

Tetrachloroethylene (Cl₂C=CCl₂)

CAS 127-18-4; UN 1897

Synonyms include carbon bichloride, carbon dichloride, ethylene tetrachloride, PCE, perc, perchlor, perchloroethylene, Perclene, perk, 1,1,2,2-tetrachloroethylene, and tetrachloroethene.

- **Persons exposed only to tetrachloroethylene vapor pose no risk of secondary contamination. Persons whose skin or clothing is contaminated with liquid tetrachloroethylene can contaminate rescuers by direct contact or through off-gassing vapor.**
- **Tetrachloroethylene is a colorless, volatile, nonflammable liquid with a sharp, sweet odor. The vapor is heavier than air and can collect in toxic levels in poorly ventilated spaces. While the odor threshold is low, tetrachloroethylene quickly desensitizes olfactory responses; therefore, odor may not be an adequate warning of toxic levels.**
- **Tetrachloroethylene is readily absorbed if inhaled or ingested. Dermal exposure to the liquid can cause burns and irritation, but absorption across intact skin is slow. Exposure by any route can cause systemic effects.**

Description

At room temperature, tetrachloroethylene is a colorless, nonviscous, nonflammable liquid. It evaporates easily and has a sweet odor. The vapors are heavier than air. Tetrachloroethylene is slightly soluble in water, and is miscible with most organic solvents and oils. Although it is considered to be quite stable, at temperatures greater than 600 °F (316 °C), it breaks down to form the poisonous gas, phosgene, and hydrogen chloride, which are potent pulmonary irritants. Tetrachloroethylene is stored in mild steel tanks equipped with breathing vents and chemical driers in cool, dry, well-ventilated locations, away from any area where fire hazard may be acute, or in glass containers.

Routes of Exposure

Inhalation

Inhalation is the most important route of exposure, and tetrachloroethylene is absorbed readily through the lungs. Most people can smell tetrachloroethylene in the air at levels of 5 to 50 ppm (OSHA PEL is 100 ppm). **Odor is an adequate warning for high-dose acute exposures, but might not be adequate for prolonged exposures because olfactory fatigue can occur.** The vapors are heavier than air and can collect to toxic levels in poorly ventilated or low-lying areas and cause asphyxiation. Levels of 75 to 100 ppm can cause mild ocular irritation and levels of 216 ppm or more produce respiratory tract irritation. Central nervous system (CNS) effects, including sleepiness, headache, and loss of coordination, have been observed at exposures of 100 to 300 ppm.

During exposures of 1,000 to 1,500 ppm for less than 2 hours, people have experienced mood changes, slight ataxia, faintness, and dizziness. Exposure to higher concentrations or for longer periods of time can lead to collapse, coma, or death.

Children exposed to the same levels of tetrachloroethylene vapor as adults may receive a larger dose because they have greater lung surface area:body weight ratios and increased minute volumes:weight ratios. 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 tetrachloroethylene vapor found nearer to the ground.

Skin/Eye Contact

Exposure to high levels of tetrachloroethylene vapor causes ocular irritation. Direct contact with the liquid can cause skin and eye irritation and burns. Absorption across intact skin is slow. Thus, systemic toxicity is unlikely unless liquid on the skin is prevented from evaporating by heavy clothing or other impermeable covering.

Children are more vulnerable to toxicants absorbed through the skin because of their relatively larger surface:body weight ratio.

Ingestion

Ingested tetrachloroethylene is rapidly absorbed and can cause systemic effects similar to those seen with inhalation exposure.

Sources/Uses

Tetrachloroethylene is made by direct chlorination or oxychlorination of certain hydrocarbons. Tetrachloroethylene is used as a chemical intermediate, as solvent for metal cleaning and vapor degreasing, and for dry-cleaning and textile processing. It is found in many household products, including paint removers, water repellents, silicone lubricants, spot removers, adhesives, wood cleaners, and many products used by hobbyists. Tetrachloroethylene may still be employed as grain fumigant. It was formerly used as a deworming medicine in humans. It has been intentionally abused for its CNS-intoxicating effect. With improved recovery and recycling efforts, production has declined from about 500 million pounds in the 1980s to about 250 million pounds in the 1990s.

Standards and Guidelines

OSHA PEL (permissible exposure limit) = 100 ppm (averaged over an 8-hour workshift)

OSHA Ceiling for 15-minute exposure = 200 ppm; 5-minute maximum peak in any 3 hours = 300 ppm

NIOSH IDLH (immediately dangerous to life or health) = 150 ppm; potential occupational carcinogen

AIHA ERPG-2 (maximum airborne concentration below which it is believed that nearly all persons could be exposed for up to 1 hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair their abilities to take protective action) = 200 ppm.

Physical Properties

Description: colorless, nonviscous, nonflammable liquid

Warning properties: sweet, chloroform-like odor detectable at 5 to 50 ppm; adequate for acute exposures, but might be inadequate for chronic exposure because olfactory fatigue can occur.

Molecular weight: 165.83 daltons

Boiling point (760 mm Hg): 250.16 °F (121.20 °C)

Freezing point: -8.14 °F (-22.3 °C)

Specific gravity: 1.623 at 68 °F (20 °C) (water = 1.000)

Vapor pressure: 15.8 mm Hg at 71.6 °F (22 °C)

Vapor density: 5.83 (air = 1.00)

Water solubility: negligible (0.015% at 68 °F [20 °C])

Flammability: nonflammable liquid; vapors do not readily ignite; at temperatures >600 °F (>316 °C), tetrachloroethylene oxidizes to form hydrogen chloride, phosgene, and carbon monoxide.

Incompatibilities

Tetrachloroethylene reacts with strong oxidizers such as nitric acid or nitrogen tetroxide and strong alkali such as sodium hydroxide or potassium carbonate, but only at elevated temperatures. Tetrachloroethylene reacts with metals very slowly at 25 °C, but will react explosively with molten potassium and possibly with other reactive metals such as barium or lithium at elevated temperatures. Tetrachloroethylene does not react with water at ordinary temperatures, but with strong aqueous alkali at higher temperatures, tetrachloroethylene will form dichloroacetic acid and hydrochloric acid.

Health Effects

- **Inhalation or ingestion of tetrachloroethylene can cause CNS depression and cardiovascular effects. At high concentrations, the vapor is irritating to the eyes, mucous membranes, and respiratory tract. The liquid is irritating to the skin and can cause chemical burns.**
- **Tetrachloroethylene effects on the CNS are thought to be caused by interaction of the parent compound with neural membranes; other effects as well as liver cancer in animals are thought to be caused by tetrachloroethylene metabolites, but the exact mechanisms are not known.**

Acute Exposure

Tetrachloroethylene probably depresses the CNS through a solvent effect on lipids and protein components of neural membranes. It defats the skin, causing redness, blistering, and scaling. Organ damage, primarily liver and kidney, may occasionally be seen. CNS effects appear immediately during and following exposure, while organ damage may be delayed for hours to days. Most inhaled or ingested tetrachloroethylene leaves the body unchanged in exhaled air. Only 1% to 3% is metabolized (though there is considerable individual variation), and residual organ damage is not commonly observed.

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

CNS

Tetrachloroethylene causes dose-related CNS and respiratory depression, but transient initial CNS excitation can also occur. Symptoms can include irritability, impaired coordination, lightheadedness, headache, slurred speech, malaise, nausea, ataxia, sedation, coma, and death. Sublethal CNS effects generally resolve quickly when the victim is removed from further exposure, but may be delayed due to fat uptake. CNS effects can also be prolonged following ingestion exposure.

Cardiovascular

Tetrachloroethylene can lower the myocardial threshold to the dysrhythmogenic effects of catecholamines and can predispose exposed people to dysrhythmias, although this appears to be much less likely with this chemical than with other related chemicals.

Respiratory

Upper respiratory tract irritation can occur following inhalation of high concentrations of tetrachloroethylene.

Exposure to certain chemicals can lead to Reactive Airway Dysfunction Syndrome (RADS), a chemically- or irritant-induced type of asthma.

Children may be more vulnerable because of relatively increased minute ventilation per kg and failure to evacuate an area promptly when exposed.

Gastrointestinal Ingestion or inhalation of tetrachloroethylene can cause nausea and vomiting.

Hepatic Exposure to high levels of tetrachloroethylene can cause transient hepatocellular damage manifested as hepatomegaly, icterus, and elevated serum levels of liver enzymes. Liver injury might not develop until several days after exposure.

Renal Proteinuria, hematuria, and oliguric renal failure can occur following exposure to very high levels of tetrachloroethylene.

Dermal Direct skin exposure to liquid tetrachloroethylene can cause irritation and blistering. Prolonged contact can result in second- and third-degree chemical burns.

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

Ocular High concentrations of tetrachloroethylene vapor or direct contact with the liquid can cause intense conjunctival and scleral irritation, pain, swelling, lacrimation, and photophobia.

Potential Sequelae Survivors of severe acute exposures that induced coma or respiratory arrest might suffer brain or heart damage from decreased levels of oxygen to these organs. Dermal exposure may result in dermal hypersensitivity.

Chronic Exposure Prolonged exposure to tetrachloroethylene can result in memory and concentration impairment, vision disturbances, dizziness, irritability, ataxia, sleep disturbances, and peripheral neuropathy. Chronic exposure can cause liver and kidney abnormalities. Chronic skin exposure can cause irritant contact dermatitis.

Carcinogenicity The U.S. Department of Health and Human Services (DHHS) has determined that tetrachloroethylene is reasonably anticipated to be a human carcinogen based on adequate evidence from experimental animals (hepatocellular adenomas and carcinomas in male mice and hepatocellular carcinomas in female mice and mononuclear cell leukemia in rats). The International Agency for Research on Cancer

*Reproductive and
Developmental Effects*

(IARC) has classified tetrachloroethylene as probably carcinogenic to humans (Group 2A) based on limited evidence in humans and adequate evidence from experimental animals.

Tetrachloroethylene is 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. There is no conclusive evidence that tetrachloroethylene has adverse reproductive or developmental effects in humans. In animal studies, high level exposures of pregnant females caused behavioral and neurochemical changes in the offspring.

Tetrachloroethylene has been detected in human breast milk.

Prehospital Management

- **Victims exposed only to tetrachloroethylene vapor pose no risk of secondary contamination to rescuers. Victims whose skin or clothing is contaminated with liquid tetrachloroethylene can contaminate rescuers by direct contact or through off-gassing of vapor. Vomitus from patients who have ingested tetrachloroethylene might also off-gas the vapor.**
- **Inhalation or ingestion of tetrachloroethylene can cause CNS depression, respiratory irritation, and cardiovascular effects. At high concentrations, the vapor is irritating to the eyes, mucous membranes, and respiratory tract. The liquid is irritating to the skin and can cause chemical burns.**
- **There is no antidote for tetrachloroethylene poisoning. Treatment consists of support of respiratory and cardiovascular functions.**

Hot Zone

Rescuers should be trained and appropriately attired before entering the Hot Zone. If the proper equipment is not available, or if the 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

Inhaled tetrachloroethylene vapor is readily absorbed and can irritate the respiratory tract. The liquid is a skin and eye irritant with slow skin absorption.

Respiratory protection: Positive-pressure, self-contained breathing apparatus (SCBA) is recommended in response situations that involve exposure to any level of tetrachloroethylene vapor.

Skin protection: to prevent possible skin irritation and dermal absorption (a slow process), chemical-protective clothing is recommended when skin contact with the liquid is expected.

ABC Reminders

Quickly access for a patent airway, ensure adequate respiration and pulse. Provide supplemental oxygen if cardiopulmonary compromise is suspected. If trauma is suspected, manually maintain cervical immobilization and apply a cervical collar and a backboard when feasible. Apply direct pressure to stop any heavy bleeding. Maintain adequate circulation.

Victim Removal

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

Consider appropriate management of chemically contaminated children, such as measures to reduce separation anxiety if a child is separated from a parent or other adult.

Decontamination Zone

Victims exposed only to tetrachloroethylene vapor who have no eye or skin 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 required in the Hot Zone (described above).

ABC Reminders

Quickly access for a patent airway, ensure adequate respiration and pulse. If trauma is suspected, manually maintain cervical immobilization and apply a cervical collar and a backboard when feasible. Administer supplemental oxygen as required. Assist ventilation with a bag-valve-mask device if necessary. Apply direct pressure to control heavy bleeding.

Basic Decontamination

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

Wash exposed skin and hair with mild soap and water (preferably under a shower). Rinse thoroughly with water. Use caution to avoid hypothermia when decontaminating children or the elderly. Use blankets or warmers when appropriate.

Irrigate exposed eyes with copious amounts of tepid water or saline for at least **15 minutes**. Remove contact lenses if present and easily removable without additional trauma to the eye. If pain or injury is evident, continue irrigation while transferring the victim to the Support Zone.

In cases of ingestion, **do not induce emesis**. If the victim is alert, asymptomatic, and has a gag reflex, administer a slurry of activated charcoal at 1 gm/kg (usual adult dose 60–90 g, child dose 25–50 g). A soda can and straw may be of assistance when offering charcoal to a child.

Consider appropriate management of chemically contaminated children at the exposure site. Also, provide reassurance to the child during decontamination, especially if separation from a parent occurs. If possible, seek assistance from a child separation expert.

<i>Transfer to Support Zone</i>	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 <i>Decontamination Zone</i> above). Victims who have undergone decontamination or have been exposed only to tetrachloroethylene vapor pose no serious risk of secondary contamination to rescuers. In such cases, Support Zone personnel require no specialized protective gear.
<i>ABC Reminders</i>	Quickly access for a patent airway. If trauma is suspected, maintain cervical immobilization manually and apply a cervical collar and a backboard when feasible. Ensure adequate respiration and pulse. Administer supplemental oxygen as required and establish intravenous access if necessary. Place on a cardiac monitor.
<i>Additional Decontamination</i>	<p>Continue irrigating exposed skin and eyes, as appropriate.</p> <p>In cases of ingestion, do not induce emesis. If the victim is alert, asymptomatic, and has a gag reflex, administer a slurry of activated charcoal at 1 gm/kg (usual adult dose 60–90 g, child dose 25–50 g), if not previously given. A soda can and straw may be of assistance when offering charcoal to a child.</p>
<i>Advanced Treatment</i>	<p>In cases of respiratory compromise secure airway and respiration via endotracheal intubation. If not possible, perform cricothyroidotomy if equipped and trained to do so.</p> <p>Treat patients who have bronchospasm with aerosolized bronchodilators. The use of bronchial sensitizing agents in situations of multiple chemical exposures may pose additional risks. Consider the health of the myocardium before choosing which type of bronchodilator should be administered. Cardiac sensitizing agents may be appropriate; however, the use of cardiac sensitizing agents after exposure to certain chemicals may pose enhanced risk of cardiac arrhythmias (especially in the elderly). Epinephrine or other beta-adrenergic agents should be used only with caution and only when clearly indicated. Careful EKG monitoring for the possible induction of arrhythmias should be done, and resuscitation medications and equipment should be readily available.</p> <p>Consider racemic epinephrine aerosol for children who develop stridor. Dose 0.25–0.75 mL of 2.25% racemic epinephrine solution in 2.5 cc water, repeat every 20 minutes as needed, cautioning for myocardial variability.</p>

Patients who are comatose, hypotensive, or seizing or have cardiac dysrhythmias should be treated according to advanced life support (ALS) protocols, observing the precautions for catecholamines described above.

Transport to Medical Facility

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

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

If tetrachloroethylene has been ingested, prepare the ambulance in case the victim vomits toxic material. Prepare several towels and open double-sealable plastic bags to quickly clean up and isolate vomitus, if necessary.

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 histories or evidence suggesting significant exposure, such as incoordination, disorientation, or difficulty breathing, and patients who have ingested tetrachloroethylene should be transported to a medical facility for evaluation.

Patients who have mild or transient symptoms may be discharged from the scene after their names, addresses, and telephone numbers are recorded. They should be advised to rest and to seek medical care promptly if symptoms develop or recur (see *Patient Information Sheet* below).

Emergency Department Management

- **Patients exposed only to tetrachloroethylene vapor pose no risk of secondary contamination to rescuers. Patients whose skin or clothing is contaminated with liquid tetrachloroethylene can contaminate rescuers by direct contact or through off-gassing of vapor. Vomitus from patients who have ingested tetrachloroethylene can also off-gas the vapor.**
- **Inhalation or ingestion of tetrachloroethylene can cause CNS depression, respiratory irritation, and cardiovascular effects. At high concentrations, the vapor is irritating to the eyes, mucous membranes, and respiratory tract. The liquid is irritating to the skin and can cause chemical burns.**
- **There is no antidote for tetrachloroethylene poisoning. Treatment consists of support of respiratory and cardiovascular functions.**

Decontamination Area

Previously decontaminated patients and those exposed only to tetrachloroethylene vapor and who have no skin or eye irritation may be transferred immediately to the Critical Care Area. All others require decontamination as described below.

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

Because of their relatively larger surface area:body weight ratio, children are more vulnerable to toxicants absorbed through the skin. Also, emergency room personnel should examine children's mouths for signs of irritation because of the frequency of hand-to-mouth activity among children.

ABC Reminders

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

Treat patients who have bronchospasm with aerosolized bronchodilators. The use of bronchial sensitizing agents in situations of multiple chemical exposures may pose additional risks. Consider the health of the myocardium before choosing which type of bronchodilator should be administered. Cardiac sensitizing agents may be appropriate; however, the use of cardiac sensitizing agents

after exposure to certain chemicals may pose enhanced risk of cardiac arrhythmias (especially in the elderly). Epinephrine or other beta-adrenergic agents should be used only with caution and only when clearly indicated. Careful EKG monitoring for the possible induction of arrhythmias should be done, and resuscitation medications and equipment should be readily available.

Consider racemic epinephrine aerosol for children who develop stridor. Dose 0.25–0.75 mL of 2.25% racemic epinephrine solution in 2.5 cc water, repeat every 20 minutes as needed, cautioning for myocardial variability.

Patients who are comatose, hypotensive, or having seizures or have ventricular arrhythmias should be treated in the conventional manner, observing the precautions for catecholamines described above. Arrhythmias might respond to beta-adrenergic blockers (e.g., propranolol, esmolol) if lidocaine is ineffective.

Basic Decontamination

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

Wash exposed skin and hair with mild soap and water (preferably under a shower). Rinse thoroughly with water. Use caution to avoid hypothermia when decontaminating children or the elderly. Use blankets or warmers when appropriate.

Flush exposed or irritated eyes with plain water or saline for at least **15 minutes**. Remove contact lenses if easily removable without additional trauma to the eye. If pain or injury is evident, continue irrigation while transferring the patient to the Critical Care Area.

In cases of ingestion, **do not induce emesis**. Give activated charcoal at 1 gm/kg (usual adult dose 60–90 g, child dose 25–50 g), if available and not previously given. A soda can and straw may be of assistance when offering charcoal to a child.

Critical Care Area

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

ABC Reminders

Evaluate and support the airways, breathing, and circulation (as in *ABC Reminders* above). Children may be more vulnerable to corrosive agents than adults because of the relatively smaller diameter of their airways. Establish intravenous access in seriously ill patients. Continuously monitor cardiac rhythm.

Patients who are comatose, hypotensive, or seizing or have ventricular arrhythmia should be treated in the conventional manner, observing all precautions for catecholamines described below. Arrhythmias might respond to beta-adrenergic blockers (e.g., propranolol, esmolol) if lidocaine is ineffective.

Inhalation Exposure

Administer supplemental oxygen by mask to patients who have respiratory complaints. Treat patients who have bronchospasm with aerosolized bronchodilators. **Use these and all other catecholamines only when clearly indicated and when no alternatives are available. Administer the lowest effective doses. Monitor for cardiac arrhythmia and be prepared to treat as indicated.** Also consider the health of the myocardium before choosing which type of bronchodilator should be administered.

Consider racemic epinephrine aerosol for children who develop stridor. Dose 0.25–0.75 mL of 2.25% racemic epinephrine solution in 2.5 cc water, repeat every 20 minutes as needed, cautioning for myocardial variability.

Skin Exposure

If the skin was in prolonged contact with liquid tetrachloroethylene, chemical burns might be present; treat these as thermal burns.

Eye Exposure

Ensure that adequate eye irrigation has been completed. Test visual acuity. Examine the eyes for conjunctival or corneal damage and treat appropriately. Immediately consult an ophthalmologist for patients who have corneal injuries.

Ingestion Exposure

Do not induce emesis. If the patient is alert and able to swallow and activated charcoal has not been given previously, administer a slurry of activated charcoal at 1 gm/kg (usual adult dose 60–90 g, child dose 25–50 g). A soda can and straw may be of assistance when offering charcoal to a child.

Consider endoscopy to evaluate the extent of gastrointestinal-tract injury. Extreme throat swelling may require endotracheal intubation or cricothyroidotomy. Consider gastric lavage with a small nasogastric tube if: (1) a large dose has been ingested; (2) the patient's condition is evaluated within 30 minutes; (3) the patient has oral lesions or persistent esophageal discomfort; and (4) the lavage can be administered within 1 hour of ingestion. Care must be taken when placing the gastric tube because blind gastric tube placement may further injure the chemically damaged esophagus or stomach.

Because children do not ingest large amounts of corrosive materials, and because of the risk of perforation from NG

intubation, lavage is discouraged in children unless intubation is performed under endoscopic guidance.

Toxic vomitus or gastric washings should be isolated (e.g., by attaching the lavage tube to isolated wall suction or another closed container).

*Antidotes and
Other Treatments*

There is no antidote for tetrachloroethylene poisoning. Treatment is supportive. Controlled hyperventilation to enhance respiratory elimination of tetrachloroethylene has been reported, but is not a proven treatment method.

Laboratory Tests

Routine laboratory studies for all seriously exposed patients include CBC, glucose, electrolytes, liver enzymes, and kidney function tests. Chest radiography and pulse oximetry (or ABG measurements) are recommended in cases of severe inhalation exposure. Abdominal radiography may be useful in evaluating the severity of ingestion exposure and in assessing decontamination. Since hepatic and renal effects following acute tetrachloroethylene exposure may be delayed, serial testing over 1 to 3 days should be performed.

Tetrachloroethylene levels in blood or expired air are not clinically useful but can be used to document an exposure. Exposure to tetrachloroethylene is also suggested by detection of trichloroacetic acid in blood or urine; however, these tests are not specific for tetrachloroethylene.

**Disposition and
Follow-Up**

Consider hospitalizing patients who have had significant inhalation exposure (e.g., with loss of consciousness) and patients who have ingested significant amounts of tetrachloroethylene.

Delayed Effects

Skin injury can develop several hours after exposure. Dermal hypersensitivity may also develop. Hepatic or renal injury can develop a few days after exposure, depending on the magnitude of the exposure.

Patient Release

Patients who have not experienced alterations in mental status or respiratory difficulty may be discharged. Patients who initially had mild symptoms, but who are asymptomatic 6 to 8 hours after exposure, may also be discharged. Discharged patients should be advised to rest and to seek medical care promptly if symptoms develop or recur (see the *Tetrachloroethylene—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 laboratory evaluation of hepatic and renal function should be arranged for severely exposed patients. Neurologic examination for post-hypoxic injury is recommended in cases of CNS or respiratory depression. Patients who have skin burns or corneal lesions should be reexamined within 24 hours.

Reporting

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

Other persons might still be at risk at the place where this incident occurred. If the incident occurred in the workplace, discussing it with company personnel might 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 the Occupational Safety and Health Administration (OSHA) or the National Institute for Occupational Safety and Health (NIOSH). See Appendices III and IV for a list of agencies that may be of assistance.

Tetrachloroethylene Patient Information Sheet

This handout provides information and follow-up instructions for persons who have been exposed to tetrachloroethylene.

What is tetrachloroethylene?

Tetrachloroethylene is a colorless liquid with a sweet smell. It is used to make other chemicals, to degrease metal parts, to dry-clean fabric and in fabric processing. It is also used as a solvent in printing inks, paints, lacquers, varnishes, and adhesives. It is found in many products used in the average home, such as spot removers, adhesives, paint removers, water repellants, wood cleaners, and silicone sprays. Sometimes people intentionally inhale it to get “high”.

What immediate health effects can be caused by exposure to tetrachloroethylene?

Breathing or swallowing tetrachloroethylene can cause lightheadedness, dizziness, clumsiness, nausea, and vomiting. Very large amounts can cause sleepiness, coma, and even death. It can damage the liver and kidneys. If the liquid spills on the skin or eyes, it can cause irritation or burns. Vapors in the air can cause burning eyes.

Can tetrachloroethylene poisoning be treated?

There is no antidote for tetrachloroethylene poisoning, but its effects can be treated and most exposed persons recover completely. People who have been exposed to large amounts of tetrachloroethylene might 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. An exposure that occurs over many years can affect the brain, skin, liver, and kidneys and can increase the risk of certain types of cancer.

What tests can be done if a person has been exposed to tetrachloroethylene?

Specific tests for the presence of tetrachloroethylene breakdown products in blood and urine are available, but they are not generally useful to your doctor. If a severe exposure has occurred, blood and other tests might show whether the heart, lungs, liver, or kidneys have been affected. Testing is not needed in every case.

Where can more information about tetrachloroethylene be found?

More information about tetrachloroethylene 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. Ask the person who gave you this form for help locating these telephone numbers. 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:

- dizziness or clumsiness
- nausea or vomiting
- loss of appetite
- difficulty breathing

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 _____