



**Cornell University**  
**Cornell Center for Animal Resources and Education**

**CARE712.01 Waste Anesthetic Gas Scavenging Systems**

The intent of this standard operating procedure (SOP) is to describe waste anesthetic gas scavenging systems and safety precautions. This SOP is intended for use by CARE staff, and all investigators and staff that perform, or assist with, procedures utilizing gas anesthetics. This SOP is approved by the Cornell Institutional Animal Care and Use Committee (IACUC) and the Cornell Center for Animal Resources and Education (CARE). Any exemption must be approved by the IACUC prior to its application.

**TABLE OF CONTENTS**

1. Introduction
2. Materials
3. Procedures
4. Safety
5. Contingencies
6. References

---

**1. Introduction**

- a. Ensure that all individuals responsible for anesthesia are properly trained. Training records are maintained by the CARE training coordinator, and are provided upon request.
- b. All personnel must adhere to IACUC approved protocols and institutional policies.
- c. Maintain equipment in good working order, and have it inspected/certified yearly to ensure optimal performance. Equipment certification records must be maintained and provided upon request from the facility manager.

**2. Materials**

- Activated charcoal canister (i.e. F/Air canister) and canister holder,
- Fume hood,
- Hard-ducted biosafety cabinet,
- or, Room exhaust (if not re-circulated).
- Sealable plastic bags (i.e. Ziploc bags).

### 3. Procedures

- a. To eliminate waste anesthetic gases (WAGS) from the work area and minimize exposure of personnel, follow these guidelines.
  - i. Work in a well-ventilated area (10–15 air changes/hour), ideally under a fume hood or a hard-ducted biosafety cabinet.
  - ii. Maintain a reasonable distance between the source of the gas and yourself, as the gas concentration decreases rapidly.
  - iii. Ensure a tight seal around the animal's face when using an anesthetic mask.
  - iv. Clean the induction chambers with soap and water immediately after each use to avoid residual anesthetic waste release into the environment. WAGS can continue to be released for up to 3 hours.
  - v. Use an appropriate scavenging option (see Section 3b).
  - vi. The facility manager or CARE technician ensures that the anesthetic equipment is certified once a year to deliver the right concentration of anesthetic, and to ensure absence of leaks.
- b. Scavenging system options
  - i. Canalize the exhaust from the anesthetic circuit to a fume hood, a hard-ducted biosafety cabinet or to the room exhaust if it is evacuated directly outside the building without recirculation. Ensure a minimum room ventilation air exchange is maintained (10–15 air changes per hour). Contact Environmental Health and Safety (EH&S) to conduct exposure monitoring when dilution ventilation is utilized instead of local capture exhaust ventilation.
  - ii. Perform procedures under a certified fume hood when using an induction chamber to capture the gas escaping the chamber when the lid is opened.
  - iii. Activated charcoal canisters (i.e. F/Air canisters)

**Note:** Activated charcoal canisters (i.e. F/Air canisters) only absorb halogenated anesthetics (e.g., isoflurane, halothane).

- Remove the activated charcoal canister from the anesthesia machine.
- Weigh the canister and record the date and weight on the canister in the space provided.
- Shake canister briefly to evenly redistribute contents.
- Reattached canister to the machine. Place the canister in a holder so as to maintain a vertical orientation and proper exhaust ventilation.

**Note:** Do not to occlude the canister vent holes.

- Proceed with anesthesia.
- Record the amount of time in use beside the dated, weight record immediately after use.
- Discard canister after either:
  - i. 12 hours of use,

- ii. or 50 gram increase in weight.
- To discard, seal canister inside a plastic bag (i.e. Ziploc bag) and place in the regular trash.

**Important:** Passive systems that vent gases to the floor level and rely on inhalant anesthetic gases being heavier than air are prohibited.

c. Monitoring

- i. Measure human exposure to WAGS whenever:
  - an induction chamber is used indoors but without the use of a certified fume hood or a hard-ducted biosafety cabinet.

**Note:** the exhaust of the induction chamber must always be scavenged adequately (see Section 3b), and the chamber must be used in a well-ventilated area.

- Anesthetic gas can be smelled.
- People are complaining of fatigue or headaches when using the anesthetic equipment.
- ii. Monitoring is conducted by Environmental Health and Safety.

#### 4. Safety

For some gases the exposure limit is exceeded once you can smell the gas. Be sure to check the odor threshold on the MSDS. If the odor threshold exceeds the OSHA guidelines contact EH&S to conduct monitoring.

#### 5. Contingencies

- a. Contact CARE to schedule annual inspection/certification of anesthetic equipment.
- b. Contact EH&S for questions concerning waste anesthetic gas monitoring.

#### 6. References

- a. Smith, J.C. and Bolon, B. Atmospheric Waste Isoflurane Concentrations Using Conventional Equipment, Rat Anesthesia Protocols. *Contemporary Topics*, **41 (2)**, 2002.
- b. *NIOSH Guidelines for Protecting the Safety and Health of Healthcare Workers*; NIOSH Pub. No. 88-119; U.S. Dept. of Health and Human Services, U.S. Government Printing Office: Washington, DC, 1988. <http://www.cdc.gov/niosh/docs/88-119/health.html> (accessed Aug. 2009)
- c. *Waste Anesthetic Gases - Occupational Hazards in Hospitals*; NIOSH Pub. No. 2007-151; U.S. Dept. of Health and Human Services, U.S. Government Printing Office: Washington, DC, 2007. <http://www.cdc.gov/niosh/docs/2007-151/> (accessed Aug. 2009)

- d. Anesthetic Gases: Guidelines for Workplace Exposures. OSHA Directorate for Technical Support. Office of Science and Technical Assessment. July 20, 1999 [Revised May 18, 2000].  
<http://www.osha.gov/dts/osta/anestheticgases/index.html> (accessed Aug. 2009)
- e. University of Florida, Animal Care Services Newsletter. Vol. 2, Issue 4. August 2002.  
<http://acs.ufl.edu/news/Newsletter%2008-02.pdf> (accessed Aug. 2009).
- f. Duke University & Duke University Medical Center Animal Care & Use Program Policy. General Inhalational Anesthesia Machine/Vaporizer/Waste Gas Maintenance and Calibration.  
[http://vetmed.duhs.duke.edu/documents/iacuc/pdf/policy\\_on\\_vaporizer\\_calibration\\_&\\_maintenance.pdf](http://vetmed.duhs.duke.edu/documents/iacuc/pdf/policy_on_vaporizer_calibration_&_maintenance.pdf)(accessed Aug. 2009).
- g. Molecular Imaging Products Co., Principles of the Anesthetic Machine.  
[http://anesthesiatechnologies.com/princ\\_anesthesia.pdf](http://anesthesiatechnologies.com/princ_anesthesia.pdf) (accessed Aug. 2009).

---

Written by/date :  
Brenda Collins  
August 6, 2003

Effective date :  
Oct. 2005

Review date :  
August 2009

Referee:  
F. Cantone

SOP :  
CARE712.01