



GUIDELINES FOR RODENT SURVIVAL SURGERY

Survival surgery on rodents does not require the use of a dedicated facility but must be performed in an aseptic manner. All surgical procedures must be carried out by an individual who is trained to competency in the procedures, and who is listed on the animal protocol. The following guidelines should be followed:

Surgical Facility: While a dedicated aseptic surgical facility is required for USDA regulated mammals, rodent surgeries can be conducted on a clean, uncluttered lab bench or table surface. Consideration should be given to locate the surgery area away from potential sources of contamination such as open windows, fans, or fume hoods that can blow dust into the area and increase desiccation of exposed tissues. It is also best practice to keep the room door closed to minimize traffic and to keep non-trained personnel out of the area.

Note: Preoperative procedures can be done in the same room as the surgery but at a safe distance from the surgical environment to prevent contamination with fur/dander.

Animal Preparation:

- **Acclimation:** A 3 – 5 day adaptation period is suggested for all newly arrived animals prior to any surgical procedures. If husbandry conditions will be changed after surgery (e.g. to single housing), animals should be adapted to conditions before surgery if possible.
- **Presurgical Fasting:** Vomiting is not a complication in anesthetized rodents and thus, pre-surgical fasting is *not recommended*. Water should always be provided *ad libitum*.

General Procedures:

- Administer anesthetic according to protocol (see also Guidelines for Anesthesia)
- Administer analgesics according to protocol (see also Guidelines for Analgesia)
- After sedation is achieved, and prior to taking the animal to the surgery area, remove hair from the surgical site, e.g., use animal clippers, razor, or depilatory cream and then vacuum or otherwise remove loose hair from the intended surgical site.
- Apply sterile ophthalmic ointment to both eyes to prevent drying and possible corneal damage.
- Clean and aseptically prepare the surgical site. Use an appropriate surgical scrubbing technique (e.g., scrubbing in a gradually enlarging circular pattern from the interior of the shaved area towards the exterior) and an effective disinfectant technique such as alternating chlorhexidine and alcohol/sterile water wipes several times. Avoid getting the animal excessively wet as this will result in loss of body heat.
- Move the animal to the surgery area and place on a clean absorbent surface. To minimize hypothermia, a padded surface is recommended with warmth provided by a circulating water blanket or other safe method until recovery.

Preparation of Surgeon:

- Wear a surgical mask and a clean scrub/lab coat/gown; hair covering is recommended.
- Thoroughly wash hands with soap and water or surgical scrub (e.g. Betadine Scrub™) and dry using a sterile towel prior to applying **sterile gloves**.
- If doing surgery on multiple rodents at the same sitting, one pair of sterile gloves can be used as long as the gloves are disinfected (by wiping with an appropriate disinfectant) between animals and maintained as sterile. If they come in contact with non-sterile areas or equipment between surgeries, the gloves should be replaced.

Preparation of Surgical Instruments:

- Instruments designed for use in pediatric or ophthalmic surgery are typically sized appropriately for rodent surgery.
- All instruments should be sterile prior to initial use and can then be disinfected in between animals as summarized below. Methods of sterilization include, but are not limited to the following:

Method	Sterilization time (Pre-surgical)	Sterilization time (between animals)
Autoclave- Steam	Manufacturer's recommendation (e.g. 250°F, 15psi, 20 min)	N/A
Hot Glass Bead unit	N/A	15 seconds
Cidex OPA®	12 minutes at 25°C	12 minutes at 25°C
Cidex Plus®	20 minutes at 25°C	20 minutes at 25°C
*Ethylene oxide unit	Manufacturer's recommendation	N/A

- Instruments must have tissue and blood cleaned off prior to sterilization.
- To prevent thermal or chemical burns, instruments must be cooled down and rinsed in sterile saline/water before being used on animal tissues.
- Several sets of instruments should be available and alternated. This will allow for adequate time for cleaning and sterilization between animals.
- If using chemical disinfectant, instruments must be soaked and then well rinsed in sterile water or 0.9% sterile saline prior to use on animals.

Surgical Best Practices:

- Prior to beginning, ensure that all necessary materials are at hand and that they have been properly prepared. Begin surgery with sterile surgical instruments; designate an area for sterile materials like gauze, suture & instruments.

- If doing surgery on multiple animals, the surgical instruments must be disinfected between each animal (most often a **hot bead sterilizing unit** is used for this purpose; the BRF has several units on hand that can be used).
- Check the animal's depth of anesthesia (commonly verified by absence of pedal withdrawal reflex) and supplement anesthetic if necessary.
- Invasive procedures should involve draping the surgical site using sterile plastic sheets, stockinette, sterile towels or gauze. This serves to protect the sterility of the instruments, the surgical site and also helps preserve body heat.
- Follow procedural techniques that promote good surgical outcomes such as:
 - Gentle tissue handling
 - Minimal dissection of tissue
 - Appropriate use of instruments
 - Effective hemostasis
 - Reducing surgical time as much as possible
 - Correct use of suture materials and patterns
- Tissue closure methods must be appropriate and specified in the protocol (subcuticular sutures, surgical staples, non-absorbable monofilament suture material, tissue glue, or a combination)

Surgical Monitoring and Supportive Care:

- Monitor to assure adequate anesthetic depth by frequent use of toe pinch and by checking respiratory rate and breathing pattern, either of which can increase if anesthesia depth is inadequate.
- Body temperature assessment (via rectal probe).
 - Animals should be provided an external heat support if there is surgical penetration of a body cavity. Performing the surgery in the shortest possible time can minimize organ exposure, thus reducing heat loss. Heat loss is also reduced by keeping exposed tissues moist with warm sterile saline soaked gauze sponges. This will also keep exposed tissues healthy and prevent desiccation, which will interfere with wound healing
 - Surgeries exceeding 15 minutes for mice or 30 minutes for rats generally should utilize a contact heat source to prevent hypothermia.
 - Animals should never be placed directly on the warming device but should be placed on a cloth/drape on top of the warming device.
- In the case of respiratory arrest, administer oxygen/air and compress thorax rapidly.

Postoperative Care And Treatments:

Postoperative care begins immediately following surgery and extends for up to 10 days.

- Analgesia must be provided. The first dose should be provided immediately after, or during, the surgery; Major survival procedures require a minimum of 48 hrs of analgesia, minor procedures require at least 24 hrs of analgesia. See IACUC "Guidelines for Analgesia" for more information.

- The animal should be kept warm, quiet, clean, and dry and remain under close observation until it regains a righting reflex and can ambulate. It may be necessary to keep the animal in contact with a heat source during this time. The animal should be turned from side to side every 30 minutes until ambulating to prevent dependent pulmonary congestion.
- To prevent cannibalism house rodents individually until they are fully recovered from anesthesia. NEVER return an animal to its housing room in the BRF unless it has fully recovered from anesthesia.
- It is sometimes desirable to individually house animals for several days during the initial post -surgical interval to prevent damage from other animals and to allow accurate monitoring of food & water intake, urine and feces production, postoperative pain, wound healing, and general activity. Use the cage card Single Housing Stickers and indicate “postsurgical” – with a date!
- Antibiotics should not be given routinely after surgery unless justified by the investigator and discussed with the attending veterinarian.
- Recommendations to prevent dehydration: 1 - 2 ml of fluids (sterile 0.9% saline for injection) per 100 gm of body weight subcutaneously. The first treatment can be done while the animal is still anesthetized and can be continued for several days thereafter if needed.
- Investigators must place a special card on the animal(s) cage (available from the BRF) that identifies the animal as a postsurgical patient; the date of surgery & type of procedure should be noted. The reverse side of this cage card is used to document post-operative analgesic administration.
- Investigators should monitor the animals daily, including weekends and holidays, during the initial postoperative recovery period (~5 days). Clinical problems should be reported to the veterinary staff to ensure prompt and appropriate veterinary medical care. Some procedures may involve a prolonged recovery and it may be critical that these rodents receive nutritional and/or hydration support. The BRF has Hydrogel ClearH2O[®] and DietGel Recovery tins available for use. The veterinarians are available to provide additional information on available post-op recovery aides.
- **Skin sutures or staples should be removed 7-10 days after surgery** after establishing that the wound is fully healed. This is documented on the back of the post-op cage card.