# University of Arizona

## Anesthetic Gases Standard Operating Procedure

*[This is a template. Fill in all necessary blanks and delete all highlighted areas when complete. Add any sections necessary for your laboratory. This will be appended to your Laboratory Chemical Hygiene Plan.]*

**Title:**  **Click here to enter the title of your SOP.**

**Approval Holder (AH):** Click here to enter text **Approval #:** Click here to enter text

**Approval Holder Phone Number(s):** Click here to enter text

**Approval Safety Coordinator (ASC):** Click here to enter text

**Approval Safety Coordinator Phone Number(s):** Click here to enter text

**Department:** Click here to enter text

1. **Purpose**

This standard operating procedure (SOP) is intended to provide guidance on how to safely use, store, and disposal of anesthetic gases (halogenated anesthetic gases or waste anesthetic gases) in Enter AH’s name’s laboratory. Laboratory personnel should review this SOP, as well as the appropriate Safety Data Sheet(s) (SDSs), before Describe the procedure or process this SOP will address. If you have questions concerning the requirements within this SOP, contact your Approval Holder (AH) or Approval Safety Coordinator (ASC).

1. **Scope**

*[Describe when this SOP applies and to whom this SOP applies.]*

1. **Hazard Description**



Inhaled anesthetic gases are most used in the laboratory to induce general anesthesia in animal subjects for the purposes of surgery or euthanasia. Common anesthetics include nitrous oxide and various halogenated hydrocarbons, such isoflurane (Forane®), desflurane (Suprane®), sevoflurane (Ultane®), halothane (Fluothane®), and enflurane (Ethrane®).

Many of these substances are liquids at room temperature and are mixed with pure oxygen gas to create an anesthetic gas that poses inhalation hazards to users. The use of pure oxygen creates a serious hazard due to the potential to support any flames or make a fire worse.

Exposure to anesthetics and waste anesthetic gases (WAGs) may result in adverse neurological effects, reproductive problems in women, and developmental defects in the unborn fetus. While there is no OSHA permissible exposure limit (PEL) for isoflurane or other halogenated anesthetic gases, best practices stipulate that exposure should be maintained at the lowest achievable limit. The National Institute of Occupational Health and Safety (NIOSH) recommends a maximum occupational exposure limit of 2 ppm over 60 minutes.

1. **Process & Hazard Controls**

*[Describe the steps needed to set up and complete the procedure or process in safe manner following the* [*hierarchy of controls*](https://www.cdc.gov/niosh/topics/hierarchy/default.html)*. Use as much detail as is necessary to ensure all laboratory workers can complete the procedure or experiment safely.]*

* 1. **Elimination/Substitution**

*[Describe any eliminations of hazardous chemicals or processes; alternatively, any substitutions with less hazardous alternatives that could be used to accomplish the task. Delete this section if you are unable to eliminate or substitute.]*

* 1. **Engineering Controls**

*[Describe any engineering controls (e.g. fume hoods, gas cabinets, local exhausts, blast shields, etc.) that are used to safely accomplish the task.]*

* **Fume hoods or Biosafety Cabinet**
  + Use fume hoods or hard-ducted Class II B2 biosafety cabinet (BSC) whenever possible.
  + Filling of vapor chambers, use of the anesthetic gases, and more should be performed in a fume hood or hard ducted BSC whenever possible.
* **Active Scavenging** 
  + When a fume hood or appropriate BSC is not available, active scavenging devices can be used. These include exhausted induction chambers/surgery nose cones or snorkel trunks ducted to the building exhaust system. Do not use the house vacuum line for active scavenging unless approved by RLSS.
* **Passive Scavenging**
  + When a fume hood or appropriate BSC is not available, active scavenging devices can be used. These include exhausted induction chambers/surgery nose cones or snorkel trunks ducted to the building exhaust system. Do not use the house vacuum line for active scavenging unless approved by EH&S.
  1. **Work Practices**

*[Describe any work practices (e.g. staggering schedules, additional cleaning measures for particulates, etc.) that are used to safely accomplish the task.]*

* Delivery & Scavenging
  + Utilize mechanical controls on anesthetic delivery devices like anti-spill adaptors on isoflurane bottles to reduce spills when filling vaporizers, gasket fitted chambers with exhaust ports, and waste scavenging systems like adsorbent filters when exhausted devices are not available.
  + The weight of each new canister should be recorded before its first use.
  + Before each subsequent use, the weight should be checked and recorded.
  + Canisters should be replaced when the total increase reaches the maximum weight indicated by the canister manufacturer.
  + Keep carbon canister at a level below the vaporizer in an upright position to assist passive scavenging
  + Ensure that the holes on the bottom of the canister are not blocked
  + Regularly and dispose of once sorbent material is saturated
* Only fill vaporizing chambers prior to leaving the lab if a fume hood and/or BSC are not available.
* Regularly leak test chambers, anesthetic delivery machines, and gas scavenging systems;
  + Can be done at the lab via the soap/bubble method or by RLSS with a refrigerant detector.
* Confer with your building manager/facility manager to ensure the room has adequate general ventilation (6 air changes per hour minimum).
* Use extreme caution when using pure oxygen for delivery of gas anesthesia to animals. Avoid open flame, cautery work or electric spark hazards (to include static) in proximity to pure oxygen delivery systems to prevent spontaneous combustion and fires.
* Ensure that you are using the proper nose cone size for the animals under anesthesia. Improper nose cone sizes can result in worker exposures through leaks.
  1. **Personal Protective Equipment**

*[Describe the personal protective equipment needed to adequately protect laboratory workers when performing the process or procedure addressed by this SOP. Ensure to specify any personal protective equipment beyond the minimum (i.e. safety glasses, lab coat, gloves, long pants and closed-toed shoes).]*

Respiratory protection may be required, depending upon the use and conditions of the worker. Respirators cannot be worn without consulting RLSS for an official hazard assessment ([rlss-chem-support@arizona.edu](mailto:rlss-chem-support@arizona.edu)).

* **Hand and Arm Protection**: Nitrile gloves are required.
* **Face and Eye Protection**: Safety goggles are required; glasses will not protect eyes from any splashes of chemical or biological materials.
* **Body Protection**: 100% cotton lab coat, due to work with flammable materials and oxidizing gas (potential for fires or explosion).
* **Respiratory Protection**: Respirators may be required if exposures are not able to be adequately controlled by the use of engineering controls or other means. All uses of respiratory protection require RLSS assessment and consultation (for assessment of work, selection of respirator and filtration, and OSHA-mandated medical clearance and fit testing). Contact [rlss-ppe@arizona.edu](mailto:rlss-ppe@arizona.edu) with any questions or concerns.
  1. **Transportation and Storage**

*[Describe how to safely transport and/or store (e.g. ventilated cabinet, flammable cabinet, under inert blanket, etc.) the hazardous chemical(s) or processes.]*

* **Storage**
  + Store in a well-ventilated location below 30°C (86°F), away from heat, flame, and from other materials that may be chemically incompatible. Incompatibilities include strong oxidizing agents, strong acids, bases, and alkali metals.
  + Keep container tightly closed and locked up.

1. **Spills, Cleanup & Disposal**

*[Describe how to safely end the procedure or process, clean up the process or spills, and/or dispose of any waste generated.]*

Spills should always follow the [University Chemical Hygiene Plan](https://rgw.arizona.edu/sites/default/files/cs-univeristy_chemical_hygiene_plan.pdf) Section 8.2.

* **Spills**
  + 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 room immediately. Contact RLSS at 520-626-6850.

**Exposure Response**

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| --- | --- | --- | --- |
| **Inhalation** | **Ingestion** | **Skin Contact** | **Eye Contact** |
| If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician. | Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician. | Wash off with soap and plenty of water. Consult a physician. | Flush eyes with water as a precaution. |

1. **Enter Additional Section Title**

*[Add as many sections as necessary to adequately describe how to safely perform the procedure or process addressed by this SOP.]*

1. **References**

* UCLA Anesthetic Waste Gas SOP: <https://rsawa.research.ucla.edu/wp-content/uploads/waste-anesthetic-gases-fact-sheet.pdf>
* NIOSH Pocket Guide to Hazardous Chemicals