Working Safely with Isoflurane Guideline

Section 1 - Purpose and Scope

(1) This Guideline provides advice regarding The University of Queensland's (UQ) requirements for working safely with isoflurane by outlining the hazards and safety considerations through:

a. providing information on risk management for working safely with Isoflurane; and
b. providing information on Emergency Procedures and First Aid.

(2) The Guideline applies to all UQ workers (the definition is broad and can be found in the appendix) who carry out work with isoflurane at UQ.

(3) This Guideline should be read in conjunction with other applicable UQ Policy and Procedure Library (PPL) documents covering chemical management and chemical waste disposal.

Section 2 - Process and Key Controls

(4) UQ has a duty under the Work Health and Safety Act 2011 to provide a system of work that ensures the risk of exposure to isoflurane is eliminated or minimised as far as practicably possible. This includes avoiding potential exposure that could result in chronic health effects, as well as ensuring the workplace has suitable first aid procedures.

(5) UQ workers have a duty to comply with any reasonable instruction, and to cooperate with all reasonable policy or procedure relating to health or safety at the workplace.

(6) The following requirements apply to all UQ workers who use, store, handle, transport and/or dispose of isoflurane:

a. Prior to working with isoflurane, a risk assessment must be documented in UQSafe to enable effective risk control measures to be identified and implemented.
b. Precautions, as outlined at the risk control section must be taken to minimise the risk of exposure to isoflurane.
c. Pregnant workers should consider seeking advice from their medical treating practitioner and then speak with their Supervisor regarding working with isoflurane to avoid exposure. Contact the Health, Safety and Wellness Division Occupational Hygiene Advisor if needed for advice on exposure controls.

(7) All incidents, hazards and near misses must be reported in UQSafe.

Section 3 - Key Requirements

Part A - Hazard Information

(8) Isoflurane is a highly volatile, fluorinated organic liquid used for the anaesthesia of animals. It is usually delivered by means of a precision vaporiser but may be administered by means of simpler apparatus for short-term anaesthesia.

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(9) UQ workers may potentially be exposed via inhalation to anaesthetic gases and waste anaesthetic gases (WAG), including isoflurane if care is not taken to scavenge or prevent release into the laboratory environment. The quantity of isoflurane gas potentially escaping into the workers breathing zone will depend on the type of equipment being used and the size of the animal being anaesthetised. Other factors influencing worker exposure to isoflurane is the suitability of the animal to be intubated (minimising direct leakage), the physiology of the animal and the skill of the worker performing the anaesthetic procedure, e.g. students may be exposed to higher isoflurane levels intubating an animal than an experienced animal anaesthetist.

(10) The variations in the source of contaminate isoflurane, the type of animal being anaesthetised, and the level of worker experience should be considered when assessing the risk of exposure from isoflurane.

(11) Other incidental exposures to isoflurane potentially may occur, e.g. lab workers filling vaporisers and technicians calibrating or trouble shooting issues with precision vaporisers.

Risk Control

(12) A thorough examination of work practices is essential to determine if there is a likelihood of worker exposure to isoflurane and steps should be taken to minimise that exposure as far as reasonably practicable.

(13) Precautions should be adopted to ensure that workers are not unnecessarily exposed to the hazard and that they are not working alone. These precautions include adequate general ventilation in the surgical areas, the use of well-designed and well-maintained scavenging systems, work practices to minimise leaks and spills while the anaesthetic agent is in use, routine equipment maintenance to minimise leaks and reducing the number of animal surgeries performed to reduce exposure time.

(14) UQ workers working with isoflurane should complete a risk assessment prior to ordering the substance to identify and reduce or eliminate the associated hazards.

(15) If the isoflurane is not able to be eliminated or substituted, then engineering controls, along with training, supervision and appropriate personal protective equipment (PPE) should be used.

(16) The risk assessment should be checked and approved by the work group’s Supervisor to ensure all identified and appropriate controls to avoid or minimise exposure have been implemented.

(17) Safe working procedures should be monitored and reviewed regularly by the Supervisor to ensure their effectiveness and changed if required.

(18) Persons working with isoflurane should read the Safety Data Sheet (SDS) and receive training from their Supervisor as per the ‘Training and Competency’ provisions below.

(19) Isoflurane should be stored in a secure location so that it is not accessible by the general public.

(20) Detailed emergency response and waste disposal procedures should be in place.

Ventilation

(21) Isoflurane should be used with a scavenging/ventilation mechanism that minimises inhalation exposure to the user. Isoflurane should be used in a well-ventilated room, preferably with no recirculation of exhaust air.

(22) Proper engineering controls including a fume hood, downdraft table or scavenging system should be used:

a. Fume hood – This is impractical for large animals or where highly controlled anaesthesia is required, as a precision vaporiser will not fit in a fume cabinet.
b. Downdraft table – Downdraft tables provide the most effective Local Exhaust Ventilation extraction, although

they are expensive as well as impractical for small animals. Charcoal canisters should be used to adsorb isoflurane or other halogenated anaesthetics if using this method.

c. Scavenging – The collection and disposal of WAG is essential for reducing occupational exposures. An appropriate anaesthetic gas scavenging system is the preferred method of control to protect employees from exposure to anaesthetic gases. Removal of excess anaesthetic gases from the anaesthesia circuit can be accomplished by either active or passive scavenging.
    i. Active scavenging – Procedures done using active scavenging involve an exhaust extraction system. Extracted air can be either removed from the room or cleansed using charcoal filters and returned.
    ii. Passive scavenging – Procedures are done where a combination of exhalation effort of the animal and positive pressure from the delivery of anaesthetic gas drives the air through an activated charcoal canister.

(23) For most laboratory situations, active scavenging should be employed in combination with good general dilution ventilation for a high level of protection from contaminate gas to be provided to workers. It is important that the scavenging system be part of the regular maintenance and calibration of the anaesthetic equipment.

(24) A visual check of hoses for cracks, obstructions or kinks should be performed. Leaks should be identified and corrected, before the system is used. The visual check should also include the flow-monitoring indicator of the scavenging system and this should be done before and throughout use of the equipment.

(25) If scavenging equipment is used, a log of usage should be kept ensuring the charcoal filter is replaced regularly.

Optimising Equipment

(26) Equipment should be optimised to minimise isoflurane leakage into the air. Steps to include:

a. Selecting nose cones and endotracheal tubes to suit various sizes and species encountered. When a nose cone is used for induction or maintenance of anaesthesia, use a nose cone that properly fits the contour of the animal's face to minimise gas leakage.
b. Using a box for induction of anaesthesia in small or uncooperative animals. As with the nose cone technique, the induction box method usually requires high gas-flow rates, with potential for substantial risk of anaesthetic spillage to occur. Methods to minimise this spillage include tight seals on the box and placement of the box near a ventilation port of a well-ventilated room or an exhaust extraction system. Only purpose-built induction boxes should be used.
c. Ensuring that components of anaesthetic circuits are specifically designed for animal anaesthesia, especially connecting tubing and nose cone equipment. Improvised equipment is likely to leak and expose workers to isoflurane, as well as compromise the anaesthesia of the animal.
d. Keyed fillers with good seals are used when filling anaesthetic vaporisers.

Personal Protective Equipment

(27) Nitrile gloves, lab coats and eye protection (safety glasses, goggles, or a face-shield) should be worn to prevent contact with liquid anaesthetic gases as determined by the risk assessment.

Part B - Training and Competency

(28) UQ workers working in laboratories with hazardous chemicals are required to complete online training modules for laboratory and chemical safety. Access to these modules can be found on the HSW Division website: Staff and Health and Safety Training and Induction.

(29) In addition to these online modules, UQ workers who handle or use isoflurane must read the Safety Data Sheet

(SDS), and receive instruction from their Supervisor on:

a. proper handling, use, storage, and disposal of isoflurane;
b. the anaesthesia procedures, including the use of the anaesthetic machine and the waste anaesthetic gas scavenging system;
c. proper use of chemical fume hoods or other applicable local exhaust ventilation; and
d. spill clean-up and emergency response procedures.

(30) Supervisors should verify and document worker and student competency before allowing work with isoflurane to proceed in their areas of responsibility. The local site safety inductions conducted by local Work Health and Safety Coordinator (WHSC) are an important complement to this process and local WHSC's should be notified if any work involving isoflurane is planned for the local area.

(31) It is also recommended that UQ workers who handle or use isoflurane, enrol in and attend an Anaesthesia Workshop facilitated by Biological Resources Veterinarians.

(32) All these training elements should also be documented in the risk assessment as administrative controls.

Part C - Storage Requirements

(33) Isoflurane is classified Schedule 4 (S4) under the Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP), but it is not included in either regulated restricted drug (RRD) or restricted drugs of dependency (RDD) S4 subcategories where additional acquisition, storage and usage requirements apply.

(34) To comply with S4 storage requirements, facilities and laboratory should be secured with controlled access. For open laboratories without controlled access, a locked cupboard/drawer/fridge should be used. Further details of UQ requirements for scheduled drugs and poisons usage can be found at the UQ Medicines and Poisons intranet site.

(35) Isoflurane should be stored in a cool well-ventilated area.

(36) Isoflurane is non-flammable and is not classified as dangerous goods.

Part D - Waste Disposal

(37) Waste management must be included in the risk assessment process. Information regarding chemical waste disposal can be found on the UQ Science Store webpage.

(38) Disposal of absorbent canisters that contain activated carbon to prevent release of the anaesthetic gas to the environment must be managed as hazardous chemical waste.

(39) A request for waste disposal of activated carbon canisters can be submitted through the UQ Science Store under "Chemical Waste Request".

Part E - Emergency Procedures

Minor Spill (less than 500 ml)

(40) Increase ventilation within the room and consider temporary evacuation of the immediate area while vapours disperse.

(41) Wear nitrile gloves, lab coats, eye protection (safety glasses or goggles) and activated carbon respirator and clean up any remaining liquid using an absorptive material.

(42) Dispose of absorptive material as waste through UQ Science Store – Chemical Waste Request.

Major Spill (more than 500ml)

(43) In the event of a major spill, evacuate all persons from the area, contact UQ Security on 07 3365 3333 (or the contact displayed on the Emergency Procedure Card) and the local Safety Team for advice.

(44) Prevent others entering the area.

(45) Do not attempt to clean up any major spills of this material.

(46) All incidents must be recorded in UQSafe. The incident should be reviewed, and the risk assessment/SOP updated and modified with any changes identified during subsequent investigation that will attenuate the risk of a repeat incident.

Part F - First Aid

(47) In the event of an emergency, remove the casualty from further exposure if safe to do so, call UQ Security on 07 3365 3333 and the local First Aid Officer. Refer to local emergency procedure card for the location. All incidents, hazards and near misses must be reported in UQSafe. Refer to the Health and Safety Incident and Hazard Reporting Procedure.

Skin Exposure

(48) Small quantities of isoflurane on skin or clothing will evaporate rapidly but remove excessive isoflurane from the affected area by flushing with water for at least 15 minutes.

Inhalation

(49) Remove the person affected by isoflurane vapour to an area with fresh, uncontaminated air.

Eye Exposure

(50) Immediately flush with large amounts of water for at least 15 minutes.

Section 4 - Appendix

Definitions

Terms	Definitions
Regulated Restricted Drug (RRD)	One of the additional 2 sub-categories of S4 regulated drugs.
Restricted Drugs of Dependency (RDD)	One of the additional 2 sub-categories of S4 regulated drugs.
Safety Data Sheet (SDS)	A document containing information on the health, safety and environmental aspects of a material or chemical for the purposes of storing, using and disposing of the substance in a safe way.
Safe Operating Procedure (SOP)	Step-by-step instructions on how to safely perform a task or activity which involves some risk to health and safety.
Scavenging	The prevention of a contaminate gas entering the breathing zone of workers through selective capture at the feed gas interface with the animal. The captured contaminate can then be exhausted from the room or cleaned and return to the work area.

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Terms	Definitions
UQSafe	UQ's system for the recording of incidents, hazards and near misses and documenting risk assessments.
UQ Workers	For the purposes of this Guideline includes: 1. staff - continuing, fixed-term, research (contingent funded) and casual staff; 2. visiting academics and researchers; 3. affiliates - academic title holders, visiting academics, Emeritus Professors, adjunct and honorary titleholders, Industry Fellows and conjoint appointments; and 4. all students including Higher Degree by Research, postgraduate coursework and undergraduate students.
Waste Anaesthetic (WAG)	Can include both nitrous oxide and halogenated anaesthetics such as halothane, enflurane, isoflurane, desflurane, sevoflurane, and methoxyflurane.
Workplace Exposure Limit (WEL)	Represents the airborne concentration of a particular substance or mixture that must not be exceeded.

Contacts and Additional Information

a. Occupational Hygiene Advisors: hsw@uq.edu.au;
b. Occupational Health Nurse Advisor: hsw@uq.edu.au;
c. UQ Chemicals Store: via UQ Science Store website or uqsciencestore@uq.edu.au;
d. Chemwatch database: print summary SDS, first aid summary, advice to doctor summary and other relevant information on isoflurane.

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