

**University of Cincinnati  
Institutional Animal Care and Use Committee**

**Rodent Anesthesia Guidelines**

These guidelines provide general recommendations for anesthesia of laboratory rodents at the University of Cincinnati.

**Questions** or Schedule training- contact LAMS veterinary staff at 558-5171 or [LAMS@uc.edu](mailto:LAMS@uc.edu).

**Considerations when performing rodent anesthesia**

- **Acclimation period** - at least 48 hours for newly arrived use to minimize affects from shipping stress.
- **Age, strain, gender & body weight** – selection of anesthetic protocol to use.
- **Corneal drying and trauma** - for procedures lasting greater than 5 minutes or when using a facemask, an ophthalmic ointment (e.g., Paralube®) must be used.
- **Hypothermia** – significant effects on heart rate and blood pressure resulting in increased morbidity and/or mortality.
- **Hypoxia** – when oxygen is not delivered, all rodents develop varying degrees of significant effects on heart rate and blood pressure.

**Anesthetic delivery mechanisms**

- **Inhalation** – preferred method due to safety, anesthetic plane stability, and prevention of hypoxia.

**Isoflurane**

- Anesthetic agent of choice for both short and long procedures.
  - Rapid and reliable recovery.
  - Use of a precision vaporizer gas anesthesia machine with oxygen source to deliver anesthetic is recommended.
  - For induction, turn on vaporizer up to 4% (mice), 5% (rat), and turned down to 2% for maintenance. Oxygen flowmeter should be turned up to 1L/min.
  - Due to the small respiratory capacity in rodents, a non-rebreathing system should be used.
  - Drop box method discouraged - creates high concentrations of isoflurane in the chamber which causes:
    - 1) Extreme irritation of the nasal mucosa leading to discomfort and distress.
    - 2) Uncontrolled delivery and potential to reach toxic concentrations - increase risk for anesthetic death.
    - 3) Human health hazard - use of a fume hood or an anesthetic system equipped with a gas scavenging system should be used.
  - Anesthesia chambers and facemasks are available from LAMS by service request.
- **Injectable** – Intraperitoneal is the most common and preferred route.
    - Other routes include subcutaneous, intramuscular (rats only), and intravenous (catheter placement required).

- **Combination of inhalation and injectable anesthetics can be used**

**Preemptive Analgesia** - prevention of pain before the actual pain insult occurs.

- Lowers the amount of general anesthetic needed to maintain a surgical plane of anesthesia.
- Helps prevent the development of 'wind up' – painful response to a non-painful stimulus.
- **Common preemptive analgesic classes**
  - Opioids (Buprenorphine)
  - Non-steroidal anti-inflammatory drugs (Meloxicam)
  - Local anesthetics-Most common - Lidocaine and bupivacaine
    - 1) Can be diluted in sterile saline to increase volume of injection.
    - 2) Due to potential cardiovascular effects (e.g., hypotension, dysrhythmias) and/or CNS depression, each animal should be weighed and the maximum safe dosage calculated.

### **Neonatal Rodent Anesthesia**

- Neonatal rodent - mouse or rat < 10 days of age.
- **Anesthetic methods** – inhalation, physical, and parenteral.
  - **Physical – Hypothermia (ONLY for neonates < 6 days of age and short procedures [30 minutes or less])**
    - 1) Proposed mechanism of action - decreases neural conduction and synaptic transmission.
    - 2) May be painful so avoid direct contact with cooling agent.
    - 3) Procedure
      - a) Place neonates on a latex covered bed of crushed ice/ice water OR in a cut off finger of a latex glove placed in ice water (animal's head must be held above water to prevent aspiration and death).
      - b) Monitor for loss of pedal reflex (no response to toe pinch).
      - c) Remove from ice bath and maintain on a chilled cold pack or bed of ice.
      - d) Following anesthesia, re-warm slowly (rapid warming can cause tissue damage) using either Circulating water heating pad (40 °C) or Incubator (33 °C)
      - e) Return to dam when able to crawl.
  - **Inhalation**
    - 1) Safe and effective.
    - 2) Induction time may be longer.
  - **Parenteral** – not recommended
    - 1) Increased sensitivity to most injectable anesthetic agents.
    - 2) Associated with a high anesthetic mortality.
- **Parental Cannibalism**
  - Common problem with neonatal rodent anesthesia.
  - To minimize:
    - 1) Ensure neonate is fully recovered before returning to the dam.
    - 2) Transfer scent of dirty bedding to neonate by gently rubbing/rolling neonate with soiled bedding from the mother's cage.

- 3) Place neonate back in the middle of the litter.
- Following any procedure where neonate is removed from dam – ensure neonate nurses within 2 hours. If not, then contact LAMS veterinary staff for immediate assistance.

### **Anesthesia Monitoring and Recovery**

- **Parameters to be monitored while under anesthesia**
  - Respiratory rate and pattern
    - 1) Normal undisturbed awake animal respiratory rate
      - a) Mice – 180 breaths/min
      - b) Rats - 70-110 breaths/min
      - c) During anesthesia - a slow rate drop of 50% is acceptable.
    - 2) Mucous membrane color - pink (not blue or grey).
    - 3) Assessment of respiratory rate - movement of chest wall and observation of abdominal movements.
  - Response to stimuli
    - 1) Loss of pedal withdrawal reflex
    - 2) Loss of eye blink reflex
    - 3) Lack of response to a surgical stimulus (e.g., incision)
  - Muscle relaxation
- **Depth of Anesthesia**
  - If too deep
    - 1) Injectable anesthetics
      - a) Appropriate Reversal agent (see references) can be used
      - b) Supplemental oxygen via facemask or nose cone
    - 2) Inhalation anesthesia
      - a) Turn of isoflurane vaporizer (leave oxygen on) until condition improves; then turn vaporizer back on.
    - 3) Ensure normal body temperature
- **Prevention of hypothermia**
  - Use of a recirculating warm water blanket or isothermal heat source.
    - 1) Place towel or sterile drape between animal and heat source.
    - 2) Electric heating pads discouraged.
      - a) Uneven heating.
      - b) Increased risk of thermal injury.
  - Cover animal with sterile drape or gauze helps to conserve body heat.
  - Additional methods
    - 1) Administration of warmed sterile 0.9% sodium chloride or lactated ringers
      - a) Subcutaneous or intraperitoneal
      - b) 5-10 ml/kg/hr
- **Recovery**
  - Recover in a separate clean cage without bedding (use sterile paper towel).
  - Continually monitor until sternal.
  - Do not place back in home cage with other animals until fully ambulatory.
  - If needed, provide food and fluid supplements on cage floor.

## Recommended Anesthetics in Rodents-see RAP anesthesia standard procedure for recommendations and dosage

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