



SAFE WORK PROCEDURE	Modified from: https://riskmanagement.sites.olt.ubc.ca/files/2017/11/Working-Safely-With-Hydrofluoric-Acid-SWP.pdf
Health, Safety & Environment https://hse.ok.ubc.ca/	Effective date: January 22, 2021 Review date: NA Supersedes: NA

Working Safely with Hydrofluoric Acid

1. SCOPE

This safe work procedure applies to working directly with HF as a reagent as well as procedures where HF is a by-product.

2. PURPOSE

Hydrofluoric acid (HF) is an extremely dangerous chemical, and can cause death from a skin exposure of less than 3% of body area. Special training, preparation, personal protective equipment, and handling precautions are needed when handling HF.

3. RESPONSIBILITY

Supervisors and members of research groups who are using HF must:

- Plan work in the knowledge that any exposure may cause permanent incapacity or death
- Ensure all personnel working in the laboratory containing HF are familiar with the properties and hazards of HF
- Document all required training
- Create and document a risk assessment prior to HF use
- Document and follow the appropriate safe work procedure.

4. TRAINING REQUIRED

All employees working with HF must receive appropriate training covering:

- Health effects resulting from HF exposure
- Safe work procedures
- Personal protection
- How to clean an HF spill
- First aid and emergency procedure

Laboratory workers, who are not actually handling HF, but are working in a laboratory where HF is used, must receive HF First aid and emergency procedure training.



5. MATERIALS/EQUIPMENT

All labs having concentrated HF must have the following:

- HF first aid kit
 - 3 pairs of disposable gloves
 - Calcium gluconate gel (has a limited shelf life, check its validity regularly)
 - Eye pads
 - Bandages
- HF spill kit
 - Isolate spill area: caution tape, signage
 - Neutralization, containment and absorption: liquid or powder HF neutralizer
 - Personal protective equipment: goggles, face shield, nitrile gloves, neoprene gloves, lab coat, PVC apron, and rubber boots.
 - Clean-up waste collection: plastic tong/tweezers, small dust pan, wide-mouthed plastic container with lid
 - Verify complete neutralization: pH strip, neutralizer with pH indicator
 - HF spill clean-up procedure
- Personal Protective Equipment (PPE)
 - Standard laboratory PPE (lab coat, safety glasses, enclosed shoes, long pants and sleeves)
 - Face shield (and safety glasses) for handling, transferring, and cleaning HF
 - Fume hood (with sash down) for pipetting and dispensing
 - PVC apron
 - Long neoprene gloves over nitrile gloves – inspect gloves frequently and change them immediately whenever contaminated, punctured or torn. To reuse outer gloves, rinse thoroughly after use and then dip them into a saturated solution of sodium bicarbonate.
 - Liquid resistant closed toed shoes (not fabric or mesh) or polyvinyl alcohol (PVA) boots

6. HAZARD

Hydrofluoric acid is a clear, colorless liquid. It is an extremely dangerous material. All forms, including vapors and solutions can cause severe, slow-healing burns to tissue. At concentrations of less than 50%, the burns may not be felt immediately and at 20% the effects may not be noticed for several hours. At higher concentrations, the burning sensations will become noticeable much more quickly, in a matter of minutes or less.



HF burns pose unique dangers, distinct from other acids, because HF readily penetrates skin. The fluoride ion can then cause destruction of soft tissues and decalcification of the bones. HF can cause severe burns to the eyes, which may lead to permanent damage and blindness.

Concentration	Dermal Exposure Health Effects	Timing of symptoms
Less than 20%	Erythema (skin redness) and pain	Delayed up to 24 hours
20 to 50%	Erythema (skin redness) and pain	Delayed from 1 to 8 hours
Greater than 50%	Erythema, severe pain, rapid tissue destruction	Immediate

The symptoms observed after accidental dermal exposure to HF depend on the concentration of the acid and the duration of exposure. Symptoms are delayed for concentrations under 50%; concentrations as low as 2% may cause symptoms if the skin contact time is long enough.

WorkSafe BC regulation states the ceiling limit (the concentration in air which may not be exceeded at any time during the work period) for HF is 2 ppm. Solutions of HF at concentrations of 40% or higher are capable of producing vapors.

7. GUIDELINES FOR SAFE WORK PRACTICES

7.1. Handling

- All operations involving HF must be performed in a fully functioning chemical fume hood
- The fume hood must be in the immediate vicinity of a safety shower and emergency eyewash station
- An HF spill kit and an HF first aid kit must be nearby
- A warning sign must be posted on the fume hood (Caution: Hydrofluoric Acid in use)
- Secondary containment trays are used in the fume hood to contain accidental spills
- Laboratory workers must use all personal protective equipment (particularly gloves) specified – inspect gloves frequently and change them immediately whenever contaminated, punctured or torn. To reuse outer gloves, rinse thoroughly after use and then dip them into a saturated solution of sodium bicarbonate.
- Individuals working near and with HF should have no skin exposed to the chemical. There should always be a barrier (clothing, gloves, etc) between the handler and the material.
- Never work alone with HF. A second person cognizant of the dangers and emergency procedures for handling HF contact must be present at all times within the laboratory while the operations with concentrated HF are being carried out.



- Work with HF should only involve plastic lab ware (polyethylene) resistant to HF.
- Perform detailed hazard assessment of all the steps of the procedure, introduce control measures, have decontamination neutralization procedure for equipment, and tools.
- Perform decontamination of all lab ware and equipment in the fume hood. Have detailed disposal procedure in place.

7.2. Storage

- Concentrated HF must be stored in an acid cabinet in a secondary containment container.
- HF containers must be clearly labelled with the arrival date.
- Secondary containment container must be constructed of polyethylene (a type of plastic). NEVER store in glass containers.
- Do not store HF with incompatible materials such as ammonia (aqueous or anhydrous), glass, ceramics, and metals. Reactions with metals may generate potentially explosive hydrogen gas.
- Minimal quantities of material should be purchased and stored.

7.3. Spills

Do not attempt to clean up a spill volume larger than 200ml of > 20% HF – contact Health, Safety & Environment or Campus Security for assistance

HF spill on an individual

- Immediately remove contaminated PPE items and/or contaminated clothing
- If, during the spill, the skin or eye(s) came in contact with HF, follow the specific emergency procedures below
- Ask for assistance with clean-up and proceed to decontamination
- Any clothes contaminated with HF should be disposed of as hazardous waste
- Contaminated PVC gloves can be decontaminated as per procedure below

HF spill on equipment or surfaces

- Alert supervisor and personnel in the immediate area and ask a co-worker to bring the spill kit
- Isolate spill area (caution tape, signage)
- Put on PPE (face shield over safety goggles, disposable gloves, neoprene gloves on top, PVC apron over lab coat, rubber boots – if necessary)
- Contain spill by spreading HF neutralizing powder outside spill area, working inwards
- Allow sufficient contact time as recommended by the manufacturer



- Verify that neutralization is complete by using pH strips or observing the color change needed for the specific neutralizer used
- Collect HF clean-up waste and all materials used in the clean-up in a sealed plastic container. Label the container “HF clean-up waste” and arrange for disposal as hazardous waste through the Hazardous Waste Inventory System.
- Decontaminate the PVC gloves, face shield and goggles for re-use (if not heavily contaminated); other contaminated PPE should be disposed of as hazardous waste.

7.4. Decontamination

- Equipment that came in contact with HF should be rinsed with a large amount of water then rinsed with 10% sodium carbonate solution followed by rinsing again with water
- Contaminated PVC gloves, face shield and goggles are rinsed with water then soaked overnight in a 10% sodium carbonate solution. Inner gloves should be disposed of as hazardous waste
- Any clothes contaminated with HF should be disposed of as hazardous waste.

7.5. Waste

- Waste HF should be placed in a chemically compatible container, neutralized and disposed of as hazardous waste.
- Never dispose of HF contaminated material in the trash

8. EMERGENCY PROCEDURES

Exposure to this chemical is potentially life threatening! In case of skin, eye contact, inhalation or ingestion first call 911 followed by 7-8111. Provide this SWP and the SDS of hydrofluoric acid to emergency responders.

Skin contact

- Wash the affected area immediately under running water under the safety shower and flush affected area thoroughly with cool running water for at least 5 minutes. Remove all contaminated clothing while flushing.
- Apply a generous amount of calcium gluconate gel to the affected area; the gel will turn white upon reaction with the acid. Massage the 2.5% calcium gluconate gel into the burn site. Apply every 15 minutes and massage continuously until pain and/or redness disappear or until more definitive medical care is given. It is advisable for the applicator to wear protective gloves.
- Seek immediate medical attention at a hospital; continue applying gel during transport to the medical facility.

Eye contact



- If HF liquid or vapor has contacted the eyes, immediately flush for at least 15-20 minutes. Hold upper and lower eyelids open and away from the eye during irrigation.
- Do not apply calcium gluconate gel to the eye
- Avoid rubbing of the eyes
- Seek immediate medical attention.

Inhalation

- Vapor exposures can cause skin and mucous membrane burns as well as damage to pulmonary tissue

Ingestion

- Have victim drink large amounts of room temperature water as quickly as possible
- Drink several glasses of milk or several ounces of Mylanta, Maalox, or antacid tablets (all contain calcium or magnesium which may act as antidote)
- Do not induce vomiting, do not give emetics or baking soda or any bicarbonate
- Seek immediate medical attention; ingestion of HF is a life-threatening emergency.

If emergency procedures were activated, notify Health, Safety & Environment to get help with reporting and investigation.

9. REVIEW AND RETENTION

This SWP is reviewed annually or whenever deemed necessary by the responsible Health, Safety & Environment representative.

10. DOCUMENT INFORMATION

Written by: SRS Advisor, Chemical Safety,
UBC Vancouver, November 2017
Modified for Okanagan: HSE Advisor, Safety & Environment
January 2021
Contact: <https://hse.ok.ubc.ca/>