

# Halogenated Anesthetic Gases

## Health Hazards

Epidemiological studies indicate overexposure to Halogenated gases can have adverse effects on the central nervous system, reproductive organs, cause congenital abnormalities, and adverse effects on the liver and kidneys.

## Exposure Limits

OSHA has not established a permissible exposure limit (PEL) for anesthetic gases. NIOSH has a recommends an exposure limit (REL) for halogenated agents of 2 ppm or 15.1 mg/m<sup>3</sup> as a ceiling limit (average over 1 hour), and an REL for nitrous oxide of 25 ppm as a time-weighted average during the period of anesthetic administration. The ACGIH threshold limit value (TLV) for nitrous oxide is 50 ppm as an 8-hour TWA.

## Approved Scavenging methods

In order to reduce the risk of exposure to escaped vapors, one of the following control measures must be in place during the anesthetic application process:

**First Choice:** Placement of entire gas mixing and delivery system inside a fume hood. Note, the use of ductless fume hoods are not permitted at the University of Minnesota.

**Second Choice:** Installation of local exhaust over isoflurane delivery system to address a single source of anesthetic gas such as that shown in the photo to the right or a slot or canopy exhaust for procedures that involve multiple sources of anesthetic gas (e.g., knockout box, procedure table, etc.).

**Third Choice:** Capture waste gas using gas scavenging canisters. This method is only recommended as a control measure under the following circumstances:

- There is no fume hood or other local, hazardous exhaust system available for use.
- Leak checks are performed routinely on equipment.
- Saturation levels of canisters are checked prior to each use.
- Researchers are well trained and supervised in proper use and maintenance of the anesthetic equipment. If not properly used or maintained, gases may escape into the work area resulting in overexposure.



Figure 1: A worker using local ventilation while working with anesthetic gas

## Notes on use of gas scavenging systems

Decreasing oxygen flow rates during anesthetic gas administration can also reduce the concentration of waste gases in the work environment. For example, reducing the oxygen flow rate from 2 to 0.4 for a single mouse on a nose cone will still anesthetize the mouse while reducing the concentration of waste gases in the work environment to more acceptable levels.

Absorption canisters with exhaust ports located on the top work better than those with the exhaust ports on the bottom. Both types of cylinders should be used in the upright position; however, the location of the exhaust ports on the top of the canister alleviates back pressure and minimizes development of open channels through the charcoal which results in better capture.



Figure 2: An f/air canister with exhaust ports on the bottom



Figure 3: A VaporGuard canister with exhaust ports on the top

## PPE

Gloves, lab coats and eye protection should be worn to prevent contact with liquid anesthetic gases.

## Work Practices

Store in a cool, well-ventilated areas away from direct sunlight and sources of ignition or open flames.

## Signs and Symptoms of Exposure

**Acute Exposure:** Nausea, vomiting, skin irritation, nose/throat/respiratory irritation, headache, dizziness, and drowsiness

**Chronic Exposure:** Hypotension, tachycardia, respiratory depression, elevated blood glucose

## Emergency Procedures

**Eye Exposure:** Flush with copious amounts of water for at least 15 minutes, preferably at an eyewash.

**Skin Exposure:** Remove contaminated clothing and immediately wash the affected area with soap and water.

**Ingestion:** If anesthetic gases are inhaled, move the victim to a source of fresh air.

**Inhalation:** Obtain medical attention immediately.

Contact DEHS at (612) 626-6002 for an evaluation of your control system or for personal exposure monitoring.

## References

[OSHA Safety and Health Topics: Waste Anesthetic Gases](#)

[University of Minnesota Research Animal Resources](#)