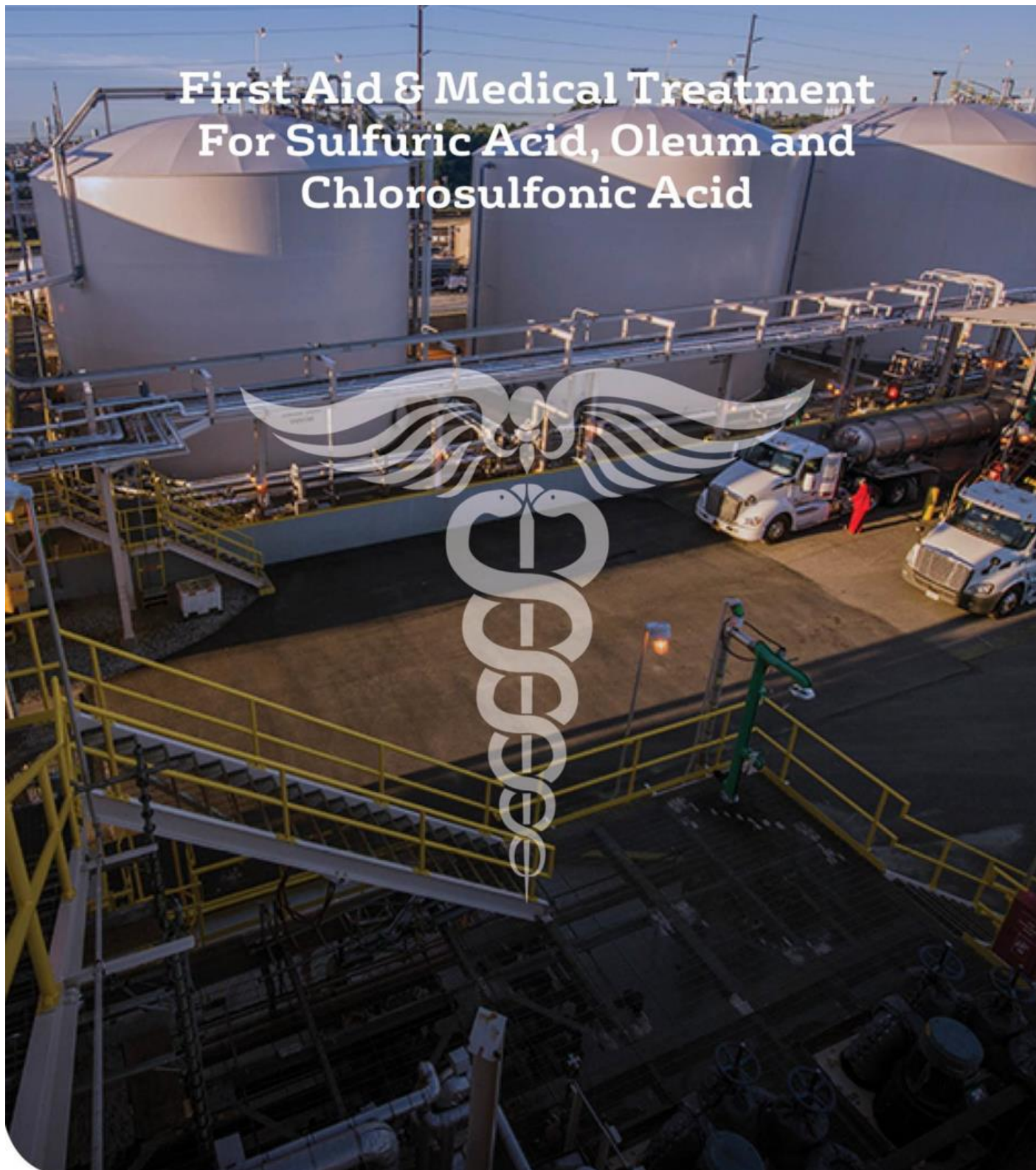




**First Aid & Medical Treatment
For Sulfuric Acid, Oleum and
Chlorosulfonic Acid**



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First Aid Treatment For Sulfuric Acid Exposures

General:

Exposure to sulfuric acid can cause skin burns, corneal ulceration of the eyes, and respiratory irritation.

Small exposures may cause:

- Skin irritation with discomfort or pain.
- Eye irritation with discomfort, tearing or blurring of vision.
- Upper respiratory system irritation manifested by coughing, throat irritation, and choking sensation.

Larger exposures may lead to:

- Skin burns or ulceration.
- Eye corrosion with corneal or conjunctival ulceration.
- Respiratory irritation manifested by coughing, discomfort, difficulty in breathing, or shortness of breath.
- High or prolonged exposures may cause delayed lung edema.

All personnel who handle sulfuric acid are to be thoroughly trained and drilled in first aid procedures for handling these burns and other exposures. This section provides information that will be used when first aid and medical treatment are required.

1. FIRST AID:

Speed in removing personnel from the contaminated area and in removing the sulfuric acid from the skin and eyes is of primary importance. **First aid must be started immediately in all cases of contact with sulfuric acid in any form.**

Inhalation:

Immediately remove the patient to an uncontaminated atmosphere. Call a physician. Check for breathing and pulse. Start oxygen 100% at 6L/min. Check for other injuries. If not breathing, give artificial respiration. Keep the patient warm and at rest.

Skin Contact:

Immediately shower exposed area(s) with large quantities of water after contact or suspected contact, and completely remove all contaminated personal protective equipment, clothing, and shoes while in the shower. Flush the skin thoroughly with water for at least 15 minutes. Call for medical help while flushing the skin. Adequate

flushing with large quantities of water is extremely important. Only after flushing with water should one apply clean white terry towels, specifically dedicated for first aid use, dipped in clean iced water, to the affected area. If ice water isn't available tepid water irrigation/compresses should be used. Continue applying the towels until a doctor or other qualified medical personnel determines it should be stopped. **If the injured is transported to a hospital or other emergency facility, continue to re-apply the towel compresses during the trip.**

Do not freeze the burned area. Do not apply ice directly to any area.

Do not use a cloth, rag or other object to try to "wipe" the acid off of the skin. This will only delay the water shower treatment and could cause a break in the skin which could lead to infection.

Caution: *The first aid responder should anticipate shock in all third degree or second degree burns of >9% body surface area (BSA). See Figure 1, Rule of Nines, to determine the extent of BSA burned. **Indications of shock are the patient becoming pale, cold and clammy, or lightheaded.** If the patient shows symptoms of shock, stop the ice water treatment but continue the tepid water irrigation/compresses to the affected area and start oxygen 100% at 6L/min, keep the patient warm and immediately raise his/her feet. Depending on the speed of local community response and the degree of training of the first aid responders, consideration should be given to starting an IV of normal saline via a large bore needle in an area free of burn.*

Caution: *If the burn breaks the skin, use all precautions to protect the person applying the treatments from potential blood borne pathogens. The proper protective equipment (gloves, eye shields, etc.) must be used. Also do not use the same bucket of water on multiple patients.*

Eye Contact:

Immediately flush eyes with large quantities of water while holding the eyelids apart. Continue flushing for at least 15 minutes. Do not try to neutralize the acid. Call a physician immediately. Transfer the patient promptly to a medical facility. Apply cool packs to eyes during transport.

Ingestion:

Do not induce vomiting. Give large quantities of water. Call a physician immediately and transfer promptly to a medical facility. Never give anything by mouth to an unconscious person.

2. Medical Treatment:

Inhalation:

Persons exposed by inhalation to large concentrations of the material should be given 100% humidified oxygen (6 liters per minute).

Assess patient condition while continuing oxygen treatment. Evaluate for nasopharyngeal burns.

Symptoms may vary from mild chest discomfort and slight cough, to severe cough, wheezing, and extreme shortness of breath. Physical examination may be normal or, may reveal mild rhonchi, wheezes or moist rales. Chest x-rays are usually normal at first, and then changes may develop over 24-48 hours showing pulmonary edema or infiltrates.

All but the briefest exposures and all symptomatic patients need to be assessed in a local hospital preferably a tertiary care center (large hospital/burn center).

For very brief exposures in asymptomatic patients:

Give oxygen (100% at 6L/min) for 15 minutes and re-evaluate; if still asymptomatic, observe for 15 - 30 minutes more.

If symptomatic, give oxygen, as above, and continue while transporting to local hospital preferably a tertiary care center.

If a patient is referred to a hospital, send the last chest x-ray and a copy of the last physical examination on file. Send a copy of the SDS. Do not delay transportation to the hospital if any of the information cannot be found immediately.

If a patient is not referred to a hospital, closely monitor respiratory function for 12-24 hours to assure that pulmonary edema does not develop.

Skin Contact:

All third degree and deep second-degree burns should be referred to local tertiary care center or local specialist for definitive treatment. Small deep burns involving hands, face, feet, perineum should also be referred.

Follow up is needed, especially to detect delayed infection or other complications.

For first-degree burns and superficial small second-degree burns, treatment may be given at the site. After adequate flushing has been accomplished, cool down small burns by continuous irrigation with either white terry cloth towels, specifically dedicated for first aid use, dipped in ice water or with tepid water irrigation.

Caution: *Be alert for symptoms of shock, especially if large areas (>9% BSA) are affected by the burn. Discontinue the iced water treatments if any signs of shock are observed but continue tepid water irrigation/compresses and treat the shock.*

Evaluate exposed areas and determine if irritation or pain persists. Continue the irrigation as long as pain persists. Consider pain medication. If exposure is a small area of contact and case will be managed by site medical, a medical protocol should be developed to allow for pain control (OTC or prescription, likely a non-steroidal anti-inflammatory drug, check for allergy). If exposure is going to be treated by a local hospital or preferably tertiary care center then allow them to determine appropriate pain medication.

In the acute setting do not cover exposure area with any ointment /cream if the patient is to be seen for follow-up medical care by a local hospital or tertiary care center.

If integrity of skin is compromised, apply dressing of impregnated gauze (Vaseline) or moist gauze (saline gauze) and a dry bulky dressing. Splint appropriately in neutral position if joints are involved. Use all available precautions to protect from blood-borne pathogens.

If integrity of the skin is not compromised, apply moist dressing (saline gauze) and cover with a bulky dressing to protect the affected area from contamination or further trauma. Do not open blisters.

Assess the need for prophylactic antibiotics on a case-by-case basis. Generally if the skin is intact prescription antibiotic ointments and creams are not indicated.

Also review tetanus status and consider tetanus booster if > 10 years since last tetanus toxoid booster.

Eye Contact:

All eye exposures to strong acid pH* <2.5 need immediate referral to a local hospital, preferably a tertiary care center or local ophthalmologist. Continue irrigation of eye(s) with water or normal saline while in transport.

***Caution: All Nexpera manufacturing plants making or handling Sulfuric acid should be considered strong acids and handled as such.**

Exposures to weaker acid (pH > 2.5)

Rewash eye with 2 liters of normal saline being sure to retract and evert the upper lid. A topical anesthetic might aid in the patient's tolerance during the irrigation. A useful endpoint is the normalization of the conjunctival pH. A pH of 7.5=8.0 is near normal for pH of the conjunctival cul-de-sac.

Wait 10 minutes with a cool compress on the eye(s) between irrigation and the touching of the cul-de-sac with pH sensitive paper.

The irrigation cycle can be repeated until the pH is 7.5-8.0.

After irrigation has been completed and the eyes have been allowed to rest, the patient's visual acuity can be tested and the results documented.

A Fluorescein strip examination should be conducted to assess for corneal abrasion. Defects/abrasions in the conjunctival layer stain bright green under UV light.

If an abrasion is noted or vision is not clear a referral to a local ophthalmologist is required.

If not referred, an antibiotic ointment may be instilled (site protocol) and consideration given to patching the eye. Re-evaluate in 24 hours. If the eye is patched, consider appropriate driving/work restrictions.

Ingestion:

All ingestions need to be transferred promptly to tertiary care center for definitive treatment. Do not induce vomiting. Give large quantities of water. Never give anything by mouth to an unconscious person

3. MEDICAL SUPPLIES FOR FIELD AND SITE MEDICAL OFFICE:

Objective:

To ensure that all sites handling sulfuric acid have adequate procedures, supplies and equipment to treat persons exposed to them.

Background:

Nexpera Corporate IHS has reviewed procedures for first aid and medical treatment for exposures and has developed a corporate IHS guideline on Irritant Chemical Exposures. This was done to ensure consistency and provide the most prudent and medically sound treatment for the patient. These guidelines require that certain procedures, medications, and equipment be available for use both in the field and in medical facilities to facilitate proper treatment.

Field:

Safety showers and eyewashes (minimum 15 minute water supply) should be located in areas where there is the potential for exposure. It is recommended that an emergency "kit" be kept in a designated, readily accessible, and centrally located area such as in a control room or shift supervisor's office, if the site does not have ready access to a medical facility. The area should have a bucket, clean ice, drinking quality water, and clean (preferably sterile) white terry cloth towels available. The terry cloth towels must be pre-washed to remove the sizing. They should also be packaged in a zip lock bag. If the site does not have buckets and ice then it must have drinking quality tepid water. The kit should contain, as a minimum, the following supplies:

- Sterile impregnated gauze (Vaseline gauze) dressings
- Sterile Saline gauze dressings
- Kerlix gauze wraps
- Sterile 4x4 inch gauze dressings
- Sterile normal saline solution (eye)
- Blanket/clean white terry cloth towels, stored in zip lock bags
- Eye patches
- Checklist of contents (inventory)
- Set of instructions and procedures for first aid and medical treatment
- Phone numbers of site medical personnel and emergency 800 information number
- SDS information

The kit is intended to be used to initiate first aid and to go in the ambulance in the event that the injured has to be transported to an off-site treatment center.

The kit must be kept sealed and a full inventory of the contents should be made on a monthly basis.

Medical Office:

The following is recommended as a minimum inventory of medical supplies that should be kept at the site medical facility.

Each site must evaluate how much to keep in inventory based on the extent and potential number of people that may be exposed. An analysis of injuries due to a worst case scenario may be used to make this determination.

The supplies should be inventoried at least every six months, including:

- Standard medical dressings
- Sterile Vaseline gauze dressings
- Sterile Saline gauze dressings
- OTC (Neosporin, Triple ointment, A&D ointment) and Prescription antibiotic ointments (Silvadene)
- Prepackaged clean (preferably sterile) sheets
- Cylinders of 99% USP oxygen. - Blanket, clean (preferably sterile)
- White terry cloth towels, stored in zip lock bags.
- Sterile saline solution.
- Set of procedures for first aid and medical treatment
- Changes of clothes
- Decontamination facilities (eyewash/shower)
- Eye Tray that contains:
 - Handheld flashlight
 - Ophthalmoscope
 - Visual acuity chart (Snellen or Jaeger)

- Sterile, cotton-tipped applicators
- Isotonic saline (2) 1000 ml bags
- Sterile Fluorescein strips
- Clean pH strips - Ultraviolet lamp
- Proparacaine 0.5% or tetracaine 0.5% ophthalmic solutions (check for allergy)(also these are prescription pharmaceuticals – need appropriate storage and dispensing facilities)
- Eye patches

Each site should establish contact with local suppliers for the above and determine the availability on short notice of supplies such as oxygen, in the event of a catastrophic emergency.

4. TRAINING:

Objective:

To ensure that all sites handling sulfuric acid have an adequate number of people trained to provide first aid. Also, ensure that the local hospital or trauma center has adequate information and training to provide the treatment for personnel exposed to sulfuric acid/oleum.

First aid procedures require training of the rescue team.

On site medical treatment procedures include the recommended treatment and evaluation criteria as outlined in the IHS regional standards and guidelines.

In order to ensure that the proper first aid and medical treatment is provided to the exposed or injured persons, each site must develop and conduct training programs aimed at on/off site rescue teams, and plant IHS resources. Sites should ensure that local emergency rooms/providers have been trained in handling chemical burns. Sites should share SDS information with these local providers so the local providers understand the type of exposure(s) that they might receive from a Nexpera facility. Knowledgeable persons must prepare these training programs and training must be conducted on a frequency to ensure personnel remain competent in the techniques that they will be expected to use. The recommended minimum frequencies for rescue team training and site an IHS resource is annually. Sites should ensure that refresher training is provided periodically to local providers by their institutions.

Rescue Team-On Site Personnel:

This training must be given to the site rescue team or whoever would be expected to assist the injured so that first aid could be initiated immediately. This training **MUST** be "HANDS ON". A site may choose to limit the number of persons who may administer oxygen, to ensure that adequate training is maintained.

Participants must be trained, as appropriate, on:

- Decontamination of exposed employees
- How and when to irrigate the eyes with sterile saline solution
- How and when to administer oxygen

Records of the personnel trained and date of training must be kept by the site.

Off-Site Support Facilities:

Periodically, site personnel shall ensure that local medical personnel have received training on the medical management of acute chemical exposures as part of their training or in-service programs.

A primary off-site support facility must be selected so that patients are sent to that facility. Information about the site, typical type of exposures and strength of the sulfuric acid should be shared with the facility personnel. The periodic review should include visiting the facility and ensuring adequate supplies are available and personnel are familiar with Nexpera's SDS information.

Figure 1 Rule of Nines:

