

Standard Operating Procedure

This document covers basic chemical safety information for hydrofluoric acid. The use of hydrofluoric acid is subject to pre-approval by the Principal Investigator (PI) and/or Supervisor. **DO NOT USE HYDROFLUORIC ACID UNTIL YOU HAVE OBTAINED THE NECESSARY PRE-APPROVAL.**

Hydrofluoric Acid (HF)

Hydrofluoric acid is a mineral acid which is highly toxic due to the fluoride ion. HF is a lipid-soluble molecule that penetrates tissue more rapidly than typical mineral acids. As a result, poisoning can occur readily through exposure of skin, eyes, when inhaled or swallowed. Symptoms of exposure to HF may not be immediately evident since HF interferes with nerve function. HF is also a calcium seeker; it dissolves the calcium in the bone. Accidental exposures can go unnoticed, delaying treatment and increasing the extent and seriousness of the injury.



[Click Here](#) to access the Hazardous Communication and GHS training course

Personal Protective Equipment & Personnel Monitoring



Lab Coat

Traditional lab coat (or NRF cleanroom gown) **AND** natural rubber apron over the top



Eye Protection



Face Shield

ANSI Z87.1-compliant safety goggles **AND** face shield.



Gloves

**Dilute Solutions
(<30%)**

For brief use of dilute solutions, nitrile exam gloves can be employed. **Double gloving** is recommended. Dispose of immediately when contamination is suspected



Gloves

**Concentrated
Solutions (>30%)**

For the use of concentrated solutions: gloves **must** cover the hands, wrists, and forearms. According to the Quick Selection Guide to Chemical Protective Clothing (5th edition, page 149), the following gloves will provide protection from hydrofluoric acid (30-70%) for 4 hours or more: Butyl rubber, neoprene rubber, Viton®/butyl rubber, Barrier® (PE/PA/PE), Silver Shield/4H® (PE/EVAL/PE), Trelchem® HPS, Trelchem® VPS, Tychem® SL (Saranex®), Tychem® CPF3, Tychem® BR/LV, Tychem® Responder®, Tychem® TK. The following gloves will protect against hydrofluoric acid (>70%) for 4 hours or more: Neoprene rubber, Barrier® (PE/PA/PE), Trelchem® HPS, Tychem® TK

Review the chemical specific Safety Data Sheets (SDS) and your Laboratory's Hazard Assessment (LHAT) for additional guidance on PPE selection. [Click Here](#) to access the Personal Protective Equipment training course.

Labeling & Storage

HF easily dissolves glass; therefore HF must be always be stored in its original container and placed in Nalgene/polypropylene secondary containment. HF solutions must be stored in plastic bottles and placed in Nalgene/polypropylene secondary containment. Do not store above eye level. Do not store with oxides, organic chemicals, bases or metals. Labels identifying the material as Acute Toxicant must appear on the bottles and secondary containers. Also, if not plainly visible (e.g. through a cabinet window), labelling must be applied to storage locations (e.g. cabinet doors & secondary containment) where these are stored, to avoid an inadvertent encounter.

The template for chemical labels can be found in **Appendix C** of the Lab Safety Manual.
[Click Here](#) to download the label template

Engineering Controls, Equipment & Materials

Fume Hood

Use fume hood to keep exposure to HF as low as possible. If your protocol does not permit the handling of such materials in a fume hood, contact EH&S at askEHS@mssm.edu to determine if additional respiratory protection is warranted.

[Click Here](#) for access to the fume hood training course

Spills and Waste Management

Spills involving Hydrofluoric Acid are always considered major spills and should be treated as such. **Do not try to clean up spills of any size. All HF spills require emergency response.** Immediately notify others in the area of the spill, including your supervisor. Attend to injured and/or exposed personnel **only if safe to do so**, evacuate the area, close the door, notify any persons in adjacent areas, and **call Security (x60) (24/7) for immediate response.**

Please provide the following information:

Spills

- **Inform if there are injured personnel for immediate medical response**
- Your name
- Location of the Lab or area of spill (building, floor, room)
- What material spilled
- Approximate amount of material spilled
- Location of spill (on the floor, in the hood, behind the cabinet, etc.)

Try to have the SDS for the material on hand, if safe to do so, when calling for the spill. Remain calm. Leave the spill area but stay in a safe location nearby.

Waste

HF waste is considered Extremely Hazardous. Note: Empty containers of HF and gloves/PPE that come in contact with HF must be disposed of as hazardous waste. Requests for chemical waste pickups should be sent to [#ehswaste@mountsinai.org](mailto:ehswaste@mountsinai.org)
Refer to Mount Sinai's Chemical Hygiene Plan / Laboratory Safety Manual for more details on managing these materials as a hazardous waste.

[Click Here](#) for access to the Hazardous Waste training course.

First Aid & Exposures

All labs working with or storing HF must include in their first-aid kit a **Calcium gluconate gel**. If you or any other lab personnel have suffered from a chemical exposure or are feeling any symptoms as described on the SDS, notify your supervisor and go to the Emergency Department immediately.

If you have a copy of the SDS immediately available, bring it with you; otherwise, ask someone to bring a copy for you. An SDS will help the physician provide the best treatment options for the specific material.

All employees should be aware of the location and shortest route to the Emergency Department (ED) located in Guggenheim Pavilion (GP) B1 level. View the map in **Appendix H** of the Laboratory Safety Manual to determine the quickest route to the ED from your location.

All employees should be aware of the location of emergency equipment, including the nearest safety shower and eyewash station. Eyewash stations must be tested on a weekly basis. [Click here](#) to download the eyewash inspection log.

Below is more specific information regarding various routes of chemical exposure.

Skin Contact

Immediately (within seconds) shower or flush with plenty of water. Remove all clothing while in the shower (remove goggles last; double-bag contaminated clothes). If 2.5% calcium gluconate gel or 0.13% benzalkonium chloride is available, rinsing may be limited to *5 min* [this is sufficient time to effectively remove HF from the skin; additional flushing time is unnecessary and will delay further treatment]. If neither neutralizing

agent is on hand, continue to flush until medical help is available. Continue with either (a) or (b).

- (a) Apply calcium gluconate gel (2.5%) while wearing impervious gloves. Massage the gel promptly and repeatedly into burned area until pain is relieved. If pain does not subside within 20 to 30 min, injections of 5% calcium gluconate by a professional may be needed.
- (b) Immerse affected area in iced 0.13% benzalkonium chloride (Zephiran). Use ice cubes, not shaved ice in order to prevent frostbite. If immersion is not practical, use towels soaked with iced 0.13% benzalkonium chloride as compresses for the burned area. Change compresses every 2 to 4 min. Continue until pain is relieved (this may require hours).

Get immediate medical attention.

IT IS IMPERATIVE that immediate and thorough treatment be provided at the **EARLIEST** possible time.* Alert emergency personnel.

(2) Immediately utilize emergency deluge showers and/or emergency eyewash[†] based on the amount or area of contamination to the body.

(3) The employer's first responders must be trained in first aid for hydrofluoric acid burns, including the use of 0.13% benzalkonium chloride and 2.5% calcium gluconate gel and calcium gluconate intravenous solution (first responders per OSHA are to be trained to service the potential hazards).

(4) Upon arrival at the scene, first responders should evaluate the victim for potential cardiovascular or pulmonary complications, and initiate emergency medical treatment based on the existing emergency medical services protocol.

(5) Whereas initial irrigation of a corrosive with deluge shower or emergency eyewash generally lasts 15 minutes, in the case of HF burns, it is 5 minutes prior to further medical treatment or until relieved by emergency personnel. Clothing, jewelry, and shoes should be removed during the showering period, removing chemical goggles last over head and eyes closed. Normally, individuals tend to close their eyes when flushing, so it is important to hold the eyelids open and have the victim roll the eyeballs so water will flow to all surfaces.

Eye Contact

(6) It is critical to irrigate beneath the eyelids, not just the face and external surfaces of the eyelids. It is important not only to flush away the caustic substance, but also to remove any particulate matter that may have lodged under the eyelids.

(7) A device such as a Morgan Lens or, preferably, an Eye Irrigator can be used with a standard Ringers solution containing 1.0% calcium gluconate and a local anesthetic for HF ocular burns. The Eye Irrigator[‡] is a fairly new device, consisting of a slitted loop designed to easily slide up under the upper lid without having to pry open or otherwise traumatize the eye. The procedure is simple but does require some basic training. *Benzalkonium chloride solutions should not be used for ocular burns.*

(8) Eye irrigation should be continued by the first responder until relieved by a physician, preferably by an ophthalmologist. *Calcium gluconate should not be injected subconjunctivally or subtenons*, because it is too toxic for ocular tissue.

(9) The ophthalmologist may elect to continue irrigation with 500–1000 mL of 1% calcium gluconate solution utilizing a local anesthetic. Depending on the severity of the injury, the patient may be admitted to hospital or discharged with a topical application of 1% calcium gluconate eye solution, ophthalmic steroids, antibiotics (systemic or topical), and other treatments for alkali corrosive eye burns such as glaucomatous agents for elevated intraocular pressure.

Inhalation

Immediately get to fresh air. Call or have someone call a physician. Breathe 100% oxygen (10 to 12 L/min flow rate) as soon as possible. Emergency personnel should provide calcium gluconate (2.5%) by nebulizer.

Ingestion Get immediate medical attention.

Drink large amounts of water. Do not induce vomiting or administer activated charcoal. Drink several glasses of milk or several ounces of milk of magnesia, Mylanta, Maalox, or similar product, or up to 30 Tums, Caltrate, or other antacid tablet.

Get immediate medical attention.

Needle Stick

Seek medical attention immediately. Notify Employee Health Services, Monday-Friday 8:30 am-4:30 pm, at 646-951-7233. At other times, notify the Nursing Administrator on duty (dial "0" for page operator MSH).

Lab Specific Processes

Please describe in the allotted space below the specific processes and equipment (including PPE and engineering controls) that will be utilized while handling materials of this nature in your lab.

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Name	Signature	Date