CM SOP #206 – Maintenance of Gas Anesthesia Equipment

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I. Purpose & Scope

The purpose of this Standard Operating Procedure (SOP) is to establish standardized procedures for the inspection, maintenance, servicing, and documentation of anesthesia equipment used for animal procedures within Comparative Medicine (CM) facilities at Florida Atlantic University (FAU).

Proper maintenance of anesthesia equipment ensures:

- Accurate delivery of inhalant anesthetic agents
- Proper functioning of vaporizers and flow systems
- Effective scavenging of waste anesthetic gases
- Protection of personnel from occupational exposure
- Compliance with institutional animal care and use standards

This SOP applies to all inhalational anesthesia equipment used for animals in CM-managed surgical suites and research laboratories, including vaporizers, anesthesia machines, SomnoSuite®, SomnoFlo®, induction chambers, nose cones, and associated scavenging systems.

II. Roles & Responsibilities

Comparative Medicine Staff

- Following procedures outlined in this SOP.
- Performing routine inspection of anesthesia equipment prior to use.
- Ensuring anesthesia machines and accessories are clean, complete, and functional.
- Monitoring charcoal scavenging canisters and replacing them when weight limits are reached.
- Reporting damaged or malfunctioning equipment to supervisory or veterinary staff.
- Documenting maintenance and inspections when required.

Research Staff, Students, Visitors

- Using anesthesia equipment only after receiving appropriate training.
- Conducting a pre-use inspection of anesthesia equipment prior to performing procedures.
- Ensuring scavenging systems are properly connected and functional during anesthetic use.
- Reporting equipment malfunctions immediately to CM staff or veterinary personnel.
- Maintaining laboratory anesthesia equipment in accordance with this SOP if equipment is owned by the research laboratory.

CM Management

- Ensuring anesthesia equipment is maintained in accordance with this SOP.

- Coordinating scheduled preventative maintenance and professional servicing of anesthesia machines and vaporizers.
- Ensuring appropriate training is provided to CM and research personnel using anesthesia equipment.
- Maintaining documentation of maintenance and service records.

CM Director and AV

- Providing oversight of anesthesia equipment maintenance and safety.
- Approving anesthesia equipment and associated components used within the animal care program.
- Ensuring anesthesia equipment maintenance procedures meet institutional and regulatory standards.
- Modifying maintenance schedules when necessary to support animal welfare or personnel safety.

III. General Notes & Definitions

- An **inhalational anesthesia system** consists of:
  - An anesthesia machine
  - Vaporizer
  - Flowmeter
  - Breathing circuit
  - Induction chamber or nose cone
  - Waste gas scavenging system
- **Vaporizer Calibration**
  - Calibration refers to verification that a vaporizer delivers the correct anesthetic concentration within an acceptable tolerance range.
  - Vaporizers must be calibrated periodically to ensure anesthetic delivery accuracy.
- **Waste Anesthetic Gas (WAG)**
  - Waste anesthetic gas refers to anesthetic agents that escape into the environment during anesthetic administration.
  - Proper scavenging systems must be used to minimize occupational exposure.
  - Chronic exposure to waste anesthetic gases may affect the liver, kidneys, and central nervous system.
- **Scavenging Systems**
  Acceptable waste anesthetic gas scavenging methods include:
  - Activated charcoal canisters
  - Ventilation through a chemical fume hood
  - Dedicated exhaust systems connected to building ventilation
  - House vacuum systems designed for gas removal

IV. Materials & Equipment

- Anesthesia Delivery Systems
  - Precision vaporizers
  - Rodent anesthesia machines
  - SomnoSuite® anesthesia system
  - SomnoFlo® vaporizer systems

- Breathing System Components
  - Induction chambers
  - Nose cones
  - Breathing circuits
  - Tubing and hoses
  - Flow meters
- Waste Gas Scavenging Equipment
  - Activated charcoal canisters
  - Exhaust tubing
  - Vacuum-based scavenging systems
  - Certified fume hoods or biosafety cabinets

V. Procedure

A. Pre-Use Equipment Inspection

Prior to each anesthetic procedure, users must inspect anesthesia equipment to ensure it is functioning properly.

1. Check tubing and hoses for cracks or punctures
2. Verify that connections are secure
3. Ensure the vaporizer is properly mounted
4. Confirm anesthetic agent is present in the vaporizer
5. Verify the scavenging system is attached and functioning
6. Ensure induction chambers and nose cones are appropriate size to minimize excess anesthetic gas use.

B. Routine Equipment Maintenance

1. Clean external surfaces of anesthesia equipment after use
2. Inspect tubing and gaskets regularly
3. Replace damaged or worn components
4. Ensure anesthesia workspaces remain clean and organized
5. Report missing equipment immediately to CM management.

C. Vaporizer Calibration and Professional Servicing

- Anesthesia vaporizers and machines must be serviced periodically by qualified personnel.
- Standard servicing schedule:
  - Annual preventative maintenance inspection
  - Full professional servicing and certification every three years
- Servicing includes:
  - Mechanical inspection of the anesthesia machine
  - Leak testing
  - Calibration verification
  - Gas concentration testing
- If vaporizer output deviates more than ±10% from the expected concentration, the unit must be removed from service and sent for repair.
- Manufacturer recommendations should always be followed.
- SomnoSuite® and SomnoFlo® systems follow manufacturer-specific maintenance recommendations and do not require annual calibration.

D. Carbon Dioxide Absorbent Replacement

1. Replace CO_2 absorbent materials such as soda lime or Baralyme regularly.
2. At minimum, replacement should occur:

a) After approximately 12 hours of cumulative use, or
b) When absorbent material changes color indicating exhaustion.

E. Waste Gas Scavenging

1. An effective waste gas scavenging system must be used during inhalant anesthesia procedures.
2. Acceptable scavenging methods include:
   a) Activated charcoal canisters
   b) Certified chemical fume hoods
   c) Vented biosafety cabinets (Class IIB)
   d) Dedicated building exhaust systems
3. Personnel should position anesthetic procedures near room exhaust vents whenever possible.

F. Charcoal Canister Maintenance

1. Record the initial weight of the canister upon installation.
2. Weigh the canister after each use.
3. Record weights and dates on the canister or designated log.
4. Replace the canister when weight increases by 50–100 grams (according to manufacturer instructions).
5. Positioning requirements:
   a) Standard vaporizers: canisters must remain vertical
   b) SomnoSuite® systems: canisters should be positioned horizontally to avoid vent obstruction

G. Indicators of Equipment Malfunction

1. Remove any equipment from service and have inspected if any of the following occur:
   a) Cracked hoses or tubing
   b) Sticking valves or knobs
   c) Anesthetic levels inconsistent with expected responses
   d) Yellow or brown discoloration in vaporizer sight glass
   e) Gas leaks or unusual odors
2. Do not use malfunctioning equipment until repaired.

H. Recordkeeping

1. Maintenance and service documentation must be maintained for all anesthesia equipment.
2. Records must include:
   a) Date of service or inspection
   b) Type of maintenance performed
   c) Name of individual performing maintenance
   d) Results of inspection or calibration
   e) Corrective actions for failed equipment
3. Professional service providers should provide documentation verifying maintenance.
4. Service stickers indicating next calibration date should be visible on anesthesia equipment.
5. Records must be readily accessible for inspection by the IACUC or regulatory agencies.

VI. Health & Safety

- Personnel working with anesthesia equipment may be exposed to waste anesthetic gases.
- To minimize exposure risks:
  - Waste gas scavenging must be used during inhalant anesthesia procedures.
  - Equipment must be maintained in proper working condition.
  - Personnel should avoid positioning themselves between the anesthetized animal and exhaust airflow.
- Standard vivarium safety policies apply:
  - Eating, drinking, chewing gum, or applying cosmetics are prohibited in animal areas.
  - Appropriate PPE must be worn when working with animals or anesthetic equipment.
- Personnel should report injuries or chemical exposure immediately.
- Additional precautions may be required for personnel with medical considerations such as pregnancy.

VII. References & Attachments

- *Guide for the Care and Use of Laboratory Animals*
- AAALAC International
- Office of Laboratory Animal Welfare Public Health Service Policy on Humane Care and Use of Laboratory Animals
- CM Forms & SOPs
  - CM Form 025 Anesthesia Machine Use Log
  - CM Form 071 Surgery Room Checklist
- Anesthesia Equipment Pre-Use Inspection Checklist
- Anesthesia Equipment Maintenance Log
- Manufacturer Maintenance Instructions (if applicable)

VIII. Revision History

Revision Date	Revision Number	Summary of Changes
12/07/2020	2	Addition of SomnoSuite
05/29/2024	3	Add SomnoFlo
03/24/2026	4	Updated formatting, made ADA compliant, streamlined language, updated forms

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