UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL
STANDARD ON SURVIVAL SURGERIES FOR USDA-COVERED SPECIES

Introduction

PURPOSE
Research with USDA covered species may include performing survival surgical procedures. These procedures require pre, peri, and post-operative management of anesthesia, analgesia, and asepsis. ‘Activities that involve surgery include appropriate provision for pre-operative and post-operative care of the animals in accordance with established veterinary medical and nursing practices. All survival surgery will be performed using aseptic procedures, including surgical gloves, masks, sterile instruments, and aseptic techniques. Major operative procedures on non-rodents will be conducted only in facilities intended for that purpose which shall be operated and maintained under aseptic conditions.’ (USDA AWR 2.31C)

This document serves to describe the University's Standards for creating and maintaining aseptic conditions during survival procedures in USDA covered species, while also providing a standard for the pre and post-operative management.

SCOPE OF APPLICABILITY
The standards and procedures described within this Standard provide guidance to all those engaged in care and maintenance of USDA-covered species before, during and after survival surgical procedures.

The UNC-CH IACUC expects that anyone involved in animal work at the University will comply with this Standard. Requests for exceptions to this Standard must be reviewed and approved by the IACUC. USDA regulations require consultation with a (DCM) veterinarian in the planning of these procedures.

Standard

Surgical Location Approval

DCM maintains dedicated surgical suites that are approved by the IACUC for survival surgery in USDA covered species. If the procedures are not planned to be performed in this DCM operated facility, then the alternate location must first be evaluated and approved by IACUC Staff and DCM Veterinary staff. This evaluation occurs independently of the IACUC protocol review process and
Acceptable Sterilants and Disinfectants: For a full list of common and approved disinfectants, please see the Aseptic Technique for Rodent Survival Surgeries.

Surgical Area

1. The surgical area must be approved and regularly inspected by the IACUC for this purpose.
2. The area should be clean and uncluttered.
3. Surface areas should be sealed and easily sanitizable.
4. An animal preparation and recovery area, separate from the surgical area, should be provided. A heat source should be utilized during surgery, since animals rapidly lose body heat under anesthesia.
5. The surgery area should contain sufficient lighting.
6. Do not store cardboard and paper products at the surgery site. Sealable, plastic containers may be used for storage.
   Chairs located in animal use areas should have an impervious, cleanable surface. No cloth chairs are allowed in areas animals will be used.

Animal Preparation (Consult DCM veterinarians for appropriate materials for use in non-mammalian species.)

a. Apply a sterile ophthalmic lubricant to the eyes, since the blink reflex is lost during anesthesia. For extended procedures, reapplication of the ophthalmic lubricant should occur as needed in order to keep the eyes from drying out.
   b. The area around the surgical site must be devoid of hair, since hair around the surgical site can act as a wick for bacterial infection. Hair removal may be achieved by either using a clipper blade or a depilatory.
   c. Prepare the surgical site by using ethyl alcohol or isopropyl alcohol, followed by an Iodophor or Chlorhexidine scrub.
   d. Using gauze, start with the first alcohol application. Follow the alcohol application with the first Iodophor or Chlorhexidine application. Starting in the center of the incision site, spiral outward in concentric circles toward the margins of the prepared area (never go back and forth over a cleansed area with the same gauze).
   e. Repeat the alcohol and Iodophor or Chlorhexidine step for a total of three times each with a fresh piece of gauze for each application.

Surgeon Preparation

a. Surgical personnel should wear a mask, bouffant cap, sterile surgical gloves and, depending upon the procedure, a sterile gown. If performing multiple surgeries, new gloves should be donned between animals.
   b. Surgeons should perform a surgical hand scrub with antimicrobial soap prior to gloving.
Placement of Drape Material

The use of a drape is recommended to prevent contamination of the disinfected surgical site. This is especially true for procedures that require exteriorization of the viscera. Positioning of the drape over the surgical area should proceed with sterile gloves or instruments in order to maintain sterility. Sterile surgical towels may be draped and clamped around the surgical site in place of (or in addition to) a sterile drape.

Instruments

All instruments must be properly sterilized. Ensure the instruments are cleaned and free of all organic material before sterilizing. A sterility indicator must be placed inside or on the surgical pack to confirm proper sterilization. Confirmation of sterilization method should be conducted regularly (ex: spore indicator testing of autoclaves) Acceptable methods include:

1. Autoclave
2. Gas sterilization with ethylene oxide (available by contacting DCM Veterinary Services)
3. Cold sterilization

Equipment Manipulation

During some surgeries there may be a need to manipulate certain types of equipment (microscopes, anesthetic machines, drills, etc.). Such equipment should be disinfected before surgery. If you are wearing sterile gloves to maintain asepsis and touch objects outside of the sterile field; your gloves are no longer sterile. Once surgery commences, adjustments and handling of equipment outside of the sterile field must be made using a piece of sterilized gauze, sterilized aluminum foil or commercially available sterile sleeve.

MONITORING THE ANESTHETIZED PATIENT

“Careful surgical monitoring and timely attention to problems increase the likelihood of a successful surgical outcome” (Guide). Careful surgical monitoring includes confirmation of anesthetic depth, maintenance of anesthesia, and monitoring of vital signs.

Confirmation of Anesthesia Depth

The animal must be maintained on a plane of anesthesia appropriate to the surgical intervention from immediately before a surgical procedure begins until the procedure is finished. For most species, the following techniques can be used to ascertain that the animal is appropriately anesthetized.

- **Toe pinch.** Brief clamping of the web of skin between toes or claws with a hemostat or fingers. Firmly pinching multiple toes should not elicit a withdrawal response from an animal at a surgical depth of anesthesia.
- **Palpebral reflex.** Gently tapping the medial canthus of the animal’s eye should not elicit a blink or eye flutter. This technique is not always reliable in all animals (e.g. swine).
• **Jaw tone.** The animal’s jaw should remain slack when gently extending the mandible. If the jaw is “tight” and clenched, then the animal’s anesthesia depth may not be deep enough for surgery.

**Maintenance of Anesthesia**

Anesthetized animals should not be left alone. Each animal responds differently when under anesthesia, therefore it may be necessary to modify your use of anesthetics during the procedure. All routinely used anesthesia options must be described in the IACUC protocol as well as a plan of how and by whom anesthetic emergencies will be addressed. Anesthetists must be highly skilled in not only delivering the anesthetic to the patient, but also in identifying anesthetic related problems.

**Monitoring Vital Signs**

• The anesthetist must continuously monitor the animal patient’s basic physiological function for the duration of the procedure—from induction through recovery. Animals should be monitored continuously with the following vital signs documented at least every 15 minutes (DCM Vet Services will provide an anesthesia template monitoring for this purpose)
  • Respiratory Rate (RR) can be assessed by watching the rising and falling of the chest, by monitoring end-tidal CO2, or by artificial ventilation.
  • Heart rate (HR) may be monitored manually (stethoscope) or with ECG or Doppler.
  • Body temperature should be measured using a thermometer or rectal probe or other device
    o Hypothermia often occurs due to anesthesia-induced vasodilation and from surgery via opened body cavities.
    o During any surgical procedure, the animal’s body temperature should be maintained by an active heating device such as a [covered] recirculating water heating pad, forced-air warming (Bair-Hugger), induction warming device or by covering the animal with warm drapes/towels.
    o DCM Veterinarians may assist in choosing an appropriate method for your species.

For best practices, it is recommended that additional monitoring techniques be employed depending on the procedure; such as pulse oximetry, blood pressure, ECG, arterial blood gas parameters, and end-tidal CO2 when appropriate for the animal model and procedure.

**Surgical Closure**

The fascial layer and the skin must be closed separately. Appropriate suture material and suture pattern for each layer should be used. When using sutures to close skin incisions, a monofilament material is required (braided sutures used in skin tend to promote wound infection).

Wound clips or surgical staples may be used in the skin. If clips, staples, or non-absorbable sutures are used to close the skin, they should typically be removed seven to fourteen days after
surgery. Commercially available tissue adhesive products for skin closure can be effective on small skin incisions which would normally require one or two clips or sutures.

**ANESTHETIC RECOVERY AND POSTOPERATIVE MONITORING**

**Anesthetic Recovery**

“Particular attention should be given to thermoregulation, cardiovascular and respiratory function, and postoperative pain or discomfort during recovery from anesthesia” (Guide). The anesthetic recovery period may last from minutes to hours.

- Animals should be placed into a clean recovery area in sternal or lateral recumbency. For prolonged recoveries rotating animal position (from lateral to sternal or one side to the other) will help support lung function
- A heat source must be used during recovery.
- As during the procedure, temperature, respiratory rate and heart rate should be monitored, evaluated, and documented during the recovery period.
- Animals should NOT be left unattended until they have completely recovered from anesthesia.

**Postoperative Recovery**

- During the post-surgical period, animals must be appropriately monitored for signs of pain and/or distress. In most species, signs of pain include decreased activity, abnormal posture, increased attention to surgical site, and gait abnormalities.
- The cardinal signs of infection include heat, swelling, redness, pain, and/or exudation. Consult a DCM Veterinarian for any abnormal medical condition.
- The frequency and length of observation may depend on the degree of invasiveness of the procedure and the individual animal. A written plan of observation must be outlined in the IACUC protocol for each procedure proposed. The laboratory staff should observe animals at least daily following major procedures.
- Following surgical implantation of research devices such as head caps, care must be taken to ensure frequent examination and routine cleaning, is performed and documented as needed. Details for monitoring frequency and cleaning procedures should be included in the IACUC protocol. Please consult a DCM veterinarian for more detailed guidance.
- If there are any concerns about an animal’s health status, a DCM veterinarian should be consulted for treatment recommendations, or to help assist in determining if clinical endpoints have been reached.

**RECORDKEEPING FOR USDA-SPECIES**

- The USDA and PHS Policy require proper documentation of animal care and use to assure compliance with research protocols and clinical care procedures. All entries must be legible, made in ink, and initialed by the individual making the entry.
- Dates of all observations, treatments, and procedures must be recorded. Dates and times (including AM/PM) of all time-sensitive observations or treatments (post-operative evaluations, pain medication) must be recorded.
Any deletions from the record must consist of making a single line through the entry and initialing and dating next to the line.  
Clinical records should be kept in the vicinity of the animals and/or records must be readily accessible to the DCM veterinary services staff and authorized inspectors.  
The USDA requires that all records be maintained for a 3 year period after the final disposition of the animal. Extent of records vary based on the nature of the procedure; however, at a minimum, records of the procedure must consist of: Animal ID, date of procedure, type of procedure, anesthetics/analgesics used (dose, route, time), anesthesia chart (vital signs – e.g. pulse rate, heart rate), drugs given (dose and time), general procedures (e.g. intubation, beginning and end of surgery, extubation, etc.). Any deviations from the procedure as approved in the protocol due to emergency need must be documented and explained. If you need further information or if you need to review aseptic techniques, please visit http://research.unc.edu/iacuc/.

EXCEPTIONS
Requests for exceptions to this Standard must be described in the protocol and approved by the IACUC prior to implementation.

Definitions

IACUC: Institutional Animal Care and Use Committee  
DCM: Division of Comparative Medicine  
PI: Principal Investigator  
University Standard: The minimum acceptable limits or rules used to achieve Policy implementation, enforceable by the IACUC.  
Disinfectant: A germicidal chemical substance that kills microorganisms on inanimate objects, such as instruments and other equipment that cannot be exposed to heat.  
Antiseptic: A chemical agent that either kills pathogenic microorganisms or inhibits their growth.  
Sterilization: The complete elimination of microbial viability, including both the vegetative and spore forms of bacteria.

Related Requirements

UNIVERSITY POLICIES, STANDARDS, AND PROCEDURES

For more detailed guidance, please refer to the University Policy on the Care and Use of Vertebrate Animals for Research, Training and Teaching Purposes.

Contact Information
Subject | Contact | Telephone | Email  
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Aseptic Technique Training | IACUC | 919-966-5569 | iacuc@med.unc.edu  
USDA Covered Species Training/Questions | DCM | 919-843-3407 |  

**Important Dates**

- Effective Date and title of Approver: 3/8/2013; UNC IACUC
- Revision and Review Dates, Change notes, title of Reviewer or Approver: 03/2013, 02/2017, 11/2017; UNC IACUC

Approved by: UNC IACUC

Dr. Mitchell Picker  
UNC IACUC Chair  
11/2017