

Animal Care and Use Program Policy



Inhalant Anesthesia Machine/Vaporizer Maintenance and Waste Anesthetic Gas Management

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BACKGROUND

Proper functioning of inhalant anesthetic equipment helps ensure the health and well-being of animals used for research, teaching, and testing during procedures at Oregon Health & Science University. Proper removal of waste anesthetic gas (WAG) is necessary for a safe working environment. This policy provides guidance regarding inhalant anesthetic machine/vaporizer use and maintenance, as well as proper waste anesthetic gas management.

SCOPE

This policy applies to all procedures in which animals are placed under general inhalational anesthesia.

DEFINITIONS

Inhalant anesthesia – anesthetic agent, usually a halogenated ether, that is delivered as a gas via inhalation.

Vaporizer – device that volatilizes an inhalant anesthetic agent from its liquid state to its gaseous state with the aid of a carrier gas, often oxygen or room air. Vaporizers may be non-precision, which produces a relative concentration of anesthetic agent, or precision, which produces a determined concentration of anesthetic agent.

Anesthetic machine – Device that includes carrier gas regulator +/- source, vaporizer, delivery tubing, waste gas tubing, +/- induction chamber, face mask, and activated charcoal canister which delivers inhalant anesthesia to the animal.

Service – inspection, functional testing, and cleaning of an anesthetic machine and/or vaporizer.

Calibration – Evaluation and/or adjustment of a vaporizer to ensure accurate anesthetic delivery.

POLICY

- I. Maintenance
 - A. Anesthesia machines must be maintained in good working condition to ensure optimal agent delivery in a safe manner.
 - B. Each piece of equipment involved in the delivery of inhalant anesthetics and removal of waste gases must be evaluated regularly to ensure its proper function and integrity. Tubing, hoses, rubber items, and seals require periodic replacement..
 - C. Anesthetic vaporizers must be serviced at least once a year or at an interval in accordance with manufacturer's recommendations. More frequent servicing intervals may be necessary for heavily utilized anesthetic machines and vaporizers.
 - D. It is the responsibility of the owner of the equipment (Principal Investigator (PI), department, or DCM) to contact an authorized service vendor, pay for the service, and to maintain service records and certification for all anesthesia equipment owned.
- II. Operation
 - A. The owner is responsible for ensuring that personnel are trained in the proper use of

anesthetic machines and vaporizers prior to operation, and ensuring safe handling of the animals and the anesthetic agent.

- B.** Personal Protective Equipment (PPE) required for normal activity in the animal room or operating space is required when individuals are providing anesthesia in these locations. Scavenging of waste anesthetic gases must also be employed.

III. Waste Anesthetic Gas Scavenging

- A.** An effective mechanism of waste gas scavenging is required when using inhalant anesthesia. Scavenging equipment must be maintained in good working order to ensure a safe working environment. Care should be taken to ensure the scavenging system does not compromise anesthetic delivery to the animal or contaminate the procedure area.

PROCEDURES

IV. Anesthesia machines and vaporizers

- A.** All anesthetic vaporizers must be serviced by qualified personnel (authorized service center).
- B.** The primary standard for service and calibration is the manufacturer's recommendation, if such recommendation exists, otherwise, this policy applies. If the manufacturer's recommendation is the standard chosen, then a copy of the manufacturer service manual or instructions or certification requirements should be available within the laboratory to assist in adequate IACUC oversight of anesthetic equipment.
- C.** If no manufacturer recommendation is available, then the vaporizer must be calibrated annually or any time the vaporizer has not been in service for more than a year. If the verified delivery is +/- 10% out of calibration, the vaporizer should be calibrated by an authorized service center.
- D.** Discoloration (yellowish-brown) in the "Fill" sight glass of a vaporizer may be an indicator of the need for service by an authorized service center. Other indicators might include cracked or damaged hoses, sticking valves or knobs, or animals not responding as anticipated to the amount of anesthetic provided.
- E.** An active anesthetic monitor (e.g. Datex-Ohmeda) may be used as a continuous monitor of the integrity of the anesthesia system. Such devices may assist in ensuring appropriate anesthetic delivery level for animals, but may not be useful in ensuring a safe and healthy working environment for research staff.
- F.** Other components of the anesthesia circuit (e.g., Soda lime/Baralyme, CO₂ absorbers or other devices) should be serviced / replaced as per manufacturer's guidelines. Manufacturer recommendation should be available for IACUC review in these cases.

V. Documentation of Equipment Calibration and Service

- A.** Anesthetic machines and vaporizers must have documentation of service and calibration. Information that must be maintained includes:
 - a.** Date of last service and calibration
 - b.** Initials of the person who performed the service and calibration
 - c.** Service and calibration results
- B.** Documentation of service and calibration must be affixed to each anesthesia machine or vaporizer that is available for use.

VI. Waste Anesthetic Gas scavenging

An effective mechanism of waste gas scavenging is required when using inhalant anesthesia. The following mechanisms are considered acceptable for waste gas scavenging:

- A.** Dedicated Exhaust: A dedicated exhaust or zone capture exhaust is preferred for removal of waste gases from the surgical theater or procedure space. These may include an active vacuum waste gas line or an "elephant trunk" exhaust.
- B.** Fume Hoods: The use of a fume hood to capture waste gas is acceptable. If an anesthesia machine is being used, then placement of the exhaust gas line inside the fume hood is appropriate.
- C.** Activated charcoal canisters: Activated charcoal canisters (e.g. f/air canisters) may be used to absorb anesthesia waste gas.

1. These canisters are not effective for capture of nitrous oxide which is often added to anesthesia.
2. A log indicating the number of hours used must be maintained on the side of the canister. The total hours the f/air canister is in use may not exceed 12 hours.
3. An alternate method of monitoring canister life involves weighing the canister after each use and discarding the canister when there is a 50 gm increase above the initial weight.
4. Activated charcoal canisters must be used in a vertical position (i.e., do not lay them on their side while in use). f/air canisters must be raised off of the table top or floor (the exhaust ports are in the bottom of the canister and must not be blocked).

AUTHORITY

Guide for the Care and Use of Laboratory Animals, Eighth Edition, 2011.
Animal Welfare Act and Animal Welfare Regulations
The National Institute for Occupational Safety and Health (NIOSH)