

RODENT SURGICAL GUIDELINES

In accordance with the PHS Policy, the 'Guide', and best practice standards, the following guidelines must be followed for rodent surgeries at the University of Maryland School of Medicine. Investigators who consider their rodent experiments exempt from these guidelines must submit scientific justification for those exceptions for IACUC review and approval prior to implementation.

1. **Surgical Area Preparation:** The area where surgery will be performed must be clean and uncluttered. It should be in an area away from high foot traffic. The surface should be disinfected with 10% household bleach, Roccal, chlorine dioxide or similar disinfectant spray. *(Please note that alcohol is not acceptable).* Once dry, place a clean or sterile pad/drape on the surface, e.g., "chuck" pads.
2. **Surgical Instruments:**
 - a. **Survival Surgery** – Each survival surgery requires sterile instruments to be used. Acceptable sterilization methods include: steam sterilization (121 °C for 30 minutes); dry heat (Glass Bead sterilizer, 230 °C, avg. 10-15 seconds (check manual); or cold sterilization or ethylene oxide for instruments that will not withstand high temperatures / heat exposure. *(Please note that minimum exposure time for cold "sterilization" is 5-10 hrs depending on product utilized. Please rinse instruments in sterile water before use as chemical sterilants are irritating to tissues.)*
 - b. **Non-survival Surgery** – For non-survival surgeries lasting less than 3 hrs before performing euthanasia: Clean / disinfected instruments are adequate. Wash instruments with 10% Betadine scrub then rinse with sterile water or 70% alcohol between animals. Remove all tissue / blood debris from instruments when cleaning. Non-survival surgeries lasting more than 3 hrs require sterile instruments to be used. Please adhere to guidance as noted above for survival surgery.

For additional information on cold sterilants, please review the following document: FDA-Cleared Sterilants and High Level Disinfectants with General Claims for Processing Reusable Medical and Dental Devices (<http://www.fda.gov/cdrh/ode/germlab.html>). Please verify proper storage and disposal procedures with EHS.
3. **Thermal Support** must be provided when anesthesia is to last longer than 6-8 minutes before animal recovery. Thermal support should be provided post-skin prep, during surgery and recovery until the animal is ambulating normally. Home heating pads are NOT acceptable. Warm water thermostatically controlled heating pads (e.g., Gaymar), Isothermic heating pads (e.g., Braintree Scientific, "Deltaphase Isothermal Pad"), or scientific grade heating pads (e.g., Harvard Apparatus) are preferred. REMINDER: Please place a thick towel / cardboard under pad to insulate it from delivering heat to the table top instead of the animal.
4. **Anesthesia:** Select the appropriate anesthesia that meets the needs of the procedure and provides the minimum anesthesia time needed for the goals of the protocol. Please refer to the IACUC website for recommended anesthetic regimens for the most commonly used species (<http://medschool.umaryland.edu/acuo/guidelines.asp>).
5. **Animal preparation:** Evaluate the animal for alertness, hydration status, and weight prior to anesthetizing. Once sedated, apply ocular protectant (e.g., Lacrilube ointment or artificial tears – repeat administration of tears every 30 minutes while anesthetized due to evaporation). Surgical prep should occur in a location separate from the designated surgical performance area. Remove hair with an electrical clipper (# 40 or 50 blade) or by use of a depilatory, e.g., Nair. Shaving with a blade is discouraged due to skin irritation. Hair removal margins should be a minimum of 1cm from planned incisions unless prohibited anatomically. Apply surgical scrub (e.g., 10 % Betadine or Chlorhexidine surgical scrub) using clean cotton tipped applicator (e.g., Q-tips) or 2x2 cotton gauze. Restricting the area of application of liquids to clipped skin only will reduce heat loss by the animal due to conduction / evaporation. Rinse scrub with 70% alcohol on a cotton tipped applicator /gauze, repeat skin prep one additional time (two times minimum). A drape should be employed to prevent contamination for survival surgeries, e.g., a sterile 4x4 cotton gauze sponge unfolded with a window cut in the center is acceptable; it will also act to conserve body heat.
6. **Surgeon Preparation:** The surgeon should wear a clean lab coat, surgical scrub top or don a surgical gown (*gown should be donned after hand scrub to prevent cuffs becoming wet during hand scrub*) and a mask (cap is optional, but

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recommended). The surgeon should perform a hand scrub using soap (antibacterial or Betadine preferred), dry hands with a clean towel and put on sterile gloves for ALL surgeries. Gloves should be changed between animals, if contaminated (e.g., break in aseptic technique) or excessively soiled with blood or other fluids intra-operatively.

7. **Tissue Closure:** Skin may be closed with surgical clips, with non-absorbable, non-braided suture materials, or with sterile veterinary skin glues, e.g., Nexaban, Vet Bond, etc. [Please note that subcutaneous (SQ) sutures may also be required with the use of skin glue.] The suture gauge chosen should be proportional to the size of rodent, e.g., for mice: suture gauge 4-0, 5-0 or possibly 6-0 and for rats, suture gauge 4-0 or 5-0. Silk should NOT be used for skin closure as it has been found irritating to skin and braided material may act as a “wick” carrying bacteria to the subcuticular layers. Subcuticular or muscular layers should be closed with absorbable sutures when ever possible. Newer, absorbable synthetics, e.g., Vicryl or Maxon, are preferred over “Gut” due to Gut’s inflammatory response during breakdown. Skin sutures or clips should be removed in 10-14 days post-surgery.

NOTE: If all instruments are sterile and the principles of aseptic technique are adhered to, there is no need for post-operative prophylactic antibiotic treatment. If the use of antibiotics is required, the rationale for administering antibiotics post-operatively must be clearly discussed in the protocol submission.

8. **Recovery:** A separate recovery cage should be prepared with fresh bedding and placed with ½ the cage bottom on a thick towel and the other ½ of the cage bottom on a thermal supportive device/ pad. This allows the animal to move towards or away from the heat source. NOTE: Insulate the heating pad from the table top (towel / piece of cardboard) as heat will move more rapidly to the table surface vs. to the cage). Once the animal starts to ambulate, move the animal to it’s own or a secondary cage. This is precautionary measure since animals in the recovery cage may not be able to protect themselves from other cage mates, close eyes in response to debris and/or bedding stirred by other animals, etc.

Prior to recovery from anesthesia, analgesics must be administered in the dose, route and with the gauge needle approved in the protocol. Analgesics are most effective when administered PRIOR to the first incision (prior to full induction, if possible, is preferred). Allow adequate time for analgesic effect prior to procedure (3-5 min).

Minor surgeries: Analgesics should be administered to provide analgesia for a minimum effective period of 24 hrs post minor surgery unless scientifically justified. Administration of local analgesics (e.g., lidocaine or bupivacaine) may be adequate for minor procedures involving the skin or SQ, please consult with a VR veterinarian for additional guidance.

Major surgeries (*those that enter a body cavity or involve orthopedics*) require systemic analgesics, e.g., nonsteroidal anti-inflammatories (e.g., Carprofen) or opioid class drugs (e.g., Buprenorphine). Analgesics should be administered to provide analgesia for a minimum effective period of 36-48 hrs post major surgeries unless scientifically justified.

9. Documentation:

- a. **Green Procedural Cage Card** must be completed and inserted into cage card holder. This cage card can be obtained from the animal facility supervisor. Please note that analgesic administration must be documented on the back of these cards.
- b. **PI Research Records** must include surgical and post-operative documentation. Examples of information that should be recorded include anesthetic and analgesic administration, how the animal(s) tolerated anesthesia, surgery start and end time, brief description of surgical procedures, time of animal recovery, post-operative observation and summary of complications. The IACUC recommends that procedural and animal observation records be placed in a centralized location. Surgical and post-operative templates can be obtained from the IACUC Office or Veterinary Resources.

Please contact Veterinary Resources (410-706-3540) for questions relative to aseptic technique, anesthesia, or analgesics.