

# Guidelines – Survival Surgery in Rodents and Lower Vertebrates

Version 2.1

## I. Introduction

The Animal Welfare Act (AWA) and the Public Health Service (PHS) Policy on Humane Care and Use of Laboratory Animals require that research, testing and teaching activities using animals be performed in such a way as to minimize discomfort, distress and pain to the animals. When these activities involve surgery, they must include appropriate provisions for pre-, intra- and post-operative care consistent with established veterinary medical and nursing practices. Survival surgical procedures will be performed using aseptic procedures such as the use of sterile surgical gloves, sterile instruments and aseptic technique.

To assure compliance with the AWA and the PHS Policy, the UIC Animal Care Policy, section IX.A., contains the following language: Investigators or instructors performing any surgical procedure on an animal shall conform to the requirements stated in the *Guide for the Care and Use of Laboratory Animals*. A facility intended for aseptic surgery shall be used only for that purpose and shall be maintained and operated to insure cleanliness and directed and staffed by trained personnel. Aseptic technique shall be used on all animals undergoing survival surgery. Survival surgery on rodents and lower vertebrates does not require a special facility, "but should be performed in a dedicated space in a laboratory appropriately managed to minimize contamination from other activities in the room during surgery."

## II. Institutional Guidelines

The following guidelines have been written to help investigators assure that work done under their supervision complies with the UIC Animal Care Policy. The Committee recognizes that some characteristics of common laboratory rodent and lower vertebrate surgery - such as small incision sites, few personnel in the surgical team, manipulation of multiple animals at one sitting and briefer procedures (as opposed to surgery in larger species) can make modifications in standard aseptic techniques desirable or necessary.

- A. Pre-operative Care** - A positive surgical outcome starts with a healthy, well-acclimatized patient. The animal's health should be assessed prior to surgery and only animals that appear healthy should be used. The extent of this examination will vary with the species of animal and type of surgery to be performed. The animal should be acclimatized to its new environment prior to surgery or other experimental manipulation. Generally this requires a minimum of 3-5 days. Handling animals in a way, which minimizes stress, will also help provide a healthier animal.
- B. Anesthetics and Analgesics** - The appropriate choice of an anesthetic protocol is also essential to a positive surgical outcome. The Animal Welfare Act requires that the principal investigator consult with a veterinarian about the use of anesthetics and analgesics. If volatile agents are used, an appropriate scavenging system should be in place in accordance with UIC Environmental Health and Safety Policy and the UIC-ACC guidelines for the Use of Inhalation Aesthetics for Laboratory Animals. The depth of anesthesia should be assessed and determined to be appropriate prior to initiation of a surgical procedure. This is achieved by ensuring that the animal does not respond to toe pinch. Anesthetic depth and the physiological status of the animal should then be assessed throughout the procedure. This may be accomplished by assessing the response to toe pinch or other manipulation, respiratory rate, and color of skin/tissue. Post-operative analgesics should be administered as described in the approved UIC ACC protocol. If post-operative analgesics will not be used, then a justification as to why they are not necessary and/or appropriate must be described in the protocol.

- C. Surgical Area** - Survival surgery should be performed in an area that is easy to sanitize and is not being used for any other purpose at the time of surgery. This area should be kept uncluttered and free of dirt and debris. The work surface where surgery will be performed should be disinfected before and after each session. Examples of appropriate surface disinfectants include Clidox®, MB-10®, Virkon®, Roccal®, Quatricide®, Nolvasan® or 10% bleach solution. There should be separate areas for clipping the animal and anesthetic recovery. The surgical area should have minimal personnel traffic, and if possible, have positive ventilation pressure in relation to other areas. Adequate lighting and ventilation is also important.
- D. Surgical Procedures** - Surgery should be performed using aseptic technique. This involves appropriate animal preparation, which usually includes the following: clipping of hair at the surgical site; prepping (disinfecting) the surgical site and draping the surgical site to prevent contamination. Surgical preparation of the incision site in rodents can be done using alcohol (70%), an iodine based solution, and a hexachlorophene or iodine based or other surgical detergent. If a surgical detergent is used to prepare the incision site it should be rinsed with alcohol and/or sterile water and followed by a final iodine solution application. Preparation of the surgical site should begin at the center of the surgical field (incision site) and work outward. Care should be taken during the preparation process not to get the rodent too wet, which can lead to hypothermia. Aseptic technique also includes the use of gloves, gown or clean lab coat, and sterile instruments by the surgeon(s). In addition, a cap and mask may be helpful to prevent contamination. Only sterile instruments, equipment, and other surgical supplies should come in contact with the surgical site. For many rodent surgical procedures, the tip is the only part of the instrument that actually touches the tissue/organ. For these surgeries, it is acceptable to sterilize the tip of the instruments provided that the rest of the instrument is clean. To do this, instruments may be washed with standard kitchen detergent and dried with a clean cloth. Next, instrument tips can be heated in a glass bead sterilizer for 15 seconds. Instrument tips **MUST** be allowed to cool approximately one minute before placing them in contact with tissue. Instruments must be maintained in the surgical field so not to contaminate the tips following sterilization. For example, the tips may be placed on a sterile gauze or sterile drape within the surgical field. For surgical procedures that warrant the sterilization of only the tips, one set of instruments may be used on multiple rodents during a single session. To do this, instruments should be wiped free of tissue and debris. The instruments tips should be placed in the hot bead sterilizer for 15 seconds. Again, the tips **MUST** be allowed to cool for approximately 1 minute. For some rodent surgeries, more than the tip of the instrument comes into contact with the animal. In these cases the entire surface of the instruments should be sterilized. This may be done by one of two methods: 1) Instruments may be autoclaved using appropriate wrapping material and heat sensitive tape/indicator or 2) Liquid chemical sterilants can be used if contact times are adequate and specified, and instruments are rinsed with sterile water or saline before use. Examples include Cidex® and Wavicide®. **Alcohol is not considered a sterilant or a high-level disinfectant and should not be used as a chemical sterilant for instruments. Instruments that have been sterilized by any of the three aforementioned methods may be used on multiple animals during a single session. To do this, instruments are wiped of tissue or debris and the tips are placed for 15 seconds in a hot bead sterilizer.** The performance of the surgery should be in such a fashion as to maintain this sterility. Of particular importance is keeping sterile instruments and supplies within the sterile field. Tissues should be handled gently to minimize trauma that will decrease postoperative complications such as infection and pain. Skin should be closed with either a monofilament suture material or wound clips.
- E. Post-operative Care** - Post-operative care includes close observation during anesthetic recovery and provisions to maintain homeostasis such as supplemental heat, fluids, etc., as indicated. Following recovery from anesthesia, the animal should be observed, at a minimum, once the following day. Thereafter, the animal should be observed as described in the approved UIC ACC protocol to assure adequate eating and drinking, integrity of the incision and to assess the need for supplemental analgesics. Post-operative analgesics should be administered as described in the approved UIC ACC protocol. If post-operative analgesics will not be used, then a justification as to why they are not necessary and/or appropriate, must be described in the protocol. Some typical signs of pain and distress in rodents include: partially closed eyelids, rough hair coat, hunched posture, reduced exploratory behavior, licking, biting, scratching, guarding, and aggressive vocalization when handled. Skin sutures or wound clips should be

removed 10 to 14 days following surgery.

**F. Personnel Qualifications** - Personnel who perform surgical procedures should receive appropriate training including supervised experience performing procedures prior to being given responsibility for conducting the procedure. This training should include: knowledge of the biology and behavior of the animal species to be used; an understanding of how pain and distress affect their behavior; a working knowledge of the anesthetic and analgesic drugs that will be used and how to monitor the adequacy of their effect; an understanding of aseptic principles and how to apply those principles to the procedure(s) to be performed; a knowledge of the surgical anatomy relevant to the procedure; and demonstrated proficiency in performing the technique before working unsupervised.

**References:**

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- *BRL Bulletin, Volume 17, No. 3, 2002.*
- *Bennett, B.T., Brown, M.J. and Schofield, J.C., Essentials for Animal Research: A Primer for Research Personnel. National Agricultural Library, Beltsville, MD, 1990.*
- *Brown, M.J., Pearson, P.T. and Tomson, F.N., Guidelines for Animal Surgery in Research and Teaching. Am. J. Vet. Res. Vol. 54, No. 9, pgs. 1544-1559, 1993.*
- *Guide for the Care and Use of Laboratory Animals, 8<sup>th</sup> Edition, National Academy Press, 2010.*
- *Public Health Service Policy on Humane Care and Use of Laboratory Animals, Reprint, October, 2000.*
- *Public Law 99-198. Code of Federal Regulations, Title 9, Subchapter A, Animal Welfare, 1989.*