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STANDARD OPERATING PROCEDURE

**CERTIFICATION OF GAS ANESTHESIA EQUIPMENT AND ANESTHESIA
MONITORING EQUIPMENT**

Approval(s):

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08/17/06

Date

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A. PURPOSE

The purpose of this SOP is to assure that anesthesia machines, vaporizers and monitoring equipment are maintained and operating in good working condition.

B. BACKGROUND

In an effort to address this concern, we have consulted other programs, sought the aide of manufacturers, professional and scientific anesthesia groups reviewed the recommendations of the American Animal Hospital Association, and Compmed. After collecting all the information, the following SOP has been established.

C. APPLICABILITY

1. All anesthesia and monitoring equipment must be maintained in good working condition to assure optimal anesthetic agent delivery in a safe manner. Monitoring equipment includes, EKG, pulse oximetry, and end tidal CO₂. Anesthesia equipment includes anesthesia machines and vaporizers, and stand alone vaporizers.
2. The primary standard for vaporizer recalibration / certification is to be governed by manufacturer's recommendations. Manufacturer's recommendations for service must be implemented and the written documents available for review. If manufacturer's recommendations are not available, the equipment must be validated at least every two years. If the equipment has been out of service for more than one year, it must be validated before being put into service. Certification consists of the inspection and approval of all mechanics associated with the vaporizer and anesthesia machine. Calibration consists of the scientific analysis of the emitted gas and insuring the accuracy of the concentration settings and subsequent correction as needed.
3. All anesthesia and monitoring equipment is to be serviced by a qualified personnel or an authorized service center. Qualified personnel must be experienced in clinical equipment maintenance, service and certification.
4. Waste anesthesia gas must be scavenged. The scavenging equipment must be maintained in good working order to ensure a safe working environment. Active scavenging is preferred and can be done by use of dedicated evacuation systems or house vacuum, (if house vacuum is exhausted directly outside the building to the atmosphere). Passive scavenging using an F-Air canister or comparable scavenging

systems and material is a second choice if active scavenging cannot be used. The approval of the scavenging system planned is by EH &S and should also follow their guidelines as addenda entitled "Waste Anesthetic Gases".

5. This SOP applies to both acute and chronic use in any surgical or laboratory space approved by the IACUC where vertebrate animal research or teaching is done.

D. SAFETY AND EFFICACY

1. Routine checks of equipment must be performed before initiating inhalant anesthesia. Routine checks consist of a pressure check of the anesthesia system and an integrity check of the scavenging system.

E. RESPONSIBILITIES

It is the responsibility of the investigator to contact an authorized service vendor, pay for the certification and to maintain records. Records are to include, a) date of last service, b) initials of service technician, c) date of calibration. Practices are reviewed by the IACUC, EH&S during semi-annual visits to animal care spaces and annual EH&S lab inspections.

F. PROCEDURES

The DLAR has identified service sources other than manufacturers service centers.

1. Draeger (services only Draeger machines and vaporizers) 1-800 4-DRAGER (437-2437)
2. Eagle Eye Anesthesia (all anesthesia machines and vaporizers) 1-800-760-6976
3. IGN Medical (all anesthesia machines and vaporizers) 1-888-256-2723
4. Ronco Technical Services, Inc. (all anesthesia machines and vaporizers) 1-800-635-2006
5. NLS Animal Health vaporizer exchange program. NLS will send a new vaporizer to be switched out with the old vaporizer for a fee of \$200.00. 724-944-6209
6. Biotronics (all equipment certification and repair) 412-648-6125
7. Vetamac, will service all vaporizers and anesthesia machines. 1-800-334-1583
8. EZ Anesthesia, (vaporizers and rodent anesthesia systems) 1-610-559-0159

G. REFERENCES

The Guide for the Care & Use of Laboratory Animals
Veterinary Anesthesia by Hall and Clark 8th Edition
Comp Med Queries July 12-15, 2006

H. EFFECTIVE DATE: IACUC Meeting 08/21/06

Addendum EH&S Guidelines:

Waste Anesthetic Gases

Anesthetic gas and vapors that leak into the surrounding room during medical or research procedures are considered waste anesthetic gases (WAGs). The waste anesthetic gases and vapors that create health effects from over-exposure include nitrous oxide and halogenated agents such as halothane, enflurane, and, trichloroethylene. University faculty, staff and students should be aware of the potential risks of WAGs and be advised to take appropriate precautions to reduce exposures.

Workers acutely exposed to excess amounts of anesthetic gas can experience symptoms of drowsiness, headache, nausea, poor judgment and loss of coordination. Chronic symptoms of over-exposure can include liver, kidney and reproductive effects.

To prevent unnecessary exposures to waste anesthetic gases, the following instructions are designed to help identify the potential for WAG exposure and to provide guidance on leak test procedures, medical surveillance, air monitoring and worker training.

1. The principal source of waste anesthetic gas exposure is leakage from anesthesia equipment or improper use of gas scavenging systems. University employees who work in hospital operating rooms, dental operatories, exam rooms and animal research areas should take steps to reduce their exposure to WAGS.
 - 1.1 A safe exposure concentration for these chemicals is less than 2 parts per million (ppm) of any halogenated anesthetic agent collected over a one hour period or 25 ppm of nitrous oxide over an 8-hour time weighted average.
 - 1.2 When nitrous oxide is used in combination with the halogenated gases, control of nitrous oxide to 25 ppm during anesthesia should limit concentrations of the halogenated gases to less than 0.5ppm.

2. Engineering Controls:

- 2.1 A scavenging system is the basic engineering control for WAGS. These systems include a collecting device (scavenging adapter) to capture gases and vapors from the breathing system at the site of overflow. Although some gas scavenging systems are elaborate and costly, an inexpensive system consisting of a flexible exhaust duct and Plexiglas hood, if well designed and properly installed, can dramatically reduce gas concentrations in the work area.
- 2.2 The HVAC system for the room should not be relied upon for waste gas scavenging. While it is important to have good supply and exhaust ventilation system to carry WAGS from the room (15 air changes per hour), scavengers should capture and exhaust gas at the point of release.
- 2.3 Modern anesthesia equipment is manufactured with scavenging systems that include a scavenging nasal mask. Select a compact double chambered mask system with a shroud large enough to capture exhausted anesthetic gas exiting

from the subject. The inner mask is contained within a slightly larger outer mask and a slight vacuum is present in the space between the masks.

3. Work Practice Controls

3.1 The anesthesia machine owner must implement a routine maintenance program to check for and fix leaking equipment and to assure that general room ventilation requirements are met. Steps taken to reduce gas leakage should include:

3.1.1 Making sure that waste gas disposal lines are connected and that fittings and hoses are not defective

3.1.2 Not turning on nitrous oxide or halogen vaporizer until the circuit is connected to the subject; and switching off the nitrous oxide and halogen when not in use.

3.1.3 Making sure that the mask properly fits the subject

3.1.4 Using the lowest gas flow rates possible

3.1.5 Maintaining oxygen flow until scavenging system is flushed.

4. Air Monitoring

EH&S should be contacted to perform worker exposure monitoring as necessary to assure safe exposure levels are being maintained. Air monitoring should be performed to capture both worst case and routine exposures for each job class. Air sampling results are reported to the supervisor within 15 days of receiving monitoring results from the lab and should be shared with the monitored employee.

5. Medical Surveillance

Faculty, staff and students with potential over-exposures to WAGs should be directed to Employee Health Services for a clinical consultation.

6. Personal Protective Equipment

Personal protective equipment is typically not necessary or recommended if an adequate WAG control program is in place. Personal protective equipment should only be utilized as an interim measure when air monitoring shows control measures are currently inadequate to limit worker exposures.

7. Training

Workers involved with waste anesthetic gases should be trained by their supervisor to recognize, understand and reduce health and safety risks of exposure to WAGs. Training and questions can be supported by the EH&S Department.