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UC Davis
Institutional Animal Care and Use Committee (IACUC)

Title: Survival Surgery Guidelines for Non-Rodent USDA Covered Species

I. Purpose:

This document addresses the current requirements for performing survival surgery in non-rodent USDA covered species. USDA covered species include, but are not limited to, opossums, ferrets, rabbits, cats, dogs, nonhuman primates, and livestock (i.e., pigs, sheep, cattle, goats, and horses used for biomedical research purposes). For all rodents, please see policy IACUC 22 "Guidelines for Rodent Survival Surgery".

II. Policy:

General requirements for survival surgery include:

1. Dedicated surgical suite for major survival surgeries.
2. Use of aseptic procedures and supplies, including surgical gloves, masks, sterile instruments, and aseptic technique.
3. Anesthesia, antibiotics, and analgesics as outlined in approved IACUC protocols.
4. Monitoring and care of animal wellbeing.
5. Post-operative care.
6. Anesthetic and post-op records.
7. Training of personnel prior to initiating surgery.

Major survival surgery in *non-rodent* USDA covered species must be conducted in dedicated facilities.

Major survival surgery: A procedure that penetrates and exposes a body cavity, produces substantial impairment of physical or physiologic functions, or involves extensive tissue dissection or transection (e.g., laparotomy, thoracotomy, joint replacement, limb amputation). Cranial implants and craniotomies that do not open the dura mater other than creating small holes for needles or small cannula shall be considered minor surgical procedures since the cranial cavity (e.g., brain) is not exposed and no substantial physical impairments are produced. Examples for minor cranial surgeries could include neurorecording chamber placement and infusion/injection cannulae placement. Any cranial surgery that involves incising the dura mater shall be considered a major operative procedure and survival surgery.

Laparoscopic procedures that do not produce substantial impairment or involve the removal of organs or large sections of an organ such as oocyte collection, tissue biopsy, visual evaluation for sex determination shall be considered minor operative procedures.

Conversely, laparoscopic procedures that include organ removal or partial organ removal such as ovariectomy, chlolecystectomy, hepatic lobectomy shall be considered major operative procedures. The ultimate decision to classify a surgery as major or minor will be made by the IACUC. Investigators cannot perform major survival surgery on *non-rodent* USDA Covered species in their own laboratories but must make use of IACUC approved survival surgery suites which shall be operated and maintained under aseptic conditions according to federal standards. Dedicated surgery suites must be approved by the IACUC prior to use and inspected semi-annually. Contact the IACUC office for additional details regarding dedicated surgical suites and major versus minor surgical classifications.

III. Procedure:

A. Acclimation Period: Per the *Guide for the Care and Use of Laboratory Animals (The Guide)*, newly received animals must be provided a period for physiologic, psychological, and nutritional stabilization before their use. Non-rodent mammals should have a minimum of a 7-day acclimation period prior to survival anesthesia, survival surgery, or similarly invasive procedures.

It is the responsibility of the Principal Investigator (PI) to ensure the animal has been released for study prior to placing the animal on project. Additional information on acquisition and acclimation can be found in IACUC Policy-40: Animal Acquisition, Acclimation and the Animal Tracking System.

B. Dedicated Surgery Area: Major survival surgery must be performed in dedicated facilities or spaces. The surgical area must be easily sanitized. The immediate surgical area should not be used for other purposes and traffic in this area should be minimized.

Preparation of Surgery Table Surface: Prior to and between surgeries, clean and disinfect the surface upon which surgery will be performed. Use soap and water, rinse thoroughly, and follow with an appropriate disinfectant. Commonly used disinfectants are quaternary ammonium compounds (such as Roccal), accelerated hydrogen peroxide products (Rescue), household bleach diluted 1 part to 32 parts water, chlorine dioxide-based sterilant (Clidox), chlorhexidine (Nolvasan), or another antimicrobial agent. Disinfectants must be prepared and used according to the manufacturer's recommendations.

C. **Use of Sterile Instruments:** Surgical instruments must be sterilized for use in survival surgery. Instruments must be sterilized between animals. Several techniques (steam, dry heat, ethylene oxide, or chemical agents) can be used to sterilize instruments and other materials that will come in contact with animal tissues. **Steam or dry heat are the preferred methods to sterilize surgical instruments (autoclave).** Please refer to the Sanitization of Handwashed Equipment Policy.

Chemicals: Chemicals used to sterilize surgical instruments ***must be classified as a sterilant not a disinfectant*.** Chemical sterilants typically require a contact time of 6-24 hours, depending on the chemical used, although there are exceptions and newer products may require shorter times. For example, chlorine dioxide requires a minimum of 6 hours of contact time. Glutaraldehyde and Cetylcide require instruments to be soaked a minimum of 10 hours. Chemical sterilants must be prepared and used according to the manufacturer's recommendations. All ***instruments sterilized by chemicals must be rinsed in sterile water before use in tissues***.

D. **Aseptic Technique:**

Preparation of Animals: While under anesthesia (as approved in an IACUC protocol) and prior to moving the animal to the surgery suite/area, remove hair around the perimeter of the surgical site. Hair can be removed by clipping with an appropriate sized clipper or by using a depilatory cream. To minimize the risk of chemical injury from the use of depilatory cream, all residue from the use of this compound must be removed from both the depilated area and the surrounding hair coat/fur/wool using saline or warm water without overly wetting the animal. Remove loose hair with a dry gauze, careful use of adhesive roller, or careful vacuuming. With the exception of standing surgeries in livestock, place lubricating ophthalmic ointment (such as Lacrilube® or Purilube®) in the anesthetized animal's eyes to prevent drying of the cornea.

Clean and aseptically prepare the surgical site: Use an effective antiseptic surgical scrub (e.g., Nolvasan, Betadine). Carefully scrub the area with a new clean surgical sponge or gauze. Scrub in a gradually enlarging circular pattern from the center of the proposed incision to the periphery. The sponge or swab must not be brought back from the contaminated periphery to the clean central area. Alternate the surgical scrub with a disinfectant solution (e.g., Nolvasan, Betadine), 70% alcohol, sterile water, or sterile saline soaked sponge or gauze applied in the same manner. **Repeat this process a minimum of three times** to minimize the presence of microorganisms and repeat if dirt/debris is still present on the sponge/gauze.

Preparation of the Surgeon: Surgeons must wash their hands with a surgical scrub (e.g., Betadine Scrub®, Nolvasan Scrub®, Avagard™). For a minor procedure, the surgeon must wear a mask, **sterile gloves**, and clean scrub shirt or surgical gown/lab

coat. For a major surgery, the surgeon must also wear a hair bonnet and sterile gown. A new pair of sterile surgical gloves must be used for each animal**.**

During Surgery: The surgical field must be kept sterile throughout the procedure. Sterile instruments must be prevented from contacting non-sterile surfaces and replaced with a new sterile instrument if this occurs. Instruments must be placed on a sterile surface when not in use. In most cases, the use of sterile drapes is also required for maintenance of the sterile field.

E. Monitoring and care of animal well-being: Monitor the animal carefully during the surgical procedure. Anesthetized animals must not be left unattended during the procedure. Surgeons/anesthetists must pay close attention to the animal's heart rate, respiratory rate, and body temperature. Assess the animal's depth of anesthesia by jaw tone, response to stimulus, or other appropriate method prior to making an incision. Evaluating the animal's response to surgery (e.g., increased bleeding, increased respiratory rate, movement, vocalization, jaw tone) will also help determine the anesthetic depth. Pulse and respiratory rate must be documented at least every 15 minutes and temperature must be documented at least every 30 minutes on the anesthesia record.

Maintain Body Temperature: To prevent hypothermia in small animal species, do not wet the animal any more than necessary. Care must also be taken to prevent contamination of the sterile surgical field during subsequent handling and positioning of the animal. Place the animal on a clean absorbent surface and maintain body temperature using a circulating water blanket, warm water bottle, or equivalent external heat source, taking care not to cause thermal burns to the animal's skin (e.g., which can occur with a heat lamp or standard heating pad).

F. Post-operative Care: Prevent hypothermia in small animal species by placing the recovering animal in a warm cage or covering with a towel or warmed blankets. Be cautious with supplemental heat sources (e.g., heat lamps). Hyperthermia can be as detrimental as hypothermia. If a heat lamp is considered, ensure that it is at a safe distance from the animal and there is a part of the cage that is not covered by the heat lamp. Check periodically to monitor for ambulation and that the recovering animal is not at risk for a thermal burn or overheating. *Traditional heating pads are not acceptable due to the risk of thermal burns*.

Observe Animal: The animal must be in a safe area where they can be frequently observed until ambulatory and clearly awake. The incision site must be assessed daily to ensure it is clean, dry, and intact. If the animal's incision dehisces, the PI or PI's staff must contact the related veterinary staff for assessment and surgical repair. Animals must be observed for signs of post-surgical pain/discomfort (e.g., vocalization, persistent lethargy, lameness, or other signs identified in the approved IACUC protocol). They may be treated per the protocol, or the veterinary staff must

be notified. Notify the veterinary staff if signs of pain or discomfort are not alleviated after approved treatments are administered.

Maintain Hydration: Appropriate fluid therapy must be used to prevent or correct dehydration. This is typically achieved by administering sterile saline for injection or Lactated Ringers Solution (LRS) IV as approved in the IACUC Protocol or at the discretion of the assigned veterinarian. If significant blood loss occurred during the surgical procedure, or if the animal is slow to recover from anesthesia, provide additional fluids. Consult with the veterinary staff for assistance with fluid therapy.

Daily Post-op Checks: The PI, a member of the investigator's staff, or other individual to whom post-surgical care has been delegated must check post-surgical animals a minimum of once daily for a minimum of 7 days, until wounds have healed, and/or sutures/staples have been removed, unless the IACUC protocol has been approved for a shorter duration for minor procedures. Analgesic drugs must be administered at a dose and frequency needed to maintain an appropriate analgesic efficacy as specified in the approved Animal Care and Use Protocol. **Multimodal analgesia is generally recommended, and deviations from this must be scientifically justified and approved by the IACUC.**

Antibiotics: In general, intra- or post-operative antibiotics are unnecessary when aseptic technique is maintained. If an inadvertent contamination occurs during surgery, consult with CVS immediately. If routine post-operative antibiotics will be needed, their use must be included in the approved Animal Care and Use (IACUC Protocol.

G. Records: Post-surgical records must be maintained for the duration of post-operative care. Medical records must be kept throughout the lifetime of the animal and at least one year after endpoint. An example of an anesthesia/surgery record and the policy for record documentation can be found here. More information about record keeping can be found in the Standard of Care for "Animal Care Program Medical and Health Records".

Documentation: All daily observations and treatments must be recorded on the animal's post-surgical record. External wound clips, staples, or sutures must be removed when surgical incisions are healed, on average 7-14 days after surgery, or as outlined in the approved IACUC protocol. Consult with a clinical veterinarian if you have questions regarding the optimal staple or suture removal time. The veterinary staff must be notified if post-surgical complications occur.

H. Training: PIs are required to ensure that they and all staff conducting or assisting with survival surgeries are appropriately trained and that ***training has been documented***. Researchers conducting surgical procedures must have appropriate training to ensure that good surgical technique is employed – that is, asepsis, gentle

tissue handling, minimal dissection of tissue, appropriate use of instruments, effective hemostasis, and correct use of suture materials and patterns. Personnel must obtain training on aseptic technique from other knowledgeable personnel or by attending the Aseptic Techniques instructor-led training. PIs and staff may also receive hands-on training for specific surgical techniques from others proficient in the procedure.

Training Opportunities: Species-specific hands on Aseptic Technique courses are offered by the IACUC Office. Please contact the IACUC office for questions regarding training (iacuc-staff@ucdavis.edu).

I. **Non-Survival Surgeries:** Non-survival surgery is defined as any surgical intervention in which the animal will not recover from anesthesia. AVMA approved methods of euthanasia are exceptions to this definition. Transcardial perfusion and exsanguination by cardiectomy are not considered non-survival surgeries. It may not be necessary to follow all the techniques outlined in the section for survival surgery if non-survival surgery is performed, however, at a minimum, the surgical site should be clipped, the surgeon should wear a lab coat and gloves, and the instruments and surrounding area should be clean. For non-survival procedures of extended duration, attention to aseptic technique may be more important to ensure stability of the model and a successful outcome.

J. Contact Campus Veterinary Services (CVS) (**530-752-0514** or **lahc@ucdavis.edu**) or the veterinarian listed in section 11 of the approved IACUC protocol for questions regarding animal health, anesthetic support, surgical wound care, post-operative analgesia, or other questions regarding these guidelines. For cases involving immediate and emergent animal health and welfare concerns, all efforts must be made to contact the veterinarian of record, and/or the on-call Campus Veterinary Services veterinarian at **530-219-3076** as soon as possible.

IV. Resources:

1. Animal Welfare Act and Regulations
   https://www.nal.usda.gov/awic/animal-welfare-act
2. ILAR, Guide for the Care and Use of Laboratory Animals
   http://nap.edu/12910
3. IACUC-22 “Guidelines for Rodent Survival Surgery”
   https://research.ucdavis.edu/wp-content/uploads/IACUC-22.pdf
4. IACUC Policy-40 “Animal Acquisition, Acclimation and the Animal Tracking System”
   https://research.ucdavis.edu/wp-content/uploads/IACUC-40.pdf
   IACUC Policy-58 " Sanitization of Handwashed Equipment”

5. https://research.ucdavis.edu/wp-content/uploads/IACUC-58.pdf UC Davis Campus Vet Services Anesthesia Record https://research.ucdavis.edu/wp-content/uploads/Anesthesia-Record.pdf
6. Standard of Care-40-404 “Animal Care Program Medical and Health Records” https://research.ucdavis.edu/wp-content/uploads/SC-40-404.pdf
7. Aseptic Technique Courses https://research.ucdavis.edu/research-support/animal-care-use/training-classes/aseptic-technique/