

**LOCAL JOINT HEALTH AND SAFETY COMMITTEE
DEPARTMENT OF BIOMEDICAL SCIENCES
STANDARD OPERATING PROCEDURE**

1. SOLVENT EXTRACTIONS USING SOLID PHASE EXTRACTION TECHNIQUES

Effective Date: January 2003

Author: Staff Technician

Purpose: To promote the safe use of flammable solvents in solid phase extraction techniques

Approvals Required: Faculty Supervisor, Local JHSC, EHS

2. DEFINITIONS:

Flash Point: The minimum temperature at which a liquid within a container gives off vapour in sufficient concentration to form an ignitable mixture with air near the surface of the liquid.

Flammable Liquid (Class I): Liquid with a flash point of less than 37.8°C (eg. acetone, acetonitrile, camp stove fuel, carbon disulphide, ethanol, ether, gasoline, hexane, methanol, toluene).

Solid Phase Extraction (SPE): an extraction technique based on the selective partitioning of one or more components between two phases, one of which is a solid sorbent; while the other is typically a liquid solvent.

Solvents Used: (See MSDS Sheets or Merck Index For Fire, Explosion, Toxicity, Health Effects and other relevant data)

(a) Diethyl Ether

(b) Methanol

(c) Hexane

3. REQUIREMENTS:

Applicable Legislation: Occupational Health and Safety Act (OHSA), R.S.O. 1990, Sects. 25-28, 36-38 and 42.

Ontario Regulations 860, R.R.O 1990, - WHMIS

The Ontario Fire Code (Ontario Regulations 388/97, Part IV

Relevant Standards: Ministry of Labour, Engineering Data Sheet No 4-01 - *Storing and Dispensing of Flammable Liquids*, 1997

Refrigeration Equipment, CSA Standard CAN/CSA-C22.2 No. 120-M91

Safety Containers, Underwriters' Laboratories of Canada, Standard UCL/ORD-C30, 1995

Storage Cabinets for Containers of Flammable Solvents, Underwriters' Laboratories of Canada, Standard UCL/ORD-C1275, 1984

Internal Requirements:

UoG Safety Policy 851.08.06

Persons handling flammables and combustibles shall be WHMIS trained with yearly WHMIS reviews.

4. DESCRIPTION OF THE TASK:

In a fume hood, Sep-Pak C₁₈ cartridges are activated with 5mL 100% methanol and washed with 5mL distilled water. These washes are discarded to waste as per section 6 of this document. Samples are percolated through the Sep-Pak and washed with 5mL water followed by 5mL hexane. Again these washes are discarded to waste. Unconjugated and conjugated steroids are eluted with 5mL diethyl ether and 5mL methanol respectively into 13 x 100 mm tubes. The ether and methanol eluates are evaporated separately under nitrogen at 35°C in a fumehood. After evaporation samples are stored at -20°C.

5. CONTINGENCY PLAN AND REPORTING:

Although good laboratory practices for the management of flammable and combustible solvents are a prerequisite for prevention of spills, knowing how to deal with spills is as equally indispensable, and the procedure for doing so is a requirement of law. The University of Guelph Environmental Health and Safety Bulletin, Vol. V No 3, October 1996 stated that laboratory personnel are responsible for cleaning “small” chemical spills of < 5 litres. Using the adage that a little goes a long way, and that each flammable solvent has a different flash point and differing toxic or health properties, the degree of spill management is thus dependant on the volume of a particular solvent which has been spilled. Five litres spilled in a laboratory is a lot.

The Ontario Fire Code, Part 4, section 4.1.6, addresses the issue of spill control procedure. The OFC states “A written spill control procedure shall be produced and posted in a visible location for any occupancy where flammable or combustible liquids are handled, processed, stored, dispensed or used.” The written procedure should consider:

- a) control of ignition sources
- b) spill containment, clean-up, and waste disposal instructions
- c) personal protective clothing and equipment necessary for spill clean-up
- d) notification to laboratory and supervisory personnel, and to Environmental Health and Safety
- e) spill mitigation orientation for laboratory personnel every six months.

A written procedure for dealing with flammable solvent spills is found below. Copy, paste and post it in the laboratory adjacent to the flammable storage cabinet or spill kit.

FLAMMABLE SOLVENT SPILL MANAGEMENT

● **Spills In The Fumehood**

- **Minor spills** of a few to 50 mL should be absorbed onto paper towels or tissues and allowed to evaporate to dryness in the fume hood with a hood sash opening of around 10 cm. No other action should be required.
- **Medium spills** of between 50 mL and 500 mL should be contained on the surface of the fume hood with the tan coloured **absorbent mats** which are an item of the spill kit station. In the likelihood that a spill of 400-500 mL overflows the lip around the surface of the fumehood, fast action to tide this flow is required. This may mean using more than one absorbent mat, so it is essential to have a stock of these mats as part of the spill kit. A lab coat splashed with solvent should be removed and placed in the fumehood to one side of the spill. Quickly put on another lab coat.
- **Larger spills** of up to a litre require, in addition to absorbent mats, the use of SOLVENT SPILL HANDLER. Spread Solvent Handler initially around the spill, then over the absorbent mats. The Solvent Handler acts to absorb and neutralize the solvent.
- Once the Solvent Handler has caked and dried, clean up the fumehood and floor, and dispose of the debris in the by-pass garbage.

● **Spills on the Laboratory Floor**

Spills on the laboratory floor of >500 ml to 5 litres require quick thinking and quick action.

- *either* if at all in doubt, vacate the laboratory immediately and phone ext. 2000 for assistance.
- **Do Not** re-enter the laboratory.

- **or continue as follows:**

- Control of ignition sources

If your lab is equipped with an electrical power kill-lever that cuts electricity to all sockets except to the fume hood, PULL THE LEVER (located either inside or outside of the main exit).

- If your lab is not supplied with an electrical kill switch, you cannot safely control ignition sources.

- *Do Not* go around the lab pulling plugs.

● **Spill Containment**

- Dump all available absorbent mats, pillows and cushions on and around the spill to prevent it spreading.
- Open the bottle of solvent spill handler and pour the contents (activated charcoal) initially around the periphery of the spill, then over the spill in a ratio of 2 parts solvent spill handler to 1 part spill volume.
- Vacate the lab (post a sign - SPILL - DO NOT ENTER) and allow time for the solvent handler to neutralize the spill, absorb odours and dry to a cake.

● **Personal Protective Clothing and Equipment Necessary for Spill Clean-Up**

- Wear a lab coat, heavy duty rubber gloves, safety glasses, a surgical face mask and stout shoes or rubber boots.

● **Clean-Up and Waste Disposal**

- Place the used absorbent pads, socks and pillows and caked solvent handler in a garbage bag, if necessary using a paint scraper if the pads have annealed to the floor and a dust pan and brush for loose charcoal. Place glass from the broken solvent bottle in the bypass stream. Damp mop the floor.
- Place the garbage bag in the regular or bypass waste stream.

● **Notification to Laboratory and Supervisory Personnel, and to Environmental Health and Safety**

- Do not allow occupation of the lab until solvent fumes have dissipated and clean-up has been completed.
- Inform your immediate supervisor of the incident and fill out an Injury/Incident Report Form which is sent to EHS.

● **Spill Mitigation Orientation**

- Identify how and why spill happened.
- Identify how to prevent reoccurrence of spills
- Identify changes in solvent purchase and storage practices.

6. **WASTE MANAGEMENT AND ENVIRONMENTAL RESPONSIBILITY:**

• **Flushing waste solvent down the sink is prohibited**

- Waste solvent must be segregated into two main streams, 1) NONHALOGENATED (eg. acetone, ethanol, methanol, xylene, hexane) and 2) HALOGENATED (eg. chloroform, acetyl chloride and bromide, benzyl chloride, chlorobenzene).
- Waste solvent containers must be returnable metal safety cans or non-returnable safety coated glass bottles of no more than 5 litres.
- Waste containers must be identified with WHMIS labels giving correct relevant information for the solvent.
- Waste solvent is part of the total solvent inventory of 50 litres for a lab with a CAS approved Solvent Storage Cabinet and should be stored in the cabinet. For a lab that does not have a CAS approved Solvent Storage Cabinets, the waste solvent volume is part of the allowable limit of 5

litres.

- To identify percentages and names of mixed solvents, keep a log by date, volume and name for each addition of solvent to the waste container.
- Following the tagging of the waste container and the appropriate filling out of Request for Waste Removal Forms, waste solvent is removed from the workplace by a service provided by EHS.

7. **REFERENCES:**

Material Safety Data Sheets for Ether, Methanol, Hexane
Merck Index
SOP for Management of Flammable Solvents
SOP for Fume Hoods
SOP for Compressed Gases

8. **DISTRIBUTION OF COPIES:**

Technicians, Graduate Students, Project Students, other University of Guelph employees working in the lab.
Dr. , Faculty Supervisor
Environmental Health and Safety
Local JHSC, Department of Biomedical Sciences

Written By: Staff Technician

Approved By: Faculty Supervisor

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