

University of Louisville
Institutional Animal Care and Use Committee
Policies and Procedures

Rodent Anesthesia

Policy: All anesthetics must be administered as described and approved in the associated IACUC *Proposal*. While under anesthesia, rodents must be appropriately monitored during and after anesthesia until fully recovered. Anesthetic dosing and monitoring must be documented as outlined below unless specific exceptions are approved in the IACUC *Proposal*. Anesthetic records must be retained and available for review for 3 years following the procedure/anesthetic event or 3 years following the expiration of the IACUC *Proposal* and available for review by the IACUC, CMRU veterinary faculty, and external regulatory agencies. For researchers' convenience, the IACUC provides sample anesthetic monitoring records that can be modified as necessary. Research personnel administering anesthesia must be appropriately trained and qualified and be able to properly assess anesthetic depth and the animal's overall condition. Training for individuals providing anesthesia to rodents may be requested through the IACUC office.

Rationale: Rodents undergo anesthesia for a variety of experimental or maintenance purposes. Appropriate anesthetics and the depth of anesthesia are vital to both animal health & welfare and the integrity of experimental data. The *Guide for the Care and Use of Laboratory Animals* states that clinical records for rodents are valuable and that "medical records are a key element of the veterinary care program and are considered critical for documenting animal well-being as well as tracking animal care and use at a facility" (p. 115).

Procedures, Guidelines, and Exceptions:

1. **Anesthetic depth:** Animals undergoing surgery or other painful procedures must be maintained in a plane of anesthesia that renders the animal insensitive to pain throughout the procedure. Animals undergoing other, non-painful procedures may need to be in a similar plane of anesthesia to eliminate movement of the animal. Response to touch, tail flick, and toe/interdigital space pinch are tests which can be used to elicit responses in animals which are not fully anesthetized. Appropriate depth of anesthesia must be ascertained prior to skin incision or potentially painful stimuli and throughout the surgical procedure or anesthetic episode and monitored at intervals no greater than 15 minutes. Heart and respiration rates provide other indications of appropriate anesthetic effectiveness. Such reflexes should be closely monitored during surgery.
2. **Vital signs:** In addition to anesthetic depth, vital signs such as heart rate, respiratory rate, mucous membrane color, blood pressure, and temperature are indicative of appropriate anesthesia. Respiratory rate should be consistent throughout the anesthetic event and indicates adequate ventilation. Heart rate should be consistent throughout anesthetic events, and particularly during surgery may indicate inadequate anesthetic depth. If an animal is in too deep of a plane of anesthesia, a decrease in heart rate may be noted. If an animal is in too light of a plane of anesthesia, an increased heart rate may be noted. Mucous membrane color should be pink and is indicative of adequate perfusion of tissue. Blood pressure and pulse oximetry are also useful indicators of adequate tissue perfusion. Temperature is a critical factor involved in normal

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physiologic maintenance and can be measured directly or indirectly. Monitoring of other vital signs may be more or less appropriate for certain procedures.

3. Anesthetic agents: The use of the proper anesthetic agents for the species and the study goals is vital. A number of guides, texts, and references are available and should be used in selecting the appropriate products (*see: **Recommended Rodent Anesthetics and Analgesics***). CMRU veterinary staff should be consulted with additional questions regarding special formulations and use of anesthetic agents and reversal agents. Review the IACUC policy, “Use of Pharmaceutical-Grade Medications and Outdated Drug Supplies,” regarding the use of pharmaceutical-grade medications and expired medical materials. All anesthetic agents administered must be documented. If an animal responds to a painful stimulus (withdrawal reflex or surgical manipulation) or if vital signs suggest that anesthetic depth is inadequate (e.g., increased respiratory or heart rate), additional anesthesia must be provided and documented. For injectable agents, this is often accomplished with an additional dose of ¼ to ½ of the initial dose (note: for ketamine admixtures, redosing of 1/4 of the original admixture, such as ketamine & xylazine, or 1/2 of the dose of ketamine alone is recommended). These additional dosage options should also be described within the IACUC proposal.
4. Thermal support: Normal body temperature must be maintained during anesthesia or surgery. Due to a large surface area-to-body mass ratio, rodents are highly susceptible to hypothermia. A thermostatically-controlled pad employing circulating water or heated air is preferred. Electric heating pads, chemical warming packs, or lamps are not recommended as they can cause thermal burns, including skin necrosis. If used, special care must be taken to avoid overheating the anesthetized animal. This includes use of rectal probes as well as monitoring ambient air temperature at the level of the animal. Rodents should not be in direct contact with the heating source (e.g., a towel or other barrier should be between the animal and the heat source). Body temperature should not exceed 102°F in rodents. Methods to prevent hypothermia include: shave the minimum feasible area, rinse disinfectant from the skin with warm sterile water rather than alcohol, insulate the animal from cold surfaces, provide supplemental heat, and/or provide warm fluids as outlined in the proposal.
5. Eye lubricant: Eye lubricant is required when rodents are anesthetized, as anesthesia may render the animal unable to blink which may lead to rapid corneal desiccation. Sterile ophthalmic lubricant/ointment must be applied to each eye at the beginning of the anesthetic event. Lubricating eye drops provide only brief corneal protection. Thus, ointments are more appropriate for anesthesia lasting longer than a few minutes.
1. Brief/momentary anesthesia: Some procedures or anesthetic events are very brief (e.g., isoflurane anesthesia for dosing, genotyping, or blood collection). Such events may not necessitate all of the requirements listed in this policy (e.g., thermal support). The monitoring and support provided during these brief anesthetic events should be described in the IACUC *Proposal* as part of the anesthesia monitoring description so that the IACUC can determine if it is adequate.
6. Anesthetic Recovery: Animals must be closely observed while recovering from anesthesia and recovery should occur in a warm cage. Recovery is generally defined as the ability to ambulate and/or maintain normal posture. Following recovery, animals may be returned to regular housing.

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7. Required Documentation: All rodents that are anesthetized require anesthesia record documentation. At a minimum, all anesthetic records must include:

- Animal identification (including species and weight where appropriate), the date of the procedure, the IACUC *Proposal* number, the Project Director's name, and the name of the anesthetist.
- The time that anesthesia started and ended.
- Evidence of monitoring of anesthetic depth and vital signs no less frequently than every 15 minutes while rodents are anesthetized (induction through recovery).
- Evidence that appropriate anesthetic depth (e.g., lack of toe-pinch withdrawal) was assured prior to surgery or potentially painful procedures.
- If abnormal anesthetic depth or vital signs are noted they must be documented along with the proper response to correct the depth to an appropriate level.
- *All* anesthetics & analgesics administered must be recorded, including agent name, dose and route.
- Evidence of monitoring animals until they are fully recovered should be documented.
- Notations of any variations from the normal and expected events during the anesthetic event and recovery period, including any actions taken and time performed (such as administering additional anesthetics), the animal's response, and the name or initials of the person monitoring the animal.
- All anesthetic records must be retained and available for review for 3 years following the procedure/anesthetic event or 3 years following the expiration of the IACUC proposal.

Example anesthesia records are available on the IACUC website. Documentation of anesthetic monitoring during surgical procedures can be noted **immediately** postoperatively to avoid breaks in aseptic technique. Note: review the "Performing Rodent Survival Surgery" IACUC policy for further information on survival surgery recordkeeping requirements.

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