



Duke University & Duke University Medical Center  
Animal Care & Use Program  
Policy



## GENERAL INHALATIONAL ANESTHESIA MACHINE / VAPORIZER / WASTE GAS MAINTENANCE AND CALIBRATION

**PERFORMANCE STANDARD:** Active delivery of general inhalational agents for animals housed at Duke University will be provided with properly function anesthetic equipment which will assure their health and well being during the anesthetic event.

**BACKGROUND:** The Guide for the Care and Use of Laboratory Animals (*Guide*) details basic care requirements for animal use. This document provides guidance regarding anesthesia machine / vaporizer calibration and maintenance. Manufacturer recommendations often range from one to three years depending on the model.

**ROLES:** Personnel must be trained in the proper use of anesthetic machines and vaporizers prior to operation, to assure safe handling of the animals and the anesthetic agent.

**PROTECTIVE POSTURES REQUIRED:** Personnel Protective Equipment (PPE) routinely required for normal activity in the animal room or operating space is required when individuals are providing anesthesia. Scavenging on waste anesthetic gases (or a plan for the protection of the humans working in the area) must also be employed.

**POLICY:** Each piece of equipment involved in the delivery of inhalant anesthetics, and removal of waste gases must be evaluated regularly to assure its proper function and integrity. Tubing, hoses and rubber items are common areas of concern.

### 1. Anesthesia machines and vaporizers:

- a. Anesthesia machines must be maintained in good working condition to assure optimal agent delivery in a safe manner.
- b. The primary standard for re-calibration / certification is the manufacturer recommendation. If no such recommendation exists, then this policy applies. If the manufacturer 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 anesthetic agent delivery must be validated 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 unit should be serviced by an authorized service center.
- d. All anesthetic vaporizers should be serviced by qualified personnel (authorized service center) as recommended by the manufacturer (or annually if no manufacturer recommendation exists).
- e. Discoloration (yellowish-brown) in the "Fill" sight glass of a vaporizer may be an indicator for the need for service by an authorized service center. Other indicators might include cracked or damaged hoses, sticking valves or knobs, animals not responding (as anticipated) to the level of anesthesia provided.

- f. An active anesthetic monitor (e.g. DATEX OMEDA) may be used as a 'continuous monitor' of the integrity of the anesthesia system. Such devices may assist in assuring a safe anesthesia level for animals, but may not be useful in assuring a safe and healthy working environment for research staff.
2. **Waste Gas Scavenging Systems:** Scavenging equipment must be maintained in good working order to ensure a safe working environment. An effective mechanism of waste gas scavenging is required for inhalant anesthesia for animal work at Duke. Waste anesthetic gases may adversely affect liver, kidney and the central nervous system of chronically exposed personnel. Care should be taken to ensure the scavenging system does not compromise anesthetic delivery to the animal or contamination of the procedure area (aseptic conditions must be maintained for survival surgery of any species).
    - 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 could include an active 'vacuum' waste gas line or an 'elephant' trunk exhaust.
    - b. Location Of Anesthesia Event Near Room Exhaust: Locating the anesthetic activity proximal to a room exhaust vent is acceptable, if the distance from the agent to the exhaust vent is small (e.g. within 6-8 feet). In this case, personnel should not work in the exhaust gas stream (from the animal to the room vent).
    - c. Fume Hoods: The use of a fume hood to capture the waste gas is acceptable. If an anesthesia machine is being used, then placement of the exhaust gas line inside of the fume hood is appropriate.
    - d. F-Air canisters: Charcoal canisters may be used to absorb halogenated waste gases. These canisters ARE NOT effective for capture of nitrous oxide (often added to an anesthesia regimen for relaxation). 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. An alternate methodology of monitoring canister life involves weighing the canister after each use and discarding the canister when there is a 50 gm increase in the initial weight. F-Air canisters must be used vertically (do not lay them on their side while in use) and suspended off of the table top or floor (the exhaust ports are in the bottom of the canister).
  2. **Documentation of Equipment Validation/Service:**
    - a. Vaporizers must have documentation of validation & service. Information that must be maintained includes:
      - i. Date of last service
      - ii. Date of the validation test
      - iii. Initials for the person who performed the test
      - iv. Test results
      - v. Vaporizers should have a certificate of the calibration date affixed after each service.
    - b. Documentation of service must be affixed to each anesthesia machine or vaporizer that is in service.
    - c. Servicing information may be obtained through Duke Hospital Clinical Engineering or DLAR.
  3. **Other components of the anesthesia circuit** (e.g. Soda lime/Baralyme [CO<sub>2</sub> absorbers] or other devices) should be serviced / replaced as per manufacturer's guidelines. Manufacturer recommendation should be available for IACUC review in these cases.