

Anesthetic Gas Fact Sheet

What is Anesthetic Gas?

Anesthetic gases/vapors such as nitrous oxide and isoflurane are commonly used in laboratory animal research protocols. Halothane, enflurane, and desflurane may also be used in some circumstances. Exposure may occur through inhalation of waste anesthetic gases (WAGs) unintentionally released into the laboratory from leaks in the scavenging system, animal respiration, or uncaptured WAGs.

What are the Hazards?

Possible health effects of exposure to anesthetic gas may include:

- Acute effects: Drowsiness, irritability, depression, headaches, dizziness, and nausea, as well as problems with coordination, audiovisual ability, and judgment.
- Chronic effects: Liver and kidney disease, and adverse reproductive effects.



How Can You Minimize the Hazards?

- Capturing WAGs at the source with **active capture scavenging** (negative-pressure applied) (e.g. working in a [fume hood](#), type IIB Biosafety cabinet vented to the outside, or using other ducted local exhaust ventilation like downdraft tables or [snorkel hoods](#)).
- Capturing WAGs with **passive capture scavenging** in a fume hood. Please only use passive scavenging in addition to active scavenging or when active scavenging is unfeasible (see Fig. 1).
- Maintain charcoal filtration systems to manufacturer standards.
 - Charcoal canisters rely on positive pressure from the anesthetic gas delivery system and/or the exhalation effort of the animal. It absorbs and removes WAGs before being discharged back into the room.



Fig. 1. (a) Example of passive scavenging system. (b) Charcoal filtration system.

- Only to be used for halogenated waste anesthetic gases (e.g. isoflurane, sevoflurane), never nitrous oxide. Nitrous oxide should only be used inside a fume hood.
- Charcoal canisters have a finite effective life span, which must be monitored by weight.
- Working in a well-ventilated area to dilute and remove WAGs not collected by scavenging.
- Optimize nose cone fit to reduce WAGs released at the breathing apparatus.
- Inspect anesthesia equipment and scavenging system before each use.
- Verify that equipment (e.g., fume hood and vaporizer) is currently certified and in proper working condition before each use.
- Oxygen flow rate and anesthetic concentration should be as low as possible to minimize anesthetic gas usage (e.g., 1-2% isoflurane concentration and 0.5 L/min oxygen flow rate for healthy mice/rats).
- Keep WAG capture/collection devices positioned as close as possible to potential points of release (e.g., at animal nosecone), and ensure that the collection device is pulling air away from the researcher's breathing zone (see Fig. 2).
- Keep the researcher's breathing zone at maximal distance away from the animal nosecone, as gas concentrations decrease rapidly with distance.

Other Recommendations

Check with your supervisor and lab veterinarian regarding specific experimental protocols prior to administering any anesthetic.

Activated charcoal canisters that exceed the manufacturer's recommended hours of use or accumulated weight (whichever comes first) must be removed from service, placed in a sealed plastic bag and disposed of as a hazardous waste. If you want to repurpose the canisters, please empty the spent charcoal in a fume hood and refer it for disposal as hazardous waste; then refill the canister with new activated charcoal. Containers of ether must be tested for peroxides every three months. Contact EHS ([413-545-2682](tel:413-545-2682) or askehs@umass.edu) for other questions regarding proper waste disposal of anesthetic agents.

Do not use any damaged or leaking scavenging systems or anesthetic gas equipment. [Refer broken or damaged equipment for disposal through SED](#) if the manufacturer cannot repair the units.

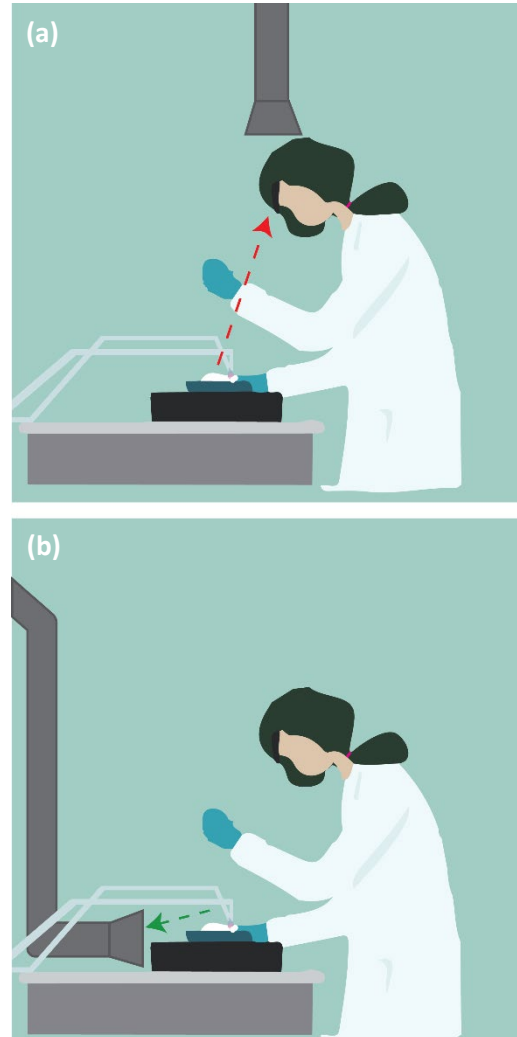


Fig. 2. (a) A local exhaust ventilation unit, poorly positioned, is pulling WAG into the researcher's breathing space. (b) A local exhaust ventilation unit, properly positioned, is used to pull WAG away from the researcher's breathing space.

If you experience symptoms of acute exposure to anesthetic gases, turn off the gas system and remove yourself to fresh air. Feel free to call EH&S (413-545-2682) for assistance.

After any emergency, spill, or near-miss circumstance, notify EH&S ([413-545-2682](tel:413-545-2682)) as soon as possible and complete the [lab incident form](#).

References and Sources

1. Waste Anesthetic Gases Factsheet (Stanford): <https://ehs.stanford.edu/wp-content/uploads/Waste-Anesthetic-Gas-Factsheet.pdf>
2. Workplace Exposure Guidelines for Waste Anesthetic Gases (OSHA): <https://www.osha.gov/waste-anesthetic-gases/workplace-exposures-guidelines>
3. Waste Anesthetic Gases (OSHA): <https://www.osha.gov/waste-anesthetic-gases>
4. Anesthetic Gases in Animal Research (Univ. Michigan): <https://ehs.umich.edu/wp-content/uploads/2016/02/AnimalAnesthetics.docx>
5. Isoflurane (Univ. of N. Carolina): <https://ehs.unc.edu/wp-content/uploads/sites/229/2017/06/isoflurane.pdf>