

UCI Environmental Health & Safety

Safety Moment



Waste Anesthetic Gases (WAG)

Halogenated anesthetic gases/vapors such as isoflurane are commonly used in animal research protocols. Researcher exposure risks occur primarily through the inhalation of waste anesthetic gases (WAG) these gases are unintentionally released into the laboratory environment if equipment is not setup or functioning properly or the WAG is not properly exhausted.

- Some potential effects of short term exposure to waste anesthetic gases are nausea, dizziness, headaches, fatigue, and irritability.
- Long term effects can include sterility, miscarriages, birth defects, cancer, liver/ kidney disease, and asphyxia.
- For hazards associated with the specific anesthetic gas used consult the Safety Data Sheet (SDS) which can be found at <http://www.ehs.uci.edu/msds.html>
- For assistance in setting up your gas anesthesia equipment, please contact the ULAR campus veterinarian at (949) 824-4666.
- If you have reproductive health concerns please visit the EH&S Occupational Health page for more information at <http://www.ehs.uci.edu/occhlth.html>

Exposure Monitoring

- Isoflurane exposure monitoring can be requested to assess the potential waste anesthetic gases in the general laboratory work area. Exposure monitoring is requested by contacting Environmental Health & Safety (EH&S) at (949) 824-6200.
- The occupational exposure limit for halogenated anesthetic agents is 2 parts per million (ppm) based on an eight-hour time weighted average.

Sources of Waste Anesthetic gases (WAG)

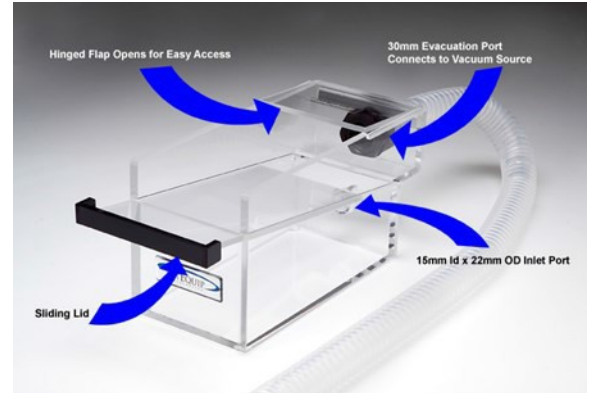
1. Leaks within the anesthesia machine, breathing system, hoses, and connections.
2. Opening of induction boxes.
3. Leaks between subject and facemask/nosecone; over reliance on passive scavenging system.
4. Leaks from around the tracheal tubing.
5. Spills of liquid anesthetics.
6. Charcoal canister misuse or over saturation.



Anesthetic Waste Gas Capture Systems

Active Capture/Scavenging

- **Fumehood, hard ducted biosafety cabinet or down draft/necropsy table:** (Most biosafety cabinets on campus are not hard ducted.)
- **Building ventilation exhaust or vacuum system:** The waste exhaust hose can be hooked into the building ventilation exhaust system or attached to a vacuum outlet. (Need to match input flow with exhaust flow if hooked up direct or use a non-direct hookup, such as with a snorkel or thimble connection.)
- **Non-ducted active scavenging device:** Vacuum devices that are designed to pull/push the WAGs through a charcoal filter system. **CANNOT** be used with nitrous oxide.



Active Scavenging Chamber



Passive Scavenging

- **Cannot be used with nitrous oxide.**
- **Charcoal Canisters:** This method relies on positive pressure from the anesthesia machine and the anesthetized animal's exhalation to push WAGs to gas absorption units.
- When tubing or a nose cone is used, a secondary scavenging system is recommended to prevent WAGs escaping around the tubing or nose cone. Nose cones are not one size fits all. Using a tight fitting nose cone will minimize WAGs.





Minimizing Exposure /Safe Work Practices

- **Bell Jars** are commonly used in the laboratory setting when a small lab animal needs to be anesthetized for a short time. All bell jars should be filled and opened inside a fumehood, ducted biosafety cabinet, or down draft table to prevent inhalation of WAGs.
- **All vaporizer units** on campus must be maintained and certified at a minimum every 3 years. Please visit the Office of Research IACUC Use and Maintenance of Gas Anesthesia Equipment Policy for more information at <http://www.research.uci.edu/compliance/animalcare-use/research-policies-and-guidance/anesthesia-equip-maintenance.htm>
- **Inspection:** Before each use, all components of the anesthetic system, including tubing, flow meters, valves, gaskets, scavenging system, etc. should be inspected by the user to ensure that all components are correctly set up and functioning properly without any leaks in the system.
- **Vaporizers** are anesthetic specific. Anti-spill bottle adaptors are available for filling.
- **Oxygen flow rate** should be as low as possible to minimize the total amount of anesthetic gas usage. Most vaporizers need to have a minimal flow rate of 500-800 ml/min to ensure proper percentage of gas output.
- **Charcoal canisters** must be weighed regularly to ensure they are within manufacturer's saturation limits. Once the canister has reached the saturation limit it should be immediately discarded into the regular trash and replaced to ensure proper WAGs absorption. Continuing to use the canister after saturation limits are met will lead to WAGs leaking out of the canister and into the work space. Do not block air ports. Depending on the model these can be located on either the top or bottom of the canister. Here is a link to the IACUC charcoal canister use safety poster. <http://research.uci.edu/compliance/animalcare-use/attachments/Gas%20Anesthesia%20Poster.pdf>
- **Induction chambers** are ideally used within a fumehood. Alternatively a hose can be attached to the vacuum line (active system) or a charcoal canister (passive system). If a passive system is being used, the chamber should be flushed/purged with a high flow rate of oxygen for 5-10 seconds prior to opening.

Injuries and Spill Procedures

If isoflurane is splashed in eyes, use an emergency eye wash to flush eyes for 15 minutes and complete an injury/incident report. If medical attention is needed refer to the UCI Injury & Medical Treatment Poster for location information at <http://www.ehs.uci.edu/MedEmErgPoster.pdf>.

- Do not attempt to clean-up if you feel unsure of your ability to do so or if you:
- Perceive the risk to be greater than normal laboratory operations.
- Small volumes of isoflurane evaporate readily at normal room temperatures, and may dissipate before any attempts to clean up or collect the liquid are initiated. If a small spill occurs rapidly absorb any liquid with absorbent pads or paper towels and place in chemical fume hood for safe evaporation.
- If a large spill occurs notify others in the area and evacuate the area immediately.
- Contact EH&S at 949-824-6200 during working hours and 911 for emergency medical attention.

Waste Disposal

- Unused (expired) solutions of all anesthetic liquids need to be disposed of as a hazardous material through EH&S. To schedule a pick-up visit <https://www.ehs.uci.edu/apps/waste/cwcollect.jsp>.
- Isoflurane saturated charcoal canisters and empty bottles can be disposed in the regular house trash.

Contact Information

- EH&S (949) 824-6200 or visit <http://www.ehs.uci.edu/>
- Campus Veterinarian Dr. Roger Geertsema rog-er.geertsema@uci.edu
- For exposure monitoring and testing results contact EH&S at x4-6200
- For all vivaria safety questions contact EH&S Vivaria Safety Officer Lorena Andrade at andradel@uci.edu

Anesthesia Equipment Vendor Information

- Harvard Apparatus <http://www.harvardapparatus.com/>
- Vet Equip <http://www.vetequip.com/>
- E-Z Anesthesia <https://www.ezanesesthesia.com/>
- Vet-Tech Active Scavenging Unit <http://www.vet-tech.co.uk/anaesthesia-supplies/scavenging.aspx>

