



Hydrogen Fluoride Emergency Protocol Training


EOHSS & EFRT
McMaster University






Agenda

- Objective
- What is Hydrogen Fluoride
- User Groups
- Uses
- WHMIS Information
- Documentation
- Injury Prevention & Administrative Controls
- MSDS
- HF Emergency Response Protocol
- Demonstration



COURSE OBJECTIVES

- Prevention Emphasis
- Communicate importance of expedient & correct emergency response to HF compound exposure
- Identify opportunities for injury prevention
- Review correct response measures
- Emphasize importance of effective communication with all parties throughout emergency response process
- Report & follow-up




What Is Hydrogen Fluoride?

- HF is an acid that is able to cause severe burns and potentially life-threatening health effects
- HF and HF-producing compounds are used in various campus areas
- Clear, colorless liquid at STP
- Corrosive
- Highly Toxic
- Strong irritating odor



Where is it found? HF User Groups

- Chemistry
- Materials Science
- BIMR
- Biochemistry
- Engineering Physics
- Geology/geography
- Health Sciences
- CEMD



Uses

- Chemical synthesis
 - ↳ Reactants
 - ↳ Catalysts
- Materials research
- Surface treatment
 - ↳ Glass etching
 - ↳ Cleaning
- Semiconductor processing



WHMIS Information

- Supplier label
- Hazard Symbols
 - ◊ Class D1 Poisonous & Infectious
 - ◊ Class D2 Other Toxic
 - ◊ Class E Corrosive
- MSDS
 - ◊ Key properties
 - ◊ Controls



Toxicity

- Ranked as one of the most hazardous compounds to ecosystems and human health



Cautionary Statements on HF Documentation

- Procedures using HF must never be attempted by an untrained person
- Procedures using HF must never be attempted outside normal working hours
- Strongly advised that HF procedures are restricted over the lunch hour
- Procedures using HF must never be attempted by someone working alone
- For larger scale operations, operators should be working in pairs

(<http://www.chm.bris.ac.uk/safety/hf.htm>)



Injury Prevention

- Substitution & Elimination
- Training & Communication
- Use of Engineering Controls
- Work Practices & PPE
- WHMIS compliance
- Monitoring & chemical handling program review
- Supervision & due diligence review & inspection
- Incident investigation & follow up



Prevention is our goal

Preventive measures include

- ◊ Everyone handling fluorine based compounds is aware of properties & dangers of HF
- ◊ Training users in handling & safety precautions
- ◊ Engineering controls provided, used, maintained, and functioning properly
- ◊ Proper PPE provided, used & trained
- ◊ Arranging ahead of time to provide first aid or medical treatment, if necessary



Administrative Control

Hydrofluoric acid user authorization form

- Read MSDS
- Read Laboratory Safety Handbook
- Read HF Emergency Response Protocol
- Agree to the following:
 - ◊ Follow written SOP for use of HF
 - ◊ Will use PPE for HF
 - ◊ Aware of location & procedures for use of first aid supplies for HF exposure
- Sign off



HF Emergency Response Protocol

- Developed in response to an incident in fall 2003
- Science JHSC, Dean of Science & departmental contact requested review
- Contributors & Reviewers:
 - ◊ Science & Central JHSCs
 - ◊ Dr. G. Schrobilgen & D. Brock, Chemistry, McMaster
 - ◊ Dr. Bob Syvret, Air Products, US
 - ◊ Poison Control Canada
 - ◊ St. Michael's Hospital, Toronto
 - ◊ Hamilton Health Sciences, Emergency Medicine
- Approved by Senior Management



Material Safety Data Sheet Review

- Chemical properties
- Health effects
- Engineering controls
- Personal protective equipment
- First aid response





What are the health effects of HF?

- Upon first contact, the burns may not be immediately visible or painful
- HF can penetrate tissue (e.g., skin) and attack underlying tissues
- Exposure & specifically tissue penetration can lead to blood chemistry changes having systemic effects

What about other HF producing compounds?

Most fluorides

- ❖ produce HF in the presence of moisture &
- ❖ produce burns & health effects similar to HF exposure

This protocol applies to fluoride compounds as well as both anhydrous & aqueous HF



What are the life-threatening health effects of HF?

- Acute life threatening systemic toxicity even with minimal external tissue damage
- Systemic toxin that may result in severe hypocalcaemia, hypomagnesaemia, hyperkalemia, metabolic acidosis, cardiac dysrhythmias and death
- May produce severe ocular & dermal injury



Routes of Exposure

- Inhalation
- Skin/Nail
- Eye
- Ingestion




First Aid Measure (See protocol)

- Skin exposure
- Nail exposure
- Eye exposure
- Inhalation exposure
- Ingestion exposure




First Aid Measures

- **Severity of burn & onset of symptoms** depends on
 - ❖ Concentration
 - ❖ Duration of exposure
 - ❖ Penetrability of exposed tissue
- **Destruction of tissue** proceeds under toughened coagulated skin so that ulcers extend deeply, heal slowly & leave a scar



First Aid Measures

- Skin exposure (section 3.1)
- Nail exposure
- Eye exposure
- Inhalation exposure
- Ingestion exposure



First Aid Measure (See protocol)

- Skin exposure
- Nail exposure
- **Eye exposure (section 3.2)**
- Inhalation exposure
- Ingestion exposure



First Aid Measure (See protocol)

- Skin exposure
- Nail exposure
- Eye exposure
- **Inhalation exposure (section 3.3)**
- Ingestion exposure



First Aid Measure (See protocol)

- Skin exposure
- Nail exposure
- Eye exposure
- Inhalation exposure
- **Ingestion exposure (section 3.4)**



First Aid Measure (See protocol)

- Skin exposure
- **Nail exposure (section 3.5)**
- Eye exposure
- Inhalation exposure
- Ingestion exposure



First Aid Supplies

- Medical supplies must be kept on hand in sufficient quantities at all times
- Some supplies difficult to acquire & must be ordered
- Immediate application of correct first aid measures is key to . . .
 - ❖ a positive outcome
 - ❖ rapid & successful recovery from HF contact &/or absorption




First Aid Response needs

1. **Calcium gluconate**
 - 2.5% gel
 - 23 % solution
2. **Basins** – assorted sizes for immersion
3. **Ice cubes**
4. **Triangular bandages** for wet compresses
5. **Gauze, compression dressing**
6. **Pliers** -- to open Calcium gluconate solution
7. **Sterile 0.9% saline**
 - 500 cc IV bag



First Aid Response needs (cont'd)

8. **Tums**
9. **Eye irrigator** – syringe to irrigate the eyes
10. **First Aid shears/scissors** – to open saline bag
11. **Eye wash** – plumbed fountain
12. **Safety shower**
13. **Pocket mask** to give rescue breathing
14. **Rubber/PVC gloves**
15. **Tyvek coat**
16. **Safety glasses**
17. **Sterile water**




What to do in the case of an emergency . . .

- Dial 88
- Ask injured person where the material has contacted them
- Provide immediate first aid
- Assist emergency personnel
- Provide record of first aid rendered (report within information package)
- Send info package with injured person to pass along to emergency services



First Aid Response . . .

- Responders
 - ❖ EFRT
 - ❖ Security
- Communication to other responders
 - ❖ First Aid providers in the area
 - ❖ Paramedics
 - ❖ Hamilton Fire Services



First Aid Response . . .

- Distribution of First Aid Manual
- Treatments based on routes of exposure
- HF Emergency Response Kit



What to do in the case of an emergency . . .

- **First Aid Demonstration**




Information to include with transport of person to emergency services . . .

Information packet review

- Sign requesting immediate emergency service
- McMaster University HF Emergency Response Protocol
- MSDSs
- Summary of First Aid Rendered report
- McMaster University Injury/Incident Report

HF Kit



Follow up reporting

- **McMaster University Injury/Incident Report** sent to EOHSS
- **Critical Injury?** If yes, many requirements:
 - ❖ Secure scene
 - ❖ JHSC informed
 - ❖ Immediate verbal report via EOHSS to MOL
 - ❖ 48 hour written report requirement to MOL
- **WSIB reporting requirements**



Summary

- **Prevention**
 - ❖ Substitute
 - ❖ Ensure process of hazard identification, program implementation, training, communication & monitoring in place
- **Be prepared**
 - ❖ The correct, immediate response to potential injury will be the best determinant of a positive outcome
- **Review**
 - ❖ Discuss with staff & update program, if necessary
