

Institutional Animal Care and Use Committee		UNTHSC
Title: Surgery		
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A. BACKGROUND INFORMATION

- a. In accordance with the Guide for the Care and Use of Laboratory Animals and 9 CFR, the Animal Welfare Act, all survival surgical procedures must be performed using aseptic procedures. This includes the use of sterile instruments, and the aseptic preparation of the surgical site in order to prevent infections.
- b. Surgery must be performed or directly supervised by trained, experienced personnel.
- c. Procedures that will cause more than momentary or slight pain or distress must be performed with appropriate sedatives, analgesics, and/or anesthetics, unless withholding such agents is justified for scientific reasons and that justification is provided to the UNTHSC IACUC in writing by the principal investigator.

B. RESPONSIBILITIES

It is the responsibility of the Principal Investigator (PI) to follow the procedures outlined below regarding surgical procedures in rodents.

C. PROCEDURES

- a. Definitions
 - i. **Aseptic technique:** Surgical technique conducted under conditions that prevent exposure of the patient to pathogenic organisms. It applies the strictest rules in utilizing what is known about infection prevention to minimize the risk of infection. This includes wearing appropriate PPE, including sterile gloves, sterilizing instruments used, and aseptic preparation of the surgical field.
 - ii. **Survival surgery:** Surgery performed on a live animal under general anesthesia, from which the animal is expected to recover.
 - iii. **Non-survival surgery:** the animal is euthanized at the end of the surgical procedure before recovering from anesthesia.
 - iv. **Major operative procedure or major survival surgery:** Surgical intervention that penetrates a body cavity or could potentially produce a permanent handicap in an animal that is expected to recover.
 - v. **Minor surgical procedure:** Surgical procedure restricted to the management of minor problems and injuries (e.g., wound suturing) and procedures such as peripheral vessel cannulations.
- b. Surgical Facilities:
 - i. Surgeries should be conducted in a dedicated facility or space. If the investigator's laboratory is used for surgery, the lab must be inspected by IACUC/DLAM staff before surgery begins to assure the room meets requirements.
 1. For Non-Rodent Species: Major operative procedures must be conducted in a dedicated facility maintained under aseptic conditions. Non-major operative procedures do not require a dedicated facility, but must be performed using aseptic procedures.
 2. For Rodent Species, a dedicated facility is not required, but must be performed using aseptic procedures.

- a. A rodent surgical area can be a room or portion of a room that is easily sanitized. It should be in a space with limited traffic flow, and must not be used for any other purpose during surgery. The surgical table and associated equipment must be sanitized prior to use.
- ii. If the investigator's laboratory is used for surgery, the laboratory must be inspected by IACUC/DLAM staff before surgery begins to assure the room meets requirements.
- iii. All rooms used for surgery must be approved, and listed on the IACUC protocol. Changes to the surgical room location will need to be approved through an amendment form.
- c. Preparation of the animal:
 - i. While the animal is unconscious in a surgical plane of anesthesia, after anesthetic has been administered, the hair should be clipped from the entire surgical site. Depilatory cream such as Nair can also be used to remove the hair.
 - ii. The operative site should be thoroughly cleaned with a skin detergent (scrub) to remove surface bacteria. The scrub must be applied at least three times alternating each scrub with 70% (isopropyl or ethyl) alcohol. Topical alcohol application in rodents can lead to hypothermia; therefore, it must be used with care. The use of cotton tip applicators soaked with scrub/solution materials is ideal during the skin preparation process.
 - iii. The anesthetized animal should be secured with an appropriate method to prevent contamination of the surgical site. The animal should be positioned with the head and neck fully extended to ensure a patent airway.
 - iv. Surgical drapes should be used to cover the animal's body to prevent contamination of the operative site when penetrating a major body cavity; when a drape is used in surgery on rodents the drape must be small enough to permit visualization of the animal's respiratory movements and peripheral perfusion to avoid anesthetic accidents. Surgical drapes must be sterile.
 - v. An external heat source is generally needed to prevent hypothermia and complications. The use of a water circulating blanket is an ideal source of heat. Electrical blankets and heat lamps must be used with great caution as they can induce severe thermal damage to animals. Heating blankets must be covered.
- d. Preparation of the surgeon:
 - i. Clean outer garments should be worn during surgery (e.g. a dedicated lab coat, a gown, or a clean scrub top). A surgical cap and gown are required for USDA covered species, but optionally recommended for mice and rats. The sleeves of garments must not be allowed to come in contact with sterile surfaces (e.g., gloves, the animal, etc.).
 - ii. Sterile gloves should be donned after prepping the animal for survival surgeries. Clean exam gloves should be donned for terminal surgeries.
 - iii. A face mask must be worn for survival surgeries.
- e. Surgical Instruments:
 - i. For survival surgeries:
 1. All instruments must be cleaned, wrapped in packs and sterilized prior to surgery. The sterilization date should be written on the outside of each pack when it is prepared. Steam autoclaving is the preferred method. Packs sterilized this way will expire 6 months after sterilization and will need to be re-sterilized before use. Any implants to be used as part of the surgery, must be sterilized prior to inserting into the animal.
 2. In the instance where surgery will be performed on multiple rodents, bead sterilization (instruments placed in the beads for at least 15 seconds) should be used on instruments in between each animal and the instruments should be rinsed with alcohol before being placed in the beads to remove blood and tissue. The surgical instruments must be allowed to cool before applying them to tissue.

3. It is generally accepted that no more than five rodents will be used per sterilized surgical pack. Any exception to this guideline should be specified in the proposal with sufficient justification.
- ii. For non-survival surgeries:
 1. All instruments must be clean before use. The tips of the instruments can be sterilized in a bead sterilizer (instruments placed in the beads for at least 15 seconds). The instruments should be rinsed with alcohol before being placed in the beads to remove blood and tissue between animals. The surgical instruments must be allowed to cool before applying them to tissue.
- f. Suture material:
 - i. The abdominal or thoracic body wall should generally be closed with absorbable sutures (i.e. Vicryl) in a simple interrupted pattern.
 - ii. Skin should be closed with non-absorbable suture or wound clips. Skin sutures or staples should be removed 7 – 10 days post-surgery by the surgeon. If they have not been removed by the lab by this time, the Animal Health Technician will remove the sutures/clips. A fee may be charged.
 - iii. Silk is not considered to be a good choice for suturing because it has capillary action and causes inflammation.
- g. Intraoperative Monitoring:
 - i. The animal must be monitored carefully during the surgical procedure: i.e. the animal's respiratory rate and characteristic, response to noxious stimuli (e.g., tail pinch, toe pinch), and when possible heart rate and body temperature.
 - ii. The animal may not be left unattended anytime during surgery.
 - iii. The surgical team must be trained to apply the correct initial responses to the most common emergencies associated with the type of procedure being performed.
 - iv. Surgical procedures should not be performed in the presence of conspecifics (i.e., member(s) of the same species).
- h. Postsurgical Care:
 - i. Trained personnel should observe the animal from the time surgery is completed to the time that the animal has recovered from anesthesia sufficiently to maintain itself in sternal recumbancy.
 - ii. The animal should be kept warm, quiet, and clean throughout the immediate postoperative period to facilitate the metabolism of anesthetic and to maximize healing of the incision. A water circulated heating pad can be effective here as well as during surgery to aid in maintaining the animal's body temperature near normal (37-39 C). Be cautious with supplemental heat sources (especially heat lamps); they can cause thermal burns and hyperthermia if used inappropriately.
 - iii. Supplemental fluids, analgesics, and other drugs should be scheduled in the protocol and administered as described. Special diets, housing, and environmental conditions (e.g., temperature, humidity) should be considered to maximize the rate of healing.
 - iv. Administration of analgesia is required as the default. Lack of use of analgesia following any survival surgical procedure requires specific IACUC approval following consultation with the Veterinarian and appropriate scientific justification approved in the protocol.
 - v. If large volumes of balanced electrolytes or other fluids are administered subcutaneously, the injections should be made at multiple sites to prevent tissue damage. This must be done with consultation with the Veterinarian. Dehydration can be ameliorated by the administration of appropriate fluid therapy. Initially this may be done by administering warm (approximately 37 C) sterile fluids such as 0.9% NaCl or Lactated Ringers Solution (1 to 2 ml for an adult mouse and 5-10 ml for an adult rat) by subcutaneous or intraperitoneal injection. If blood loss occurred during the surgical procedure or if the animal is slow to recover from anesthetic, additional fluids may be necessary.

- vi. Antibiotics should be used only when needed to treat postoperative infections; they must be carefully selected to avoid specific species tolerances.
- vii. Remove sutures at the appropriate time, usually 7-10 days.
- viii. Notes on daily monitoring of the animal's progress, administration of medications and management of the surgical incision up to the time of suture removal should be recorded on the Surgery/Post-Op Record (found on the DLAM website, see attached). The development of the postoperative care protocol should be done in consultation with the attending veterinarian. The Surgery Post-Op Report must be kept in a binder in the room where the animals are housed after all of the animals have recovered so that no post-surgical monitoring is missed.
- ix. Post-surgical care of animals must be evaluated daily for at least five days by a member of the principal investigator's staff or other individuals to whom post-operative care has been delegated. Animals must be monitored for evidence of excessive inflammation of the incision site, suture dehiscence (incision line failure or separation), infection, behavioral abnormalities indicative of illness (anorexia, listlessness, lethargy, dehydration, ruffled coating, lack of movement, weight loss greater than 10%). If evidence of wound infection or illness is noted then DLAM vet staff is to be contacted for evaluation and treatment or the animal should be euthanized as soon as possible.
- i. Record Keeping (for survival surgery only):
 - i. A permanent record should be established for each animal undergoing survival surgery. Rats and mice can be handled as a group rather than individually for record keeping purposes. The Surgery/Post-Op Record found on the DLAM website (see attached) must be used.
 - ii. The record should be complete, current and readily accessible.
 - iii. Records must contain the following information:
 1. IACUC protocol number and PI's name
 2. Animal ID numbers or other identifiers
 3. Date of surgery
 4. Surgeon's name
 5. Type of procedure
 6. Type of anesthetic and analgesic given, including dose and route
 7. Type of antibiotic, if given
 8. Post-operative monitoring (time, observations, etc.)
 9. Complications, if any
 10. In the comments section, after all animals have recovered, a statement must be added that states that all animals are awake, have been returned to their home cage and are recovering as expected. Any findings for individual animals should be noted here.
 - iv. The Surgery/Post-Op Record must be kept in the room where the animals are housed after all animals have recovered from anesthesia. Once the study is completed, the records should be kept in the PI's laboratory.
 - v. A blue surgical card must be placed on the cage of animals that had surgery. A card is not needed for every cage provided the animals are grouped together on a rack and the card notes as to which cages received surgery.

D. REFERENCES

- a. [National Research Council. 2011. Guide for the Care and Use of Laboratory Animals: Eighth Edition. Washington, DC: The National Academies Press.](#)
- b. [USDA. 2022. Animal Welfare Act and Animal Welfare Regulations, 9 CFR Parts 1,2,3 and 4.](#)

- c. [PHS \(Public Health Service\). 2015. Public Health Service Policy on the Humane Care and Use of Laboratory Animals. Department of Health and Human Services, National Institute of Health, Office of Laboratory Animal Welfare.](#)
- d. [UNTHSC \(2023\) DLAM Surgery/ Procedure Anesthesia Record](#)