Calcium Hypochlorite ($CaCl_2O_2$)/Sodium Hypochlorite (NaOCl) CAS 7778-54-3/7681-52-9; UN 1748/1791

Synonyms of calcium hypochlorite include Losantin, hypochlorous acid, calcium salt, BK powder, Hy-Chlor, chlorinated lime, lime chloride, chloride of lime, calcium oxychloride, HTH, mildew remover X-14, perchloron, and pittchlor.

Synonyms of sodium hypochlorite include Clorox, bleach, liquid bleach, sodium oxychloride, Javex, antiformin, showchlon, chlorox, B-K, Carrel-dakin solution, Chloros, Dakin's solution, hychlorite, Javelle water, Mera Industries 2MOM3B, Milton, modified dakin's solution, Piochlor, and 13% active chlorine.

- **Persons contaminated with calcium hypochlorite dust, or whose clothing or skin is soaked with industrial-strength hypochlorite solutions may be corrosive to rescuers and may release harmful vapor. Individuals exposed only to gases released by hypochlorite pose little risk of secondary contamination to others.**
- **Calcium hypochlorite is generally available as a white powder, pellets, or flat plates; sodium hypochlorite is usually a greenish yellow, aqueous solution. Although not flammable, they may react explosively. Calcium hypochlorite decomposes in water to release chlorine and oxygen; sodium hypochlorite solutions can react with acids or ammonia to release chlorine or chloramine. Odor may not provide an adequate warning of hazardous concentrations.**
- **Both hypochlorites are toxic by the oral and dermal routes and can react to release chlorine or chloramine which can be inhaled. The toxic effects of sodium and calcium hypochlorite are primarily due to the corrosive properties of the hypochlorite moiety. Systemic toxicity is rare, but metabolic acidosis may occur after ingestion.**

Description

Calcium hypochlorite is generally available as a white powder, pellets, or flat plates. It decomposes readily in water or when heated, releasing oxygen and chlorine. It has a strong chlorine odor, but **odor may not provide an adequate warning of hazardous concentrations**. Calcium hypochlorite is not flammable, but it acts as an oxidizer with combustible material and may react explosively with ammonia, amines, or organic sulfides. Calcium hypochlorite should be stored in a dry, well ventilated area at a temperature below 120 °F (50 °C) separated from acids, ammonia, amines, and other chlorinating or oxidizing agents.

Sodium hypochlorite is generally sold in aqueous solutions containing 5 to 15% sodium hypochlorite, with 0.25 to 0.35% free alkali (usually NaOH) and 0.5 to 1.5% NaCl. Solutions of up to 40%

sodium hypochlorite are available, but solid sodium hypochlorite is not commercially used. Sodium hypochlorite solutions are a clear, greenish yellow liquid with an odor of chlorine. **Odor may not provide an adequate warning of hazardous concentrations**. Sodium hypochlorite solutions can liberate dangerous amounts of chlorine or chloramine if mixed with acids or ammonia. Anhydrous sodium hypochlorite is very explosive. Hypochlorite solutions should be stored at a temperature not exceeding 20 °C away from acids in well-fitted air-tight bottles away from sunlight.

Routes of Exposure

Inhalation

Hypochlorite solutions can liberate toxic gases such as chlorine. Chlorine's odor or irritant properties generally provide adequate warning of hazardous concentrations. However, prolonged, low-level exposures, such as those that occur in the workplace, can lead to olfactory fatigue and tolerance of chlorine's irritant effects. Chlorine is heavier than air and may cause asphyxiation in poorly ventilated, enclosed, or low-lying areas.

Children exposed to the same levels of gases as adults may receive a larger dose because they have greater lung surface area:body weight ratios and higher minute volumes:weight ratios. Children may be more vulnerable to corrosive agents than adults because of the smaller diameter of their airways. In addition, they may be exposed to higher levels than adults in the same location because of their short stature and the higher levels of chlorine found nearer to the ground.

Skin/Eye Contact

Direct contact with hypochlorite solutions, powder, or concentrated vapor causes severe chemical burns, leading to cell death and ulceration.

Because of their relatively larger surface area:weight ratio, children are more vulnerable to toxicants affecting the skin.

Ingestion

Ingestion of hypochlorite solutions causes vomiting and corrosive injury to the gastrointestinal tract. Household bleaches (3 to 6% sodium hypochlorite) usually cause esophageal irritation, but rarely cause strictures or serious injury such as perforation. Commercial bleaches may contain higher concentrations of sodium hypochlorite and are more likely to cause serious injury. Metabolic acidosis is rare, but has been reported following the ingestion of household bleach. Pulmonary complications resulting from aspiration may also be seen after ingestion.

Sources/Uses

Sodium and calcium hypochlorite are manufactured by the chlorination of sodium hydroxide or lime. Sodium and calcium hypochlorite are used primarily as oxidizing and bleaching agents or disinfectants. They are components of commercial bleaches, cleaning solutions, and disinfectants for drinking water and waste water purification systems and swimming pools (Teitelbaum 2001).

Standards and Guidelines

AIHA WEEL:
STEL (15-min) = 2 mg/m^3

Physical Properties	Calcium Hypochlorite	Sodium Hypochlorite
Description:	White powder, pellets or flat plates	Clear greenish yellow liquid
Warning properties:	Chlorine odor; inadequate warning of hazardous concentrations	Chlorine odor; inadequate warning of hazardous concentrations
Molecular weight:	142.98 daltons	74.44 daltons
Boiling point (760 mm Hg):	Decomposes at 100 °C (HSDB 2001)	Decomposes above 40 °C (HSDB 2001)
Freezing point:	Not applicable	6 °C (21 °F)
Specific gravity:	2.35 (water = 1)	1.21 (14% NAOCl solution) (water = 1)
Water solubility:	21.4% at 76 °F (25 °C)	29.3 g/100 g at 32 °F (0 °C)
Flammability:	Not flammable	Not flammable

Incompatibilities

Calcium or sodium hypochlorite react explosively or form explosive compounds with many common substances such as ammonia, amines, charcoal, or organic sulfides.

Health Effects

- **Hypochlorite powder, solutions, and vapor are irritating and corrosive to the eyes, skin, and respiratory tract. Ingestion and skin contact produces injury to any exposed tissues. Exposure to gases released from hypochlorite may cause burning of the eyes, nose, and throat; cough as well as constriction and edema of the airway and lungs can occur.**

- **Hypochlorite produces tissue injury by liquefaction necrosis. Systemic toxicity is rare, but metabolic acidosis may occur after ingestion.**

Acute Exposure

The toxic effects of sodium and calcium hypochlorite are primarily due to the corrosive properties of the hypochlorite moiety. Hypochlorite causes tissue damage by liquefaction necrosis. Fats and proteins are saponified, resulting in deep tissue destruction. Further injury is caused by thrombosis of blood vessels. Injury increases with hypochlorite concentration and pH. Symptoms may be apparent immediately or delayed for a few hours. Calcium hypochlorite decomposes in water releasing chlorine gas. Sodium hypochlorite solutions liberate the toxic gases chlorine or chloramine if mixed with acid or ammonia (this can occur when bleach is mixed with another cleaning product). Thus, exposure to hypochlorite may involve exposure to these gases.

Children do not always respond to chemicals in the same way that adults do. Different protocols for managing their care may be needed.

Gastrointestinal

Pharyngeal pain is the most common symptom after ingestion of hypochlorite, but in some cases (particularly in children), significant esophagogastric injury may not have oral involvement. Additional symptoms include dysphagia, stridor, drooling, odynophagia, and vomiting. Pain in the chest or abdomen generally indicates more severe tissue damage. Respiratory distress and shock may be present if severe tissue damage has already occurred. In children, refusal to take food or drink liquid may represent odynophagia.

Ingestion of hypochlorite solutions or powder can also cause severe corrosive injury to the mouth, throat, esophagus, and stomach, with bleeding, perforation, scarring, or stricture formation as potential sequelae.

Dermal

Hypochlorite irritates the skin and can cause burning pain, inflammation, and blisters. Damage may be more severe than is apparent on initial observation and can continue to develop over time.

Because of their relatively larger surface area:body weight ratio, children are more vulnerable to toxins affecting the skin.

Ocular

Contact with low concentrations of household bleach causes mild and transitory irritation if the eyes are rinsed, but effects are more severe and recovery is delayed if the eyes are not rinsed. Exposure to solid hypochlorite or concentrated solutions can produce severe eye injuries with necrosis and chemosis of the cornea, clouding of the cornea, iritis, cataract formation, or severe retinitis.

Respiratory

Ingestion of hypochlorite solutions may lead to pulmonary complications when the liquid is aspirated. Inhalation of gases released from hypochlorite solutions may cause eye and nasal irritation, sore throat, and coughing at low concentrations. Inhalation of higher concentrations can lead to respiratory distress with airway constriction and accumulation of fluid in the lungs (pulmonary edema). Patients may exhibit immediate onset of rapid breathing, cyanosis, wheezing, rales, or hemoptysis. Pulmonary injury may occur after a latent period of 5 minutes to 15 hours and can lead to reactive airways dysfunction syndrome (RADS), a chemical irritant-induced type of asthma.

Children may be more vulnerable to corrosive agents than adults because of the smaller diameter of their airways. Children may also be more vulnerable to gas exposure because of increased minute ventilation per kg and failure to evacuate an area promptly when exposed.

Metabolic

Metabolic acidosis has been reported in some cases after ingestion of household bleach.

Potential Sequelae

Exposure to toxic gases generated from hypochlorite solutions can lead to reactive airways dysfunction syndrome (RADS), a chemical irritant-induced type of asthma. Chronic complications following ingestion of hypochlorite include esophageal obstruction, pyloric stenosis, squamous cell carcinoma of the esophagus, and vocal cord paralysis with consequent airway obstruction.

Chronic Exposure

Chronic dermal exposure to hypochlorite can cause dermal irritation.

Carcinogenicity

The International Agency for Research on Cancer has determined that hypochlorite salts are not classifiable as to their carcinogenicity to humans.

Reproductive and Developmental Effects

No information was located regarding reproductive or developmental effects of calcium or sodium hypochlorite in experimental animals or humans. Calcium and sodium hypochlorite are not included in *Reproductive and Developmental Toxicants*, a 1991 report published by the U.S. General Accounting Office (GAO) that lists 30 chemicals of concern because of widely acknowledged reproductive and developmental consequences.

Prehospital Management

- **Rescue personnel are at low risk of secondary contamination from victims who have been exposed only to gases released from hypochlorite solutions. However, clothing or skin soaked with industrial-strength bleach or similar solutions may be corrosive to rescuers and may release harmful gases.**
- **Ingestion of hypochlorite solutions may cause pain in the mouth or throat, dysphagia, stridor, drooling, odynophagia, and vomiting. Hypochlorite irritates the skin and can cause burning pain, inflammation, and blisters. Acute exposure to gases released from hypochlorite solutions can cause coughing, eye and nose irritation, lacrimation, and a burning sensation in the chest. Airway constriction and noncardiogenic pulmonary edema may also occur.**
- **There is no specific antidote for hypochlorite poisoning. Treatment is supportive.**

Hot Zone

Rescuers should be trained and appropriately attired before entering the Hot Zone. If the proper equipment is not available, or if rescuers have not been trained in its use, assistance should be obtained from a local or regional HAZMAT team or other properly equipped response organization.

Rescuer Protection

Hypochlorite is irritating to the skin and eyes and in some cases may release toxic gases.

Respiratory Protection: Positive-pressure, self-contained breathing apparatus (SCBA) is recommended in response to situations that involve exposure to potentially unsafe levels of chlorine gas.

Skin Protection: Chemical-protective clothing should be worn due to the risk of skin irritation and burns from direct contact with solid hypochlorite or concentrated solutions.

ABC Reminders

Quickly establish a patent airway, ensure adequate respiration and pulse. If trauma is suspected, maintain cervical immobilization manually and apply a cervical collar and a backboard when feasible.

Victim Removal

If victims can walk, lead them out of the Hot Zone to the Decontamination Zone. Victims who are unable to walk may be removed on backboards or gurneys; if these are not available, carefully carry or drag victims to safety.

Consider appropriate management in victims with chemically-induced acute disorders, especially children who may suffer separation anxiety if separated from a parent or other adult.

Decontamination Zone

Victims exposed only to chlorine gas released by hypochlorite who have no skin or eye irritation do not need decontamination. They may be transferred immediately to the Support Zone. All others require decontamination as described below.

Rescuer Protection

If exposure levels are determined to be safe, decontamination may be conducted by personnel wearing a lower level of protection than that worn in the Hot Zone (described above).

ABC Reminders

Quickly establish a patent airway, ensure adequate respiration and pulse. Stabilize the cervical spine with a collar and a backboard if trauma is suspected. Administer supplemental oxygen as required. Assist ventilation with a bag-valve-mask device if necessary.

Basic Decontamination

Rapid decontamination is critical. Victims who are able may assist with their own decontamination. Remove and double-bag contaminated clothing and personal belongings.

Flush exposed skin and hair with copious amounts of plain tepid water. Use caution to avoid hypothermia when decontaminating victims, particularly children or the elderly. Use blankets or warmers after decontamination as needed.

Irrigate exposed or irritated eyes with saline, Ringer's lactate, or D_5W for at least 20 minutes. Eye irrigation may be carried out simultaneously with other basic care and transport. Remove contact lenses if it can be done without additional trauma to the eye. If a corrosive material is suspected or if pain or injury is evident, continue irrigation while transferring the victim to the support zone.

In cases of ingestion, **do not induce emesis or offer activated charcoal.**

Victims who are conscious and able to swallow should be given 4 to 8 ounces of water or milk; if the victim is symptomatic, delay decontamination until other emergency measures have been instituted. Dilutants are contraindicated in the presence of shock, upper airway obstruction, or in the presence of perforation.

Consider appropriate management of chemically contaminated children at the exposure site. Provide reassurance to the child during decontamination, especially if separation from a parent occurs.

Transfer to Support Zone

As soon as basic decontamination is complete, move the victim to the Support Zone.

Support Zone

Be certain that victims have been decontaminated properly (see *Decontamination Zone* above). Victims who have undergone decontamination or have been exposed only to vapor pose no serious risks of secondary contamination to rescuers. In such cases, Support Zone personnel require no specialized protective gear.

ABC Reminders

Quickly establish a patent airway, ensure adequate respiration and pulse. If trauma is suspected, maintain cervical immobilization manually and apply a cervical collar and a backboard when feasible. Administer supplemental oxygen as required and establish intravenous access if necessary. Place on a cardiac monitor, if available.

Additional Decontamination

Continue irrigating exposed skin and eyes, as appropriate.

In cases of ingestion, **do not induce emesis or offer activated charcoal.**

Victims who are conscious and able to swallow should be given 4 to 8 ounces of water or milk; if the victim is symptomatic, delay decontamination until other emergency measures have been instituted. Dilutants are contraindicated in the presence of shock, upper airway obstruction, or in the presence of perforation.

Advanced Treatment

In cases of respiratory compromise secure airway and respiration via endotracheal intubation. Avoid blind nasotracheal intubation or use of an esophageal obturator: only use direct visualization to intubate. When the patient's condition precludes endotracheal intubation, perform cricothyrotomy if equipped and trained to do so.

Treat patients who have bronchospasm with an aerosolized bronchodilator such as albuterol.

Consider racemic epinephrine aerosol for children who develop stridor. Dose 0.25–0.75 mL of 2.25% racemic epinephrine solution in water, repeat every 20 minutes as needed cautioning for myocardial variability.

Patients who are comatose, hypotensive, or having seizures or who have cardiac arrhythmias should be treated according to advanced life support (ALS) protocols.

Transport to Medical Facility

Only decontaminated patients or those not requiring decontamination should be transported to a medical facility. "Body bags" are not recommended.

Report to the base station and the receiving medical facility the condition of the patient, treatment given, and estimated time of arrival at the medical facility.

If a chemical has been ingested, prepare the ambulance in case the victim vomits toxic material. Have ready several towels and open plastic bags to quickly clean up and isolate vomitus.

Multi-Casualty Triage

Consult with the base station physician or the regional poison control center for advice regarding triage of multiple victims.

Patients who have ingested hypochlorite, or who show evidence of significant exposure to hypochlorite or chlorine (e.g., severe or persistent cough, dyspnea or chemical burns) should be transported to a medical facility for evaluation. Patients who have minor or transient irritation of the eyes or throat may be discharged from the scene after their names, addresses, and telephone numbers are recorded. They should be advised to seek medical care promptly if symptoms develop or recur (see *Patient Information Sheet* below).

Emergency Department Management

- **Hospital personnel are at low risk of secondary contamination from victims who have been exposed only to gases released from hypochlorite solutions. However, clothing or skin soaked with industrial-strength bleach or similar solutions may be corrosive to rescuers and may release harmful gases.**
- **Ingestion of hypochlorite solutions may cause pain in the mouth or throat, dysphagia, stridor, drooling, odynophagia, and vomiting. Hypochlorite irritates the skin and can cause burning pain, inflammation, and blisters. Acute exposure to gases released from hypochlorite solutions can cause coughing, eye and nose irritation, lacrimation, and a burning sensation in the chest. Airway constriction and noncardiogenic pulmonary edema may also occur.**
- **There is no specific antidote for hypochlorite poisoning. Treatment requires supportive care.**

Decontamination Area

Unless previously decontaminated, all patients suspected of contact with hypochlorite and all victims with skin or eye irritation require decontamination as described below. Patients exposed only to chlorine gas who have no skin or eye irritation may be transferred immediately to the Critical Care Area. Because hypochlorite is an irritant, don butyl rubber gloves and apron before treating patients.

Be aware that use of protective equipment by the provider may cause anxiety, particularly in children, resulting in decreased compliance with further management efforts.

Because of their relatively larger surface area:weight ratio, children are more vulnerable to toxicants affecting the skin. Also, emergency department personnel should examine children's mouths because of the frequency of hand-to-mouth activity among children.

ABC Reminders

Evaluate and support airway, breathing, and circulation. Children may be more vulnerable to corrosive agents than adults because of the smaller diameter of their airways. In cases of respiratory compromise secure airway and respiration via endotracheal intubation. If not possible, surgically secure an airway.

Treat patients who have bronchospasm with an aerosolized bronchodilator such as albuterol.

Consider racemic epinephrine aerosol for children who develop stridor. Dose 0.25–0.75 mL of 2.25% racemic epinephrine solution in water, repeat every 20 minutes as needed cautioning for myocardial variability.

Patients who are comatose, hypotensive, or having seizures or cardiac arrhythmias should be treated in the conventional manner.

Metabolic acidosis can be managed with intravenous sodium bicarbonate and buffer solutions.

Basic Decontamination

Patients who are able may assist with their own decontamination. Remove and double bag contaminated clothing and personal belongings.

Flush exposed skin and hair with copious amounts of plain water. Use caution to avoid hypothermia when decontaminating victims, particularly children or the elderly. Use blankets or warmers after decontamination as needed.

Irrigate exposed or irritated eyes with saline, Ringer's lactate, or D_5W for at least 20 minutes. Remove contact lenses if it can be done without additional trauma to the eye. Continue irrigation while transporting the patient to the Critical Care Area.

In cases of ingestion, **do not induce emesis or offer activated charcoal**.

Victims who are conscious and able to swallow should be given 4 to 8 ounces of water or milk. Dilutants are contraindicated in the presence of shock, upper airway obstruction, or in the presence of perforation.

Critical Care Area

Be certain that appropriate decontamination has been carried out (see *Decontamination Area* above).

ABC Reminders

Evaluate and support airway, breathing, and circulation as in ABC Reminders above. Children may be more vulnerable to corrosive agents than adults because of the smaller diameter of their airways. Establish intravenous access in seriously ill patients if this has not been done previously. Continuously monitor cardiac rhythm.

Patients who are comatose, hypotensive, or having seizures or cardiac arrhythmias should be treated in the conventional manner.

Metabolic acidosis can be managed with intravenous sodium bicarbonate and buffer solutions.

Inhalation Exposure

Administer supplemental oxygen by mask to patients who have respiratory symptoms. Treat patients who have bronchospasm with an aerosolized bronchodilator such as albuterol.

Consider racemic epinephrine aerosol for children who develop stridor. Dose 0.25–0.75 mL of 2.25% racemic epinephrine solution in water, repeat every 20 minutes as needed cautioning for myocardial variability.

Skin Exposure

If concentrated hypochlorite solutions contact the skin, chemical burns may occur; treat as thermal burns. Patients developing dermal hypersensitivity reactions may require treatment with systemic or topical corticosteroids or antihistamines.

Because of their relatively larger surface area:body weight ratio children are more vulnerable to toxicants that affect the skin.

Eye Exposure

Irrigate exposed or irritated eyes with saline, Ringer's lactate, or D_5W for at least 20 minutes. Check the pH of the conjunctiva every 30 minutes for 2 hours after irrigation is stopped. If the pH is not neutral an irrigating contact lens should be used to apply continuous irrigation for several hours until the pH of the tissue normalizes. Test visual acuity and examine the eyes for corneal damage and treat appropriately. Immediately consult an ophthalmologist for patients who have corneal injuries.

Ingestion

In cases of ingestion, **do not induce emesis or offer activated charcoal**.

Give 4 to 8 ounces of water or milk to alert patients who can swallow if not done previously. Dilutants are contraindicated in the presence of shock, upper airway obstruction, or in the presence of perforation.

Direct visualization of the esophagus is of primary importance for determining the extent of injury. All patients who are suspected of having significant ingestion, or those (such as children) for whom there is an unreliable history, must have early endoscopy within 36 to 48 hours of ingestion. Use of a flexible endoscope is associated with a lower risk of perforation. The esophagus, stomach and duodenum should be endoscopically evaluated because burns of the

esophagus do not correlate with the presence of burns in the stomach.

Contraindications for endoscopy include: unstable patient, evidence of perforation, upper airway compromise, or more than 48 hours after ingestion.

Gastric lavage is not generally recommended for hypochlorite ingestion.

Antidotes and Other Treatments

There is no specific antidote for hypochlorite. Treatment is supportive.

Laboratory Tests

The diagnosis of acute hypochlorite toxicity is primarily clinical. However, laboratory testing is useful for monitoring the patient and evaluating complications. Routine laboratory studies for all exposed patients include CBC, glucose, and electrolyte determinations. Patients who have respiratory complaints may require pulse oximetry (or ABG measurements) and chest radiography. Chlorine inhalation may be complicated by hyperchloremic metabolic acidosis; in addition to electrolytes, monitor blood pH.

Disposition and Follow-up

Consider hospitalizing patients who have a suspected significant exposure or have eye burns or serious skin burns. Patients with perforation should be prepared for emergency surgery.

Delayed Effects

Patients who ingested large volumes of hypochlorite, who have unreliable histories, or are symptomatic complaining of pain in swallowing, persistent shortness of breath, severe cough, or chest tightness should be admitted to the hospital and observed until symptom-free. Injury may progress for several hours.

Patient Release

Asymptomatic patients and those who experienced only minor irritation of the nose, throat, eyes, or respiratory tract may be released. In most cases, these patients will be free of symptoms in an hour or less. They should be advised to seek medical care promptly if symptoms develop or recur (see the *Hypochlorite—Patient Information Sheet* below).

Follow-up

Obtain the name of the patient's primary care physician so that the hospital can send a copy of the ED visit to the patient's doctor.

Follow up is recommended for all hospitalized patients because long-term gastrointestinal or respiratory problems can result. Respiratory monitoring is recommended until the patient is symptom-free. Chlorine-induced reactive airways dysfunction syndrome (RADS) has been reported to persist from 2 to 12 years.

Patients who have skin or corneal injury should be re-examined within 24 hours.

Reporting

If a work-related incident has occurred, you may be legally required to file a report; contact your state or local health department.

Other persons may still be at risk in the setting where this incident occurred. If the incident occurred in the workplace, discussing it with company personnel may prevent future incidents. If a public health risk exists, notify your state or local health department or other responsible public agency. When appropriate, inform patients that they may request an evaluation of their workplace from OSHA or NIOSH. See Appendix III for a list of agencies that may be of assistance.

Calcium/Sodium Hypochlorite
Patient Information Sheet

This handout provides information and follow-up instructions for persons who have been exposed to calcium or sodium hypochlorite.

What is hypochlorite?
Calcium hypochlorite is generally available as a white powder, pellets, or flat plates, while sodium hypochlorite is usually a greenish yellow, aqueous solution. Hypochlorite is used widely in cleaning agents, and in bleaching, drinking-water and swimming-pool disinfecting. Calcium hypochlorite decomposes in water to release chlorine and sodium hypochlorite solutions and can release chlorine gas if mixed with other cleaning agents.

What immediate health effects can be caused by exposure to hypochlorite?
Hypochlorite powder, solutions, and vapor are irritating and corrosive. Swallowing hypochlorite or contact with the skin or eyes produces injury to any exposed tissues. Exposure to gases released from hypochlorite may cause burning of the eyes, nose, and throat; cough; and damage to the airway and lungs. Generally, the more serious the exposure, the more severe the symptoms.

Can hypochlorite poisoning be treated?
There is no antidote for hypochlorite, but its effects can be treated and most exposed persons get well. Persons who have experienced serious symptoms may need to be hospitalized.

Are any future health effects likely to occur?
A single small exposure from which a person recovers quickly is not likely to cause delayed or long-term effects. After a serious exposure, symptoms may worsen for several hours.

What tests can be done if a person has been exposed to hypochlorite?
Specific tests for the presence of hypochlorite in blood or urine generally are not useful to the doctor. If a severe exposure has occurred, blood and urine analyses and other tests may show whether the lungs, heart, or brain have been injured. Testing is not needed in every case.

Where can more information about hypochlorite be found?
More information about hypochlorite can be obtained from your regional poison control center, your state, county, or local health department; the Agency for Toxic Substances and Disease Registry (ATSDR); your doctor; or a clinic in your area that specializes in occupational and environmental health. If the exposure happened at work, you may wish to discuss it with your employer, the Occupational Safety and Health Administration (OSHA), or the National Institute for Occupational Safety and Health (NIOSH). Ask the person who gave you this form for help in locating these telephone numbers.

Follow-up Instructions

Keep this page and take it with you to your next appointment. Follow *only* the instructions checked below.

[ ] Call your doctor or the Emergency Department if you develop any unusual signs or symptoms within the next 24 hours, especially:

- difficulty swallowing, or pain in the abdomen or chest
- coughing or wheezing, difficulty breathing, shortness of breath, or chest pain
- increased ocular pain or discharge, change in vision
- increased redness or pain or a pus-like discharge in the area of a skin burn

[ ] No follow-up appointment is necessary unless you develop any of the symptoms listed above.
[ ] Call for an appointment with Dr. _____ in the practice of _____. When you call for your appointment, please say that you were treated in the Emergency Department at _____ Hospital by _____ and were advised to be seen again in _____ days.
[ ] Return to the Emergency Department/ _____ Clinic on (date) _____ at _____ AM/PM for a follow-up examination.
[ ] Do not perform vigorous physical activities for 1 to 2 days.
[ ] You may resume everyday activities including driving and operating machinery.
[ ] Do not return to work for _____ days.
[ ] You may return to work on a limited basis. See instructions below.
[ ] Avoid exposure to cigarette smoke for 72 hours; smoke may worsen the condition of your lungs.
[ ] Avoid drinking alcoholic beverages for at least 24 hours; alcohol may worsen injury to your stomach or have other effects.
[ ] Avoid taking the following medications: _____
[ ] You may continue taking the following medication(s) that your doctor(s) prescribed for you: _____
_____
_____
[ ] Other instructions: _____
_____
_____

- Provide the Emergency Department with the name and the number of your primary care physician so that the ED can send him or her a record of your emergency department visit.

- You or your physician can get more information on the chemical by contacting: _____ _____ or _____, or by checking out the following Internet Web sites: _____; _____.

Signature of patient _____ Date _____

Signature of physician _____ Date _____