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

I. Purpose:

This document explains 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 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, including surgical gloves, masks, sterile instruments, and aseptic techniques.
3. Anesthesia, antibiotics, and analgesics as outlined in approved protocols.
4. Monitoring and care of animal’s wellbeing.
5. Post-operative care.
6. Anesthetic and post-op records.
7. Training of personnel.

Major survival surgery in non-rodent USDA covered species must be conducted in dedicated facilities. Major survival surgery: 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). The ultimate decision to classify a surgery as major or minor will be made by the IACUC. Investigators cannot perform major survival surgery in non-rodent USDA Covered species in their own laboratories, but must make use of IACUC approved survival surgery suites that meet federal standards. 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. 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, newly received animals must be given a period for physiologic, psychological, and nutritional stabilization before their use.

Non-rodent mammals should have 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 other 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's tissues. Steam or dry heat are the preferred methods to sterilize surgical instruments. Please see the Standard of Care for “Sanitation and Sterilization Quality Assurance and Monitoring”.

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 to this and newer products may require shorter times. For example, chlorine dioxide requires a minimum of 6 hours of contact time. Glutaraldehyde and Cetylncide require instruments to be soaked a minimum of 10 hours. Chemical sterilants must be prepared and used according to the manufacturer’s recommendations.
instruments sterilized by chemicals must be rinsed in sterile water before use in tissues.

D. Aseptic Technique:

Preparation of the Animals: While under anesthesia (as approved in a protocol) and prior to taking the animal to the surgery 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 without overly wetting the animal. Remove loose hair with a dry gauze 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 should 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’s 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 should 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).

**F. Postoperative 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. Check periodically to monitor for ambulation and that the recovering animal is not at risk for a thermal burn or overheated.

**Observe Animal:** Animals must be in a safe area where they can be frequently observed until they are 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's staff must contact the related veterinary staff for assessment and surgical repair. Animals should 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 should be used to prevent or correct dehydration. This is typically achieved by administering saline or Lactated Ringers Solution (LRS) IV as approved in the Animal Care and Use 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:** A member of the investigator’s staff or other individual to whom postsurgical care has been delegated must check postsurgical 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 approved protocol has been approved for shorter duration for minor procedures. **Animals must be given analgesics as specified in approved protocols and if needed thereafter,** as prescribed by a clinical veterinarian.
**Antibiotics:** Intra- and post-operative antibiotics may be indicated depending on the duration and type of surgery; consult the veterinary staff for guidance. If an inadvertent contamination occurs during surgery, consult with a clinical veterinarian immediately. If routine intra- and post-operative antibiotics are needed, their use must to be included in the approved 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 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 practiced – 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 techniques 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:** In non-survival surgery, an animal is euthanized before recovery from anesthesia. It may not be necessary to follow all the techniques outlined in this section if non-survival surgery is performed but, 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 in order to ensure stability of the model and a successful outcome.

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:**

2. ILAR, Guide for the Care and Use of Laboratory Animals [http://nap.edu/12910](http://nap.edu/12910)