

**University of Cincinnati
Animal Care and Use Program**

Survival Surgery

These guidelines apply to all survival surgical procedures performed on vertebrate animals at the University of Cincinnati.

Questions: Contact [LAMS Veterinary Staff](#) or 513-558-5174.

Definitions

1. **Survival Surgery** – a surgical procedure from which an animal receives and is allowed to recover from anesthesia.
 - a. **Major** - any surgical procedure that penetrates and exposes a body cavity or has potential to produce permanent/significant physical or physiological impairment.
 - b. **Minor** – any surgical procedure that does not penetrate or expose a body cavity or produces permanent/significant impairment of physical or physiological function.
2. **Multiple** – two or more surgical procedures conducted as separate anesthetic events.
3. **Aseptic Technique** – limiting microorganism contamination of a clean environment.
4. **Sterilization** – elimination or destruction of all viable microorganisms.
5. **Disinfection** – elimination or destruction of most viable microorganisms (effective against vegetative organisms, but not necessarily spores).

Required Training

1. Researchers performing or assisting in survival surgery or post-operative care must complete all required training per [ACUP training policy](#).
2. Surgeon should be trained and proficient in the surgery they are performing.
3. Lab should keep all records of internal surgical/procedural trainings.

Surgical Room Requirements

1. Procedures should be performed in a clean, uncluttered, minimal traffic dedicated surgical space. During surgery, non-animal procedures may not be performed in this dedicated space.
2. USDA covered species require dedicated surgical facilities intended for that purpose that are operated and maintained aseptically. Initial animal preparation should be done in a room separate from the animal surgery.
3. Non-USDA covered species (e.g. rodents, ectotherms) surgeries may be performed in the same room as surgical participant and initial animal preparation, but the room must have dedicated areas for each activity.

Preparation of the Surgical Equipment

1. Surgical equipment must be steam or gas sterilized prior to surgery and handled aseptically and maintained within an aseptic field during surgical procedures.
 - a. Sterilization indicators (e.g. autoclave tape) must be used on all equipment packs.
 - b. The sterilization date must be noted on each equipment pack. Pack must be re-sterilized if damaged or unused within 6 months of the sterilization date.
2. Surgeries conducted on multiple rodents or ectotherms in a single session may use one sterile equipment pack **for no more than 5 animals**.
 - a. Equipment must be sterilized between each procedure. Glass bead sterilization is recommended: clean equipment with appropriate cleaning solution/disinfectant,

submerge in heated glass beads, remove and allow time to cool before touching animal tissue.

- b. Cover the glass beads when not in use.
- c. Replace glass beads as per manufacturer recommendation.

Preparation of the Animal

1. Fast animals (if applicable) according to the approved IACUC protocol.
2. Hair must be removed from the area surrounding the incision site. This may be accomplished with animal clippers, a razor, or a depilatory agent.
3. After hair removal, the animal should be placed on a clean, absorbent surface, such as an absorbent pad, to minimize heat loss during surgery.
4. A recirculating warm water blanket or self-regulating heating pad should be provided for the duration of anesthesia.
5. Administer pre-emptive analgesics, anesthetics, and other drugs according to the approved IACUC protocol or as prescribed by a LAMS veterinarian.
6. Skin of the surgical area should be scrubbed with alternating scrubs of povidone iodine or chlorhexidine and 70% ethanol repeated 3 times. One-step patient preparation systems can also be used.
7. Animal should be covered with a sterile drape to help minimize contamination of the surgical site.

Preparation of the Surgeon

1. Surgical participants should prepare for surgery by washing hands with soap and drying them before aseptically donning sterile surgical gloves.
 - a. **If operating on USDA covered species:** surgical participants must complete a 5-minute hand and lower arm surgical scrub (or comparable process) prior to aseptically donning personal protective equipment (PPE).
2. All surgical participants are required to don PPE. If a type of PPE is not required for a specific species, it is still *recommended best practice* to wear it.

Types of PPE	Required For
Dedicated, clean surgical attire <i>e.g. lab coat, surgical scrubs, disposable gown</i>	All species
Face mask or respirator	All species
Sterile surgical gloves	All species
Sterile gown	USDA covered species only
Hair bonnet/cap	USDA covered species only
Shoe covers	USDA covered species only

Operative Procedures

1. Survival surgery must be performed using aseptic technique during the procedure.
2. The animal must be maintained at an appropriate depth of anesthesia before the surgical procedure is initiated and must be monitored for surgical plane of anesthesia (negative response to a painful stimulus) throughout the procedure.
3. Monitor the animal's vital signs (e.g. depth and rate of respiration) throughout surgery.
For USDA covered species, monitor and document at least every 15 minutes.
4. Anesthetized animals must never be left alone.

Post-Operative Procedures

1. All post-operative monitoring and documentation is the responsibility of the research staff unless prior arrangements are made with LAMS Veterinary Staff.
2. After surgery, move the animal to a warm, dry area and monitor until recovered/sternal.
3. Once recovered from anesthesia, it's recommended to provide supportive care (water bottle, moistened floor chow, or warmed subcutaneous fluids) to promote hydration and recovery.
4. Post-operative analgesics must be provided according to the approved IACUC protocol and documented in the surgical record. Refer to associated documents:
 - a. [Mouse Standard Analgesics and Anesthetics](#)
 - b. [Rat Standard Analgesics and Anesthetics](#)
 - c. [Minimum Analgesic Period by Pain Level in Mice and Rats](#)
5. General animal condition must be evaluated and documented, and any adverse reactions/abnormalities promptly reported to LAMS Veterinary Staff.

Required frequency of post-operative observation and documentation:

- a. **Minor surgery**
 - Procedures with minimal (Level 0) pain: 1 day of post procedural monitoring
 - Procedures with mild (Level 1) pain: 2-3 days of post procedural monitoring
- b. **Major surgery**
 - Procedures with moderate (Level 2) pain: 3-5 days of post procedural monitoring
 - Procedures with severe (Level 3) pain: 5-7 of post procedural monitoring
6. Sutures and/or staples must be removed 10-14 days after surgery unless otherwise noted in the approved IACUC protocol. This includes animals arriving post-operation from another institution or vendor.

Surgical Records

1. Animals arriving post-operation from another institution or vendor must document the previous surgery date, procedure performed, and name of institution/vendor on the LAMS barcoded cage card upon arrival, as well as a copy of the animal's individual animal health record for USDA species.
2. Surgical records must be available for inspection while the animal is alive and must be retained as per UC record retention policy.
3. Surgical records must be legible, written in English, and maintained in a surgical log or cage card.
 - a. LAMS Rodent Anesthesia/Surgery Cards should be used for all rodent and ectotherms (see example card below)
 - b. USDA covered species should have an individual record
4. Records must contain:
 - a. IACUC protocol number and Principal Investigator's name
 - b. Surgery date and type
 - c. Surgery start time
 - d. Surgeon's name or initials
 - e. Animal species
 - f. Animal identification (e.g. barcode ID)
 - g. Presurgical body weight and condition
 - h. Anesthetics administered, including route and time given
 - i. Analgesics administered, including route, and time given
 - j. Additional drugs or supportive fluids administered with route and time
 - k. Post-procedural care (see Post-Operative Procedures)

- l. Suture removal date
 - m. **Large animal only:** description of surgical procedure and vital signs (e.g. temperature, heart and respiratory rates, mucous membrane color)
5. **Non-USDA animals surviving 6 hours or less post-operation:** minimal surgical documentation is required and must include (on LAMS barcoded cage card) the surgery date and time, procedure performed, and surgeon's initials.

LAMS - RODENT ANESTHESIA / SURGERY CARD (check one):	
<input type="checkbox"/> Survival Surgery <input type="checkbox"/> Anesthesia only	
Date/Time:	Surgeon:
Barcode/ID#:	Procedure Name:
Pre-surgical weight:	Suture/Wound Clip removal date:
Pain level (check mark): <input type="checkbox"/> Minimal (1 day) <input type="checkbox"/> Mild (2-3 days) <input type="checkbox"/> Moderate (3-5 days) <input type="checkbox"/> Severe (5-7 days)	
Check mark medications:	Route/Time
<input type="checkbox"/> Isoflurane <input type="checkbox"/> Ketamine/Xylazine	
<input type="checkbox"/> Ketamine/Xylazine/Acepromazine	
<input type="checkbox"/> Other: _____	
<input type="checkbox"/> Buprenex <input type="checkbox"/> Buprenex ER <input type="checkbox"/> Ethiq	
<input type="checkbox"/> Meloxicam <input type="checkbox"/> Meloxicam ER <input type="checkbox"/> Carprofen	
Other:	

LAMS - RODENT POSTOPERATIVE RECORD					
Date	Time	*Surgical Site	Pain Assessment (+/-)	Comments Drug (Name/Route)	Initials
Study # / Comments:					
*Surgical site: N = normal; AB = abnormal Submit an ER animal health notice for any abnormal surgical site, + pain assessment or any inactive/moribund animal					

Frog Oocyte Collection

1. Multiple survival surgeries for frog oocyte collection may be approved by the IACUC if there is adequate scientific justification.
2. The total number of laparotomies should be limited and will depend on the condition of the animal, quality of the oocytes, life span of the animal and the duration of egg production. Up to five recovery surgeries (the 6th would be terminal) per animal are acceptable. There should be at least 4 weeks between surgeries and the procedure should only be done if the animal is physically normal with complete healing from the previous surgery. This minimizes individual animal distress while reducing the total number of frogs required for this procedure.
3. Animals must be properly identified; surgical records and post-operative monitoring must be properly documented to ensure compliance with regulatory requirements and adequate veterinary care.