

**STANDARD OPERATING PROCEDURES**  
DIVISION OF COMPARATIVE MEDICINE  
UNIVERSITY OF SOUTH FLORIDA

SOP#: 033

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<b>TITLE:</b>	<b>General Anesthetic Techniques</b>
<b>SCOPE:</b>	All Authorized Personnel
<b>RESPONSIBILITY:</b>	Facility Manager and Technical Staff
<b>PURPOSE:</b>	To Outline Appropriate and Safe Anesthetic Monitoring Techniques

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**I. PURPOSE**

1. To describe universally accepted best practices when utilizing general anesthesia in an animal model.

**II. RESPONSIBILITY**

1. The Training Coordinator and Assistant Directors/Veterinary staff is responsible for training and supervising personnel regarding the proper implementation of this SOP.
2. The Assistant Directors/Veterinary staff reviews anesthesia administration route (e.g., face mask, intubation), evaluates associated risks to both animal patient and staff, and makes recommendations to reduce exposures as needed.
3. It is the responsibility of personnel anesthetizing research animals to be familiar with these procedures.

**III. BACKGROUND INFORMATION**

1. Isoflurane and sevoflurane are common halogenated anesthetic gases.
  - a. Halogenated anesthetics are typically clear, colorless, highly volatile liquids at ordinary pressure and temperature. Consequently, these gases possess very poor warning properties, and odor is not an adequate indication of overexposure.
  - b. Exposure to these agents occurs when vapors escape into the work place during the process of anesthetic administration.
  - c. Potential for health risks in the unscavenged anesthetic environment necessitates that waste anesthetic gas be scavenged and exposures to waste anesthetic gas be kept to the lowest practical level. Please refer to SOP #909 **Anesthetic Gas Monitoring and Safety Practices**.
2. Surgical areas are physically separated from corridors and animal housing areas. Procedural and surgical area air flows and pressure gradients are adjusted so that they are positive and airflow is toward the adjoining corridors. Information on decontamination of procedural space, room configuration and requirements are based on species involved and can be found in SOPs #003 **Facilities for Aseptic Surgery for Non-rodent USDA**, #1009 **Decontamination**, #1015 **Decontamination of Common Procedural Areas**

**IV. PROCEDURES**

1. **IACUC protocol is reviewed to ensure compliance with approved methods, drugs and manipulations.**
2. **Anesthesia equipment** must be routinely inspected and maintained as described per appropriate equipment specific SOP(s). Prior to using an anesthesia machine,

- a. Visually inspect hoses and connections,
  - b. Connect the waste gas scavenging system,
  - c. Test breathing circuit for leaks, and verify that it can maintain positive pressure,
  - d. Ensure adequate oxygen and anesthetic agent supplies are available
3. Prior to anesthetizing an animal patient, **all monitoring and supplemental support equipment should be operational and in good working order** per appropriate equipment specific SOP(s). Prior to using monitoring equipment,
- a. Visually inspect sensor and electrical connections
  - b. Clean all sensors prior to and after use
  - c. Allow ample time to run internal calibrations and tests per appropriate SOP
4. **Pre-procedural Considerations**
- a. **Examination**
    1. Overall condition
    2. **Weight taken within the past 24hrs**
    3. Pre and Post-operative weights should be taken
  - b. **Preparation of supplies & drugs**
    1. Pre-anesthetic medications may be pulled up into properly labeled syringes (medication, dosage, animal number) no more than 12 hours prior to procedure
    2. Some medications react with the plastic or rubber in traditional syringes. Be aware of the medication in use and their reactivity and use appropriate types of syringes.
    3. Some medications may come in pill form and require crushing for easier oral administration.
    4. Intra-operative medications may be pulled up in ready-to-dose syringes the morning of surgery. All syringes must be appropriately labeled (medication, dosage, animal number).
    5. Post-operative medications may not be pulled up greater than 12 hours prior to scheduled administration. All syringes must be appropriately labeled (medication, dosage, animal number).
  - c. **Preemptive Analgesics**
    1. Giving analgesic prior to commencement of surgery allows for smoother induction, a lower dose of intra-operative anesthetic, and facilitates recovery efforts.
    2. Preemptive analgesics are given typically within 2-4hrs of induction.
5. **Induction Considerations**
- a. Liberal application of an ophthalmic lubricant to help protect against corneal injuries is required in survival surgical situations in all species.
  - b. **Topical application of an anesthetic to the larynx is required when passing an endotracheal tube. Sufficient time should be allowed after application to ensure efficacy prior to attempting intubation**
    1. Cetacaine – used to control gag reflex as well as reduce laryngeal spasm. Available as a spray or gel, typically used on non-rodent USDA species
    2. Viscous Oral Lidocaine 2% - gel used to lubricate and numb larynx for intubation purposes, useful for all research species
6. **Intubation**
- a. Apply topical anesthetic as appropriate – to both the back of throat and tip of endotracheal tube
  - b. Select appropriately sized species specific endotracheal tube as outlined in the research protocol.

1. Assess appropriate length (measure from corner of mouth to last rib palpated), trim if needed, ensuring no sharp edges.
2. Test inflation cuff, if one is available, then deflate completely; ensure all connections are secured and will not dislodge during surgery.
  - a. Rodents = non-cuffed, typically made of flexible tubing, or trimmed percutaneous vascular catheters.
  - b. Rabbits = size 2.5-4.0 is normal range; generally  $\leq 3.0$  are non-cuffed;  $\geq 3.5$  are cuffed.
  - c. Large Animals = size 4.0 and greater; generally come cuffed.
- c. The larynx can be easily damaged during intubation; therefore, if one encounters difficulty, causes obvious trauma and or has not successfully placed the tube within 3 attempts, a more experienced technician will take over.
- d. Endotracheal tube must be secured; typically with roll gauze in larger species, while adhesive or umbilical tape will suffice in rodent species. Inflation cuff, if available, is blown up until firm but not overly tight (e.g.: "grape-like" consistency).

## 7. Peripheral Vascular Catheterization

- a. Choose appropriately sized catheters for species and intended use (e.g.: fluid administration, invasive blood pressure monitoring).
- b. Vessels can vasospasm or form hematomas if damaged while attempting to place catheters. If one encounters difficulty, causes obvious trauma and or has not successfully placed the catheter within 3 attempts, a more experienced technician will take over.

## 8. Urinary Catheterization

- a. Choose appropriately sized catheters for species and research requirements.
- b. Apply viscous Lidocaine 2% or Cetacaine gel as topical anesthetic prior to catheterization attempts to both the urethral opening and catheter tip.
- c. Swelling may occur if urethra is damaged during catheterization attempts, resulting in bleeding and obscuring the opening. If successful placement of the catheter is not achieved within 3 attempts, a more experienced technician will take over.

## 9. Monitoring Methods

- a. Ventilation
  1. Small animals are assessed by visual monitoring of mucous membrane color and tissue perfusion
  2. Large animals are also monitored using specialized equipment
    - a. Pulseoximetry (SpO<sub>2</sub>)
    - b. Capnography (end-tidal CO<sub>2</sub> or ETCO<sub>2</sub>)
    - c. Arterial or venous blood gas analysis
- b. Thermoregulation
  1. Table probe
  2. Nasal, auricular or rectal probe
- c. Heart rate, pulse and ECG – in rodents rate and pulse characteristics can be assessed by visualization of vasculature; larger animals will have probes, clips or cuffs affixed.
- d. Respiratory rate - in rodents rate, depth and pattern characteristics are assessed via direct observation; large animals will be monitored via probes, clips or cuffs affixed.
- e. Blood pressure
  1. Invasive – via arterial catheter attached to transducer
  2. Non-invasive
    - a. Rodent = CODA Non-Invasive Blood Pressure (NIBP) System
    - b. Large animal = variety of cuff systems

- f. Physical monitoring
- g. Perfusion - capillary refill time
- h. Depth of anesthesia
  - 1. Jaw tone
  - 2. Palpebral or blink response
  - 3. Deep pinch/noxious stimuli

#### 10. Monitoring Specifics

- a. Data collection of parameters appropriate to the protocol will be taken a minimum of **every 15 minutes**. Any change made (e.g.: change in ventilation rate or volume, change in O<sub>2</sub> flow, change in isoflurane %, etc.) and why the change was made (e.g.: animal response to stimuli, animal is cyanotic, etc.) will be recorded on the surgical form.
- b. Observations will begin upon initial administration of pre-anesthetic drug, and entries will commence as soon as the animal loses consciousness. Parameters notated will be appropriate to the species.
- c. Please note that when working rodent patients it is often hard to assess and record entries as outlined above; often times the surgeon serves a dual role and is the primary anesthetist as well. Rodents are continually assessed throughout surgery by the surgeon via gross observation of respiratory and heart rates and patterns, perfusion of tissues, and response to noxious stimuli. In these cases, a general notation regarding the overall anesthetic episode is all that is needed in the surgical records.
- d. Notations will be made in such a way as to be legible and complete, additional records can/will be printed to ensure all notations are captured until final resolution of the case (i.e.: animal recovers from anesthesia or animal is euthanized).
- e. In an effort to facilitate tracking of significant changes to animal health, and increase positive anesthetic outcomes, notations related to the research aims should be kept to a minimum unless related to actual anesthetic monitoring efforts. Examples of a research aim entry related to anesthetic monitoring, and therefore included in the anesthetic record, might be administration of a drug/substance, or introduction of a device, that could cause an immediate physiological response.
- f. Technician anesthetists will remain in close physical proximity to the animal(s) assigned to their care and should maintain visual contact with their animal patient(s) throughout the procedure. If an anesthetist must leave the room, they must seek and receive acknowledgement from appropriate personnel that the request has been heard and that their duties will be covered in the interim; they may not leave the area without this assurance to ensure that a patient is not left unattended.

**Approved:**

**Date:**