IACUC GUIDELINE FOR RODENT SURGERY AND POST ANESTHETIC MONITORING

I. Purpose: The University of Pennsylvania’s Institutional Animal Care and Use Committee is charged with ensuring that all surgical facilities and procedures meet the criteria set by the federal regulations, including the Animal Welfare Act (AWA) and the Public Health Service (PHS) Policy.

II. Definitions
A. Aseptic Technique: Aseptic technique is required for all survival surgeries regardless of species. It includes hair removal and disinfection of the operative site; preparation of the surgeon such as clean surgical attire, surgical scrub, sterile surgical gloves; sterilization of instruments, supplies, and implanted materials; and the use of operative techniques to reduce the likelihood of infection.¹
B. Disinfection: Cleaning procedure that reduces the number of pathogenic organisms to a harmless level.
C. Sterilization: Cleaning procedure that kills all living organisms on an object.

III. Aseptic Procedures
A. Location/Field
   1. The “Guide for the Care and Use of Laboratory Animals” states: “For most rodent surgery, a facility may be small and simple, such as a dedicated space in a laboratory appropriately managed to minimize contamination from other activities in the room during surgery.”
   2. The area should be disinfected prior to performing surgery and cleaned afterwards. (See http://oacu.od.nih.gov/ARAC/index.htm)²
   3. Surgical field should be draped with a sterile material.

B. Instruments
   1. All instruments must be cleaned and sterilized prior to use on animals. Alcohol is NOT a sterilant. (See http://oacu.od.nih.gov/ARAC/index.htm)² Examples of methods of sterilization include: steam, gas, and plasma sterilization.
   2. Ensure that the tools are appropriate for surgery (i.e. do not use dull or rusted surgical instruments or those not manufactured for surgical use.)
   3. If instruments are to be used for multiple surgeries on a single day they must be sterilized between animals. (See http://oacu.od.nih.gov/ARAC/index.htm)² Hot bead sterilizers are often used in these cases.

C. Animal
   1. Remove the hair (clip, depilatory cream) in the area where surgery is to be performed.
   2. Clean the hair and any other debris off with an alcohol pad.
3. Disinfect the area with appropriate scrub. Alcohol is NOT an appropriate disinfectant. Iodophors (i.e. Betadine) or Chlorohexidines (i.e. Nolvasan) should be used. (See http://oacu.od.nih.gov/ARAC/index.htm)²
4. Sterile drape should be placed over the animal.
5. “Pinning” animals down for survival and non-survival surgeries is prohibited. Options for securing animal limbs include tape and gauze.

D. Surgeon and Surgical Assistant(s)
   1. Perform surgical scrub. (This includes scrubbing both hands, in between fingers, and both forearms with a designated surgical scrub brush for approximately 5 minutes.)
   2. Wear a clean lab coat, scrubs, or other appropriate gown.
   3. Wear a face mask.
   4. Wear sterile gloves.
   5. Movements of the surgeon and assistant(s) should be done carefully to avoid contamination of the surgical site.

IV. Anesthetics
A. Evidence indicates that rodents feel pain in a manner similar to humans. Therefore, all procedures must be planned applying the maximum in pain/distress relief possible consistent with the goals of the research. The approved protocol must provide a detailed description of the anesthetic and pain management regimen.
B. Injectable Anesthetics: Animals should be weighed prior to surgery to calculate the appropriate dose of anesthetics. Examples of recommended injectable anesthetic regimens are located in IACUC Guideline 15.
C. Inhalation Anesthetics: Anesthetics should be scavenged with appropriate devices and methods. If training is needed please contact ULAR Training for help. Examples of recommended inhalation anesthetics are located in IACUC Guideline 15.

V. Procedural Care
A. The animal must be under a surgical plane of anesthesia before a surgical procedure begins. Check the animal prior to and during the procedure using the "toe pinch" (brief clamping of web of skin between toes with a hemostat or a firm pinch with the index finger nail and thumb) method. Firmly pinching multiple toes should not elicit a withdrawal response from the animal. The animal should remain unaffected. If at any time, an animal begins to respond to pain or attain an anesthetic depth that is too light, stop the procedure and adjust the inhalant anesthetic level or give a supplemental dose of injectable anesthetics. Reassess that the toe-pincher reflex is again absent before resuming work.

PLEASE NOTE: During a procedure, animals that are under anesthesia should NEVER be left alone.
B. The animal should be continuously monitored by looking at the rising and falling of the chest - which will show you the respiratory rate and effort. The rate does not need to be counted; you are ultimately looking for a consistent pattern. The animal’s heart rate should also be monitored throughout the procedure (if the surgical procedure allows) by palpating with fingers over the chest (more advanced monitoring techniques can be used as well, depending on your study - such as ecg, pulse oximetry, Doppler, etc.)

C. An animal that has a sudden increase in respiratory rate and effort or heart rate could potentially be too light on anesthesia and may require supplemental dosing or an increase of the anesthetic being administered. On the other hand, if the animal’s respiratory rate and effort or heart rate greatly decreases, the animal could be too deep; therefore the anesthetic dose may need to be decreased.

D. During the surgical procedure, the animal’s body temperature should be maintained by insulation provided by drapes/towels, a covered recirculating water heating pad, or a heat lamp. If possible, monitoring body temperature with a rectal probe is recommended.

VI. Post-procedural Analgesia and Monitoring

A. Animals should be placed into a clean recovery cage in sternal recumbency. Ideally the recovery cage should be lined with a clean paper towel to prevent suffocation from bedding. During anesthetic recovery, the animal’s body temperature should be maintained with an approved, well-maintained heating device (i.e recirculation water heating pad, heat lamp). However, be cautious that the heating device is not too close to the animal to avoid burning. There should always be a cooler location in the cage, where the animal can escape to if they are feeling too warm.

B. Recovering animals should not be in the cage with awake animals to prevent cannibalistic activity by the awake animals.

C. Animals in the recovery cage should be monitored every 5 to 10 minutes. Once animals have regained all postural reflexes and are ambulatory (can walk well in the cage), they can be placed in clean caging with bedding, and returned to the vivarium housing. **ANIMALS SHOULD NOT BE RETURNED TO THE ANIMAL HOLDING ROOMS IN THE VIVARIUM UNTIL THEY ARE COMPLETELY RECOVERED FROM ANESTHESIA.**

D. The policy of the University of the Pennsylvania’s IACUC is that pre-operative and post-operative analgesics are required for all major invasive procedures, and for procedures that have the potential for causing pain in laboratory animals. IACUC approval is required for any protocol that requires withholding use of analgesics. Contact a ULAR veterinarian for recommended analgesic agents or refer to IACUC Guideline 15.

E. Rodents should be observed during the postprocedural recuperation period for signs of pain and/or distress including decreased activity, hunched posture, not grooming, abnormal gait, teeth chattering. The cardinal signs of infection
such as heat, swelling, redness, and or exudation should be monitored for. The length of time observations are made may depend on the degree of invasiveness of the protocol procedure, and the individual animal. It is recommended by the IACUC that you **observe animals daily for a minimum of seven days** for major procedures. If the health of the animal is questionable, a ULAR veterinarian should be notified for treatment recommendations, or to help assist in determining endpoints for the animal (i.e. euthanasia).

**VII. Record Keeping:** The following records should be available upon request for inspection:

A. Surgical records – These should include the protocol number, animal identification number, date of surgery, surgeon’s initials, weight of animal prior to surgery, anesthesia and dose, brief description of procedure, any deviations from the approved procedure (i.e. supplemental doses of anesthetics), pre- or intra-operative analgesics.

B. Post-operative records – These should include the protocol number, animal identification number, initials of individual making observations, date(s) of observation(s), a comment on the general condition and health of animal, analgesics and/or other medications given. Attached to this guideline is a template of a post-operative record sheet.

C. **If you are using USDA covered rodents, such as guinea pigs, hamsters, gerbils, cotton rats, etc., you will also need to refer to IACUC Guideline 12- Record Keeping for USDA Covered Species.**

**VIII. Physiological data**

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<tr>
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<th>TEMPERATURE</th>
<th>RESPIRATORY RATE</th>
<th>HEART RATE</th>
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</thead>
<tbody>
<tr>
<td>MICE</td>
<td>96.6-99.7°F (35.8-37.4°C)</td>
<td>90-220 per minute</td>
<td>328-780 per minute</td>
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<tr>
<td>RATS</td>
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<td>66-144 per minute</td>
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<td>GUINEA PIGS</td>
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<td>42-104 per minute</td>
<td>230-320 per minute</td>
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<td>HAMSTERS</td>
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<td>250-600 per minute</td>
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<td>GERBILS</td>
<td>96.3-102.7°F (35.7-39.3°C)</td>
<td>70-120 per minute</td>
<td>260-600 per minute</td>
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**IX. References**