

**EEM-EHS**

**Environmental Health and Safety**

**Handling Hydrofluoric Acid**

**Standard Operating Procedure**

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| **SOP Number: LS001** | **Revision Number: 0** | **Date of Last Revision:** |

Name:

Date:

Revision Number:

Date of Revision:

**\*Attach description of process that involves the use of hydrofluoric acid.\***

**1.0 Hazards Associated with Hydrofluoric Acid:**

Hydrofluoric acid (HF) is extremely corrosive and a serious systemic poison. Acute exposure to hydrofluoric acid can cause extreme respiratory irritation, delayed fever, cyanosis, immediate and severe eye damage as well as pulmonary edema. HF can penetrate the skin, destroying soft tissues and decalcifying bone. Contact of the skin with the liquid may cause severe burns, erythema, swelling, vesiculation, and serious crusting. With more serious burns, ulceration, blue –discoloration, and necrosis may occur. Exposure to greater than 50% hydrofluoric acid solutions will cause severe, penetrating burns to the skin, eyes, and lungs and a whitish discoloration of the skin which may form blisters. **Exposure to less concentrated solutions will also cause severe burns but the appearance of symptoms may be delayed for up to 24 hours.** (The fluoride ion readily penetrates the skin causing destruction of deep tissue layers and bones.) **If you are exposed to hydrofluoric acid seek medical attention immediately, even if you do not feel pain.** Chronic exposure to HF can result in fluorosis, bone and joint damage. Hypocalcemia, hyperkalemia, and hypomagnesemia can occur from absorption of fluoride ion into the blood stream. With low levels of calcium and magnesium in the blood and high levels of potassium in the blood; low blood pressure, irregular heartbeat, seizures, involuntary muscle contractions and death can occur. People with pre-existing skin disorders, eye problems, or impaired kidney or respiratory function may be more susceptible to the effects of HF.

**2.0 Controls:**

**2.1 Engineering Controls:**

* Identify and use a less hazardous chemical. (Before purchasing, do research into possible substitutes for hydrofluoric acid.)
* Utilize a fume hood.

**2.2 Administrative Controls:**

* Do not work alone in the lab. Implement the buddy system.
* Attend baseline laboratory safety training (required annually). The training schedule is located at the following link - <http://www.uml.edu/ehs/Training_Schedule.html>.
* Attend laboratory-specific training on handling HF and first aid procedures for HF.
	+ Document this training in section 8 of the Chemical Hygiene Plan Notebook.
* Verify that there is an unexpired tube of calcium gluconate gel in the lab’s first aid kit. Please contact EEM-EHS at extension 42543 if in need of an unexpired tube of calcium gluconate gel.
* Know the location of the emergency shower and eyewash station.
* Review this SOP and safety data sheet (SDS)for HF as part of your laboratory-specific training on handling HF.
* Keep a hard copy of the safety data sheet (SDS) for HF in section 6 of the CHP Notebook.
* Place HF SOP in section 7 of the CHP Notebook. This SOP may also be posted by work station for handling HF.
* Label areas that contain HF so that the hazard is evident.
* Purchase only enough material needed to complete an experiment.
* Stock a pair of thick neoprene, natural rubber or Viton ® gloves in the first aid kit for applying the calcium gluconate gel onto the contaminated areas of a person’s skin.
* Keep a second set of clothes available in the lab in case your clothes become contaminated with HF. (This way, you will have a second set of clothes to put on after removing contaminated clothes and before being transported to the Emergency Room.)
* Wash hands thoroughly with soap and water after removing gloves.
* If gloves become contaminated with HF, remove gloves immediately and wash hands with soap and water for 15 minutes. Check hands for any signs of contamination.

**2.3 Personal Protective Equipment:**

* Safety goggles
* Face shield if splash hazard to the face and/or using concentrated HF
* Laboratory coat
* Acid-resistant apron made of natural rubber, Viton ®, or neoprene
* Medium to heavy weight Viton ®, natural rubber, or neoprene gloves (Refer to a glove compatibility chart and/or contact Kathi Lyon at extension 42746.) Wear a pair of disposable nitrile gloves under the medium to heavy weight Viton ®, neoprene or natural rubber gloves for added barrier protection.
	+ NOTE: Gloves must be selected on the basis of their chemical resistance to the material(s) being handled, their suitability for the procedures being conducted as well as temperature extremes. Improper selection may result in permeation of the chemical through the glove and possible personal exposure to the chemical.
* Closed toe shoes and pants

**3.0 Precautions:**

* Reactions may occur in the presence of heat and light.
* Avoid contact between HF and metals. Contact with metals results in the formation of hydrogen gas which can form an explosive mixture in air.

**4.0 Storage:**

* Store HF in a cool, dry, well-ventilated area in tightly sealed containers that are properly labeled.
* Store HF in chemically compatible containers such as Teflon ® and polyethylene.
* Glass, metal, and ceramic containers are not compatible with HF.
* Store HF in a separate location away from incompatible materials. HF is incompatible with metals, concrete, glass, ceramics, ammonia, strong bases such as sodium hydroxide and potassium hydroxide.
* All cabinets containing corrosives should be clearly marked with a “corrosives” label.
* Recommend storing all corrosives in secondary containment such as a polyethylene spill tray.

**5.0 Disposal:**

Place the UMass Lowell Hazardous Waste Label on the container and fill out the label. (Do not use glass or metal containers.) Full and/or dated containers of hazardous waste are picked up by EEM-EHS during the weekly inspection checks for satellite accumulation areas or upon request by calling 42543. Remember, the container must be picked up within 3 days after the container is full or dated. Since weekly inspection checks occur every Wednesday, please call extension 42543 for a pick-up if your full and/or dated container of hazardous waste is generated on a Thursday, Friday, or Saturday.

Empty containers that once contained HF must be disposed of as hazardous waste. Please properly label the empty container with a hazardous waste label and then place the empty container in a Ziploc bag.

**NOTE: Gloves that are not contaminated with HF may be disposed of in the trash. Gloves contaminated with HF must be disposed of as hazardous waste. Please place contaminated gloves in an impervious, properly labeled container. Contact the chemical receiving stockroom at extension 42543 if in need of a waste container.**

**6.0 Emergency Procedures:**

**6.1 Spills**

**For spills that occur inside of a fume hood (< 100 milliliters)**

* If lab group has received proper training and a proper spill kit is available, the spill may be cleaned up by the lab group.
* If the lab group has not received proper training and a spill kit is not available or greater than 1 liter of HF has spilled, please contact EEM-EHS at extension 2618.

*Examples of proper spill kits for HF are the following: powdered calcium carbonate, calcium hydroxide, caustic soda, and Spill-X-C caustic neutralizer.*

**For spills that occur outside of a fume hood**

* Evacuate the lab, post a restriction on the lab door and call UMass Lowell Police at extension **44911**.
* Stay close by to answer questions when EEM-EHS and emergency response personnel arrive.

**6.2 First Aid**

**No person exposed to HF should be allowed to go home or return to work without first seeing a doctor who is aware of the nature and extent of the exposure.**

**Often, symptoms of HF exposure are delayed for several hours after exposure. If you suspect you may have been exposed to HF but do not feel pain, apply first aid immediately. Remember, exposure to less concentrated solutions will also cause severe burns but the appearance of symptoms may be delayed for up to 24 hours.** (The fluoride ion readily penetrates the skin causing destruction of deep tissue layers and bones.)

For eyes

* Irrigate the eyes for 15 minutes, holding eyelids apart.
* Buddy must call extension **44911** to seek medical assistance and then can keep track of the length of time eyes are being irrigated.
* Give MSDS for HF to medical personnel when they arrive on scene.
* Do not apply calcium gluconate gel to the eyes.

 For skin when calcium gluconate gel is available

* For full body exposure, remove contaminated clothing and go under the emergency shower for 5 minutes. (Place contaminated clothing in a plastic bag or in the fume hood.) If bare hands or arms are contaminated, rinse area with water for 5 minutes. After 5 minutes, apply calcium gluconate gel to exposed areas on skin. Reapply calcium gluconate gel every 15 minutes. (To avoid cross contamination, the victim should self-apply the calcium gluconate gel with thick neoprene, natural rubber or Viton ®gloves. If the victim is unable to self-apply, anyone present can apply the calcium gluconate gel after first putting on proper gloves.)
* Buddy must call extension **44911** immediately to seek medical assistance.
* Give MSDS for HF to medical personnel when they arrive on scene.

For skin when calcium gluconate gel IS NOT available

* For full body exposure, remove contaminated clothing and go under the emergency shower for 15 minutes. If bare hands and/or arms are contaminated, rinse area with water for 15 minutes. Remove clothing and rinse contaminated area for 15 minutes.
* Buddy must call extension **44911** immediately to seek medical assistance.
* Give MSDS for HF to medical personnel when they arrive on scene.

For inhalation

* Remove to fresh air. Seek medical attention immediately. Call extension **44911**. NOTE: Even small amounts of vapor can cause irreversible damage to the mucous membranes.
* Give SDS for HF to medical personnel when they arrive on scene.

**6.3 Fire:**

* Evacuate the lab, pull the nearest fire alarm pull station and then go to a safe area and call extension **44911**. Follow the fire safety evacuation plan.

(Toxic gases and vapors such as fluorine may be released in a fire involving hydrogen fluoride.)

**NOTE:** All work-related injuries must be reported immediately to Human Resources (HR) by calling extension 43560. An Incident/Injury Report Form must be filled out and faxed to EEM-EHS at 934-4018. [The Incident/Injury Report Form is available on-line at <http://www.uml.edu/ehs>. Please double click on the link at the end of this web page entitled [UMass Lowell Emergency Accident / Incident Report Form (PDF).]](http://www.uml.edu/ehs/Documents/UMass_Lowell_Emergency_Accident-%20Incident_%20Report_%20Form.pdf) The original Incident/Injury Report Form must be turned in to HR.

*\*The buddy, supervisor, or Principal Investigator may fill out the Incident/Injury Report Form while the injured employee follows first aid procedures and seeks medical attention.*