



Policy 368

Anesthesia Vaporizer Preventative Maintenance and Servicing

Responsible Official:	Research Administration
Administering Division/Department:	IACUC / Research Compliance and Regulatory Affairs
Effective Date:	01/07/2009
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368.1 Policy

Inhalational anesthetic vaporizers are required to function properly for the administration and use of general inhalation agents on animals at Emory University. The IACUC requires that vaporizers be fully serviced every 3 years by a professional service. In addition, the IACUC requires preventative maintenance of anesthesia machines be performed and documented annually by trained laboratory personnel unless the triennial professional service has occurred within the last 12 months.

368.2 Definitions of Key Terms Specific to this Policy

368.2.1 Preventative maintenance includes the evaluation of each piece of equipment involved in the delivery of inhalant anesthetics and removal of waste gases. Trained laboratory personnel can perform the annual preventative maintenance as opposed to a professional service. Equipment used in the delivery of inhalant anesthetics should be evaluated before each use. In addition, documentation of proper function should be done annually. Refer to Appendix A.

368.2.2 Servicing of the machine is to be done by a professional service and includes physical inspection of the anesthesia machine and vaporizer and the performance of necessary cleaning, calibration, lubrication, testing, and adjusting of vaporizer parts. If the machine is found to be out of calibration (+/- 10%) per the evaluation of the qualified technician, the machine will need to be sent out for service or repaired on site.

368.2.3 Documentation of maintenance includes information about preventative maintenance and service. Documentation of service must be affixed to each anesthesia machine or vaporizer that is in service. Documentation of preventative maintenance must be available for review. It should be affixed to the machine or located on the wall or other site within immediate proximity to the machine. Refer to Appendix A.

368.2.4 Training of Personnel: Personnel must be trained in the proper use of anesthetic machines and vaporizer prior to operation, to assure safe handling of the animals and the anesthetic agent. Acute effects of excess volatile anesthetic in the environment include excessive amounts of gases producing feelings of drowsiness, irritability, depression, headache, nausea, fatigue, and problems of judgment and coordination (OHS 5.1.12.2.1). Chronic effects include embryo toxicity, liver and kidney disease, and cancer. There is a suggested relationship between exposure to waste gases and increased cancer rates and adverse effects on reproduction among exposed workers (OHS 5.1.12.2.2). It is the responsibility of the PI to ensure adequate training of personnel.



368.3 Applicability

368.3.1 This policy applies to all Emory research animal activities that fall under the IACUC's jurisdiction when using inhalation anesthetic vaporizers to maintain anesthesia.

368.4 Inhalation anesthesia vaporizer maintenance

368.4.1 Preventative Maintenance

368.4.1.1 All equipment pieces involved in the delivery of inhalant anesthetics must be evaluated to ensure proper function. This includes examination of tubing, hoses, and gas connections. Discoloration (yellowish-brown) in the "Fill" sight glass of the vaporizer may be an indicator for the need for service by a professional service. Other indicators might include cracked or damaged hoses, sticking valves or knobs, or animals not responding as anticipated to the level of anesthesia provided.

368.4.1.2 While the evaluation should be done at each use, the check list must be completed annually. A specific evaluation check list is attached at the end of the document. See Appendix A.

368.4.1.3 Vaporizers must have documentation of preventative maintenance. Information that must be maintained includes (refer to Appendix A):

- Date of maintenance test
- Name of person who performed the test
- Test results

368.4.2 Charcoal Filter Canister Maintenance

368.4.2.1 To be effective, it is required that all charcoal/carbon filter canisters in use be monitored for the level of absorbency of the halogenated waste gases. Monitoring canister absorbent life should be done by following total hours of use or monitoring the weight of the canister.

368.4.2.2 To monitor by the weight of the canister, the baseline weight must be recorded directly on the canister. After each use or before next use, the canister must be weighed and value recorded on the canister. Note that manufacturer's guidelines must be followed in regard to weight limits. Canister must be discarded once it reaches those limits as it is no longer effective for absorbing waste gases.

368.4.2.3 Saturated canisters are considered hazardous chemical waste. They must be disposed of as hazardous waste through EHSO. (see Appendix B – example of a product insert)

Request Waste Collection by going to https://emory-integration.zerionsoftware.com/chemical_pickup

368.4.2.4 In order to vent correctly, cannisters must be oriented and positioned to allow airflow (e.g., some cannisters must be oriented vertically to allow airflow through the bottom or top). Refer to Appendix C for examples.¹

368.5 Resources

1. Moore ES, Daugherty EK, Singh B, Mooneyhan DE, Porri TJ, Williams WO. Influence of the position of charcoal air-filtration canisters on the efficacy of waste isoflurane scavenging as assessed in a randomized experiment. J Am Vet Med Assoc. 2019 Jun 15;254(12):1459-1465. doi: 10.2460/javma.254.12.1459. PMID: 31149873.

Appendix A: Annual Vaporizer Maintenance Checklist

Appendix B: Package Insert for Charcoal Filter

Appendix C: Examples of canister design and implications thereof



Contact Information

Subject	Contact	Phone	Email
Clarification of Policy	Office of Research Compliance and Regulatory Affairs - IACUC	404-712-0734	iacuc@emory.edu

Revision History

- 08/21/2019; 10/05/2022; 12/21/2022; 01/04/2023



Appendix A. Annual Vaporizer Maintenance Checklist

Instructions: Perform each test; check and initial as appropriate. Schedule professional service if any components are not functioning properly.

Date of Inspection: _____

Date of last professional service: _____

Test	Result		Initials	Comment
Examine vaporizer for physical damage	No damage	Damage		
Inspect tubing, fittings, and connections for cracks, breaks, or loose connections.	Functional/ no damage	Not functional/ damage		
Perform soap bubble test on all connections to detect leaks (<i>Place a drop of soapy water on each connection while oxygen is flowing. Bubbling indicates leakage.</i>)	No leaks	Leak detected		
Check O2 flush valve.	Functional	Not functional		
Ensure proper operation of vaporizer handwheel lock and release button.	Functional	Not functional		
Verify that vaporizer handwheel turns smoothly through entire range.	Functional	Not functional		

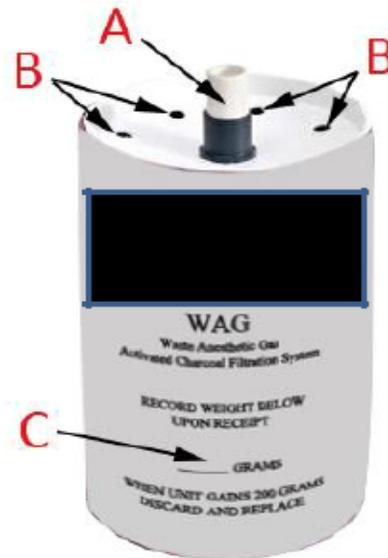
Name of inspector: _____

Signature of inspector: _____

NOTE: Please remember that vaporizers must be serviced by a professional once every three (3) years and maintained by a lab member once yearly in between servicing dates. Keep these inspection checklists for your records and to provide upon lab inspection.



Appendix B: Package Insert for Charcoal Filter



- A** Universal Tubing Connector: Will accommodate 19mm blue EVAC tubing (standard in industry), 22mm clear EVAC tubing or fitting for 15mm male to use 1/4" ID tubing.
 - a. Will also accommodate the Patterson T-Splitter Adaptor (07-8917858) for connecting tubing from multiple devices or multiple tubing sizes.
- B** Vent holes (8 total).
- C** Initial canister weight record.

Use and Operation:

1. Remove protective cap from top of Universal Tubing Connector (**A**)
2. Weigh WAG canister in grams before use and record weight in designated area (**C**).
3. Rest canister upright on level surface or in the Patterson WAG Canister holder (07-8909583).
 - a. As vent holes (**B**) are on the top of the canister, it is not necessary to place the WAG Canister at any orientation other than upright.
4. Connect EVAC tubing or T-Splitter to Universal Tubing Connector (**A**)
5. Weigh WAG Canister periodically during use and discard when it gains 200 grams.



Appendix C Examples of canister design and implications thereof

Some manufacturers such as F/Air specify that the canister stands upright and that it be elevated to allow for ventilation of the bottom of the canister. Newer manufactured canisters have been designed for upright use and ventilation at the bottom, but older styles of canisters may require a base or a holder.

Here is a newer canister with upright design and ventilation at base:



Some canisters may require a special holder to orient and position them correctly:



Moore ES, Daugherty EK, Singh B, Mooneyhan DE, Porri TJ, Williams WO. Influence of the position of charcoal air-filtration canisters on the efficacy of waste isoflurane scavenging as assessed in a randomized experiment. *J Am Vet Med Assoc.* 2019 Jun 15;254(12):1459-1465. doi: 10.2460/javma.254.12.1459. PMID: 31149873.