Standard Operating Procedure

for work with

Chemical name/class:	**Chloroform**	**CAS #:**	**67-66-3**
PI:	**Mark Walters**	**Date:**	**October 30, 2018**
Building:	**Fitzpatrick CIEMAS**	**Room #:**	**Cleanroom and Sample Prep**
		Designated Work Area:	**Solvent Fume Hood**

1. **Circumstances of Use:**

Chloroform is used as a solvent in SMIF. It is a user supplied chemical.

2. **Potential Hazards:**

- Chloroform is a probable human carcinogen. Some animal studies show evidence of reproductive and developmental toxicity from chloroform exposure.
- Inhalation of vapors can cause headaches, drowsiness, dizziness, and nausea. At high concentrations, disorientation, anesthetic effects, and unconsciousness can occur, but acute toxicity is low.
- Chloroform is an eye and skin irritant.
- The OSHA Permissible Exposure Limit for chloroform is 50 ppm as a ceiling limit (exposure must never exceed this level). ACGIH has a threshold limit value (TLV) for chloroform of 10 ppm for an 8-hour workday.
- The odor threshold for chloroform ranges from 85-307 ppm (above OSHA's ceiling limit), so it does not have good warning properties.
- Chloroform is not combustible but exposure to fire or high temperatures may lead to formation of phosgene, a highly toxic gas.
- Consult the Safety Data Sheet and the Laboratory Chemical Safety Summary for chloroform for additional information on hazards.

3. **Engineering Controls:**

- Always work with chlorinated solvents in a designated solvent fume hood in the Clean Room or Sample Preparation Lab.
- All SMIF solvent hoods are equipped with a CO_2 fire suppression system. If the local hood fire alarm starts to beep (the fire alarm strobe on the hood will also flash) then back away from the hood as the CO_2 system will activate 10 seconds after the alarm starts. Alternatively, if there is a fire in the hood the hood's local fire pull alarm can be pulled for immediate release of the CO_2 fire suppression.
    - Exit the cleanroom and contact SMIF staff as soon as possible if this occurs
- An eyewash and safety shower are available in the immediate area.

4. **Work Practice Controls:**

- Use only in a designated solvent chemical hood.
- Keep containers of chloroform closed as much as possible. Only open a container when it is inside a designated solvent chemical hood and you are wearing the proper PPE (section 5).
- Be aware of skin absorption as a possible route of exposure. Plan work so that minimal glove contact is expected, and purchase appropriate gloves for cleaning up small spills (for glove recommendation, see Spill Procedure section).
- Use in the smallest practical quantities for the experiment being performed.
- To decontaminate surfaces, wipe the affected area three times with towels moistened with water (gloves must be worn).

Revised 7-12-2013 and 10-30-2013 to provide improved glove recommendations and spill instructions.

5. **Personal protective equipment (PPE):**

WARNING: Chloroform readily penetrates standard nitrile laboratory gloves (and many other types of gloves).

- ***Wear two pairs of standard nitrile gloves and work so that gloves do not contact chloroform.***
- ***Remove outer gloves immediately if splashed. Remove inner gloves also if degradation is noted***.

Cleanroom

- Standard cleanroom attire, which includes nitrile gloves (double glove) and safety glasses.

Sample Prep Lab

- Fastened lab coat
- Nitrile gloves (double glove)
- Safety glasses or goggles

Gloves for spills: Labs using chloroform should have **North Silver Shield/4H laminate gloves** (which will provide protection for over 8 hours), Best Viton gloves, or other gloves protective for chloroform. Do NOT use double nitrile gloves for spills due to quick breakthrough time. To improve dexterity with laminate gloves, don a nitrile glove over the laminate glove. Be sure to check the glove guide for the specific glove you purchase if not listed here. Not all laminate gloves provide good protection for chloroform.

6. **Transportation and Storage:**

- Chlroform solutions must be in sealed shatter-resistant containers and stored in an exhausted chemical cabinet designated for solvents. They should be stored using secondary containment.
- Do not store chloroform with incompatibles. Chloroform is not compatible with the following: acetone, alkalis, chemically-active metals (such as aluminum magnesium, sodium, or potassium), dinitrogen tetroxide, fluorine, triisopropylphosphine, and solid potassium tert-butoxide.
- Transport chloroform in secondary containment, preferably a polyethylene or other non-reactive acid/solvent bottle carrier.

7. **Waste Disposal:**

Chloroform waste should be poured into a designated chlorinated solvent waste container found inside the solvent hood. ***Note: Never pour chloroform down the solvent cup drain***

8. **Exposures/Unintended contact:**

Contact Employee Occupational Health and Wellness (EOHW) at 919-684-3136 for medical advice on occupational chemical exposures. For an actual chemical exposure/injury

- Flush exposed eyes or skin with water for at least 15 minutes, then seek emergency medical attention.
- For volatile toxic liquids, remove all persons from the contaminated area. (It may be necessary to go outside.)
- Call 911 from a campus phone or 919-684-2444 from any phone to request assistance if needed. Contact Employee Occupational Health and Wellness at 919-684-8115 for exposure-related advice.

The work-related injury or illness report found at: http://www.hr.duke.edu/benefits/medical/workcomp/report.php should be completed within 24 hours. Follow-up medical attention should be sought through Duke Employee Occupational Health and Wellness (919-684-3136).

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9. **Spill Procedure:**

Most spills of chloroform outside of a chemical fume hood should be referred to the OESO spill response team by calling 911 from a campus phone or 919-684-2444 from any phone.

In the event of a spill, follow SMIF spill procedures and immediately contact SMIF staff. Only SMIF staff and/or appropriate OESO personnel should clean up spills

Spills Contained Inside a Chemical Hood

- Avoid breathing vapors from the spill and leave the immediate area of the chemical hood
- Alert people in the immediate area of the spill
- Notify SMIF immediately by calling emergency numbers posted near the phone
- Wait for instructions from SMIF or for SMIF personnel to arrive to complete the clean-up of the affected area.
- Spills of chloroform inside a chemical fume hood, or small spills outside a hood, may be cleaned by laboratory personnel. Wear Silvershield, Viton, or other gloves protective for spills (not nitrile), splash goggles, lab coat (and impermeable apron, if available) and use absorbent pads to absorb spilled material.

Spills Outside of a Chemical Hood

- Attend to injured or contaminated persons and remove them from exposure
- Press the closest manual alarm button (blue box) and evacuate the lab

Make yourself available to the SMIF staff and/or emergency responders and be prepared to tell the following: What chemical(s) are involved, how much was spilled, where the spill is located, nature of any injuries

10. **Training of personnel:**

- All personnel are required to complete the SMIF General Lab Safety session and the SMIF Chemical Safety and Wet Hood training session.
- All personnel shall read and fully adhere to the ***Wet Hood Operating Procedure*** and the ***SMIF Lab Safety and Procedures Manual***

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