

**Chlordane ($C_{10}H_6Cl_8$)
CAS 57-74-9; UN 2996**

Synonyms include a wide variety of trade names: Chlordan, Chlor-Kil, CD-68, Octachlor, Termi-Ded, Toxichlor, Topichlor, and Velsicol 1068.

- **Persons exposed only to chlordane vapor do not pose risks of secondary contamination to others. Persons whose skin or clothing is contaminated with liquid or powdered chlordane can cause secondary contamination by direct contact.**
- **Chlordane is a white powder or a colorless to amber/brown viscous liquid. Chlordane itself is not combustible, but it is often dissolved in solvents that are flammable. Chlordane has low volatility; however, solid residues can result in contaminated air and inhalation exposure. Odor generally provides inadequate warning of hazardous concentrations.**
- **Chlordane is absorbed well by the lungs and gastrointestinal tract and through intact skin. Exposure by any route can cause systemic effects.**

Description

Technical-grade chlordane is a mixture of chlordane isomers and more than 140 related reaction products. Depending on the composition, the mixture may be an amber-to-brown, viscous liquid or a white powder. At room temperature, chlordane is almost odorless or may have a slight chlorine-like odor, but the odor is inadequate as a warning of exposure. It is semi-volatile, volatilizing in hot environments but not under cooler conditions. Chlordane is insoluble in water and soluble in hydrocarbon solvents. It is not combustible, but will decompose when heated or reacted with strong oxidizers or alkaline agents to produce corrosive and/or toxic gases: carbon monoxide, hydrogen chloride gas, chlorine, and phosgene. As a commercial pesticide, chlordane is usually dissolved in hydrocarbons and used as a spray. Chlordane will attack some forms of plastics and rubber and is corrosive to iron and zinc; it can be stored in a cool, dry, well-ventilated area in aluminum, aluminum-clad or high-baked phenolic enamel-lined metal containers.

Routes of Exposure

Inhalation

Acute inhalation of chlordane vapor is unlikely because of chlordane's low vapor pressure at ordinary temperatures; however, chlordane is semi-volatile and may volatilize in hot environments. **The odor threshold for chlordane is about 10 times lower than the OSHA permissible exposure limit (PEL); however, odor may not provide an adequate warning for prolonged exposures because olfactory fatigue may**

occur. Toxic effects can occur after acute inhalation of a spray or mist containing chlordane and after chronic inhalation, usually by occupants of contaminated houses. With pesticide formulations, toxicity may also occur from inhalation of the solvents used to dissolve chlordane.

Children exposed to the same levels of chlordane as adults may receive 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 chlordane found nearer to the ground.

Skin/Eye Contact

Chlordane is rapidly absorbed through the skin, which can lead to systemic toxicity. Oils applied to the skin increase the absorption of chlordane. Early formulations of chlordane were irritating to the skin and mucous membranes.

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

Ingestion

Acute toxic effects, including death, can result from ingestion of chlordane.

Sources/Uses

Chlordane is a synthetic compound. It was used widely as an insecticide on food crops and as a termiticide in buildings and homes. Since 1988, the use and commercial production of chlordane (except for export) has been prohibited in the United States and many other countries. However, chlordane residue is still present from prior use in many homes and other structures, as well as the surrounding soil. Old supplies of chlordane may still exist in locations such as warehouses, garages, and landfills.

Standards and Guidelines

OSHA PEL (permissible exposure limit) = 0.5 mg/m³ (skin)
(averaged over an 8-hour work shift)

NIOSH IDLH (immediately dangerous to life or health)
= 100 mg/m³

Physical Properties

Description: Amber, viscous liquid

Warning properties: Nearly odorless; inadequate warning for acute or chronic exposure.

Molecular weight: 409.8 daltons

Boiling point (2 mm Hg): 347 °F (175° C)

Melting point (cis isomer): 225–228 °F (107–109 °C)

Melting point (trans isomer): 217–221 °F (103–105 °C)

Vapor pressure: 0.00001 (1 x 10⁻⁵) mm Hg at 77 °F (25 °C)

Specific gravity: 1.59–1.63 at 77 °F (water = 1)

Water solubility: Water insoluble

Flammability: Noncombustible liquid (but the commercial product may be dissolved in various flammable solvents).

Incompatibilities

Chlordane reacts with strong oxidizers and alkaline reagents; decomposition produces corrosive/toxic fumes of carbon monoxide, hydrogen chloride gas, chlorine, and phosgene. Chlordane will attack some forms of plastic, rubber, and coatings. It is corrosive to iron and zinc.

Health Effects

- Significant chlordane exposure by any route disrupts the transmission of nerve impulses, resulting in CNS excitation, convulsions, and respiratory depression.
- Chlordane is absorbed well through intact skin. Early formulations contained impurities that were skin and mucous-membrane irritants.
- Common symptoms of chlordane poisoning include headache, nausea, excitability, confusion, and muscle tremors that may precede convulsions.

Acute Exposure

Adverse health effects of chlordane are due both to the parent compound and its metabolites. The mechanism of neurotoxic effects may involve competitive inhibition of gamma aminobutyric acid (GABA), reducing GABA-mediated inhibition of post-synaptic neuronal excitability.

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

CNS

Chlordane poisoning by any exposure route can cause blurred vision, sensory disturbances, headache, refractory convulsions, muscle tremors, excitability, confusion, loss of consciousness, coma, and death. Serious poisonings are characterized by onset of violent convulsions within 0.5 to 3 hours, with death or remission of convulsions following shortly thereafter.

Gastrointestinal

Nausea, vomiting, and diarrhea can occur, especially after ingestion.

Dermal

Extensive skin contact may result in dermal irritation. Chlordane produced prior to 1951 had a high percentage of irritant impurities; chlordane produced after that date is generally nonirritating. Chlordane is absorbed well even through intact skin, and dermal absorption can lead to systemic toxicity and death.

Because of their larger surface area:body weight ratio, children are more vulnerable to toxicants absorbed through the skin

Ocular

When splashed in the eye, chlordane may produce redness and pain.

<i>Respiratory</i>	Respiratory depression, irritation, reduced gas exchange, and chemical pneumonitis may occur.
<i>Musculoskeletal</i>	In serious acute exposures, myoclonic jerking may be so intense as to cause compression fractures of the vertebrae.
<i>Metabolic</i>	Severe metabolic acidosis may be a consequence of convulsions and an immediate cause of death.
<i>Hepatic</i>	Chlordane induces liver microsomal enzymes, thereby enhancing the metabolism of and reducing the efficacy of therapeutic drugs such as phenobarbital, which may be administered as an anticonvulsant.
<i>Potential Sequelae</i>	Chlordane poisoning by any exposure route can cause permanent alterations of nervous system function, including problems with memory, learning, thinking, sleeping, personality changes, depression, numbness in the extremities, headache, and sensory and perceptual changes. Inflammation of the lungs due to pulmonary aspiration of vomitus, accumulation of fluid in the lungs, and acute kidney failure may occur after acute poisoning. If a toxic or lethal dose has been absorbed, anorexia and loss of body weight may be marked if death is delayed.
Chronic Exposure	Chronic chlordane exposure can cause permanent alterations of nervous system function, including problems with memory, learning, thinking, sleeping, personality changes, depression, numbness in the extremities, headache, and sensory and perceptual changes. It has been suggested that chronic exposure can cause blood disorders, but these disorders were not shown to have an increased incidence in heavily exposed groups of workers. Besides blood disorders, jaundice has been reported in persons living in homes treated with chlordane for termite control, but liver-function tests were normal in workers who manufactured chlordane. Chronic exposures may be more serious for children because of their potential longer latency period.
<i>Carcinogenicity</i>	IARC has determined that chlordane is possibly carcinogenic to humans (group 2B). The EPA has determined that technical grade chlordane is a likely human carcinogen. Chlordane is structurally similar to rodent carcinogens and chronic chlordane exposure can cause hepatocellular carcinoma in several strains of mice. The evidence for carcinogenicity in humans is weak: a few case reports and mixed or equivocal case-control study results associating exposure to chlordane with leukemia and non-Hodgkin's lymphoma. Epidemiological evidence for an

Reproductive and Developmental Effects

association is supported by limited evidence of mutagenicity in human and rodent lymphocytes tested *in vitro*.

The TERIS database states that no epidemiologic studies have reported birth defects among infants born to mothers exposed to chlordane during pregnancy. Chlordane is excreted in breast milk. Chlordane 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. No teratogenic effects from acute exposure have been reported. Prenatal exposure to chlordane has been reported for a few cases of neuroblastoma, blood dyscrasias, and depressed cell-mediated immunity, but no direct link with the chemical was established.

Chlordane induces liver enzymes and enhances metabolism of steroid hormones, including oral contraceptives; sterility has been reported in animals.

Prehospital Management

- Chlordane is absorbed well through intact skin. Victims whose skin or clothing is contaminated with liquid or powdered chlordane can secondarily contaminate response personnel by direct contact and in very severe contamination by off-gassing of carrier solvents. In rare instances, toxic vomitus can also secondarily contaminate rescuers by the same routes.
- Chlordane can cause CNS excitation, blurred vision, confusion, and intractable seizures. Victims should be protected from loud noises or other stimuli that might trigger seizures. Do not administer epinephrine (or other adrenergic drug) or atropine, since ventricular fibrillation may ensue.
- There is no specific antidote for chlordane poisoning. Treatment consists of supportive measures.

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

Chlordane is a moderately toxic systemic poison that is absorbed well by inhalation, and through the skin. It is also irritating to the skin and eyes on direct contact. Rescuers should wear chlordane-resistant gear.

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

Skin Protection: Chemical-protective clothing is recommended because skin irritation and dermal absorption may occur and may contribute to systemic toxicity. For chlordane hazards, NIOSH recommends suits made of CPF3™ (Kappler Company), and Trellchem HPS™ (Trelleborg Company) and gloves or boots made of Teflon™ (DuPont Company). NTP recommends Tyvek-type clothing or sleeves and gloves made of Viton (North F-091), Nitrile (Edmont 37-155), PVA (Edmont 15-554), or Neoprene (Pioneer N-44).

ABC Reminders

Quickly access 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 of chemically contaminated children, such as measures to reduce anxiety if a child is separated from a parent or other adult.

Decontamination Zone

All victims who have contacted chlordane liquid or powder require decontamination as described in this section (see *Basic Decontamination*). Victims exposed only to chlordane vapor who have no skin or eye irritation do not need decontamination and may be transferred to the Support Zone.

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 (see *Rescuer Protection* above).

ABC Reminders

Quickly access a patent airway, ensure adequate respiration and palpable pulse. Stabilize the cervical spine with a collar and a backboard if trauma is suspected. Apply artificial respiration if the victim is not breathing. Assist ventilation with a bag-valve-mask device if necessary. Do not use mouth-to-mouth resuscitation if the victim inhaled or ingested chlordane. Administer supplemental oxygen as required.

For inhalation exposures, monitor for respiratory distress. If cough or breathing difficulty develops, evaluate for respiratory tract irritation, bronchitis, or pneumonitis. Administer 100% humidified supplemental oxygen if breathing is difficult.

Basic Decontamination

Victims who are able and cooperative may assist with their own decontamination. Remove and double-bag contaminated clothing and personal belongings. Leather absorbs chlordane; therefore, items such as leather shoes, gloves, and belts should be discarded.

If there has been direct contact with liquid or powdered chlordane, flush exposed skin, hair, and under nails with plain, running, tepid water for 20 minutes, then wash twice with mild soap. **Do not scrub**, since this can increase absorption through the skin. Rinse thoroughly with water.

If eyes have been exposed directly, irrigate with large amounts of plain, tepid water or saline for 20 minutes, occasionally lifting the lower and upper lids. During this time, remove contact lenses, if easily removable without additional trauma to the eye.

Keep victims (adults or children) warm and quiet to avoid triggering seizures and the complication of hypothermia.

In cases of chlordane ingestion, **do not induce emesis**. If the victim is conscious and able to swallow, administer an aqueous 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. (The efficacy of activated charcoal for chlordane poisoning is uncertain).

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 *Basic Decontamination* above). Persons who have undergone decontamination or who have been exposed only to vapor pose no serious risks of secondary contamination to rescuers. In such cases, Support Zone personnel require no special protective gear.

ABC Reminders

Quickly access 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.

Additional Decontamination

Continue irrigating exposed skin and eyes, as appropriate.

In cases of chlordane ingestion, **do not induce emesis**. If the exposure is recent (within 1–2 hours) and the patient is conscious and able to swallow, administer a slurry of activated charcoal (at 1 gm/kg, usual adult dose 60–90 g, child dose 25–50 g) if it has not been given previously. A soda can and straw may be of assistance when offering charcoal to a child. (The efficacy of activated charcoal for chlordane poisoning is uncertain.)

Advanced Treatment

In cases of respiratory compromise secure airway and respiration via endotracheal intubation. If not possible, perform cricothyroidotomy if equipped and trained to do so.

To control metabolic acidosis, treat with sodium bicarbonate under medical base control (adult dose = 1 ampule; pediatric dose = 1 mEq/kg).

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

High concentrations of chlordane can increase cardiac irritability, use caution with cardiac or bronchial sensitizing agents.

Transport to Medical Facility

Only decontaminated patients or patients not requiring decontamination should be transported to a medical facility. “Body bags” can cause added danger and 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 chlordane-containing mixture 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.

Because of the rapidity of the onset of intractable seizures in patients who have chlordane toxicity and the potential for vomiting during seizures, suction should be readily available. Be prepared to protect the airway by positioning or intubation.

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 symptoms suggesting substantial exposure (CNS effects, eye irritation, respiratory distress, or cardiac dysrhythmias) and all persons who have ingested chlordane should be transported to a medical facility for evaluation.

Asymptomatic patients exposed only by inhalation may be released from the scene after their names, addresses, and telephone numbers are recorded. Be certain that no significant dermal exposure has occurred before releasing a patient from the scene. Those released should be advised to seek medical care

promptly if symptoms develop (see the *Patient Information Sheet* below).

Emergency Department Management

- Chlordane is absorbed well through intact skin. Patients whose skin or clothing is contaminated with liquid or powdered chlordane can secondarily contaminate response personnel by direct contact and, in cases of severe contamination, by off-gassing of carrier solvents. Rarely, toxic vomitus can also secondarily contaminate rescuers by the same routes. Patients do not pose serious contamination risks after contaminated clothing is removed and the skin is thoroughly washed.
- Chlordane is irritating to the skin, eyes, and respiratory tract. Systemic effects can occur from all routes of exposure and may include CNS excitation, intractable seizures, respiratory depression, and ventricular dysrhythmia. Sensory and motor abnormalities may be early signs of convulsions.
- There is no specific antidote for chlordane poisoning. Treatment consists of management of seizures and other measures to support respiratory and cardiovascular function.

Decontamination Area

Unless previously decontaminated, all patients suspected of direct contact with chlordane liquid or solid and all patients with skin or eye irritation require decontamination as described below. Because chlordane is absorbed through the skin and can attack rubber and several kinds of plastics, don Teflon™ gloves and suits before treating patients. Patients exposed only to vapor who have no skin or eye irritation do not need decontamination and may be transferred to the Critical Care area.

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 larger surface area:weight ratio, children are more vulnerable to toxicants absorbed through the skin. Also, emergency room 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 or irritating agents than adults because of the smaller diameter of their airways. Intubate the trachea in cases of respiratory compromise. If the patient's condition precludes intubation, surgically create an airway.

Chlordane exposure may cause cardiac arrhythmias. Therefore, administration of epinephrine or other adrenergics or atropine is **not recommended** unless absolutely necessary.

Patients who have seizures or ventricular dysrhythmias or who are comatose or hypotensive should be treated in the conventional manner.

For seizures, administer a benzodiazepine: Diazepam: *adults*, 5 to 10 mg i.v., repeated every 10 to 15 minutes as needed to a maximum of 30 mg; *children*, 0.2 to 0.5 mg/kg i.v., repeated every 5 minutes as needed to a maximum of 10 mg in children over 5 years or to a maximum of 5 mg in children under 5 years; or Lorazepam: *adults*, 4 to 8 mg i.v.; *children*, 0.05 to 0.1 mg/kg i.v.. Consider phenobarbital and/or phenytoin or fosphenytoin if seizures are uncontrollable or recur after diazepam.

Correct acidosis in the patient who has coma, seizures, or cardiac dysrhythmias by administering intravenously sodium bicarbonate (adult dose = 1 ampule; pediatric dose = 1 Eq/kg). Further bicarbonate therapy should be guided by arterial blood gas (ABG) measurements.

Basic Decontamination

Patients who are able may assist with their own decontamination. If the patient's clothing is contaminated with chlordane, remove and double-bag the contaminated clothing and all personal belongings. Since leather absorbs chlordane, items such as leather belts, shoes, and gloves should be discarded and destroyed by incineration.

Flush exposed skin, hair, and under nails with plain water for 20 minutes (preferably under a shower), then wash twice with mild soap and shampoo. Rinse thoroughly with water.

Exposed adults or children should be kept warm and quiet to avoid seizures or the complications of hypothermia.

Flush exposed eyes with plain water or saline for at least 20 minutes, occasionally lifting the lower and upper lids. During this time, remove contact lenses if easily removable 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**. (More information is provided in *Ingestion Exposure* under **Critical Care Area** below).

Critical Care Area	Be certain that appropriate decontamination has been carried out (see <i>Decontamination Area</i> above).
<i>ABC Reminders</i>	Evaluate and support airway, breathing, and circulation as in <i>ABC Reminders</i> above under Decontamination Zone . Children may be more vulnerable to corrosive agents than adults because of the smaller diameter of their airways. Establish intravenous access in symptomatic patients if this has not been done previously. Continuously monitor cardiac rhythm.
	Patients exposed to high levels of chlordane should be carefully observed for sensory or motor abnormalities that might signal the onset of seizures.
	Patients who are comatose or have seizures should be treated in the conventional manner. Refractory seizures may require more aggressive measures such as mechanical ventilation or inducing muscle paralysis or barbiturate coma. Use continuous EEG monitoring.
	Control metabolic acidosis with sodium bicarbonate (<i>adult dose</i> = 1 ampule; <i>initial pediatric dose</i> = 1 mEq/kg).
<i>Inhalation Exposure</i>	Administer supplemental oxygen by mask to patients who have respiratory symptoms (difficulty in breathing, pneumonitis).
	Do not administer epinephrine, other adrenergic amines, or atropine, since enhanced chlordane-induced myocardial irritability may predispose to ventricular fibrillation.
<i>Skin Exposure</i>	Washing the skin and hair with mild soap and rinsing thoroughly with water is usually sufficient treatment for skin exposure.
	Because of their larger surface area:weight ratio, children are more vulnerable to toxicants absorbed through the skin.
<i>Eye Exposure</i>	Continue irrigation for at least 15 minutes. Test visual acuity. Examine the eyes for corneal damage and treat appropriately. Immediately consult an ophthalmologist for patients who have severe corneal injuries.
<i>Ingestion Exposure</i>	Do not induce emesis because the patient is at risk of CNS depression or seizures, which may lead to pulmonary aspiration during vomiting. Control any seizures first.
	Consider cautious 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.

If the patient is alert and 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. (The efficacy of charcoal for chlordane poisoning is uncertain.)

Because of the risk of perforation from NG intubation, lavage is discouraged in children unless intubation is performed under endoscopic guidance.

*Antidotes and
Other Treatments*

There is no specific antidote for chlordane. Repeated doses of cholestyramine (3 to 8 g four times a day for several days) mixed with pulpy fruit or liquid, or activated charcoal have been suggested to enhance the elimination of chlordane in cases of severe poisoning. During convalescence, enhance carbohydrate, protein, and vitamin intake by diet or parenteral therapy.

The following treatments are NOT effective: forced diuresis, hemodialysis, and hemoperfusion. Oil-based cathartics should NEVER be used, as they may facilitate absorption.

Laboratory Tests

Routine laboratory studies for all exposed patients include CBC, glucose, and electrolyte determinations. Additional studies for patients exposed to chlordane include liver and renal-function tests.

Determining chlordane or chlordane-metabolite levels in blood after acute exposure is not clinically useful. However, these tests may be useful in documenting massive acute exposure.

If problems with memory, concentration, and personality changes are present, or seizures or convulsions have occurred, then neurobehavioral toxicity testing is indicated. If numbness of the hands or feet is present, then nerve conduction studies are indicated.

**Disposition and
Follow-up**

Consider hospitalizing patients who have a suspected serious exposure and are symptomatic.

<i>Delayed Effects</i>	Patients exposed by inhalation should be observed for signs of pulmonary edema and those who have ingested chlordane should be watched for signs of aspiration pneumonitis.
<i>Patient Release</i>	Patients who are initially asymptomatic and who remain so 2 to 3 hours after exposure may be discharged with instructions to seek medical care promptly if symptoms develop (see the <i>Follow-up Instructions</i> on the <i>Chlordane – Patient Information Sheet</i> below).
<i>Follow-up</i>	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. Patients who have shown symptoms of seizures, convulsions, headache or confusion, need to be followed for permanent central nervous system dysfunction with neurobehavioral toxicity testing, with particular attention to problems with memory, personality changes, and perceptual dysfunction. If peripheral numbness is present, then nerve conduction studies are indicated.
	Chlordane has been inconclusively implicated in rare cases of megaloblastic anemia and a variety of other blood dyscrasias. Patients should be evaluated for blood dyscrasias after substantial exposure. Since kidney damage has been observed in humans exposed to chlordane, a urinalysis should be repeated on an annual basis. In addition, the condition of eyes, skin, liver, and lungs should be evaluated following exposure to chlordane.
	Patients who have corneal injuries should be reexamined within 24 hours.
Reporting	If a pesticide or 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 Appendices III and IV for a list of agencies that may be of assistance.

Chlordane

Patient Information Sheet

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

What is chlordane?

Chlordane was produced as a thick, amber liquid or white powder. It was used as an insecticide in the form of a spray or powder on food crops and to rid homes and buildings of termites. It has been banned in the United States since 1988; however, many buildings and the soils around them have residue from previous chlordane use. Old bottles of chlordane may still be found in garages, warehouses, and landfills. Chlordane is not flammable, but may be dissolved in flammable solvents. On burning, or upon reaction with strong oxidizers or alkalis, chlordane decomposes to produce toxic fumes that include chlorine, phosgene (mustard gas), and hydrogen chloride.

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

Chlordane may cause effects when it is breathed or swallowed or when it touches the skin. Common effects of poisoning are nausea, irritability, headaches, stomach pain, and vomiting. Loss of coordination, tremors, convulsions, and death can occur with severe exposures. Generally, the higher the exposure, the more severe the symptoms. If lactating mothers are exposed, chlordane will contaminate the breast milk and may cause adverse effects in nursing infants.

Can chlordane poisoning be treated?

There is no antidote for chlordane, but its effects can be treated, and most exposed persons get well. Persons with 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. However, a single large exposure can result in the same neurological effects seen with chronic exposure. Exposure to chlordane over many years may cause blood disorders, and neurological effects, such as memory loss, irritability, numbness, loss of coordination, and seizures.

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

Specific tests for the presence of chlordane 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 blood, brain or kidneys have been injured. An electroencephalogram (EEG) may be used for evaluation if seizures have occurred. Testing is not needed in every case.

Where can more information about chlordane be found?

More information about chlordane 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:

- blurred vision
- coughing, difficulty breathing, or shortness of breath
- seizures or convulsions
- fever

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 _____