

University of Pennsylvania-Radiology
Small Animal Imaging Facility
Standard Operating Procedure

Title: Safe Use of Inhaled Isoflurane Gas

SOP Number: 2.04

Revision Number: 7

Effective Date: October 10, 2023

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Review Date: October 05, 2023

Approval: Ching-Hui Huang, PhD Technical Director, Optical Imaging Core

- I. Purpose:** The purpose of this policy is to delineate the safe use of inhaled Isoflurane gas during the imaging studies at the Small Animal Imaging Facility (SAIF).
- II. Responsibilities and Scope:** All researchers who are involved in animal imaging studies at the SAIF are responsible for reading and following this SOP. The gas waste must be collected properly for the researchers' protection. The following recommendations outline the safe administration of Isoflurane anesthesia to small rodents.
- III. Definitions:**
None
- IV. Procedures:**
 - A. Preparation:** Prior to using Isoflurane, it is advisable to check the functionality of the oxygen concentrator. The Isoflurane levels in each of the vaporizers should also be checked prior to beginning the study.
 - B. Scavenging:** All protocols employing Isoflurane must employ some form of scavenging. The facility provides F/air canisters for this purpose. Prior to beginning the study, the scavenging canister to be used should be weighed. If the current weight is more than 50g over the original weight (all canisters are labeled with their initial weight upon delivery), it should be thrown in the trash and a new canister should be used. If the weight is below this threshold, the weight and date should be noted on the canister.
 - C. Induction:** Anesthesia may be induced initially using injectable anesthetics (refer to "PENN-IACUC-Guidelines for Anesthesia and Analgesia Formulary for Mice and Rats) or Isoflurane.

Those protocols using Isoflurane should utilize the induction chamber provided for this purpose. Since Isoflurane is extremely potent and fast acting (due to its high volatility and low tissue solubility with highly calibrated precision vaporizers), it is essential that the animals be closely observed by the researchers while induction of anesthesia occurs, to allow for appropriate removal of the animals following induction to prevent over-anesthetization and death. Begin by attaching the anesthesia supply and return lines to the chamber using the appropriate fittings. Fittings such as tape is not an appropriate fitting. The scavenger canister should then be attached to the return line. The animal is then placed in the induction chamber and the gas turned on at 2-3% with a flow rate of 0.8-1.0 liter/min.

- D. “Nose cones”: Only nose cones providing both supply and return lines may be used in the imaging facility. The nose cone must be designed such that all excess gas flows out the return line. As such it must fit snugly around the snout of the animal. The return line should be of a diameter which allows for free return of excess anesthesia. Vacuum should be applied to the return line if available.
- E. Animal Mounting: Once the animal is under, the gas supply to the induction chamber should be turned off. The supply and return lines should be moved to the nose cone. The animal should then be removed from the induction chamber and mounted with the nose cone. The gas flow should be restored when the animal is fully mounted with the nose cone. Once under, Isoflurane levels of 1.52 % at a flow rate of 0.4-0.8 liter/min is an appropriate level of anesthesia for rats and mice. Larger flow rates may be necessary for larger animals.
- F. Cleanup: At the conclusion of your study, all surfaces that came into contact with the animal should be wiped down with Clidox® solution and followed with Ethanol, including the induction chamber and nose cone. All equipment must then be returned to its proper storage location.

V. **Directions:** None

VI. **Safety Considerations:**

Caution: Isoflurane has been demonstrated as a reproductive and mutagenic hazard potential. For chamber induction and “nose cone” maintenance of rodents with Isoflurane, all procedures must be undertaken either with an active scavenging device on a down draft table or in a chemical safety hood.

VII. **References:**

- A. Penn-ULAR-SOP 10.30 Operating Instructions for Precision Vaporizer Use in Administering Volatile Anesthesia to Rodents

VIII. **Attachments:**

None

IX. Revision History:

| Version Number | Effective Date | Author | Reason |
|-----------------------|-----------------------|--------------------|---------------|
| 1 | August 11, 2005 | S. Pickup & I. Lee | New |
| 2 | September 8, 2005 | I. Lee | Revised |
| 3 | November 10, 2005 | I. Lee | Revised |
| 4 | December 12, 2014 | E. Browning | Revised |
| 5 | March 24, 2022 | C. Huang | Revised |
| 6 | November 18,2022 | C-H Huang | Revised |