

Waste Anesthetic Gas (WAG) Management

INSIDE THIS ISSUE:

Introduction

Health effects of WAG
exposure

WAG Controls

Best work Practice

Only YOU can prevent WAG!!!

Waste anesthetic gases (WAGs) are small amounts of volatile anesthetic gases that leak from the anesthetic breathing circuit into the air during delivery of volatile anesthesia. Waste anesthetic gases include halogenated anesthetics such as halothane, enflurane, **isoflurane**, desflurane, and sevoflurane.

The purpose of this brochure is to do the following:

- ✓ Increase awareness about the adverse health effects of WAG
- ✓ Describe how workers are exposed to waste anesthetic gases
- ✓ Recommend engineering controls and best work practices to protect users

What are the adverse health effects of WAG exposure?

Effects of exposure to high concentrations

Exposure to high concentrations of waste anesthetic gases typically occurs when using high flow rates (>2L/min) with poorly scavenged systems not typical of rodent set ups. Exposure may cause the following health effects even after a short period of time:

- ✓ Headache
- ✓ Irritability
- ✓ Fatigue
- ✓ Nausea
- ✓ Drowsiness
- ✓ Difficulties with judgment and coordination
- ✓ Liver and kidney disease

Effects of exposure to low concentrations

Although some studies report no adverse health effects from long-term exposure to low concentrations of waste anesthetic gases, several studies have linked such exposure to miscarriages, genetic damage, and cancer among operating-room workers. Studies have also reported miscarriages in the spouses of exposed workers and birth defects in their offspring. Therefore, NIOSH is concerned about worker exposures to these gases and recommends controls to prevent exposures. Persons that may be pregnant should take extra precautions to avoid exposure.

Special points of interest:

- Exposure to high levels of WAG can cause immediate clinical signs.
- NIOSH recommends controls to prevent exposure to prevent potential health risks

WAG Engineering Controls

Active Scavenge Systems

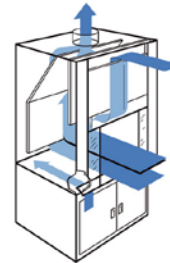
Active evacuation involves a negative pressure system or fume hood while passive evacuation relies on positive pressure generated by oxygen flow, during exhalation or compression of the breathing system reservoir bag.

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

First Choice: Placement of entire gas delivery system inside a fume hood. Especially the induction chamber

Second Choice: Installation of local exhaust over single source anesthetic gas or installation active suction to charcoal canister.

Third Choice: Passive capture of waste gas using gas scavenging canisters with appropriate work practice controls.



Examples of active scavenge engineering controls from left to right; fume hood and active scavenging cube

Best Work Practices for Passive Scavenge Systems

A hard ducted hood or local exhaust system may not always be available. The following administrative controls and works practices must be followed to mitigate risk.

- ✓ Set up system correctly and leak test
- ✓ Weigh charcoal canisters
- ✓ Use low flow rates
- ✓ Flush anesthesia systems

1. Set up the anesthesia circuit correctly. Each exhaust port (nose cone and induction chamber) should have a dedicated charcoal canister. There should be no leaks in the circuit.
Contact BWHCCMtraining@partners.org if you need a refresher on anesthesia circuit set up.
2. Weigh charcoal canisters or monitor use. Canisters MUST be disposed of once use expires because their ability to scavenge WAG is diminished. Canisters in use without entry of initial weight will be discarded.
3. Use the lowest flow rate required. Rodents on nose cone maintenance anesthesia require less than 0.5 L/min flow rate. Increasing flow rate does not increase oxygen delivery.
4. Flush the anesthesia system with oxygen before opening the circuit.
 - ✓ Induction chamber—prior to removing the anesthetized animal, turn off vaporizer and turn up flow rate of fresh oxygen (i.e. for a 1 L chamber, flush system for 30s @ 2L/min flow rate)
 - ✓ Allow rodent to recover on nose cone inhaling fresh oxygen

Exposure Monitoring

Environmental Affairs can perform air monitoring to determine anesthetic gas concentration in the work area. Personal monitoring is conducted at the employee's breathing zone to determine WAG exposure for the employee using a ChemDisk Personal Monitor and analyzed by a certified laboratory. Comprehensive leak testing on the equipment to determine if gas is escaping from various locations in the machine can also be performed by a qualified contractor.

All vaporizers must be certified at least annually.