

## Guidelines for Survival Surgery in Rodents

Revised and Reapproved August 2007

- I. **FACILITY:** A rodent surgical area can be a room or portion of a room that is easily sanitized. The immediate surgical area should not be used for other purposes during the time of surgery. Surgery should be conducted on a clean, uncluttered lab bench or table. If there are cabinets over the surgical area, items should be stored in a secure manner to prevent contamination of the surgical area below. The surface of the lab bench or table should be impervious to liquids. The work surface should be wiped with disinfectant before and after use and covered with a clean or sterile drape. Placement of a sterile drape provides an area on which sterile instruments and supplies may be placed.
- II. **PREPARATION OF THE ANIMAL:** Hair should be removed from the surgical site and the skin should be cleansed with disinfectants, e.g., dilute Betadine, Nolvasan brand chlorhexidine, or 70% ethanol. Sterile surgical drapes are recommended. Drapes should be secured so as to remain in place over the animal, yet allow for monitoring of the anesthetic depth of the animal. Sterile paper, cloth, or clear plastic adhesive drapes may be used.
- III. **PREPARATION OF SURGEON:** The surgeon should wear clean laboratory garments. The sleeves of the garment must not be allowed to come into contact with sterile surfaces. Hands should be washed with an antiseptic surgical scrub preparation and sterile surgical gloves must be worn. Wearing a surgical mask or respirator is recommended in order to protect the sterile field from accidental contamination, and to protect personnel from allergens.
- IV. **INSTRUMENTS:** Surgical instruments that enter the body must be sterilized using heat or chemical methods. Sterilization is the process of killing all microorganisms (bactericidal, virucidal, and sporocidal) with either physical or chemical agents. There are several reliable methods of physical sterilization such as steam under pressure (autoclave), dry heat sterilization (bead sterilizer), gas sterilization (ethylene oxide), and radiation sterilization (cobalt 60).

Very few chemical agents reliably achieve this stage of sterility. The only reliable chemical agent is a 2% glutaraldehyde type product (Cidex). Instruments sterilized by this method *must* be rinsed in sterile water or saline before use in animals. Deionized or distilled water *is not* considered sterile.

When performing survival surgeries on multiple animals within a related group, the surgical instruments must be sterilized or disinfected between animals. After using a set of instruments, remove all organic material and insert the instruments in a glass bead sterilizer for 20 seconds, or immerse them in an appropriately diluted chemical disinfectant for an adequate contact time (provided by the manufacturer). Disinfectant should be rinsed off instruments with sterile water or sterile saline before use. The disinfectant should be replaced when contaminated with blood or other body fluids. A glass bead sterilizer is preferable as it rapidly provides complete sterilization. Sterile gloves should be changed if non-sterile surfaces are touched and the surgeon will need to handle sterile items again.

In cases where adherence to the above procedures may invalidate research or complicate interpretation of research results permission to use alternative methods may be granted by the ACUC.

- V. **INTRAOPERATIVE MONITORING:** The animal must be monitored carefully during the surgical procedure. Surgeons should pay close attention to the animal's respiratory rate and character, and response to noxious stimuli (e.g., tail pinch). Monitoring of respiratory rate and character is facilitated by the use of transparent drapes. Although resting heart rate for rodents is rapid

(typically more than 300 beats per minute), heart beat should be checked periodically for significant changes in rate or rhythm. Heartbeat can be palpated through a sterile drape by the surgeon, or underneath the drape by a second person who is not performing sterile procedures. The surgical team should know the correct initial responses to the most common emergencies associated with the type of procedure they are performing. For procedures lasting longer than five minutes the animal should be placed on a safe, supplemental heat source (circulating warm water blanket) in order to prevent hypothermia.

- VI. POSTSURGICAL CARE:** Postsurgical care must include observing the animal to ensure uneventful recovery from anesthesia and surgery; administering analgesics as required; providing adequate care to surgical incisions and maintaining appropriate medical records. Records maintained by the laboratory should indicate the type of surgery performed, the date of the procedure, the person who performed the procedure, and the types and amounts of drugs used during and after surgery.

Hypothermia should be prevented by placing the animals in a warm room or cage. If necessary, the cage may be placed on a bedded or padded surface and supplied with extra bedding or supplemental heat as required. Be cautious with supplemental heat sources; they can cause thermal burns and hyperthermia if used inappropriately. Dehydration can be ameliorated by the administration of appropriate fluid therapy. Initially this may be done by giving 1 to 2 ml of warm (approximately 37°C) fluids (0.9% NaCl or equivalent) per 100 gm of body weight by subcutaneous injection. If blood loss occurred during the surgical procedure or if the animal is slow to recover from anesthetic, additional fluids may be necessary. If recovery from anesthetic will be prolonged (i.e., over one hour), the animal should be rotated from side to side every 15-30 minutes to minimize hypostatic congestion of the lungs. This practice should be continued until the animal is able to maintain sternal recumbency or sit. To prevent cannibalism or suffocation, rodents should be monitored continuously or housed individually until they are ambulatory.

Post-surgical animals should be seen every day by a member of the investigator's staff or other individuals to whom post-operative care has been delegated until all sutures or wound clips have been removed. Sutures and wound clips generally should be removed 7-14 days after surgery. In the event that infections or complication occur, the OLAC veterinary staff must be notified. The veterinary staff will assist the research team to review the entire surgical procedure (facility, preparation of the animal and instruments, expertise of the surgeon, and postsurgical care).

- VII. TRAINING:** Professional and technical personnel and students who perform anesthesia and surgery must be appropriately trained to accomplish these tasks in a humane and scientifically acceptable manner. The Principal Investigator (PI) is responsible for assuring that research personnel receive appropriate training. New surgeons should be trained (by PI, OLAC or ACUC-approved lab personnel) and supervised by the PI until the PI determines that the new individual is competent to perform the procedure independently. OLAC will observe new surgeons and "certify" competency to the ACUC. The OLAC veterinary staff is available to provide assistance with, or training in, aseptic technique and the proper administration of anesthesia, analgesia and euthanasia.\*

*\*For more information on anesthesia, analgesia, and euthanasia please see "Euthanasia Guidelines," "Guidelines for Anesthesia and Analgesia in Rodents and Rabbits" and the American Veterinary Medical Association's Guidelines on Euthanasia (these documents are available on the ACUC website at <http://www.acuc.berkeley.edu>). These documents provide basic information; however additional sources and training are necessary in order to become proficient in these areas.*