintain a record of surgery and post-operative care utilizing the Rodent Post-Procedure Monitoring Card.

Guidelines for Survival Rodent Surgery

These Notes include definitions and tables of information as a resource for investigators.

Aseptic Surgical Procedures

Surgery performed using procedures that limit microbial contamination so that significant infection or suppuration does not occur.

Major Surgery

Any surgical intervention that penetrates and exposes a body cavity; any procedure that has the potential for producing permanent physical or physiological impairment; and/or any procedure associated with orthopedics or extensive tissue dissection or transection.

Minor Surgery

Any surgical intervention that neither penetrates and exposes a body cavity nor produces permanent impairment of physical or physiologic function. Examples are superficial vascular cut down, and percutaneous biopsy.

Sterilization

The process whereby all viable microorganisms are eliminated or destroyed. The criterion of sterilization is the failure of organisms to grow if a growth supporting medium is supplied.

Disinfection

The chemical or physical process that involves the destruction of pathogenic organisms. All disinfectants are effective against vegetative forms of organisms, but not necessarily spores.

Table 1. Recommended Hard Surface Disinfectants (for example, table tops or equipment)

Always follow manufacturer's instructions for dilution and expiration periods.

| AGENT | EXAMPLES | COMMENTS |
|---------------------|---|---|
| Alcohols | 70% ethyl alcohol 85% isopropyl alcohol | Contact time required is 15 minutes. Contaminated surfaces take longer to disinfect. Remove gross contamination before using. Inexpensive. |
| Quaternary Ammonium | Roccal®, Quatricide® | Rapidly inactivated by organic matter. Compounds may support growth of gram negative bacteria. |
| Chlorine | Sodium hypochlorite (Clorox® 10% solution) Chlorine dioxide (Clidox®, Alcide®, MB-10®) | Corrosive. Presence of organic matter reduces activity. Chlorine dioxide must be fresh; kills vegetative organisms within 3 minutes of contact. |
| Glutaraldehydes | Glutaraldehydes (Cidex®, Cetylcide®, Cide Wipes®) | Rapidly disinfects surfaces. |
| Phenolics | Lysol®, TBQ® | Less affected by organic material than other disinfectants. |
| Chlorhexidine | Nolvasan®, Hibiclens® | Presence of blood does not interfere with activity. Rapidly bactericidal and persistent. Effective against many viruses. |

Table 2. Skin Disinfectants

Alternating disinfectants is more effective than using a single agent. For example, an iodophor scrub can be alternated three times with 70% alcohol, followed by a final soaking with a disinfectant solution. Alcohol, by itself, is not an adequate skin disinfectant. The evaporation of alcohol can induce hypothermia in small animals.

| AGENT | EXAMPLES | COMMENTS |
|---------------|-----------------------------------|---|
| Iodophors | Betadine®, Prepodyne®, Wescodyne® | Reduced activity in presence of organic matter. Wide range of microbicidal action. Works best in pH 6-7. |
| Chlorhexidine | Nolvasan®, Hibiclens® | Presence of blood does not interfere with activity. Rapidly bactericidal and persistent. Effective against many viruses. Excellent for use on skin. |

Table 3. Recommended Instrument Sterilants

Always follow manufacturer's instructions for dilution, exposure times and expiration periods.

| AGENT | EXAMPLES | COMMENTS |
|----------------------------------|---|--|
| Steam sterilization (moist heat) | Autoclave | Effectiveness dependent upon temperature, pressure and time (e.g., 121°C for 15 min. vs 131°C for 3 min). |
| Dry Heat | Hot Bead Sterilizer Dry Chamber | Fast. Instruments must be cooled before contacting tissue. <i>Only tips of instruments are sterilized with hot beads.</i> |
| Gas sterilization | Ethylene Oxide | Requires 30% or greater relative humidity for effectiveness against spores. Gas is irritating to tissue; all materials require safe airing time. |
| Chlorine | Chlorine Dioxide | Corrosive to instruments. Instruments must be rinsed with sterile saline or sterile water before use. |
| Glutaraldehydes | Glutaraldehyde (Cidex®, Cetylcide®, Metricide®) | Several hours required for sterilization. Corrosive and irritating. Instruments must be rinsed with sterile saline or sterile water before use. |
| Hydrogen peroxide-acetic acid | Actril®, Spor-Klenz® | Several hours required for sterilization. Corrosive and irritating. Instruments must be rinsed with sterile saline or sterile water before use. |

Table 4. Recommended Instrument Disinfectants

Always follow manufacturer's instructions for dilution, exposure times and expiration periods.

| AGENT | EXAMPLES | COMMENTS |
|---------------|---|--|
| Alcohols | 70% ethyl alcohol 85% isopropyl alcohol | Contact time required is 15 minutes. Contaminated surfaces take longer to disinfect. Remove gross contamination before using. Inexpensive. |
| Chlorine | Sodium hypochlorite (Clorox® 10% solution) Chlorine dioxide (Clidox®, Alcide®) | Corrosive. Presence of organic matter reduces activity. Chlorine dioxide must be fresh. Kills vegetative organisms within 3 min. Corrosive to instruments. Instruments must be rinsed with sterile saline or sterile water before use. |
| Chlorhexidine | Nolvasan®, Hibiclens® | Presence of blood does not interfere with activity. Rapidly bactericidal and persistent. Effective against many viruses. Instruments must be rinsed with sterile saline or sterile water before use. |

Table 5. Wound Closure Selection

| MATERIAL | CHARACTERISTICS AND FREQUENT USES |
|---|--|
| Polyglactin 910 (Vicryl®), Polyglycolic acid (Dexon®) | Absorbable; 60-90 days. Ligate or suture tissues where an absorbable suture is desirable. |
| Polydioxanone (PDS®) or, Polyglyconate (Maxon®) | Absorbable; 6 months. Ligate or suture tissues especially where an absorbable suture and extended wound support is desirable |
| Polypropylene (Prolene®) | Nonabsorbable. Inert. |
| Nylon (Ethilon®) | Nonabsorbable. Inert. General closure. |
| Silk | Nonabsorbable. (Caution: Tissue reactive and may wick microorganisms into the wound). Excellent handling. Preferred for cardiovascular procedures. |
| Chromic Gut | Absorbable. Versatile material. |
| Stainless Steel Wound Clips, Staples | Nonabsorbable. Requires instrument for removal. |
| Cyanoacrylate (Vetbond®, Nexaband®) | Skin glue. For non-tension bearing wounds. |

Suture gauge selection: Use the smallest gauge suture material that will perform adequately.

Cutting and reverse cutting needles: Provide edges that will cut through dense, difficult to penetrate tissue, such as skin.

Non-cutting, taper point or round needles: Have no edges to cut through tissue; used primarily for suturing easily torn tissues such as peritoneum or intestine.