HYDROFLUORIC ACID SAFETY

Although chemists consider hydrofluoric acid (HF) to be a “weak” acid, its potential to produce serious health effects greatly exceeds that of “strong” acids commonly used in the laboratory. HF shares the corrosive properties common among mineral acids but is unique in its ability to cause deep tissue damage and hypocalcemia. These properties of HF are due to the action of the fluoride ion. Fluoride ion causes soft tissue necrosis (similar to alkali damage) and bone damage by binding calcium. HF burns cause excruciating pain and are very slow to heal.

Skin contact with HF is probably the most common route of exposure for laboratory personnel (often under fingernails), however HF can cause damage through eye contact, inhalation, or ingestion. Concentrations of HF exceeding 50% produce immediate skin damage and pain, while at concentrations of 20-50% effects can be delayed for up to 8 hours. Solutions less than 20% may not produce effects for 24 hours or more. If contact is long enough, solutions as dilute as 2% can cause symptoms. Concentrated HF burns covering only 2% of the body (equivalent to about an eight-inch square) can be fatal. Concentrated solutions and anhydrous HF produce mist and are serious inhalation hazards.

If you understand the hazards of HF and respect its destructive potential, how can you work safely with HF? The goal is to prevent all contact with HF. Always wear gloves, a lab coat, and chemical safety goggles when working with any HF solution. Additionally, a face shield and rubber apron should be worn when handling solutions greater than 2% (1 molar), or if high splash potential exists. Work with HF in a laboratory hood whenever possible and always work in a hood when handling concentrated HF, anhydrous HF, or when heating HF solutions. Not all gloves provide adequate protection against HF; high quality gloves made from butyl or neoprene rubber are recommended. Two pairs of gloves are recommended when working with concentrations exceeding 20% or when heavy exposure to gloves is expected. Always check gloves for leaks prior to use.

Although HF exposures can result in injury, quick response will minimize the damage. All exposures should be treated immediately even though burns may not be felt for hours. Affected personnel must receive medical attention for all eye and inhalation exposures, and all but the most minor skin burns. A summary of first aid procedures is listed below:

**Skin Contact** - Immediately wash all affected areas with water. Be sure to remove any clothing or jewelry that could trap HF (remove goggles last). Flush skin for fifteen minutes or until medical attention is available. Flushing can be reduced to five minutes if calcium gluconate gel (2.5%) is immediately available. Apply calcium gluconate gel to the affected area (use rubber gloves) every fifteen minutes and massage continuously. Get medical attention. Calcium gluconate gel can be obtained locally from Anachemia Science for approximately $35 per tube.

**Eye Contact** - Immediately flush eyes for at least fifteen minutes with water while holding eyelids open. Get medical attention. Flushing can be limited to five minutes if medical personnel are immediately available to administer sterile calcium gluconate (1%) solution (via continuous drip).

**Inhalation** - Move to fresh air as soon as possible. Get medical attention. Medical personnel can administer pure oxygen and calcium gluconate (via nebulizer) to patient.

Laboratory personnel should only attempt to clean up small HF spills that do not involve personnel contamination and that are contained and under control. Be sure that good ventilation is available and that personal protective equipment is worn before attempting to clean up a HF spill.

Although accidents involving HF may not be totally eliminated, pre-planning will minimize the effects of such incidents. All laboratories that store or use HF should develop standard operating procedures that outline how to safely use HF, as well as how to respond to personnel contamination and HF spills. Please contact the Environmental Health and Safety Department for more information on HF, or for assistance in developing safe handling procedures.