WVU IACUC POLICY:
Calibration of Vaporizers for Inhalational Anesthesia in Animals

Inhalant Anesthetic Vaporizers

The WVU Institutional Animal Care and Use Committee (IACUC) recognizes that the delivery of inhalation anesthetic agents requires periodic calibration of precision vaporizer. The laws and regulations of the Practice of Veterinary Medicine in West Virginia and the American Veterinary Medical Association Model Practice Act contain no recommendation for the frequency of anesthetic vaporizer calibration. The primary standard for recalibration/certification is the vaporizer manufacturer’s recommendation. If no such recommendation exists, then the anesthetic agent delivery should be validated every three years or any time the vaporizer has not been in service for more than one year. If the verified delivery is $\geq 10\%$ out of calibration, the unit should be serviced by a professional service center. A sticker applied to the vaporizer by the servicing agent should document any service or calibration to a precision vaporizer. The label should contain the name of the servicing agent and the date of service. Further, the IACUC recognizes that halothane vaporizers can adequately deliver isoflurane anesthetic gas in the appropriate range if calibrated for use with the former gas. Similarly, enflurane vaporizers can deliver sevoflurane anesthetic gas in the appropriate concentration ranges if so calibrated. Therefore, these vaporizers can be used to deliver these anesthetic gases, respectively, if serviced to do so. The same requirements for periodic recalibration with documentation are the same for all vaporizers regardless of which inhalational anesthetic they deliver to research animals.

Additional indications for vaporizer service include the following:
1. Discoloration (yellowish brown) in the “Fill” sight glass of a vaporizer
2. Sticking valves or knobs
3. Patients not responding (as anticipated) to the level of anesthesia provided

To ensure adequate delivery of the anesthetic agent without untoward exposure of personnel to waste anesthetic gases, the IACUC requires that anesthetic precision vaporizers be calibrated once every three years at a minimum.

Anesthetic gas analyzers

Finally, the IACUC recognizes that some laboratories use inhalational anesthesia gas analyzers to monitor the concentration of the inspired and/or exhaled anesthetic gas. Again, the primary standard for recalibration/certification is the anesthetic analyzer manufacturer’s recommendation. If no such recommendation exists, then the analyzer should be calibrated at least once every three years or any time the analyzer has not been in service for more than one year. The use of a calibrated analyzer precludes the necessity of also calibrating the vaporizer, but the lab should document such tests.

Anesthetic Machine circuits (patient and machine circuits)

Although the vaporizer can be certified every 3 years, a pressure check of the system for leaks should be performed at least yearly, and a log kept for this purpose. See accompanying SOP for detailed procedures on how to perform this check. Ask OLAR for assistance if you are not comfortable with this procedure.
Anesthetic machine testing SOP

(Done yearly)

The purpose of this optional portion of the policy is to allow you to test your own machine to defray costly anesthetic maintenance services. That said, it is a requirement for your machine(s) to be regularly checked and certified for normal function. If you would like instead to have an anesthetic machine service technician do this work for a charge instead, OLAR can help you contact them.

During IACUC or post-approval monitoring inspections of your lab in regard to gas anesthetic machine use, three items will be checked.

1. That your vaporizer operation check (sticker) is current (required every 3 y). OLAR can help you schedule this appointment if you need help with this.

2. That your anesthetic system pressurization, maintenance and exhaust system function are up to date as listed in your log (required every year).

3. That your F/Air (or other carbon) scavenging log (typically on the canister in use) is up to date, or that the fume hood has current certification, if you gas scavenge via a fume hood (every visit). Please contact EH &S down campus: 293-3792 or HSC Safety Office: 293-6924 for fume hood inspections on a 6 month basis.

All machines

1. Check all rubber parts, including supply, distribution hosing, patient circuit and ventilation bags for cracks—inhalant anesthetics breakdown rubber. Replace with new parts. OLAR keeps many of these parts in supply, or can order these for you.

2. Every F/Air or similar passive scavenging canister has a service life. Either follow the instructions on the canister by following the hours of service guidelines, and by tracking the time it is in use. Or alternatively, pre-weigh the canister (write on canister with a Sharpie) and when the weight increases by the allowed amount, replace the canister. For F/Air canisters, this weight increase is 50 g.

Rebreathing patient circuits (larger animals):

A. If using a re-breathing system with soda lime, change the soda lime any time it is 50% used up (1/2 or more of the white granules have changed color); If the granules remain white, no change is needed.

B. On the patient circuit, the clear topped one-way covers on the inhalation and exhalation valves should be unscrewed, and the Teflon discs removed and cleaned (especially check the underside) as needed. The openings these discs normally sit on should be checked for rust, dirt or corrosion, and any moisture should be removed with a soft cloth. If a disc has any imperfection, it should be replaced. Be careful, when replacing the disc and cover. Center the disc in place, then screw the cover down carefully without damaging the disc.

C. Circuit Pressure Test:
   a. The pop-off valve on the exhaust side should be closed completely, and a second ventilation bag placed on the end of the patient circuit where the patient is situated.
b. Then oxygen is let into the circuit at ~5 L/min up to 30 cm water and the oxygen is then turned off.

c. The pressure gauge is observed to see if the generated pressure maintains itself. If not, by listening you can find the leak and repair it.

d. If necessary you can spray suspicious places with soapy water.

e. Wipe the parts off when done.

f. If you cannot find the leak and noted this in your log, a hospital standard applies. That is, you can turn up the oxygen until the flow compensates for the leak and determine the difference by reading the change in the oxygen flow meter to reach equilibrium; if the difference is < 100 cc/L at 30 cm water, then the leak is small enough to observe until it gets worse.

g. If you cannot repair the leak, call OLAR and we may have a part you need, or can refer you to an anesthetic machine repair service.

h. Open the pop-off valve, block off the F/Air canister end on a rubber pad (e.g. a computer mouse pad or similar surface) and pressurize again.

i. See if the system holds pressure. If not, check for a leak in the exhaust circuit, repair and recheck until pressure holds.

IF instead you use the house exhaust:

a. If this connection is loose, such as a thimble connection, take a tissue paper and hold it over the exhaust intake and see if there is vacuum drawing the tissue paper inward. If you are venting to a fume hood, then the fume hood should be up to date on certification and draws at least 100 FPM. Be sure the sash is at 50% height during the test.

b. If you are using a commercial closed vacuum step-down system, with the house vacuum on, the float ball needs to stay between the lines in the gauge (~ 30 mmHg). Adjust the flow valve on the step-down unit until this is the case.

Non-rebreathing (Mapleson E, Bain, etc.) patient circuits

A. Pressure test:

a. Close off the patient circuit end with an anesthetic rebreathing bag or balloon. If the circuit has a bag and valve, close the valve so the bag fills more completely.

b. If you are using an F/Air canister for scavenging, press the open end with holes against a rubber computer mouse pad, or something similar.

c. Running the oxygen at ~5 L/min, pressurize the circuit and see if the pressure holds by watching the balloon or bags, and seeing if they deflate over time.

d. Turn off the oxygen when the bags/balloon is/are completely inflated (no wrinkles).

e. Find any leak and repair or replace these until the system holds pressure.

f. A standard anesthetic rebreathing bag when well inflated fully without wrinkles is at least 30 cm water.

g. OLAR has loaner pressure and vacuum gauges for troubleshooting anesthetic machines as needed.