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Center for Biomedical Research / IACUC
Standard Operating Procedure – Guidelines

Use of Anesthetic Gases: General Guideline / Vaporizer Calibration

Purpose: The Institutional Animal Care and Use Committee (IACUC) has developed the following guidelines to control risk of exposure to waste anesthetic gases in the workplace.

Introduction: Inhalant anesthetic gases (e.g. isoflurane, halothane, sevoflurane, desmoflurane etc.) are halogenated gases that are commonly used in animal research. Halogenated anesthetics are typically clear, colorless, highly volatile liquids at normal temperature and pressure. Exposure to these substances occurs when vapors escape into the work environment during the anesthetic administration process.
Waste anesthetic gases possess very poor warning properties so odor is not an adequate indication of overexposure. Long-term exposure to waste anesthetic gases has been linked to genetic mutations, cancers, spontaneous abortions, hepatic and renal disease and psychomotor changes in humans.

Procedures to Reduce Exposure

Equipment and system maintenance for anesthesia machines and vaporizers:

1. Maintenance schedule – Isoflurane vaporizers:
   a. Calibration verification must be performed at least every 3 years; or
   b. If the machine is subject to extensive use (e.g., more than 500 hours/year) or is frequently moved to different locations, then verification must be performed annually.
2. A copy of the manufacturer's guidelines for calibration verification must be available in the laboratory to assist with oversight by the IACUC of proper maintenance of anesthetic equipment.
3. Documentation of equipment validation must be affixed to each anesthesia machine or vaporizer that is in service.
4. When the system is not going to be used for an extended period of time – 3 months or more – the vaporizer needs to be drained of any isoflurane. Documentation of when this occurred needs to be sent to the Center for Biomedical Research.

Environmental controls:

1. Work in a well-ventilated area such as a laboratory or operating room.
2. Whenever possible, handle liquid anesthetic agents in a certified chemical fume hood, hard- ducted biosafety cabinet, downdraft table, or use another suitable local exhaust system.
3. Personal protective equipment, such as gloves, lab coat, and eye protection (face shield or goggles) should be worn when dispensing anesthetic agents.
4. Use a reliable gas scavenging system to collect, remove, and dispose of waste anesthetic gases. Scavenging options include:

a. Non-circulation ventilation systems: These discharge waste gases through an exhaust vent or grill (e.g., hard-ducted biosafety cabinet or downdraft table).
b. Chemical fume hood: The anesthetic can be delivered to the animal while it is inside the fume hood or an exhaust gas line from the anesthesia machine can be vented inside the hood.
c. Adsorption devices: Charcoal canisters such as F-Air or Enviro-Pure can be used to absorb halogenated waste gases. These canisters must be properly placed so that the vent holes on the bottom of the canister are not obstructed.
d. Usage must be documented and accompanied by the method used to determine canister life as supplied by the manufacturer. For F-Air canisters this involves weighing the canister before and after use and discarding the canister when there is a 50 g increase from the initial weight.

Training and Standard Operating Procedure Requirements

Principal lnvestigators are responsible for training their staff who work with anesthetic gases before use.

Additional Useful Information

Fish, R., Danneman, P., Brown, M., Karas, A., (Eds.). Anesthesia and Analgesia in Laboratory Animals, New York: Academic Press (2008).

OSHA Guidance Document - ANESTHETIC GASES: Guidelines for Workplace Exposures: http://www.osha.gov/dts/osta/anestheticgases/index.html

For help with anesthesia delivery systems and techniques, contact the Center for Biomedical Research at 701.777.4493.