

STANFORD UNIVERSITY – HYDROFLUORIC ACID

Hydrofluoric acid, a solution of hydrogen fluoride gas (HF) in water, is one of the most corrosive and dangerous chemicals encountered in the laboratory. Exposure to HF can cause severe tissue damage and even death. Deaths have been reported from concentrated acid burns (involving $\geq 50\%$ HF solutions) to as little as 2.5% of body surface area.¹ In lower concentrations, symptoms may be delayed. The following special safety precautions are necessary when using this chemical, regardless if using dilute or concentrated HF.

BEFORE WORKING WITH HF

1. Standard Operating Procedure (SOP):

- Develop a SOP, which is a set of written instructions that describes in detail how to perform a laboratory process or experiment safely and effectively.
 - Guidance for prioritizing SOP development is available at:
<http://chemtoolkit.stanford.edu/TemplateSOP>
 - A customizable general use SOP for corrosive materials is available at:
<http://chemtoolkit.stanford.edu/CorrosiveSOP>
- Plan the operation to eliminate risk of HF splash/spray.
- Perform a “dry run” of procedure to identify and correct potential hazards.

2. Health & Safety Training:

- Lab personnel must receive:
 - General safety training, which includes General Safety & Emergency Preparedness (EHS-4200) and Chemical Safety for Laboratories (EHS-1900).
 - Lab-specific training, which includes reviewing the hazards of HF, safety precautions, and emergency procedures. The SOP, Material Safety Data Sheet (MSDS), and this fact sheet can be used for such training.
- Keep training records for at least one year.

3. Engineering Controls & Safety Equipment:

- Ensure the nearest emergency safety shower / eyewash is accessible and has been tested in the last month.
- Ensure laboratory fume hood has been certified within the last 12 months and is functioning properly (check sticker on fume hood and inward airflow monitor).

4. First Aid Procedures:

- Post SU HF First Aid Instructions in labs that store or use HF solutions or gas; see back page.
- Ensure 2.5% calcium gluconate gel (intended for dermal exposures) is available in laboratory.
 - Ensure gel has an effective shelf life of at least one year.
 - Implement a system to refresh your supply of gel before the expiration date.

- Gel can be purchased through many lab safety supply vendors, including SU SmartMart.

WORKING WITH HF SOLUTIONS

1. Engineering Controls:

- Work in a fume hood with the sash opened as little as possible — sash must not be opened beyond the stickered arrow.

2. Work Practices:

- Purchase and use the smallest quantities necessary.
- Establish designated area for HF use and post sign “Hydrofluoric Acid Use Area.” Also post sign on lab door when in use.
- Do not work alone; others present in the laboratory must be familiar with the operation’s hazards and emergency procedures.
- Add acid to water, not water to acid.
- Do not use glass, ceramic, or other incompatible containers with HF.
- Ensure secondary containment and segregation of incompatible compatible chemicals; see [SU Compatible Storage Group Classification System](#).
- Store HF solutions below eye level.

3. Personal Protective Equipment (PPE):

- Check PPE for damage before using.
- Wear appropriate PPE, which minimally includes:
 - Goggles and face shield.
 - Butyl rubber or neoprene gloves.
Verify glove selection based on concentration and potential exposure via SU’s Laboratory Chemical Glove Selection Guidance:
<http://chemtoolkit.stanford.edu/docs/LaboratoryChemicalGloveGuidance.pdf>
 - Neoprene long-sleeve apron if splash/spray is possible.
 - Lab coat and closed-toe shoes.

EMERGENCIES

1. Personnel Exposures:

- See the SU HF First Aid Instructions on following page for personnel exposures.

2. Spills:

- Immediately call EH&S at 725-9999 (286 from School of Medicine phones) to report an HF spill that is health threatening, is greater than 30 mls, or will take longer than 15 minutes to clean up.
 - See SU’s Laboratory Chemical Safety Toolkit for additional guidance on spills:
<http://chemtoolkit.stanford.edu/SmallChemSpills>

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¹ <http://emedicine.medscape.com/article/773304-overview>

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HYDROFLUORIC ACID FIRST AID INSTRUCTIONS

POST THIS SHEET IN THE ROOM WHERE THE HYDROFLUORIC ACID IS USED OR HANDLED.

Location of calcium gluconate gel:

Building and Room: _____ Exact Location in Room: _____

Expiration date: _____

Location of MSDS: _____

BACKGROUND ON HF

Hydrofluoric acid (HF) exposure is very toxic and can be fatal if not treated immediately. HF is absorbed quickly; however, damage/symptoms can occur hours to days later. **Any person exposed to HF must have immediate first aid, followed by immediate medical treatment from a physician.** When seeking medical attention **bring a copy of the HF Material Safety Data Sheet** to the Stanford Hospital Emergency Room.

SKIN EXPOSURE	EYE EXPOSURE
<ol style="list-style-type: none">1. Immediately flush affected area with water for <u>15 minutes</u> under emergency eyewash/shower station or other water source. Remove all contaminated clothing while flushing with water.2. After flushing, apply calcium gluconate to burn site with clean, gloved hand. Continue massaging gel into the burned area of skin for up to 20 minutes.3. For emergency medical assistance, call:<ul style="list-style-type: none">• 9-911 from SU phones• 911 from non-SU phones• 286 from School of Medicine phones <p>Or, take victim to seek medical evaluation at Stanford Hospital Emergency Room.</p>	<ol style="list-style-type: none">1. Immediately flush eyes with water for at least <u>15 minutes</u> under emergency eyewash or other water source. If only one eye is affected, be careful not to flush contaminated water into the other eye.2. For emergency medical assistance, call:<ul style="list-style-type: none">• 9-911 from SU phones• 911 from non-SU phones• 286 from School of Medicine phones <p>Or, take victim to seek medical evaluation at Stanford Hospital Emergency Room.</p> <p>If possible, provide continuous irrigation during transport.</p>
INHALATION	INGESTION
<ol style="list-style-type: none">1. For emergency medical assistance, call:<ul style="list-style-type: none">• 9-911 from SU phones• 911 from non-SU phones• 286 from School of Medicine phones <p>Or, take victim to seek medical evaluation at Stanford Hospital Emergency Room.</p>	<ol style="list-style-type: none">1. Rinse mouth with cold water. <u>Do not induce vomiting.</u>2. If the victim is conscious, have them drink lots of water to dilute the acid.3. For emergency medical assistance, call:<ul style="list-style-type: none">• 9-911 from SU phones• 911 from non-SU phones• 286 from School of Medicine phones <p>Or, take victim to seek medical evaluation at Stanford Hospital Emergency Room.</p>