



## **Guidelines for Ferret Inhalant Anesthesia for Brief, Non-Painful Procedures**

The expectation is that IACUC Guidelines will be followed as best practice. They allow the Animal Care & Use Program to attain acceptable performance outcomes to meet the intent of the regulations. As such, any planned variation from the guidelines requires prior IACUC approval and must be based on a scientific rationale.

Isoflurane, a halogenated anesthetic gas, is commonly used to anesthetize research animals, including ferrets. Please refer to the IACUC Guidelines on the Use of Isoflurane for safety and best practices information.

NOTE: These guidelines are for brief use of inhalant anesthetics to induce a light plane of anesthesia when performing non-painful procedures such as blood collection, injections, and nasal washes. Deeper anesthesia for longer, and/or painful procedures requires additional steps, such as fasting, and should be planned in consultation with the University Research Animal Resources (URAR) veterinarians. These guidelines also apply to healthy, adult ferrets. Special considerations apply for unhealthy and/or young and geriatric ferrets. Please contact the URAR veterinarians with questions, concerns, or for consultation.

### **I. Training and Proficiency Requirements**

All individuals involved with performing inhalant anesthesia with ferrets are required to review this document, participate in a training session with the University Research Animal Resources veterinary staff or designated trainer, and demonstrate proficiency prior to performing inhalant anesthesia of ferrets. Training and proficiency determination will be documented.

### **II. Anesthesia Procedure**

The number of animals that may be safely anesthetized and monitored to full recovery at one time will be dependent on the number of individuals available to assist and their training and proficiency. For less experienced individuals, anesthetizing animals one at a time is typically safer than anesthetizing two ferrets simultaneously, as full attention can be paid to a single animal. Well-experienced research personnel have found that ferrets are calmer, experience a smoother induction, and derive thermal support from each when anesthetized in pairs in the induction chamber. When anesthetizing any number of ferrets for study purposes, the guidelines below must be adhered to in order to ensure an adequate level of anesthesia and animal safety. All steps below must be completed each time an animal undergoes anesthesia.

1. Leak-check the anesthetic circuit using oxygen (not isoflurane) to ensure it is functioning properly and anesthetic gas is not being released into the procedure room.

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2. Ensure adequate amounts of oxygen and isoflurane are available in the tank and vaporizer, respectively.
3. Weigh passive charcoal waste anesthetic gas (WAG) scavenging canisters, if used, to ensure they are adequate for use. If more than 50 or 100 grams over baseline weight (depending on product – see label for guidance), discard and replace with new canister before anesthesia.
4. Place the ferret(s) into an anesthetic induction chamber(s) as described in introductory paragraph above. If simultaneously anesthetizing two animals, at least one well-experienced individual **must** be present.
5. Turn oxygen on (1 L/min if a setting is available) and isoflurane to 5%. Note: This may induce excitement and struggling as the inhalant anesthetic accumulates in the chamber.
6. Each animal should be monitored and the anesthesia adjusted accordingly. Monitoring during the induction phase should include spontaneous movements and respiratory rate. As the ferret's depth of anesthesia deepens, it will stop moving around the chamber. At this time, reduce isoflurane to ~3% or the lowest possible % needed to maintain anesthesia. It should take no more than 5 minutes at 5% for the animal to achieve a sufficient level of anesthesia for handling.
7. While animal #1 undergoes a procedure, animal #2 may be maintained at ~3% or the lowest possible % in the chamber as long as within direct view. Respiratory rate should be monitored during this time and should be maintained above 10 breaths/minute. If the respiratory rate goes below this limit, decrease the isoflurane further to the lowest possible % necessary to maintain anesthesia.
8. Prior to opening the chamber containing animal #1, turn off the isoflurane and flush the chamber with oxygen for at least 5 seconds to avoid releasing isoflurane into the room.
9. Once the chamber has been flushed, open chamber, remove animal #1, close and seal the chamber to minimize the release of inhalant into the procedure room.
10. Place animal #1 on a nose cone. Turn oxygen on (1 L/min if a setting is available) and isoflurane to ~3%, or the lowest possible % to maintain anesthesia.
11. Complete necessary procedures.
12. Turn off the isoflurane prior to removing the nose cone.
13. If additional procedures are to be completed prior to recovery, they should be done immediately as recovery from inhalant anesthesia is rapid.
14. Place the animal in the recovery cage when procedures are complete.
15. Repeat steps 8-14 with animal #2 while monitoring animal #1 during recovery.

### **III. Monitoring**

**Pre-Anesthesia Assessment:** Ensure animal appears healthy for anesthesia.

**Anesthesia Monitoring:** Animals must be monitored for the duration of the anesthetic period through recovery. This includes animals undergoing a procedure as well as those in the anesthesia chamber awaiting the procedure. At a minimum, animals shall be continually monitored for appropriate respiratory rate (i.e., breaths/minute) in the induction chamber, respiratory rate, heart rate (beats/minute), and character (e.g., depth, inspiratory/expiratory effort, muscle tone, eye position). Additional monitoring must be performed as outlined in the AUP.

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Other parameters that may be monitored include:

- Capillary refill time
- Mucous membrane color
- Anesthetic depth: toe pinch (i.e., withdrawal reflex), palpebral reflex

**Post-Procedural Monitoring & Recovery:** In addition to the above parameters, animals must be monitored for an appropriate recovery. If the animal is not recovering from anesthesia, please contact a URAR veterinarian for assessment and assistance. While waiting for assistance, keep the animal warm, extend the neck to maintain an open airway, and provide 100% oxygen through nose cone (make sure isoflurane is off). The animal must be monitored until fully recovered, as indicated by the ability to maintain sternal recumbency, respond to touch, and move around the cage.

### Normal Values for Reference

Parameter	Value
Heart Rate (awake)	200 – 400 beats / min
Heart Rate (anesthetized)	180 – 250 beats / min
Respiratory Rate	30 – 40 breaths / min
Temperature	100 – 104 F

## IV. References

Laboratory Animal Medicine: Third Edition.

Anesthesia & Analgesia in Laboratory Animals: Second Edition. Chapter 16 – Anesthesia and Analgesia in Ferrets.