

Tel-Aviv University –Safety Unit

Standard Operating Procedures for **Isoflurane** in Animal Care Research

Chemicals

Isoflurane is a halogenated hydrocarbon that is commonly used as an animal anesthetic.

Isoflurane is a non-flammable, clear, colorless liquid with a mild ether-like odor. It is a very volatile liquid at ordinary temperature and pressure (evaporation rate increase with increasing temperature).

For all halogenated anesthetic agents: the recommended Exposure Limit (REL) is of 2 ppm (2 parts per million), as a ceiling limit, over a 1-hour time period.

When a fire breaks out toxic substances/products may be released as a result of decomposition of isoflurane (e.g. carbon oxides, hydrogen chloride gas or hydrogen fluoride).

Health Risks

Isoflurane is an anesthetic agent known to/ potentially cause central nervous system depression.

Exposure to halogenated anesthetic gases can result in toxicity to humans.

Health effects from short-term exposure include; irritation of eyes, skin, respiratory tract; cough, sore throat, headache, drowsiness, and dizziness.

In case of acute exposure:

Cardiovascular effects may include fluctuations in heart rate, changes in blood pressure and chest pain.

Respiratory effects may include shortness of breath, bronchospasms, laryngospasms and respiratory depression.

Gastrointestinal effects may include nausea, upset stomach and loss of appetite.

Nervous system effects may include ataxia, tremor, Speech disorders, lethargy, headache and dizziness.

The health effects from long term exposure are not well known.

Halogenated anesthetics, in general, have been linked to reproductive problems in women and developmental defects in their offspring.

Engineering controls

Exposure to Isoflurane may occur mainly due to waste anesthetic gas (WAG) escaping from the induction box in which rodents are sedated or due to release/ escaping of un-scavenged isoflurane gas, when using a nose cone/face mask that does not form a tight seal around the animal's face. For the best seal around the animal's face, a diaphragm should be used on the nose cone/face mask.



Exposure to Isoflurane may also occur during filling the anesthetic machine.

Basic methods for minimizing exposures when using isoflurane:

Vaporizer Filling:

1. Fill in a fume hood or exhausting biosafety cabinet (Class II Type B1, B2 or A2)
2. Have the vaporizer modified to use an anesthetic key filler (if possible) and use an anti-spill adaptor (for filling the isoflurane).



3. Fill at the end of the day just before leaving.

Anesthesia Machine Use:

1. Use in a fume hood or exhausting biosafety cabinet (Class II Type B₁, B₂ or A₂).
2. Use a portable exhaust system, for the most probable leakage points of isoflurane.



Induction Chamber Use:

1. Use in a fume hood or exhausting biosafety cabinet (Class II Type B₁, B₂ or A₂).
2. Use a gasket chamber with exhaust port to scavenge waste gas and flush isoflurane from chamber with oxygen before Opening. Sliding induction chambers are safer than hinged.
3. Use portable exhaust system.



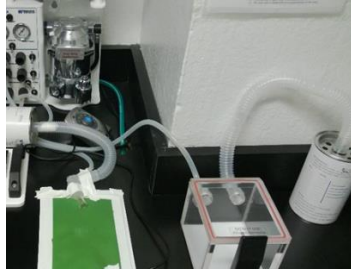
Waste Gas Scavenging:

1. When work can't be done in a fume hood or exhausting biosafety hood (Class II Type B₁, B₂ or A₂), actively extracts waste gas to an exhaust or vacuum system and discharges it to a safe outdoor location.



2. Charcoal canisters absorb waste gas, which is pushed out of the anesthesia system.

Weigh canisters periodically and dispose of when sorbent is full. *The weight of each new canister should be recorded before its first use. (A weight increase in 50 g from the original weight means the canister should be discarded and replaced with a new one).*



End of Procedure:

1. Before turning off the flow or disconnecting animal from circuit, turn off isoflurane, leaving oxygen flowing.
2. Allow animal to breath oxygen for a few minutes or until recovered, this scavenges the gas being eliminated from the lungs.

General Room Ventilation:

Ensure the lab has 6-12 fresh air changes per hour and is negative in air pressure with respect to adjacent areas.

Open drop (Bell Jar/Conical tube) Technique

Isoflurane may be used without a vaporizer. The liquid anesthetic is applied to gauze or cotton which is placed into a container for induction (bell jar), or in a conical tube for maintenance of anesthesia.

Because of the high risk for anesthetic gas exposure, this method should be **performed in a non-recirculating (fume) hood or special biosafety cabinet with a carbon filter.**

Personal Protective Equipment (PPE)	<p>Gloves, lab coats and eye protection (such as chemical goggles), when handling stock bottles of liquid anesthetic agents.</p> <p>When working with the isoflurane anesthesia for an animal protocol a respiratory half-mask / activated carbon, can be use.</p> <p>Students and employees who handle Isoflurane must be proficient in the material Safety Data Sheet (MSDS), this S.O.P and receive training on the hazards of Isoflurane concerning.</p>
Environmental / Ventilation Controls	<p>Ensure the lab has 6-12 fresh air changes per hour and is negative in air pressure with respect to adjacent areas.</p>
Spills	<p><u>Small spill (a few milliliters)</u></p> <p>Isoflurane is a highly volatile liquid. Therefore, any attempt to clean or collect liquid of small spills may not be successful (as the liquid may dissipate quickly).</p> <ol style="list-style-type: none"> 1. Notify and warn co-workers. 2. Evacuate the area immediately for at least 15-20 min (for complete elimination of gas). 3. If any residual liquid is to be picked-up, wear appropriate personal protective equipment (PPE). 4. Absorb any residual solution with absorbent (spill pads, paper towels); dispose of absorbent as chemical waste. 5. Clean spill area with soap and water. <p><u>Large spill (1-2 stock bottles)</u></p> <ol style="list-style-type: none"> 1. In the event of a large spill, evacuate immediate area. DO NOT attempt to clean up large spills of isoflurane: immediately evacuate the spill area and close all doors 2. Notify and warn co-workers

	<ol style="list-style-type: none"> 3. Evacuate the area immediately for at least 30 min (for complete elimination of gas). 4. Restrict the access to the area. 5. If any residual liquid is to be picked-up, lab users must wear appropriate personal protective equipment (PPE) (including a respiratory half-mask / activated carbon). Absorb any residual solution with absorbent (spill pads, paper towels); dispose of absorbent as chemical waste . 6. Clean spill area with soap and water.
Accident Procedures	<p>After any over exposure to anesthetic gases, such as Isoflurane, via skin, eye contact, inhalation or ingestion, call Security at ext. 5555 and ask for medical assistance.</p> <p><u>Skin Contact:</u></p> <ol style="list-style-type: none"> 1 . Immediately rinse the affected area thoroughly with large amounts of water 15 minutes. 2 .Remove all contaminated clothing while continuing to flush with water. <p><u>Eye Contact:</u></p> <p>Immediately flush the eyes with plenty of water for at least 15 minutes.</p> <p><u>Inhalation:</u></p> <ol style="list-style-type: none"> 1 .Immediately move the victim to fresh air. 2 .Call safety unit at ext. 7555 and ask for medical assistance. 3. Provide oxygen if victim has problems breathing.
Waste Disposal	<p>Isoflurane should be disposed of as a chemical hazardous waste only.</p>
Approval Required	<p>The Principal Investigator (PI) must provide lab specific training to all laboratory workers specific to the hazards (physical and health) involved in working with the substance, work area decontamination and emergency procedures. In addition, the PI must review and</p>

	<p>provide a copy of the MSDS and this SOP to any lab worker prior to working with any of the materials covered by this SOP.</p> <p>The PI must ensure that all lab personnel have attended the required training and/or refresher training.</p>
Decontamination	Wash affected area with soap and water.
<p>All staff engaged in the use or handling of isoflurane, whether in the lab or an animal resources facility, are responsible for understanding all hazards associated with its use, and for using appropriate work practices, engineering controls and personal protective equipment (PPE).</p>	
Name:	Title:
Signature:	Date:

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Safety Unit 7555