



Hydrofluoric Acid

Principal Investigator (PI) Approval is Required Prior to Performing this Procedure

Description

This standard operating procedure outlines the handling and use of hydrofluoric acid. Review this document and supply the information required in order to make it specific to your laboratory. In accordance with this document, laboratories should use appropriate controls, personal protective equipment, and disposal techniques when handling hydrofluoric acid.

Hydrofluoric Acid (HF) is used in small quantities for fabrication of electronic components, glass etching, biological staining, mineral digestion, etc. Always work in the fume hood. Hydrofluoric acid is an extremely hazardous material; lab personnel should work in the buddy system and NO ONE should be allowed to work alone. Only persons who have read and understood this SOP and who are suitably trained should be allowed to use this substance.

****POST THESE FIRST AID INSTRUCTIONS IN THE ROOM
WHERE THE HYDROFLUORIC ACID IS USED OR HANDLED****

Location of calcium gluconate gel:

Building and Room: _____

Exact Location in Room: _____

Potential Hazards

- Liquid HF is one of the strongest and most corrosive acids. It can be irritating to the skin, eyes, and respiratory tract. Contact with exposed body parts can cause painful burns and even death.
- In high concentrations (more than 50%), HF usually causes immediate burns that are extremely painful and slow to heal.
- In lower concentrations, exposure may not be apparent for several hours, but can still cause burns and further damage if not washed off.
- HF causes such severe burns because it penetrates beneath the skin and dissociates into hydrogen and fluoride ions. When fluoride ions bind with calcium in the body, it can result in tissue destruction, decalcification of bone, cardiac arrhythmia, and liver and kidney damage.
- MIOSHA Permissible Exposure Limit for Hydrogen Fluoride is 3 ppm as an 8-hour time-weighted average. The American Conference of Governmental Industrial Hygienists recommends a ceiling (instantaneous) limit of 2 ppm and an 8-hour limit of 0.5 ppm.
- [Calcium gluconate gel](#) will bind to the fluoride ions and prevent further tissue destruction, but it must be applied quickly (even if burns have not been felt) to be effective.
- Consult the Safety Data Sheet (SDS) for your specific product and the [Laboratory Chemical Safety Summary for HF in Prudent Practices in the Laboratory](#) (National Academies Press)

Engineering Controls

Any work with HF must be done in a chemical fume hood. An eyewash/drench hose combination unit must be available in the immediate work area for any work with corrosive materials. For many uses of HF, an eyewash station and a safety shower will also be necessary. Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.

Work Practice Controls

- Consider alternate methods and use a less dangerous acid if possible.
- Designate areas where HF is stored and manipulated.
- Purchase HF in the smallest amounts possible.
- Stock [calcium gluconate gel](#) to be used as first aid in case of an HF burn. (Medical attention must still be sought immediately for HF burns.) Prior to using HF, make sure the calcium gluconate tube is unopened and that the gel has not reached the expiration date stamped on the tube.
- Do not heat hydrofluoric acid.
- Do not use glass, ceramic, or other incompatible containers for HF.
- Perform a dry run to identify and correct potential hazards.
- Add acid to water, not water to acid.
- Work within sight and/or hearing of at least one other person who is familiar with the hazards and written procedures.
- Line work surfaces with plastic-backed absorbent paper and/or a containment tray of compatible material.
- Once work with HF is complete, decontaminate the area by wiping it down with a 10% sodium carbonate (Na_2CO_3 , also known as soda ash) solution.
- Gaseous hydrogen fluoride:
 - Follow SOP for [compressed gas guideline](#).
 - If you have any HF in glass containers, be aware that it can be extremely dangerous. Contact EHS at (810) 766-6763 for an immediate pickup.

Personal Protective Equipment

Wear a fully-buttoned lab coat with sleeves extended to wrists, face shield AND safety goggles, long cuff neoprene outer gloves and nitrile inner gloves, long pants (or other clothing covering the entire leg), rubber apron, and closed toe shoes. For small amounts of HF (<50 ml), double nitrile gloves can be used but must be changed immediately if splashed or thought to be contaminated.

Transportation and Storage

- Transport corrosives in secondary containment, preferably a polyethylene or other non-reactive acid/solvent bottle carrier.
- Store in a compatible container (preferably polyethylene). HF reacts with glass, ceramics, and some metals.
- Place it in a compatible secondary container to capture leaks or spills.
- Store with other inorganic acids, away from bases and other incompatibles including metal (unless the metal has a corrosion-proof coating), and do not store under the sink.
- Avoid storing on the floor.
- Store in a cool, well-ventilated areas.
- Store below eye level.
- Store away from incompatibles.

Waste Disposal

Handle and store HF wastes following the guidelines above while accumulating wastes and awaiting chemical waste pickup. Because most spent, unused and expired chemicals/materials are considered hazardous wastes, they must be properly disposed of. ***Do not dispose of chemical wastes by dumping them down a sink, flushing in a toilet or discarding in regular trash containers, unless authorized by authorized by UM-Flint EHS.*** Contact Environment, Health and Safety (EHS) at (810) 766-6763 for waste containers, labels, manifests, waste collection and for any questions regarding proper waste disposal. Also refer to UM-Flint Hazardous Waste Management Program and EHS webpage <http://www.umflint.edu/ehs/environment-health-and-safety> for more information.

Exposures/Unintended contact



If the employee is in need of emergency medical attention, call 911 immediately



For an actual chemical exposure/injury:

- In case of SKIN exposure, remove contaminated clothing from affected area. Rinse with water for **5** minutes. Immediately after rinsing, use a **gloved** hand to apply calcium gluconate gel to the skin and rub it in. Seek medical treatment below.
- In case of EYE exposure, flush eyes with water for **15** minutes. Hold the eyelids open and away from the eye to allow thorough flushing. Seek medical treatment below. Ice water compresses may be applied to eyes while transporting the person to the doctor.
- For situations with risk of inhalation exposure (including spills of powder outside of a chemical fume hood), remove all persons from the contaminated area and contact EHS at (810) 766-6763.
- If an ambulance is needed, call the UM-Flint DPS at 911 from any university telephone or (810) 766-6763 from any cell phone or non-university telephone to request assistance.

Contact EHS for advice on symptoms of chemical exposure, or assistance in performing an exposure assessment.

Report all work related accidents, injuries, illnesses or exposures to UM-Flint DPS. Additionally, employees and supervisors must be sure to report the injury to EHS and complete and submit the [Illness and Injury Report Form](#) to WorkConnections within 24 hours. Follow the directions on the WorkConnections website [Forms Instructions](#) to obtain proper medical treatment and follow-up.

If you were involved in or observed an incident or near miss, please complete the [EHS Laboratory Incident and Near-Miss Report Form](#). This will be valuable in improving laboratory safety on UM-Flint campus.

TREATMENT FACILITIES:

MAJOR INJURIES	MINOR INJURIES –During Business Hours	MINOR INJURIES –After Business Hours
<p>Genesys Hospital One Genesys Parkway Grand Blanc, MI 48439 (810) 606-5710</p> <p>Hurley Medical Center One Hurley Plaza Flint, MI 48503 (810) 262-9000</p> <p>McLaren Hospital Flint 401 South Ballenger Hwy Flint, MI 48532 (810) 342-2000</p>	<p>Genesys Occupational Health Network 1460 Center Rd. Burton, MI 48509 (810) 715-4620 Mon. to Fri. 7:30 am to 10 pm Sat. & Sun. Noon to 8 pm</p> <p>McLaren Flint-Burton OCC Center 1459 S. Center Rd. Burton, MI 48509 (810) 496-0900 Mon. - Fri. 8 am to 8 pm Sat & Sun 10 am to 2 pm</p>	<p>Downtown Flint 420 S. Saginaw St. Flint, MI 48502 (810) 762-1550</p> <p>Genesys East 1096 S. Belsay Rd, Suite F Burton, MI 48509 (810) 743-3351</p> <p>Genesys North 4154 W. Vienna Rd Clio, MI 48420 (810) 686-7397</p> <p>Genesys South 8447 N. Holly Rd Grand Blanc, MI 48439 (810) 603-0856 Mon. - Fri. 6 to 10pm / Sat. & Sun. 1-10pm</p>

Click [here](#) for more information on the UM – Flint Emergency Preparedness and Response Plan.

Spill Procedure

- When a spill occurs, ***personal safety should always come first.***
- Alert and clear everyone in the immediate area where the spill occurred.
- On the UM-Flint campus, any spill of more than 5 ml of hydrofluoric acid must be referred to EHS by calling (810) 766-6763 from any phone.
- Spills of HF in the fume hood (<5 ml) can be absorbed using magnesium sulfate, soda lime, sodium carbonate (Na₂CO₃), or other spill absorbent specified for HF. Do **NOT** use organic spill kits that contain Floor-Dri, kitty litter, or sand because HF reacts with silica to produce silicon tetrafluoride (a toxic gas). After spill has been completely absorbed, wipe down spill site with 10% sodium carbonate solution.
- **If any large Hydrofluoric Acid solution is spilled, leave the lab and call UM-Flint DPS at 911 from any university telephone or (810) 766-6763 from any cell phone or non-university telephone to request assistance from EHS.** Do not take any action to cover the spill. Post a warning on the lab and do not allow others to enter. Have a person available that has knowledge of the incident and laboratory to assist emergency personnel.

Additional Spill Links:

- www.oseh.umich.edu/pdf/chemspil.pdf
- <http://www.oseh.umich.edu/emer-chemical.shtml>

Report all emergencies, suspicious activity, injuries, spills, and fires to the UM-Flint Department of Public Safety (DPS) at 911 from any university telephone or (810) 762-3333 from cell phone or non-university telephone. Register with the [University of Michigan Emergency Alert System](#) via Wolverine Access. Also, preprogram the UM-Flint DPS telephone number (810) 762-3333 into your cell phone for quick, easy use.

Training of Personnel

All personnel are required to complete Laboratory Safety Training. Documentation of the training is required. This training can be accomplished by completing the **Comprehensive Laboratory Safety** session (BLS009 or equivalent) via [MyLINC](#), or UM-Flint EHS on-line training or other equivalent approved by EHS. Furthermore, all personnel shall read and fully adhere to this SOP when handling hydrofluoric acid.

Certification

I have read and understand the above SOP. I agree to contact my Supervisor or Lab Manager if I plan to modify this procedure.

Name	Signature	UM ID #	Date

Principal Investigator _____

Revision Date _____