

UBC ANIMAL CARE COMMITTEE

Guidelines on Anesthesia of Rodents

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1. PURPOSE:

The purpose of this guideline is to accompany the UBC Animal Care Committee (ACC) Policy 025 on Anesthesia of Rodents to ensure the best possible care and welfare of animals undergoing anesthesia.

2. SCOPE:

This guideline applies to all rodents undergoing anesthesia in University of British Columbia (UBC) animal facilities, and facilities at affiliated research institutes, centres and hospitals that fall under the review of University of British Columbia's Animal Care Committee ("UBC animal facilities").

3. ANESTHETIC REGIMEN

For all procedures, an appropriate anesthetic regimen must be approved by the UBC ACC prior to the commencement of the study. This may be as simple as following the UBC ACC SOP on anesthesia, or developing a new plan altogether in consultation with a UBC Clinical Veterinarian. This regimen will depend upon the complexity of the procedure, research goals, whether the procedure(s) have been done before, if it is recovery or non-recovery, and the age and species of rodent.

4. DEFINITIONS

Anesthetic management: the processes and events during a period of anesthesia that will result in freedom from pain during the procedure and a return to a normal physiological state as soon as possible .

Recovery procedure: Procedures where the animal is placed under general anesthetic before the start of the procedure, and is recovered back to a state of consciousness.

Non-recovery procedures: Procedures where the animal is placed under general anesthetic before the start of the procedure, and is humanely killed without ever regaining consciousness.

5. ANESTHETIC USE IN ANIMAL SPACES

Procedures involving anesthesia must be performed in appropriate spaces. These may be rooms within the facility designated for procedures (e.g. procedural or surgical rooms), or areas outside of the facility that have been reviewed and approved by the UBC ACC.

These spaces must have appropriate areas for anesthetic preparation, use and recovery. They must ensure adequate scavenging of waste gases and ventilation for human safety.

6. RECORDS:

A written record of the anesthetic details must be maintained for each animal regardless of procedure type. The anesthetic record provides a detailed account of the course of anesthesia and procedural events. This record includes the type of anesthesia, dosage and route.

For minor procedures this can be recorded at cage level. For major procedures this may be standalone, but is generally incorporated into the overall monitoring record of the animal (see UBC ACC Policy 017).

7. RECOVERY PROCEDURES:

Recovery procedures may be minor (e.g. ear notching, injection, tattooing) or major (e.g. single or repeat/multiple surgeries). The following procedures are a general outline of the requirements for pre-, intra-, and post-anesthesia regardless of procedural severity. Please refer to ACC Policy 016 (Survival Surgery in Rodents), and the ACC SOPs on Anesthesia and Surgery for more detailed procedures.

Pre-anesthetic fasting is usually not necessary for rodents due to their inability to vomit. However, if fasting is employed, limit it to no more than two to three hours due to the high metabolic rate of small rodents. Water should never be restricted unless scientifically described and justified in the approved UBC ACC protocol.

Induction:

1. Insulating materials or warming devices should be placed between the animal and the surgery/procedural table to ensure body heat is not lost during the procedure. Circulating warm water heating pads or warm water bottles should ideally be used, since electric heating pads

may result in burns. The heat source should be validated prior to use to ensure there are no hot spots that could result in burns.

2. If heating pads are used, the animals should not be in direct contact with the pad – instead they should be separated by an insulating material (e.g. paper towel).
3. When heat lamps are used, avoid placing the animal in the direct beam. If possible, reflect the heat lamp off of a metal surface and place the animal in the reflected beam.
4. Hypothermia is the most common cause of post-procedural/surgical mortality.

Intra-procedural:

5. Prevent heat loss during the procedure/surgery by placing an insulating material underneath the animal (to minimize heat loss by conduction).
6. A non-rebreathing circuit is required for rodents which are under anesthesia via a nose cone.
7. For procedures longer than 10 minutes, confirm plane of anesthesia every 10 minutes (or more frequently) throughout procedure and adjust anesthesia as necessary. The animal must be fully anesthetized and exhibit no toe pinch or other applicable reflexes prior to and throughout the procedure.
8. Animals must receive supplemental care prior to, throughout, and after the anesthetic session. For minor procedures, lasting less than 5 minutes, supportive care may not be required. For major procedures, supportive care includes, but is not limited to:
 - a. Eye lubrication to protect their corneas – this should be applied for procedures lasting more than 5 minutes or where anesthesia is being delivered by facemask, as mouse eyes remain open under anesthesia. This can lead to corneal drying and trauma.
 - i. To avoid contamination of the lubricant, do not touch the tip of the tube to the skin or eye surface.
 - ii. After application, the eyelids should be gently opposed to ensure the cornea is adequately coated in lubrication.
 - iii. A jelly-like eye lubrication is preferred over a liquid one to ensure it coats the corneas (e.g. Lacri-lube).
 - b. Analgesia (where applicable)
 - i. Refer to Rodent Anesthesia and Analgesia Formulary and General Drug Information (2016) for more information.

Recovery:

9. Rodents must be recovered from anesthesia in a quiet area away from the anesthetic area and closely monitored as needed, until fully recovered.
10. The post-procedural period consists of 3 overlapping phases: anesthetic recovery, acute and long-term post-procedural care. Recovery from anesthesia is the critical time because it is a period of physiologic disturbance during which crises can arise. Frequent observation and monitoring is required.

11. Body temperature needs to be maintained. Post-procedural care should include an external heat source while the rodents recover from anesthesia. Heat lamps or supplemental heat are often used.
12. Rodents must be individually caged during recovery to prevent injury and allow for appropriate post-anesthetic monitoring.
13. Rodents should not be returned to group cages until each and every individual in the cage has regained normal mobility and alertness.
14. Rodents who are still anesthetized must not be placed directly on to bedding. They should be placed into a clean cage lined with a clean absorbable substrate (e.g. paper towel or surgical towel)
 - a. Placing them onto bedding poses several risks, including asphyxiation due to inhalation of bedding pieces, and damage to the corneas until the return of the blink response.

8. NON-RECOVERY PROCEDURES:

Animals that are anesthetized for non-recovery procedures (except euthanasia, see below) must also be induced, maintained and monitored as described above while they are anesthetized. Instead of recovery, these animals would then be euthanized following the procedures as outlined in the ACC Policy 18 on Euthanasia.

9. EUTHANASIA:

Animals euthanized using anesthesia followed by a secondary method, where euthanasia is the only procedure performed, fall under ACC Policy 018. A record of the method of final disposition should be recorded.

10. REFERENCES:

Regulatory:

- Guide to the Care and Use of Experimental Animals, Canadian Council on Animal Care, Vol. 1, 2nd Ed., 2017.
- Guide to the Care and Use of Experimental Animals, Volume 2 (1984), Species specific chapters.
- UBC ACC Policies (<https://animalcare.ubc.ca/animal-care-committee/policies-and-guidelines>)
 - UBC ACC Policy 017 Monitoring of Animals Used for Research, Teaching & Testing
 - UBC ACC Policy 016 Survival Surgery of Rodents
 - UBC ACC Policy 018 Rodent Euthanasia
- UBC SOPs & Guidelines (<https://animalcare.ubc.ca/planning-your-research/sops-guidelines>)
 - SOP ACC-01-2017 Rodent Anesthesia

- SOP ACC-03-2012 Euthanasia of Adult Rodents using Inhalant Anesthetic, followed by Carbon Dioxide
- Rodent Anesthesia and Analgesia Formulary and General Drug Information (2016)