RODENT SURGERY

1. PURPOSE

1.1. The purpose of this Animal Care and Use Procedure (ACUP) is to describe procedures for rodent surgery. This ACUP is intended for use by qualified personnel on an Institutional Animal Care and Use Committee (IACUC) approved protocol who will be performing surgery on rodents, or assisting in those procedures. This ACUP is approved by the Cornell IACUC. Any deviation must be approved by the IACUC prior to its implementation.

2. SCOPE

2.1. This document applies to all qualified rodent users at Cornell University.

3. INTRODUCTION

3.1. This document outlines peri-operative details associated with survival surgical procedures on rodents. These are basic guidelines and should be used in accompaniment with training. Contact CARE at care@cornell.edu for more information or for assistance.

4. MATERIAL AND EQUIPMENT

4.1. Animal Support

4.1.1. Appropriate PPE
4.1.2. Isotonic solution for injection (e.g., saline 0.9%)
4.1.3. Needles and syringes
4.1.4. Analgesics
4.1.5. Anesthetics
4.1.6. Electric razor or topical hair removal cream
4.1.7. Supplemental heat source

4.2. Animal Preparation

4.2.1. Antiseptic soap (e.g., chlorhexidine scrub or povidone-iodine scrub)
NOTE: Chlorhexidine can cause severe corneal trauma and should not be used on areas of the head that may result in antiseptic products entering the eye. Povidone-iodine products are relatively safe and should be used for surgical site preparation near the eyes.

4.2.2. 70% Alcohol and/or non-soap antiseptic solution (e.g., chlorhexidine solution or povidone-iodine solution)

4.3. Surgical Supplies

4.3.1. Sterile surgical instruments ± sterilization equipment (e.g., bead sterilizer)
4.3.2. Sterile gauze, drapes
4.3.3. Sterile gloves

NOTE: Clean gloves must be worn, but sterile gloves are not required if performing “tips-only” surgery, provided only the tips of the instruments, but not the entire instrument or the surgeon’s hands, enter the sterile field. The tips must remain sterile at all times. “Tips-only” surgery may be desired if non-sterile surfaces, such as equipment or patient positioning, need to be accessed during the procedure.

4.3.4. Suture material or skin staples

5. PROCEDURE

NOTE: Expired surgical materials or pharmaceuticals cannot be used in, or applied to, animals undergoing survival procedures. See ACUP 210 Non-Survival Surgery for applicable restrictions with non-survival procedures.

NOTE: Preoperative procedures can be performed in the same room as the surgery, but with adequate precautions so as to prevent contamination of the surgical field.

5.1. Preoperative Care

5.1.1. Surgical Principles

5.1.1.1. Designate an area dedicated to rodent surgery
5.1.1.2. Ensure that all required materials are ready and on hand prior to surgery
5.1.1.3. Begin surgery with clean and sterile surgical instruments

NOTE: Alcohol immersion will not sterilize equipment. Sensitive equipment (e.g., electrical devices) can be safely sterilized with ethylene oxide or vapor phase hydrogen peroxide. This type of sterilization can be arranged by contacting CARE.

5.1.1.4. Clean and disinfect all surfaces in the surgical area
5.1.1.5. Designate a sterile area (typically a sterile drape) on the working surface for the sterile materials (instruments, suture material, drapes, gauze, etc.).
5.1.1.5.1. Maintain aseptic conditions during all survival procedures.
5.1.1.5.2. Once a non-sterile surface has been touched by an instrument, the instrument must be re-sterilized.

5.1.1.6. Verify depth of anesthesia by loss of animal's pedal withdrawal reflex prior to start of surgery (i.e., lack of response to firm toe pinch).
5.1.1.7. Use efficient surgical planning to decrease surgical time, tissue contamination, and tissue damage.

5.1.1.7.1. Handle tissues atraumatically when possible. Assure that tissues are kept moist (e.g., dab tissue with sterile saline-soaked gauze or intermittently flush with sterile saline).
5.1.1.7.2. Use a scalpel blade or scissors to make the smallest possible incisions.

5.1.2. Preoperative and Intraoperative Procedures

5.1.2.1. Administer preemptive analgesics according to ACUP 102 Analgesia.
5.1.2.2. Anesthetize the animal according to ACUP 101 Rodent Anesthesia.
5.1.2.3. Apply sterile ophthalmic ointment to both eyes to prevent corneal desiccation.
5.1.2.4. For procedures that result in fluid loss, administer 1-2 ml fluids for a 25 g mouse of warmed isotonic fluids subcutaneously [Ref 8.6].
5.1.2.5. Remove hair from the surgical site (e.g., via electric razor, hair removing cream, or plucking) and remove loose hair and debris from the animal.
5.1.2.6. Clean the surgical area to remove the majority of debris.
5.1.2.7. Place the animal in the surgical space.
5.1.2.8. Perform three rounds of surgical scrubs using sterile gauze or sterile cotton tipped swabs:

5.1.2.8.1. Scrub surgical site with an antiseptic soap solution (e.g., chlorhexidine scrub or povidone-iodine scrub as per manufacturer’s recommendations).

**NOTE:** Chlorhexidine will cause corneal trauma if it comes in contact with the eyes, use povidone-iodine for surgical site preparation around the eyes.

5.1.2.8.1.1. Start at the center of the surgical site and move to the outside of the prepared area in a circular manner.
5.1.2.8.1.2. Do not overlap areas that have been previously scrubbed with the same piece of sterile gauze or sterile cotton swab.

5.1.2.8.2. Rinse by scrubbing with a non-soap solution (e.g., 70% alcohol and/or non-soap antiseptic).

5.1.2.8.2.1. Do not excessively wet the animal.
NOTE: Excessive use of alcohol may contribute to hypothermia.

5.1.2.9. Repeat soap scrub and rinse process twice more.
5.1.2.10. Discard each piece of gauze or cotton swab after each use.
5.1.2.11. Preparation of Surgeon:

5.1.2.11.1. Don clean facility dedicated outer clothing (e.g., lab coat, surgical scrubs, or disposable gown) and a surgical mask.
5.1.2.11.2. Wash hands thoroughly with soap and water.
5.1.2.11.3. Using aseptic technique, don sterile gloves. Do not touch non-sterile surfaces. Once a non-sterile surface has been touched, the gloves are no longer sterile and the surgeon must re-glove.

NOTE: Clean gloves must be worn, but sterile gloves are not required if performing “tips-only” surgery, provided only the tips of the instruments, but not the entire instrument or the surgeon’s hands, enter the sterile field. The tips must remain sterile at all times. “Tips-only” surgery may be desired if non-sterile surfaces, such as equipment or patient positioning, need to be accessed during the procedure.

5.1.2.11.4. Sterile surgical draping: Whenever practical, drape the animal with a sterile, impermeable covering to isolate the disinfected area.

5.1.2.11.4.1. Draping is performed by the gloved surgeon, in order to prevent contamination of the surgical field.
5.1.2.11.4.2. Due to the small size of rodents, there are limitations to the effectiveness and utility of draping during surgery, consult a CARE veterinary staff member if clarification is needed.

NOTE: Surgical drapes must be sterile for the first animal, and the drapes may then be transferred to the following animals during serial surgeries. The top surface of the drape must never come in contact with unsterile items, and must not be soiled if using the same drape.

5.1.2.12. Contact CARE at care@cornell.edu for further information or assistance in surgical preparation, aseptic technique, or draping.

5.1.2.13. Tissue Closure:

5.1.2.13.1. Where practical, close tissue layers separately (i.e., peritoneum/abdominal muscle layers together, then subcutaneous tissue, and then skin).

5.1.2.14. Sterilize the instruments between each animal. Place in a bead sterilizer for approximately 10-30 seconds. Remove gross tissue contamination before placing in sterilizer (e.g., wipe with saline). Allow the instrument to cool prior to use on living tissue.
5.2. Perioperative Anesthetic Monitoring and Supportive Care

5.2.1. See References, ACUP 101 Rodent Anesthesia.

5.3. Postoperative Care

**NOTE:** Postoperative care begins immediately following surgery and extends up to 14 days. Remove skin suture or clips as per the IACUC approved protocol (typically within 7-14 days of surgery).

5.3.1. Place the animal in a clean, quiet environment for anesthetic recovery
5.3.2. Do not place anesthetized animals in a cage with fully conscious animals
5.3.3. If recovering the animal in a cage, place the animal on a clean paper towel in order to prevent aspiration of bedding material
5.3.4. Keep the animal warm and dry in order to mitigate hypothermia
5.3.5. Until the animal recovers from anesthesia, observe and monitor activity and respiratory rate. Return the animal to holding area only after it has regained coordinated movement.
5.3.6. As applicable, repeat analgesics postoperatively and for the next 48 hours, as per the IACUC approved protocol. Administering analgesia for less than 48 hours postoperative must be justified and detailed in the IACUC approved protocol, see ACUP 102 Analgésia for details.
5.3.7. For procedures that result in fluid loss, administer 1-2 ml fluids for a 25 g mouse of warmed isotonic fluids subcutaneously if this was not already done pre-operatively [Ref 8.6].

5.3.7.1. Fluids can be administered on subsequent days to maintain hydration status.

5.3.8. Examine the surgical incision daily as per protocol details (typically at least 5 days for invasive procedures).
5.3.9. For invasive surgeries, measure body weight daily.
5.3.10. Report sick animals as per ACUP 607 Reporting Sick Animals.

5.4. Record Keeping

5.4.1. Maintain detailed records of all procedures, medications, and perioperative observations/treatments as per ACUP 542 Maintaining Health and Procedure Records for Research and Teaching Animals.
5.4.2. Use “Post-Procedural Care” cards as applicable (see appendix for example). These cards may be obtained from CARE.

6. PERSONNEL SAFETY

6.1. Medical Emergencies: **CALL 911.**
6.2. When working with animals wear appropriate PPE, observe proper hygiene, and be aware of allergy, zoonosis, and injury risks. Refer to the CARE Occupational Health and Safety webpage for more information.
7. ANIMAL RELATED CONTINGENCIES

7.1. Post contact information for emergency assistance in a conspicuous location within the animal facility.

7.2. Non-emergency veterinary questions and requests for care: email CARE veterinary staff at care@cornell.edu.

7.3. Emergency veterinary care is available at all times including after working hours and on weekends and holidays by calling the CARE pager (1-800-329-2456).

8. REFERENCES


8.2. ACUP 102 Analgesia: http://ras.research.cornell.edu/care/documents/ACUPs/ACUP102.pdf


8.5. CARE Occupational Health and Safety webpage: http://ras.research.cornell.edu/care/OHS.html

8.6. AALAS Learning Library. Post-Procedure Care of Mice and Rats in Research: Minimizing Pain and Distress, Lesson 9: Fluid and Electrolyte Balance.
9. APPENDIX

9.1. Instructions: Research staff – use one of these cards, or similar document, to record post procedural care as defined in the study protocol. Write in additional information as necessary, use the reverse side of the card, or an additional sheet, if more space is required; the card can be adapted to specific situations. Make sure to date and initial each procedure and intervention and ensure this information is easy to locate within the animal housing room.

<table>
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<tr>
<th>POST-PROCEDURE CARE</th>
<th>___ DAYS OF POSTOP MEDICATION</th>
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<tbody>
<tr>
<td><strong>Day 1</strong></td>
<td>Procedure:</td>
</tr>
<tr>
<td>Anesthesia: Isoflurane ☐ Tribromoethanol ☐ Xylazine/ketamine</td>
<td></td>
</tr>
<tr>
<td>Analgesia: Local (Bupivacaine) Dose_____ mg ☐ Ketoprofen SC Dose_____ mg ☐ Meloxicam SC Dose_____ mg Times: ______ ______</td>
<td></td>
</tr>
<tr>
<td>Fluids: ☐ Saline or LRS SC Dose_____ ml ☐ Wet food</td>
<td></td>
</tr>
<tr>
<td>Heat source: ☐ During procedure ☐ After procedure until recovery</td>
<td></td>
</tr>
</tbody>
</table>

| **Day 2** | Date: | Name (Initials): |
| Analgesia: Ketoprofen SC Dose_____ mg ☐ Meloxicam SC Dose_____ mg Times: ______ ______ |
| Fluids: ☐ Saline or LRS SC Dose_____ ml ☐ Wet food |

| **Day 3** | Date: | Name (Initials): |
| Analgesia: Ketoprofen SC Dose_____ mg ☐ Meloxicam SC Dose_____ mg Times: ______ ______ |
| Fluids: ☐ Saline or LRS SC Dose_____ ml ☐ Wet food |

| **Day 4** | Date: | Name (Initials): |
| Daily monitoring |

| **Day 5** | Date: | Name (Initials): |
| Daily monitoring |

| **Day 7-15** | Date: | Name (Initials): |
| Staples/stitches removed |

<table>
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<tr>
<td><strong>ID#:</strong></td>
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<tr>
<td><strong>PROCEDURE:</strong></td>
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<tr>
<td><strong>DAY ONE</strong></td>
</tr>
<tr>
<td>Anesthesia: Isoflurane ☐ Avertin ☐ Xylazine/Ketamine ☐ Other __________</td>
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<tr>
<td>Analgesia: Drug ☐ Route ☐ Dose __________</td>
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<tr>
<td>Times: ______ ______ ______</td>
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<tr>
<td>Fluids: ☐ ☐ ☐ ☐ ☐</td>
</tr>
<tr>
<td>Heat source: ☐ During procedure ☐ After procedure until recovery</td>
</tr>
</tbody>
</table>

| **DAY TWO** | Date: | By: | By: |
| Analgesia: Drug ☐ Route ☐ Dose __________ |
| Times: ______ ______ ______ |
| Fluids: ☐ ☐ ☐ ☐ ☐ |

| **DAY THREE** | Date: | By: | By: |
| Analgesia: Drug ☐ Route ☐ Dose __________ |
| Times: ______ ______ ______ |
| Fluids: ☐ ☐ ☐ ☐ ☐ |
| Sutures/staples removed: __________ |
| Comments: __________ |
## 10. HISTORY

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<tr>
<td>18 SEP 15</td>
<td>New Format – Converted by: J. Kirby</td>
</tr>
<tr>
<td>13 NOV 08</td>
<td>Revised – Revision Author: Dr. E. Daugherity; Referee: Dr. W. Wendy</td>
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<tr>
<td>15 DEC 02</td>
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