Title: Anesthesia Machine/Vaporizer Calibration, Use, and Maintenance Guidelines

I. Purpose:

The purpose of this document is to provide guidelines regarding recommended scheduling for anesthesia machine/vaporizer calibration, use, and maintenance. All users are advised to follow the manufacturer’s recommendations if they differ from this document.

II. Background:

Anesthesia machines and vaporizers must be in good working condition to reduce anesthetic gas leaks, to ensure the best performance of scavenging equipment, and provide the appropriate percentage of anesthetic delivery. Personnel must be trained in the proper use of anesthetic machines and vaporizers prior to operation. Contact Campus Veterinary Services or the IACUC Office for training. For the proper use of waste gas scavenging canisters in the vivarium procedure rooms, contact the vivarium manager.

Each piece of equipment involved in the delivery of inhalant anesthetics must be evaluated regularly to ensure appropriate function and integrity. This includes monitoring for leakage, improper design, or defects.

III. Guidelines:

A. Vaporizer service:

Accuracy of anesthetic agent output from an agent-specific precision vaporizer must be verified annually or any time the vaporizer has been out of service for more than a year. If the verified delivery is ± 15% out of calibration of the target value, the unit must be serviced by qualified personnel or company.

All agent-specific precision anesthetic vaporizers must be serviced by qualified personnel or company at the intervals recommended by the manufacturer. Manufacturer recommendations generally range from one to ten years depending on the model and anesthetic being used.
Discoloration (yellowish-brown) in the “Fill” sight glass of a vaporizer is an indication of need for servicing by qualified personnel or company.

B. **Waste Gas Scavenging Systems:**
Anesthetic machines must have an effective mechanism of waste gas scavenging. Scavenging systems may be active or passive and could include the use of an absorber.

1. Charcoal canisters (e.g., Breath Fresh, f/air, Enviro-Pure, VaporGuard, Clean Air Filter) may be used to absorb halogenated waste gases, but **not** nitrous oxide. Manufacturer’s guidelines must be followed and usage must be documented on the side of the canister either indicating the hours used or weight of the canister.

Before using the anesthesia machine, verify an activated charcoal waste gas scavenging canister is connected to the system. It is also essential to ensure the same measurement (weight or time) is used as the previous user.

   i. Remove the canister from the system.
   ii. Shake the canister briefly to evenly redistribute contents.
   iii. **If using WEIGHT:** weigh the canister and record the date and weight on the canister.
   iv. Reattach canister to the hose or chamber.
   v. Ensure the canister is sitting upright with the holes on the bottom unobstructed (place in holder suspended off the tabletop).
   vi. **If using TIME:** record the time used on the side of the canister at the end of the procedure.
   vii. There should be a scavenging system on the induction chamber and the breathing circuit. Both must have either WEIGHT or TIME recorded on the side.
   viii. Once a canister has reached the maximum time or weight per the manufacturer recommendations, it can be disposed of in a regular trash receptacle or based on manufacturer recommendation.

Table 1. Manufacturer’s recommendations:

<table>
<thead>
<tr>
<th>Canister</th>
<th>Maximum Hours of Use</th>
<th>Maximum Weight Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breath Fresh</td>
<td>12-15 hours</td>
<td>50 grams</td>
</tr>
<tr>
<td>f/air</td>
<td>12-15 hours</td>
<td>50 grams</td>
</tr>
<tr>
<td>Enviro-Pure</td>
<td>N/A</td>
<td>100-120 grams</td>
</tr>
<tr>
<td>VaporGuard</td>
<td>N/A</td>
<td>50 grams</td>
</tr>
<tr>
<td>VetOne Clean Air Filter</td>
<td>12-15 hours</td>
<td>50 grams</td>
</tr>
</tbody>
</table>

2. CO₂ absorbers (e.g., Soda lime, Baralyme, Amsorb Plus) should be changed regularly. CO₂ absorbers react with water; the pH change when saturated with CO₂ will activate a change in the ethylene violet dye indicator
contained in these absorbers. These indicators can change back to white-grey if enough time is allowed, but this does not indicate the absorbers are still functional. Therefore, the absorbers must be changed as soon as a color change is noted. Lime based absorbers must be disposed of as chemical waste. Amsorb Plus can be disposed of in the regular trash. Contact Safety Services for details on chemical waste disposal.

3. Fume hood: Open drop anesthesia techniques must be conducted in a fume hood that has been tested and certified by Facilities Management.

C. Documentation:

1. Vaporizers: Must have documentation of a date of delivery test with the initials of the person who performed the test and the test results. Vaporizers must have a certificate of the calibration date affixed after each service.

2. Charcoal canisters: Manufacturer’s guidelines must be followed (see Table 1) and usage must be documented on the side of the canister either indicating the hours used or weight of the canister (pre and post use).

3. Anesthetic machines and vaporizers that are in storage should be tagged “Not in use”.

IV. Services available:

Below is a list of services available on campus and through private industry.

1. For verification of gas delivery concentration of anesthesia machines/vaporizers:
   Campus Veterinary Services (CVS)
   (530)752-0514
   lah@ucdavis.edu

2. Service Centers:
   Vet Equip
   1452 N Vasco Rd #303
   Livermore, CA 94551
   (800) 466-6463
   (925) 463-1943 FAX
   service@vetequip.com
   www.vetequip.com
V. **Resources:**

1. OSHA “Anesthetic Gases: Guidelines for Workplace Exposures”

2. Occupational Health and Safety in the Care and Use of Research Animals

3. UC Davis Safety Services Hazardous Materials Management and Disposal
   https://safetyservices.ucdavis.edu/units/ehs/hazardous-materials-management