

## Guidelines for Non-Rodent Mammalian Surgical Procedures

The University of Texas at Austin  
Institutional Animal Care and Use Committee (IACUC)

*These guidelines have been written to assist faculty, staff, and students in performing vertebrate animal procedures in a humane manner and complying with pertinent regulatory requirements. Under some circumstances deviations from these procedures may be indicated but such variances must be approved in advance by the IACUC.*

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This document provides information to be used when planning and performing surgical procedures on non-rodent vertebrate animals used for research, teaching, or other purposes at The University of Texas at Austin. It is organized into five sections:

- Section A – Definitions
- Section B – Requirements
- Section C – Specific Considerations
- Section D – References
- Section E – Acknowledgements

### Section A – Definitions

**Non-survival surgery** is defined as a surgical procedure after which the animal will not regain consciousness prior to euthanasia.

**Survival surgery** is defined as a surgical procedure after which the animal will be allowed recover consciousness, even for a short time.

**Minor surgery** is a procedure that involves surgical manipulation but does not meet the definition of major surgery. Typical examples include operative procedures in which only skin or mucous membranes are incised, e.g. vascular cutdown for catheter placement or implantation of minipumps in subcutaneous tissue. Also included are minimally invasive means of accessing a body cavity, such as needle biopsy or the introduction of instruments using a trocar.

**Major survival surgery** is defined as a survival surgical procedure that involves penetration and exposure of a body cavity (abdomen, thorax or cranium) or will produce a substantial physical or physiologic impairment.

**Multiple major survival surgery** occurs when two or more separate major survival surgical procedures are performed on a single animal. It is allowable only under certain circumstances, the most common being a situation in which each surgical manipulation is an essential and related component of a single study. Cost alone is not an adequate justification for performing multiple survival surgeries on the same animal. Multiple major survival surgeries must be specifically justified by the PI and approved by the IACUC as part of an approved protocol.

### Section B – Requirements

1. **Non-survival surgery** requires neither aseptic techniques nor dedicated facilities if the subjects are not anesthetized long enough to show evidence of infection. These procedures, however, must at least be

performed in a clean area, free of clutter, and using acceptable veterinary sanitation practices analogous to those used in a standard examination/treatment room. Personnel present in the area must observe reasonable cleanliness practices for both themselves and the animals. Eating, drinking or smoking is not acceptable in surgery areas, and locations used for food handling purposes do not qualify as acceptable areas for performing surgeries.

2. **Minor surgical procedures** may be performed in a suitably located and equipped laboratory area, subject to approval by the IACUC. Appropriate aseptic technique for these procedures include a clean uncluttered work area, preparation of the surgical field including clipping of hair, disinfection of skin and draping of the surgical site with sterile drapes; use of sterile instruments and supplies; and the use of sterile gloves and a surgical mask by the surgeon and any assistant working in the surgical field. Long hair of surgeons and assistants should be covered and/or restrained to keep it away from the surgical field.
3. **Major survival surgical procedures** on mammals other than rodents (including bats) must be conducted in surgical facilities intended for that purpose only, following the basic principles of aseptic techniques as described below. The operating room(s) and surgical support area should be designed and managed to ensure a level of sanitation appropriate for aseptic surgery. The actual surgical procedure must be performed in closed, single-purpose operating rooms. The operating room should contain only the ancillary laboratory, diagnostic, or clinical equipment and supplies required to support the procedure being performed. Equipment used on an infrequent basis and bulk supplies should be stored elsewhere. Permanently installed furniture or fixtures such as laboratory benches impede sanitation and therefore should be minimized in an operating room.

Activities associated with surgery generally include surgeons' preparation, animal preparation, the surgical procedure, surgical support, and post-operative care. In high-volume programs, each activity may require a separate and distinct room. However, for less intensively used areas it may be acceptable to have a single dedicated operating room and to perform the other activities in nearby procedural rooms or laboratory areas. This is acceptable only if scheduling can be established (and access controlled) to assure that there will be no other ongoing activities in those areas that could compromise the surgical procedure during the peri-operative period.

## **Section C – Specific Considerations**

### **1. Pre-operative preparation**

Non-rodent mammals should generally be fasted overnight prior to anesthesia and surgery to prevent vomiting, aspiration, and problems associated with a distended gastrointestinal (GI) tract. Fasting for 12 - 16 hours is adequate for most animals. However, the gastrointestinal characteristics of each species should be taken into consideration. For example, rabbits may not require a fasting period, while an extended 16-24 hour fast may be indicated for some ruminant species.

### **2. Anesthesia**

A proper method of anesthesia must be selected, based on veterinary consultation. Anesthesia should be complete, i.e., a single drug or a combination of agents must be used to induce a loss of consciousness, hyporeflexia, muscle relaxation and analgesia. Surgery or potentially painful procedures must not be performed on non-anesthetized animals paralyzed by chemical agents. When gas anesthetics are used, appropriate gas scavenging methods must be employed to prevent hazardous exposure of personnel.

### **3. Animal preparation for survival surgery**

The hair should be clipped from the surgical site for at least 1-2 inches beyond the extent of the planned incision.

The clipped skin should then be treated to reduce bacterial contamination. It is recommended to disinfect the skin with three applications of a surgical scrub product based on chlorhexidine or povidone iodine. Each application step should begin along the incision site and then radiate outward toward the margins of the clipped area in a circular fashion. Each application can be alternated with an alcohol cleansing, but that is not required. A final "painting" of the area with a chlorhexidine or povidone iodine antiseptic solution (NOT a soap-containing surgical scrub) is done to complete the process.

After being prepped the surgical site should be draped with sterile disposable or sterile reusable cloth drapes.

#### **4. Surgeon preparation for survival surgery**

The surgical procedure itself must be performed or directly supervised by a trained and experienced individual. Personnel unfamiliar with aseptic surgical procedures should contact the ARC veterinary staff for information or training.

The surgeon and any assistant that will be required to manipulate instruments, tissues, or other components of the sterile surgical field should don a bonnet and mask and then wash their hands and forearms using a chlorhexidine or povidone iodine scrub for 3-5 minutes. A sterile gown and sterile gloves should be put on prior to surgery, following proper technique to maintain sterility. The wearing of shoe covers, double gloving or other additional precautionary steps may be indicated depending on the specifics of the procedure being performed, based on veterinary consultation.

#### **5. Sterilization of instruments and implanted devices for survival surgery**

All instruments, supplies, or devices that will need to be handled by the surgeon or will have contact with the tissues of the animal must be sterilized before the surgery and must be handled and placed so that they remain uncontaminated until the surgery is completed. If sterile packs are stored for later use, they must be dated with the preparation date and also a re-sterilization date that reflects the accepted shelf life depending on how it is wrapped. For specific information on shelf life, contact the ARC veterinary staff. Instruments that become contaminated by touching a non-prepped part of the animal, being dropped or placed outside of the sterile field, touched by a non-prepped assistant, etc. must be resterilized before they can be reused.

Methods used may vary, but all must conform to established medical standards for complete sterilization. Options include:

- Steam sterilization at proper pressures and exposure times
- Ethylene oxide gas (ETO) used in a specialty chamber
- Dry heat sterilization at proper temperature and exposure time
- Prolonged immersion in a hospital-grade formaldehyde- or glutaraldehyde-based cold sterilant following label directions
- Hot bead sterilizer (acceptable only for minor procedures where a "tips-only" method of aseptic technique is appropriate)

#### **6. Closure of incisions**

Multiple layer closure should be performed on thoracic and abdominal incisions and any other significant

incision that may result in dead space detrimental to healing. Skin closure should be performed using noncapillary (monofilament) suture material, which may or may not be absorbable. The use of wound clips or staples to close a skin incision is acceptable in some cases but careful attention should be given to placement and spacing to promote proper healing and to prevent the clips from catching on anything in the cage. Wound clips have a higher potential for post-operative infection or adverse tissue responses if used improperly. If non-absorbable sutures or clips/staples are used they should be removed 7 - 10 days post-op.

## 7. Postoperative care

All animal activity proposals involving survival surgery must provide specific details of post-procedural care and relief of pain and distress. The IACUC must approve the specific details. However, the Attending Veterinarian retains the authority to change post-operative care as necessary to ensure the comfort of the animal.

Post surgical care must include continuous observation of the animal to ensure uneventful recovery from anesthesia until the swallowing reflex has returned and the animal has been extubated. Animals must be observed very frequently (every 2-4 minutes) when they are still sedated post-procedurally (i.e., they cannot be aroused and have no active motor function) and they must be observed frequently (every 10-15 minutes) when they have recovered some motor ability but are still depressed and ataxic. These observations should be recorded in a written record that includes time notations and is left with the animal during recovery so that it is clear to others that observation is occurring. Common parameters for monitoring include:

- Body temperature
- Heart rate and pulse character
- Respiratory rate and pattern
- Capillary refill time
- Jaw tone - resistance to opening
- Response to toe pinch - withdrawal or non-withdrawal
- Palpebral response to touching the medial canthus
- Color of mucous membranes at gums or conjunctive
- Examination for other abnormalities

During recovery, animals must be kept warm and dry in an environment that does not pose a risk of injury as they regain muscular control. In some cases the animal may be returned to its home cage during recovery, but no food or water should be left in the cage until the animal is fully conscious. Animals should be provided with a heat source (preferable) or be placed on an insulating surface (minimally) until they have fully recovered to prevent post-procedural hypothermia.

Caution: Use of heat lamps and electric heating pads can result in severe burns or hyperthermia in animals that are anesthetized or otherwise unable to escape from the heat. Close observation is required, and the use of safer equipment such as a circulating water blanket or isothermic pad is recommended whenever possible.

The drugs specified in the approved protocol for relief of pain *and/or* distress must be readily available for use as described in the approved animal use protocol. Fluids, analgesics, and antibiotics must be administered as indicated in the protocol or as directed by the Attending Veterinarian or designee. Surgical wounds must be kept clean. When bandages or wound dressings are used, they must be changed as frequently as necessary to keep them clean and dry. Subsequent care must consist of daily monitoring of the animal to include daily body temperature and clinical observation for signs of pain, abnormal behavior, appetite and excretory functions. Supportive fluids, analgesics, and other drugs must be administered as required and must be documented.

## 8. Recordkeeping

Written records of surgical procedures and postoperative care must be maintained in accordance with generally accepted veterinary procedures. Records should state what surgical procedure was performed, should include notation of any complications that occur, and must record all drugs or treatments that are administered. The record should include a notation for each time the animal is examined during and after the surgery, including a description of what parameters were monitored. The ARC veterinary staff can provide guidance on what recordkeeping is appropriate for particular studies.

After the post-operative period, the monitoring records can be filed for future reference either as a part of the animal's medical file or along with the research data. When research groups take the responsibility for maintaining these records, they must store them in a readily-retrievable manner. NOTE: These files are subject to record retention requirements, so they must not be discarded or destroyed without proper institutional approval.

## 9. Other

In some cases, there may be additional study-specific requirements that are either specified in the procedure description of the approved IACUC protocol or are prescribed by the Attending Veterinarian based on a case-by-case determination using professional judgment.

### Section D – References

1. National Research Council. 1996. *Guide for the Care and Use of Laboratory Animals*. National Academy Press, Washington, D.C. 125p.
2. Animal Welfare Act of 1966 (P.L. 89-544) as amended in 1970 (P.L. 91-579), 1976 (P.L. 94-279) and 1985 (P.L. 99-198).
3. U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Animal Care Resource Guide. Policy #3 - Veterinary Care. 2007. [http://www.aphis.usda.gov/animal\\_welfare/downloads/policy/policy3.pdf](http://www.aphis.usda.gov/animal_welfare/downloads/policy/policy3.pdf)

### Section E – Acknowledgements

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