



**Non-Rodent Mammal Surgical and Post-Operative Care –
Standard Operating Procedures**

| Document No.: | Edition No.: | Effective Date: | Page: |
|---------------|--------------|-----------------|-------------|
| ACU-212 | 002 | 05/22/2024 | Page 1 of 7 |

Table of Contents

1. Overview..... 2
 Purpose..... 2

2. Definitions..... 2

3. Survival Surgery Procedures..... 2
 3.1 Acclimation Period..... 2
 3.2 Preoperative Period..... 2
 3.3 Surgery..... 3
 3.4 Recordkeeping..... 4
 3.5 Postoperative Period 5

4. Non-Survival Surgery Procedures 5
 4.1 Procedures..... 5
 4.2 Anesthesia Monitoring 5
 4.3 Recordkeeping..... 6
 4.4 Euthanasia 6

5. Responsibilities 6
 5.1 Drexel University IACUC Responsibilities 6
 5.2 Veterinarian’s Responsibilities 6
 5.3 Principal Investigator’s Responsibilities 6

6. Revisions 7



| Document No.: | Edition No.: | Effective Date: | Page: |
|---------------|--------------|-----------------|-------------|
| ACU-212 | 002 | 05/22/2024 | Page 2 of 7 |

1. Overview

Purpose

These procedures describe the proper procedures for surgery, including pre-operative and post-operative care of non-rodent mammals (such as rabbits, pigs) in accordance with the "Animal Welfare Act" and the Association for Assessment and Accreditation of Laboratory Animal Care, International's guidelines, as outlined in the "Guide for the Care and Use of Laboratory Animals."

2. Definitions

MAJOR SURVIVAL SURGERY: Any surgical intervention that penetrates or exposes a body cavity or has the potential for producing a permanent impairment of physical or physiological functions in an animal which is expected to recover from anesthesia.

MINOR SURVIVAL SURGERY: Any surgery that does not expose a body cavity and causes little or no physical impairment. Examples are wound suturing; peripheral vessel cannulation; microchip implantation; and most procedures routinely done on an 'outpatient' basis in veterinary clinical practice.

NON-SURVIVAL SURGERY: the animal is euthanized before recovery from anesthesia. It can also be categorized as major or minor.

3. Survival Surgery Procedures

All survival surgery must be performed using aseptic procedures, including sterile surgical gloves, masks, gown, cap, sterile instruments, and aseptic techniques. Major survival surgeries must be conducted in an aseptic surgery suite. Minor survival surgeries may be performed in IACUC approved dedicated areas in laboratories and must be performed using aseptic procedures as noted above. Exceptions to these procedures must be approved by the IACUC.

3.1 Acclimation Period

Newly received animals should be given a period for physiologic, behavioral and nutritional acclimation before their use. Prior to surgery, animals should have 7 days to acclimate unless otherwise described and justified in the IACUC protocol.

3.2 Preoperative Period

Preoperative preparation involves determination of the health status of the animal, removing food from the animal's cage if required for that species, and organizing for surgery and for the postoperative period.

Decisions concerning the choice of surgical instruments, suture material and intravenous fluids for surgery as well as the need for antibiotics and analgesic administration should be made when preparing the IACUC protocol. The Attending veterinarian and ULAR staff are available to advise you in these areas.



**Non-Rodent Mammal Surgical and Post-Operative Care –
Standard Operating Procedures**

| Document No.: | Edition No.: | Effective Date: | Page: |
|---------------|--------------|-----------------|-------------|
| ACU-212 | 002 | 05/22/2024 | Page 3 of 7 |

The use of preemptive analgesia (the administration before and during surgery) should be utilized as it enhances patient stability and optimizes post-surgical care and well-being by reducing post-surgical pain.

The use of sterile instruments, suture material and supplies is required. Instruments should be sterilized by autoclaving. If surgical instruments are sterilized using an autoclave, the use of autoclave tape alone, on the outside of instruments packs, to monitor the effectiveness of such sterilization procedure is inadequate. Surgical packs must contain a sterilization indicator INSIDE of the pack. These strips should be kept in a logbook along with surgical records. The outside of the pack should be wrapped with autoclave indicator tape. The ULAR staff are available to advise you in these areas.

The choice of suture material is dependent on the layers of tissue sutured. Internal sutures should be absorbable and dissolve after the tissue is healed. Non-absorbable suture can result in tissue reactions and sterile abscesses. Skin should be closed with a non-absorbable, non-braided suture. Use of materials like silk can allow bacteria to enter the subcutaneous space by being wicked into the wound. Surgical staples can also be used to close the skin layer.

Implanted medical devices must be sterile. If these are unable to be heat sterilized, other methods of sterilization should be considered. Contact the ULAR veterinary staff for more information or refer to ACU-205 Sterilizing Procedures for Surgical Materials Used in Surgical Procedures on Animals.

3.3 Surgery

Following the induction of anesthesia, the site of the surgical incision and the area surrounding it should be shaved so that there is a large enough area in which to work comfortably and aseptically. If intubation is required, always use an appropriately sized endotracheal tube. Check the tube prior to insertion to ensure that the cuff is intact and after insertion to make sure that the tube is within the trachea. The anatomy of pigs and rabbits makes intubation difficult for non-experienced personnel. Consult with the ULAR veterinary staff if you are interested in intubating pigs or rabbits. Corneas must be protected from drying with an ophthalmic ointment such as Lacri Lube®. Catheterization of a vein is strongly recommended. This enables fluids such as Lactated Ringers Solution to be delivered if there is blood loss during surgery, to supplement fluid loss during the procedure, and for emergency drug administration.

The animal should be placed on a water-circulating heating pad or forced hot air pad (such as the 3M Bair hugger) for all surgical procedures to maintain body temperature. The surgical area should be wiped with a suitable skin disinfectant. Gauze pads or cotton tipped applicators should be used to prep the surgical site by alternating a surgical scrub (such as Betadine or Chlorohexidine) and 70% alcohol. The scrub should begin at the center of the shaved area and moved outwards towards the periphery. The alternating scrubs should be repeated a minimum of three times, starting with the surgical scrub and ending with the 70% alcohol. For major operative survival procedures, the surgeon prepares for surgery by scrubbing their arms and hands for five minutes and donning appropriate attire. The animal is draped with a sterile drape. Surgery can then commence.



**Non-Rodent Mammal Surgical and Post-Operative Care –
Standard Operating Procedures**

| Document No.: | Edition No.: | Effective Date: | Page: |
|---------------|--------------|-----------------|-------------|
| ACU-212 | 002 | 05/22/2024 | Page 4 of 7 |

If at any time during surgery your glove touches a non-sterile surface, you must change gloves before proceeding. Similarly, if an instrument touches a non-sterile surface, it must not be used until it is re-sterilized.

The monitoring of anesthesia depth is important to ensure the animal is not experiencing pain or distress during the procedure. Before surgery begins, the surgeon must ascertain that the animal is in a surgical plane of anesthesia and unresponsive to painful stimuli. To ensure adequate anesthesia, follow the monitoring procedure described in the IACUC protocol. Records of anesthesia and monitoring must be maintained by the investigator and/or staff using the ULAR Anesthesia and Monitoring Form.

3.4 Recordkeeping

Recordkeeping is a key element of surgical and post-operative care and is considered critical for documenting animal well-being and for tracking animal care. **ULAR surgical record forms must be maintained.** Records must be carefully maintained for each animal undergoing either survival or non-survival surgical procedures.

All surgical records must include the following information:

- the date
- time of day
- procedure
- the surgeon (and anesthetic monitor if a different individual)
- the animal identification
- the anesthetic agent(s) including the date of expiration and dose.
- analgesics and any preanesthetic agents including the date of expiration and times of administration.
- monitoring parameters (ex: heart rate, respiratory rate, body temperature, etc.) as specified in the protocol and recorded at least every 15 minutes.

A surgical template with spaces for all necessary information has been included at the end of these procedures.

Post-surgical records must also be maintained for each animal and include:

- the time when the animal attains sternal recumbency following surgery
- animal observations including any adverse signs during the post-operative period
- agent, dose, expiration date, and time of analgesic administration
- the name of the individual performing the post-operative care
- other information as stated in the protocol

Certain protocols require long term care of animals and may require analgesics on an as needed basis. In such cases, individual animal records should indicate the observation, care given, and, if analgesia is administered, the agent, dose, expiration date, and time of analgesic administration, and the name of the individual performing the care and treatments. These records should be available for veterinary and IACUC review.



Non-Rodent Mammal Surgical and Post-Operative Care – Standard Operating Procedures

| Document No.: | Edition No.: | Effective Date: | Page: |
|---------------|--------------|-----------------|-------------|
| ACU-212 | 002 | 05/22/2024 | Page 5 of 7 |

Surgical records should be maintained for the duration of the activity and for an additional 3 years from the completion of the activity.

3.5 Postoperative Period

Postoperatively, the animal should be supplied with supplemental heat either with a heating pad or by being draped. The animal must be continuously monitored with written observations made at least every 15 minutes until it regains sternal recumbency. Records indicating that the animal has been observed must be kept during this period on the anesthesia monitoring form. Do not return an animal to its housing room until the animal has fully recovered.

The endotracheal tube should not be removed until the swallowing reflex reappears. Depending on the surgical procedure, postoperative fluid administration may be necessary to speed recovery.

Analgesia should be continued post-operatively and recorded in the animal record. Exceptions may occur only if scientific justification for withholding analgesics is stated and approved in the IACUC protocol.

Suggestions for appropriate analgesics may be found by consulting a member of the veterinary staff.

Once the animal has regained sternal recumbency and is awake, the animals should have access to water. If a bowl is used, fill to approximately 1/2" depth. This allows an animal to reach water but will not be dangerous to the animal while groggy.

The date of surgery must be marked on the cage card.

Skin sutures or wound clips must be removed at 10-14 days post-surgery, assuming normal healing.

Animals must be checked at least daily, including weekends as described in the IACUC protocol, for general health, pain, discomfort, infection and body temperature (if appropriate for the species) during the post-operative period described in the IACUC protocol. Entries should be noted in the animal record documenting these clinical evaluations. Contact ULAR if you need assistance.

4. Non-Survival Surgery Procedures

4.1 Procedures

At a minimum the surgical site should be clipped, the surgeon should wear gloves and the instruments and surrounding area should be clean. For non-survival procedures of extended durations, attention to aseptic technique may be important to ensure stability of the model and successful outcome.

4.2 Anesthesia Monitoring

The monitoring of anesthesia depth during non-survival surgery is important to ensure the animal is not experiencing pain or distress during the procedure.



| Document No.: | Edition No.: | Effective Date: | Page: |
|---------------|--------------|-----------------|-------------|
| ACU-212 | 002 | 05/22/2024 | Page 6 of 7 |

4.3 Recordkeeping

Records of anesthesia and monitoring must be maintained by the PI and/or staff on the ULAR anesthesia form as described under survival surgery monitoring.

4.4 Euthanasia

Adequate anesthesia must be maintained following the procedure until euthanasia is conducted.

5. Responsibilities

5.1 Drexel University IACUC Responsibilities

The Drexel University IACUC and the IACUC Office are responsible for maintaining this guidance document, training, and monitoring. All exceptions to this procedure must be approved by the IACUC. For inquiries regarding these procedures, please contact the Director of Animal Welfare, a part of the Office for Research & Innovation (ORI), or the Attending Veterinarian.

5.2 Veterinarian's Responsibilities

The veterinarian shall provide guidance to the PI for preparation of the protocol and surgery, and provide the IACUC with assessments of the following:

- 1) Preparation of the animal for the surgical intervention, to include the use of pre-anesthetic drugs where indicated, and appropriate anesthetic agents;
- 2) The individual performing the surgery has adequate experience or training for the specific procedure outlined in the study;
- 3) Aseptic procedures are appropriate for the surgery;
- 4) That adequate post-operative care, including post-operative monitoring and use of analgesics as approved by the IACUC is provided and;
- 5) Veterinarian has implicit responsibilities to assess the potential for pain and distress that might be associated with the proposed animal activities, and to recommend the use of pain alleviating drugs, whenever possible, to alleviate those conditions. The veterinarian may determine that the use of alternate analgesics not approved in the IACUC protocol and methods of pain control should be used based on the animal's condition. The veterinarian can also make the determination that euthanasia of the animal is required.

5.3 Principal Investigator's Responsibilities

- 1) The responsibility for proper preoperative, surgical, and postoperative care (including weekends) is that of the Principal Investigator. The veterinarian and ULAR personnel shall provide guidance and train personnel in these general areas of care. The Principal Investigator is responsible for training and arranging training on the specific surgical procedure;
- 2) Regulations require that investigators proposing procedures that may cause more than momentary or slight pain or distress to the animals must consult with the veterinarian or their designee. The veterinary staff of the ULAR will be available to provide guidance in the care



Non-Rodent Mammal Surgical and Post-Operative Care – Standard Operating Procedures

| Document No.: | Edition No.: | Effective Date: | Page: |
|---------------|--------------|-----------------|-------------|
| ACU-212 | 002 | 05/22/2024 | Page 7 of 7 |

and use of animals regarding handling, immobilization, anesthesia, analgesia, tranquilization, and euthanasia;

- 3) Federal regulations and our internal institutional policies require that protocols must be implemented as approved by the IACUC. Any deviation from the approved protocol must be approved by the IACUC before they are implemented;
- 4) Investigators shall utilize the standard ULAR anesthesia monitoring form and animal record form to sufficiently document animal care and use that meets regulatory requirements and veterinary practice.

6. Revisions

Edition 001/Effective Date: 08/20/2003 – Original Document

Edition 001/Review Date: 01/09/2013

Edition 001/Review Date: 07/2018

Edition 001/Review Date: 03/2019

Edition 002/Review and Revision Date: 05/08/2024 and Effective Date: 05/22/2024 – Revised Document.

- Updated formatting to new template.
- Changed title to “Non-Rodent Mammal Surgical and Post-Operative Care Procedures”
- Section 2. Addition of Major and Minor Survival Surgery definitions
- Section 3.2. Addition of “The use of preemptive analgesia (the administration before and during surgery) should be utilized as it enhances patient stability and optimizes post-surgical care and well-being by reducing post-surgical pain.”
- Section 3.2. Addition of reference to ACU-205 Sterilizing Procedures for Surgical Materials Used in Surgical Procedures on Animals.
- Section 3.3. Clarification on the order in which surgical scrub and alcohol should be applied.
- Section 3.4 Change from should to must in “All surgical records **must** include the following information”
- Section 3.4. Clarification that monitoring parameters should be recorded every 15 minutes.
- Section 3.5. Clarification that the animal must be **continuously** monitored with **written observations made at least every 15 minutes** until it regains sternal recumbency
- Section 3.5. Addition of appropriate suture information.
- Section 4.4. Addition of euthanasia guidance.
- Section 5.1. Addition of Drexel IACUC responsibilities.
- Section 5.2. Addition of veterinary responsibilities in determining alternative analgesics and euthanasia methods not approved by the IACUC based on condition of animal.
- Addition of the ULAR Anesthesia and Surgical Record has been added to the end of this document.

University Laboratory Animal Resources Anesthesia and Surgical Record

Protocol #: _____

Investigator: _____ Date: _____

Animal ID: _____

Species: _____ Surgeon: _____

Animal Body Weight: _____

Anesthetist: _____

Procedure: _____

Preoperative Information

General Appearance: _____ Body Temperature: _____ Heartrate: _____ Respiratory Rate: _____

| Time | Drug | Drug Expiration Date | Dose | Route | Purpose of Drug | Initials |
|------|------|----------------------|------|-------|-----------------|----------|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Anesthetic Monitoring Information

Record times at no more than 15 minute intervals. Use additional sheets, if needed.

| | | | | | | | | | | | | | |
|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Time | | | | | | | | | | | | | |
| Heartrate | | | | | | | | | | | | | |
| Respiratory Rate | | | | | | | | | | | | | |
| Temperature | | | | | | | | | | | | | |
| Blood Pressure | | | | | | | | | | | | | |
| SpO2 | | | | | | | | | | | | | |
| O2 L/minute | | | | | | | | | | | | | |
| Isoflurane % | | | | | | | | | | | | | |
| Ventilator? (Y/N) | | | | | | | | | | | | | |

Procedure Start Time: _____

Total Replacement Fluids Given (mLs): _____ Fluid Type Given: _____ Fluid Type Given: _____

Note Any Unanticipated Events During Procedure: _____

