SUBSTANCE IDENTIFICATION
Found as a brown resin or solid or as a yellow-to-brown, viscous liquid. Can be found in powder or spray form. Hydrocarbon solvents are often used as vehicles for the chemical. Used as an insecticide. Most products have a low human toxicity potential. There are numerous natural (pyrethrins) and synthetic (pyrethroids) insecticides. Originally found as compounds extracted from the *Chrysanthemum cinerariaefolium* plant.

ROUTES OF EXPOSURE
Skin and eye contact
Inhalation
Ingestion

TARGET ORGANS
Primary
Skin
Eyes
Central nervous system
Respiratory system

Secondary
Cardiovascular system
Gastrointestinal system

LIFE THREAT
Respiratory paralysis and convulsions. Toxicity from the hydrocarbon solvent.

SIGNS AND SYMPTOMS BY SYSTEM
Cardiovascular: Mild tachycardia, hypotension, and arrhythmias caused by hypoxia.
Respiratory: Dyspnea, wheezing (reactive airway disease picture), sneezing, nasal stuffiness, and discharge. Respiratory failure caused by paralysis.
CNS: Headache, loss of coordination, tinnitus, decreased LOC, coma, seizures, tetanic paralysis, and paresthesias of the extremities may occur.
Gastrointestinal: Nausea, vomiting, and diarrhea.
Eye: Chemical conjunctivitis.
Skin: Contact dermatitis and facial swelling. May be exacerbated by sunlight exposure.
Other: Early symptoms may mimic hay fever symptoms. Toxicity from the solvent may be more acute than the product. Identify the solvent and consult appropriate guideline. Synthetic pyrethroids with a cyano group are the most toxic compounds of the group.

SYMPTOM ONSET FOR ACUTE EXPOSURES
Immediate
Allergic symptoms possibly delayed

CO-EXPOSURE CONCERNS
Organophosphates
Hydrocarbon solvents
THERMAL DECOMPOSITION PRODUCTS INCLUDE
Carbon monoxide
Carbon dioxide
Acrid smoke and fumes

MEDICAL CONDITIONS POSSIBLY AGGRAVATED BY EXPOSURE
Respiratory system disorders (asthma, allergies)

DECONTAMINATION
• Wear positive-pressure SCBA and protective equipment specified by references such as the DOT Emergency Response Guidebook or the CANUTEC Initial Emergency Response Guide. If special chemical protective clothing is required, consult the chemical manufacturer or specific protective clothing compatibility charts.
• Delay entry until trained personnel and proper protective equipment are available.
• Remove patient from contaminated area.
• Quickly remove and isolate patient’s clothing, jewelry, and shoes.
• Gently brush away dry particles and blot excess liquids with absorbent material.
• Rinse patient with warm water, 30°C/86°F, if possible.
• Wash patient with Tincture of Green soap or a mild liquid soap and large quantities of water.
• Refer to decontamination protocol in Section Three.

IMMEDIATE FIRST AID
• Ensure that adequate decontamination has been carried out.
• If victim is not breathing, start artificial respiration, preferably with a demand-valve resuscitator, bag-valve-mask device, or pocket mask as trained. Perform CPR if necessary.
• Immediately flush contaminated eyes with gently flowing water.
• Do not induce vomiting. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain an open airway and prevent aspiration.
• Keep victim quiet and maintain normal body temperature.
• Obtain medical attention.

BASIC TREATMENT
• Establish a patent airway. Suction if necessary.
• Watch for signs of respiratory insufficiency and assist ventilations if necessary.
• Administer oxygen by nonrebreather mask at 10 to 15 L/min.
• Anticipate seizures and treat if necessary (refer to seizure protocol in Section Three).
• For eye contamination, flush eyes immediately with water. Irrigate each eye continuously with normal saline during transport (refer to eye irrigation protocol in Section Three).
• Do not use emetics. For ingestion, rinse mouth and administer 5 mL/kg up to 200 mL of water for dilution if the patient can swallow, has a strong gag reflex, and does not drool. Administer activated charcoal (refer to ingestion protocol in Section Three and activated charcoal protocol in Section Four).

ADVANCED TREATMENT
• Consider orotracheal or nasotracheal intubation for airway control in the patient who is unconscious or in respiratory arrest.
• Monitor cardiac rhythm and treat arrhythmias if necessary (refer to cardiac protocol in Section Three).
• Start an IV with D5W TKO. Use lactated Ringer’s if signs of hypovolemia are present. Watch for signs of fluid overload.
• Treat seizures with diazepam (Valium) (refer to diazepam protocol in Section Four).
• Use proparacaine hydrochloride to assist eye irrigation (refer to proparacaine hydrochloride protocol in Section Four).

INITIAL EMERGENCY DEPARTMENT CONSIDERATIONS
• Useful initial laboratory studies include complete blood count, serum electrolytes, blood urea nitrogen (BUN), creatinine, glucose, urinalysis, and baseline biochemical profile, including serum aminotransferases (ALT and AST), calcium, phosphorus, and magnesium. Determination of anion and osmolar gaps may be helpful. Arterial blood gases (ABGs), chest radiograph, and electrocardiogram may be required.
• Bronchospastic symptoms should be treated with an inhalation medication regime similar to that used for reactive airways disease. Inhaled corticosteroids may be of value in severe bronchospasm.
• Obtain toxicological consultation if necessary.

SPECIAL CONSIDERATIONS
• Toxicity may result from the solvent that is used as a vehicle. Identify the solvent and consult appropriate guideline.
Rotenone and Related Compounds

SUBSTANCE IDENTIFICATION
A colorless-to-red, odorless solid. May be found in dusts and sprays and as an insecticide and pesticide. Kerosene and naphtha are frequently used as vehicles and may be more hazardous than the product itself.

ROUTES OF EXPOSURE
Skin and eye contact
Inhalation
Ingestion

TARGET ORGANS
Primary
Skin
Eyes
Central nervous system
Respiratory system
Secondary
Cardiovascular system
Gastrointestinal system
Hepatic
Renal
Metabolism

LIFE THREAT
Asphyxia from respiratory arrest.

SIGNS AND SYMPTOMS BY SYSTEM
Cardiovascular: Mild tachycardia, congestive heart failure. Arrhythmias, and bradycardia may occur.
Respiratory: Irritation of the respiratory tract, pharyngitis, rhinitis, and respiratory paralysis. At first respiratory stimulation, followed by depression.
CNS: Incoordination, CNS depression, numbness of mouth and tongue, and seizures.
Gastrointestinal: Nausea, vomiting, and abdominal pain.
Eye: Chemical conjunctivitis.
Skin: Dermatitis and cyanosis.
Renal: Kidney damage.
Hepatic: Liver damage.
Metabolism: Acidosis and hypoglycemia.
Other: The chief hazard is found in the solvent used as a vehicle. Identify the solvent and consult appropriate guideline.

SYMPTOM ONSET FOR ACUTE EXPOSURE
Immediate

CO-EXPOSURE CONCERNS
Kerosene
Naphtha
MEDICAL CONDITIONS POSSIBLY AGGRAVATED BY EXPOSURE
Central nervous system disorders
Liver disorders
Kidney disorders

DECONTAMINATION
- Wear positive-pressure SCBA and protective equipment specified by references such as the DOT Emergency Response Guidebook or the CANUTEC Initial Emergency Response Guide. If special chemical protective clothing is required, consult the chemical manufacturer or specific protective clothing compatibility charts.
- Delay entry until trained personnel and proper protective equipment are available.
- Remove patient from contaminated area.
- Quickly remove and isolate patient’s clothing, jewelry, and shoes.
- Gently brush away dry particles and blot excess liquids with absorbent material.
- Rinse patient with warm water, 30° C/86° F, if possible.
- Wash patient with Tincture of Green soap or a mild liquid soap and large quantities of water.
- Refer to decontamination protocol in Section Three.

IMMEDIATE FIRST AID
- Ensure that adequate decontamination has been carried out.
- If victim is not breathing, start artificial respiration, preferably with a demand-valve resuscitator, bag-valve-mask device, or pocket mask as trained. Perform CPR if necessary.
- Immediately flush contaminated eyes with gently flowing water.
- Do not induce vomiting. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain an open airway and prevent aspiration.
- Keep victim quiet and maintain normal body temperature.
- Obtain medical attention.

BASIC TREATMENT
- Establish a patent airway. Suction if necessary.
- Watch for signs of respiratory insufficiency and assist ventilations if necessary.
- Administer oxygen by nonrebreather mask at 10 to 15 L/min.
- Anticipate seizures and treat if necessary (refer to seizure protocol in Section Three).
- For eye contamination, flush eyes immediately with water. Irrigate each eye continuously with normal saline during transport (refer to eye irrigation protocol in Section Three).
- Do not use emetics. For ingestion, rinse mouth and administer 5 ml/kg up to 200 ml of water for dilution if the patient can swallow, has a strong gag reflex, and does not drool. Administer activated charcoal (refer to ingestion protocol in Section Three and activated charcoal protocol in Section Four).

ADVANCED TREATMENT
- Consider orotracheal or nasotracheal intubation for airway control in the patient who is unconscious or in respiratory arrest.
- Start an IV with D₅W TKO. Use lactated Ringer’s if signs of hypovolemia are present. Watch for signs of fluid overload.
- Treat seizures with diazepam (Valium) (refer to diazepam protocol in Section Four).
- Monitor for signs of hypoglycemia (decreased LOC, tachycardia, pallor, dilated pupils, diaphoresis, and/or dextrose strip or glucometer readings less than 50 mg/dL).
and administer 50% dextrose if necessary. Draw blood sample before administration (refer to 50% dextrose protocol in Section Four).

- Use proparacaine hydrochloride to assist eye irrigation (refer to proparacaine hydrochloride protocol in Section Four).

INITIAL EMERGENCY DEPARTMENT CONSIDERATIONS

- Useful initial laboratory studies include complete blood count, serum electrolytes, blood urea nitrogen (BUN), creatinine, glucose, urinalysis, and baseline biochemical profile, including serum aminotransferases (ALT and AST), calcium, phosphorus, and magnesium. Determination of the anion gap may be helpful. Arterial blood gases (ABGs), chest radiograph, and electrocardiogram may be required.

- Products may cause acidosis; hyperventilation and sodium bicarbonate may be beneficial. Bicarbonate therapy should be guided by clinical presentation, ABG determination, and serum electrolyte considerations.

- Obtain toxicological consultation as necessary.

SPECIAL CONSIDERATIONS

- Because of the toxicity of the solvents used with these products, identify the solvent and refer to the appropriate guideline.
SUBSTANCE IDENTIFICATION
Found in solid form as a colorless-to-light tan waxy substance with a musty odor. In liquid form it can be found as a colorless-to-thick amber liquid with a mild or chlorine-like odor. Also found in dust, emulsifiable concentrate, and granular or wettable powder. Used as termiticides, fumigants, pesticides, and insecticides. The EPA revoked the registration for the commercial production, distribution, sale and use of chlordane in April, 1988.

ROUTES OF EXPOSURE
Skin and eye contact
Inhalation
Ingestion
Skin absorption

TARGET ORGANS
Primary
Skin
Eyes
Central nervous system
Blood
Secondary
Cardiovascular system
Respiratory system
Gastrointestinal system
Hepatic
Renal

LIFE THREAT
Death from respiratory failure and exhaustion secondary to seizures.

SIGNS AND SYMPTOMS BY SYSTEM
Cardiovascular: Circulatory collapse with tachycardia and hypotension.
Respiratory: Sudden onset of dyspnea, followed by respiratory failure. Upper respiratory tract irritation, sinusitis, and pneumonia.
CNS: Headache, confusion, fatigue, hyperexcitability, shivering, muscle tremors, spasms of leg/back muscles and coma. Seizures that can be precipitated by external stimuli and tetanic muscular contractions. Neurobehavioral changes.
Gastrointestinal: Nausea, vomiting, and excessive salivation.
Eye: Chemical conjunctivitis and blurred vision.
Skin: Mild irritation, cyanosis, and dermatitis.
Hepatic: Liver damage.
Renal: Kidney damage.
Blood: Leukocytosis (elevation of white blood count), blood dyscrasias.
Other: Some products may present a human carcinogenic risk.
SYMPTOM ONSET FOR ACUTE EXPOSURES
Immediate
Some symptoms possibly delayed (up to 10 hours)

CO-EXPOSURE CONCERNS
Other organochlorine insecticides

THERMAL DECOMPOSITION PRODUCTS INCLUDE
Carbon monoxide
Chlorine
Hydrogen chloride
Phosgene

MEDICAL CONDITIONS POSSIBLY AGGRAVATED BY EXPOSURE
Central nervous system disorders
Liver disorders
Kidney disorders
Bone marrow disorders

DECONTAMINATION
• Wear positive-pressure SCBA and protective equipment specified by references such as the DOT Emergency Response Guidebook or the CANUTEC Initial Emergency Response Guide. If special chemical protective clothing is required, consult the chemical manufacturer or specific protective clothing compatibility charts.
• Delay entry until trained personnel and proper protective equipment are available.
• Remove patient from contaminated area.
• Quickly remove and isolate patient’s clothing, jewelry, and shoes.
• Gently brush away dry particles and blot excess liquids with absorbent material.
• Rinse patient with warm water, 30°C/86°F, if possible.
• Wash patient with Tincture of Green soap or a mild liquid soap and large quantities of water.
• Leather absorbs pesticides and should be isolated and properly disposed of.
• Refer to decontamination protocol in Section Three.

IMMEDIATE FIRST AID
• Ensure that adequate decontamination has been carried out.
• If victim is not breathing, start artificial respiration, preferably with a demand-valve resuscitator, bag-valve-mask device, or pocket mask as trained. Perform CPR if necessary.
• Immediately flush contaminated eyes with gently flowing water.
• Do not induce vomiting. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain an open airway and prevent aspiration.
• Keep victim quiet and maintain normal body temperature.
• Obtain medical attention

BASIC TREATMENT
• Establish a patent airway. Suction if necessary.
• Watch for signs of respiratory insufficiency and assist ventilations if necessary.
• Administer oxygen by nonrebreather mask at 10 to 15 L/min.
• Anticipate seizures, minimize external stimuli, and treat if necessary (refer to seizure protocol in Section Three).
• For eye contamination, flush eyes immediately with water. Irrigate each eye continuously with normal saline during transport (refer to eye irrigation protocol in Section Three).
Chlordane and Related Compounds

- Do not use emetics. For ingestion, rinse mouth and administer 5 ml/kg up to 200 ml of water for dilution if the patient can swallow, has a strong gag reflex, and does not drool. Administer activated charcoal (refer to ingestion protocol in Section Three and activated charcoal protocol in Section Four).

ADVANCED TREATMENT
- Consider oro-tracheal or nasotracheal intubation for airway control in the patient who is unconscious.
- Monitor cardiac rhythm and treat arrhythmias if necessary (refer to cardiac protocol in Section Three).
- Start an IV with D$_5$W TKO. Use lactated Ringer's if signs of hypovolemia are present.
- For hypotension with signs of hypovolemia, administer fluid cautiously. Watch for signs of fluid overload (refer to shock protocol in Section Three).
- Treat seizures with diazepam (Valium) (refer to diazepam protocol in Section Four).
- Proparacaine hydrochloride should be used to assist eye irrigation (refer to proparacaine hydrochloride protocol in Section Four).

INITIAL EMERGENCY DEPARTMENT CONSIDERATIONS
- Useful initial laboratory studies include complete blood count, serum electrolytes, blood urea nitrogen (BUN), creatinine, glucose, urinalysis, and baseline biochemical profile, including serum aminotransferases (ALT and AST), prothrombin time, calcium, phosphorus, and magnesium. Arterial blood gases (ABGs), chest radiograph, and electrocardiogram may be required.
- Obtain toxicological consultation as necessary

SPECIAL CONSIDERATIONS
- Avoid epinephrine and related beta agonists (unless in cardiac arrest or reactive airways disease refractory to other treatment) because of the possible irritable condition of the myocardium. Use of these medications may lead to ventricular fibrillation.
- Chlordane and related cyclodiene organochlorine compounds are fat soluble and easily store and accumulate in adipose tissue. Adipose tissue biopsies are required for estimation of body pesticide burden.
- Chlordane has been detected in homes (air and soil) where it was used as a termiticide for up to 15 years after the original application.
DDT and Related Compounds

SUBSTANCE IDENTIFICATION
Found as a white-to-deep gray solid with a fruitlike odor. May be used as a wettable powder, emulsion, or suspension or in solvent or aerosol form. Except for special circumstances, the EPA has severely restricted the use of these products. DDT has an extremely long biological half-life. May have a hydrocarbon vehicle that can cause additional toxic effects.

ROUTES OF EXPOSURE
Skin and eye contact
Inhalation
Ingestion
Skin absorption

TARGET ORGANS
Primary
Skin
Eyes
Central nervous system
Peripheral nervous system
Hepatic
Renal
Secondary
Cardiovascular system
Respiratory system
Gastrointestinal system

LIFE THREAT
Ventricular fibrillation, seizures, and respiratory arrest caused by central nervous system disruption and paralysis of the respiratory control center.

SIGNS AND SYMPTOMS BY SYSTEM
Cardiovascular: Circulatory collapse with arrhythmias, tachycardia, hypotension, and, rarely, bradycardia.
Respiratory: Upper respiratory tract irritation. Sudden onset of dyspnea, followed by respiratory failure. Pulmonary edema.
CNS: Headache, anorexia, nausea, fatigue, hyperexcitability, shivering, paresthesias (face, lips, tongue, legs) muscle tremor, and spasms of leg and back muscles. Seizures may be precipitated by external stimuli. Tetanic muscular contractions and neurobehavioral changes.
Gastrointestinal: Nausea, vomiting, and excessive salivation
Eye: Chemical conjunctivitis and blurred vision.
Skin: Mild irritation, cyanosis, and dermatitis.
Renal: Kidney damage.
Hepatic: Liver damage
Other: Some products may present a human carcinogenic risk. Oil-based solutions or
mixtures absorb faster than dusts or powders. Dermal absorption variable by compound. NOTE: Some of these products may be mixed with a hydrocarbon solvent as a vehicle. Toxicity may result from the solvent.

**SYMPTOM ONSET FOR ACUTE EXPOSURES**

Immediate

Pulmonary edema possibly delayed

**CO-EXPOSURE CONCERNS**

Other organochlorine compounds

**THERMAL DECOMPOSITION PRODUCTS INCLUDE**

Hydrogen chloride

Carbon monoxide

**MEDICAL CONDITIONS POSSIBLY AGGRAVATED BY EXPOSURE**

Nervous system disorders

Liver disorders

Kidney disorders

Skin disorders

**DECONTAMINATION**

- Wear positive-pressure SCBA and protective equipment specified by references such as the DOT Emergency Response Guidebook or the CANUTEC Initial Emergency Response Guide. If special chemical protective clothing is required, consult the chemical manufacturer or specific protective clothing compatibility charts.

- Delay entry until trained personnel and proper protective equipment are available.

- Remove patient from contaminated area.

- Quickly remove and isolate patient’s clothing, jewelry, and shoes.

- Gently brush away dry particles and blot excess liquids with absorbent material.

- Rinse patient with warm water, 30° C/86° F, if possible.

- Wash patient with Tincture of Green soap or a mild liquid soap and large quantities of water.

- Leather absorbs pesticides and should be isolated and properly disposed of

- Refer to decontamination protocol in Section Three.

**IMMEDIATE FIRST AID**

- Ensure that adequate decontamination has been carried out.

- If victim is not breathing, start artificial respiration, preferably with a demand-valve resuscitator, bag-valve-mask device, or pocket mask as trained. Perform CPR if necessary.

- Immediately flush contaminated eyes with gently flowing water.

- Do not induce vomiting. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain an open airway and prevent aspiration.

- Keep victim quiet and maintain normal body temperature.

- Obtain medical attention.

**BASIC TREATMENT**

- Establish a patent airway. Suction if necessary.

- Watch for signs of respiratory insufficiency and assist ventilations if necessary.

- Administer oxygen by nonrebreather mask at 10 to 15 L/min.

- Monitor for shock and treat if necessary (refer to shock protocol in Section Three).
• Monitor for signs of pulmonary edema and treat if necessary (refer to pulmonary edema protocol in Section Three).
• Anticipate seizures and treat if necessary (refer to seizure protocol in Section Three).
• For eye contamination, flush eyes immediately with water. Irrigate each eye continuously with normal saline during transport (refer to eye irrigation protocol in Section Three).
• Do not use emetics. For ingestion, rinse mouth and administer 5 ml/kg up to 200 ml of water for dilution if the patient can swallow, has a strong gag reflex, and does not drool. Administer activated charcoal (refer to ingestion protocol in Section Three and activated charcoal protocol in Section Four).

ADVANCED TREATMENT
• Consider orotracheal or nasotracheal intubation for airway control in the patient who is in respiratory arrest.
• Positive-pressure ventilation techniques with a bag-valve-mask device may be beneficial.
• Start an IV with D$_5$W TKO. Use lactated Ringer's if signs of hypovolemia are present.
• Monitor and treat cardiac arrhythmias if necessary (refer to cardiac protocol in Section Three).
• For hypotension with signs of hypovolemia, administer fluid cautiously and consider vasopressors if hypotensive without signs of hypovolemia (refer to shock protocol in Section Three).
• Consider drug therapy for pulmonary edema (refer to pulmonary edema protocol in Section Three).
• Treat seizures with diazepam (Valium) (refer to diazepam protocol in Section Four).
• Use proparacaine hydrochloride to assist eye irrigation (refer to proparacaine hydrochloride protocol in Section Four).

INITIAL EMERGENCY DEPARTMENT CONSIDERATIONS
• Useful initial laboratory studies include complete blood count, serum electrolytes, blood urea nitrogen (BUN), creatinine, glucose, urinalysis, and baseline biochemical profile, including serum aminotransferases (ALT and AST), calcium, phosphorus, and magnesium. Determination of anion and osmolar gaps may be helpful. Arterial blood gases (ABG), chest radiograph, and electrocardiogram may be required.
• Positive end-expiratory pressure (PEEP)–assisted ventilation may be necessary in patients with acute parenchymal injury who develop pulmonary edema or adult respiratory distress syndrome.
• Obtain toxicological consultation as necessary.

SPECIAL CONSIDERATIONS
• DDT (dichlorodiphenyl trichloroethane) and its primary metabolites DDD and DDE are extremely lipid soluble. These compounds rapidly bioaccumulate in adipose tissue, where they may remain for years.
• Products may have a hydrocarbon vehicle that may add to their toxicity. Ascertain the identity of the solvent and consult the proper guideline.
Aldrin, Dieldrin, Endrin, and Related Compounds

SUBSTANCE IDENTIFICATION
Cyclodiene pesticides, found in solid form as a colorless-to-light tan, waxy substance with a musty odor. Used as wettable powders, emulsifiable concentrates, dusts, granules, seed dressings, and solutions. Used as pesticides and insecticides. Use of most products in the United States is allowed on a limited basis. Aldrin is environmentally converted to dieldrin.

ROUTES OF EXPOSURE
Skin and eye contact
Inhalation
Ingestion
Skin absorption

TARGET ORGANS
Primary
Skin
Eyes
Central nervous system
Hepatic
Renal
Metabolism
Secondary
Cardiovascular system
Respiratory system
Gastrointestinal system

LIFE THREAT
Seizures and respiratory failure.

SIGNS AND SYMPTOMS BY SYSTEM
Cardiovascular: Increased blood pressure followed by circulatory collapse with tachycardia and hypotension. Myocardial irritability and arrhythmias.
Respiratory: Sudden onset of dyspnea, followed by respiratory failure. Upper respiratory tract irritation and sinusitis.
CNS: Headache, fatigue, apprehension, hyperexcitability, shivering, muscle tremor, spasms of leg/back muscles, and ataxia. Seizures, usually without warning, that may be precipitated by external stimuli. Tetanic muscular contractions and neurobehavioral changes.
Gastrointestinal: Nausea, vomiting, and excessive salivation.
Eye: Chemical conjunctivitis and blurred vision.
Skin: Mild irritation and cyanosis. Dermatitis
Renal: Kidney damage.
Hepatic: Liver damage.
Metabolism: Metabolic acidosis may occur.
Other: Oil-based solutions absorb faster than dusts or powders. NOTE: Some of these
products may be mixed with a hydrocarbon solvent as a vehicle. Toxicity may result from the solvent. Some pesticides may present a human carcinogenic risk.

**SYMPTOM ONSET FOR ACUTE EXPOSURE**

Immediate
Symptoms may be delayed up to 1 hour

**CO-EXPOSURE CONCERNS**

Other organochlorine compounds

**THERMAL DECOMPOSITION PRODUCTS INCLUDE**

Chloride fumes

**MEDICAL CONDITIONS POSSIBLY AGGRAVATED BY EXPOSURE**

Central nervous system disorders
Liver disorders
Kidney disorders

**DECONTAMINATION**

- Wear positive-pressure SCBA and protective equipment specified by references such as the *DOT Emergency Response Guidebook* or the *CANUTEC Initial Emergency Response Guide*. If special chemical protective clothing is required, consult the chemical manufacturer or specific protective clothing compatibility charts.
- Delay entry until trained personnel and proper protective equipment are available.
- Remove patient from contaminated area.
- Quickly remove and isolate patient’s clothing, jewelry, and shoes.
- Gently brush away dry particles and blot excess liquids with absorbent material.
- Rinse patient with warm water, 30°C/86°F, if possible.
- Wash patient with Tincture of Green soap or a mild liquid soap and large quantities of water.
- Leather absorbs pesticides and should be isolated and properly disposed of.
- Refer to decontamination protocol in Section Three.

**IMMEDIATE FIRST AID**

- Ensure that adequate decontamination has been carried out.
- If victim is not breathing, start artificial respiration, preferably with a demand-valve resuscitator, bag-valve-mask device, or pocket mask as trained. Perform CPR if necessary.
- Immediately flush contaminated eyes with gently flowing water.
- Do not induce vomiting. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain an open airway and prevent aspiration.
- Keep victim quiet and maintain normal body temperature.
- Obtain medical attention.

**BASIC TREATMENT**

- Establish a patent airway. Suction if necessary.
- Watch for signs of respiratory insufficiency and assist ventilations if necessary.
- Administer oxygen by nonrebreather mask at 10 to 15 L/min.
- Anticipate seizures, reduce all external stimuli, and treat if necessary (refer to seizure protocol in Section Three).
- For eye contamination, flush eyes immediately with water. Irrigate each eye continuously with normal saline during transport (refer to eye irrigation protocol in Section Three).
- Do not use emetics. For ingestion, rinse mouth and administer 5 ml/kg up to 200 ml of water for dilution if the patient can swallow, has a strong gag reflex, and does not
drool. Administer activated charcoal (refer to ingestion protocol in Section Three and activated charcoal protocol in Section Four).

**ADVANCED TREATMENT**

- Consider orotracheal or nasotracheal intubation for airway control in the patient who is unconscious or in severe respiratory distress.
- Monitor cardiac rhythm and treat arrhythmias if necessary (refer to cardiac protocol in Section Three).
- Start an IV with D$_5$W TKO. Use lactated Ringer's if signs of hypovolemia are present. Watch for signs of fluid overload.
- Treat seizures with diazepam (Valium) (refer to diazepam protocol in Section Four).
- Use proparacaine hydrochloride to assist eye irrigation (refer to proparacaine hydrochloride protocol in Section Four).

**INITIAL EMERGENCY DEPARTMENT CONSIDERATIONS**

- Useful initial laboratory studies include complete blood count, serum electrolytes, blood urea nitrogen (BUN), creatinine, glucose, urinalysis, and baseline biochemical profile, including serum aminotransferases (ALT and AST), calcium, phosphorus, and magnesium. Determination of anion and osmolar gaps may be helpful. Arterial blood gases (ABGs), chest radiograph, and electrocardiogram may be required.
- Obtain toxicological consultation if necessary.

**SPECIAL CONSIDERATIONS**

- Avoid epinephrine and related beta agonists (unless patient is in cardiac arrest or has reactive airways disease refractory to other treatment) because of the possible irritable condition of the myocardium. Use of these medications may lead to ventricular fibrillation.
- Ascertain identity of the solvent involved and refer to appropriate guideline.
- These products are fat soluble. They are excreted in breast milk and may cross the placenta. Compounds persist for years in the environment and bioaccumulate in adipose tissue.
Lindane and Related Compounds

**SUBSTANCE IDENTIFICATION**
Found as a colorless solid. Formulated as emulsifiable concentrate, wettable powder, sprays, aerosols, dusts, granules, or crystal. Wettable forms are in water. Products have a musty or aromatic odor. Liquid forms have a hydrocarbon vehicle. Toxicity from the solvent should be considered. Used as insecticides, scabicides, pediculicide, and pesticides. Lindane has greater vapor activity than most organochlorine insecticides. Lindane (1%) is the active ingredient in the miticides Kwell, Kildane, Scabene, and Gammabenzene. Although some of these products use “benzene” in their names, they do not contain benzene.

**ROUTES OF EXPOSURE**
Skin and eye contact
Inhalation
Ingestion
Skin absorption

**TARGET ORGANS**
*Primary*
Skin
Eyes
Central nervous system
Cardiovascular system
Hepatic
Renal
Blood
Metabolism

*Secondary*
Respiratory system
Gastrointestinal system

**LIFE THREAT**
Causes central nervous system excitation leading to seizures and respiratory failure.

**SIGNS AND SYMPTOMS BY SYSTEM**

**Cardiovascular:** Arrhythmias caused by hypoxia. Products may sensitize the myocardium to catecholamines.

**Respiratory:** Irritation of the mucous membranes, throat, and upper airway. Respiratory failure secondary to seizures. Pulmonary edema has been seen in some fatal cases.

**CNS:** Headache, CNS stimulation, irritability, restlessness, memory disturbances, slurred speech, muscle tremors, ataxia, paresthesias, and spasms. Seizures.

**Gastrointestinal:** Nausea, vomiting, abdominal pain, and diarrhea.

**Eye:** Chemical conjunctivitis and corneal damage.

**Skin:** Dermatitis, pruritus, burns, and cyanosis.

**Renal:** Kidney damage.

**Hepatic:** Liver damage.

**Metabolism:** Rhabdomyolysis and myoglobinuria.
Blood: Aplastic anemia (bone marrow suppression) has been reported. Abnormalities in white blood cell count (leukopenia, granulocytopenia, granulocytosis, eosinophilia) have been reported. Decreased platelet count (thrombocytopenia).

Other: Some products may present a human carcinogenic risk. The hydrocarbon solvent may cause additional toxicity.

SYMPTOM ONSET FOR ACUTE EXPOSURE
Immediate
Some symptoms may be delayed up to 24 hours

CO-EXPOSURE CONCERNS
Other organochlorine compounds

THERMAL DECOMPOSITION PRODUCTS INCLUDE
Phosgene
Hydrogen chloride
Carbon monoxide

MEDICAL CONDITIONS POSSIBLY AGGRAVATED BY EXPOSURE
Central nervous system disorders
Seizure disorders
Liver disorders
Kidney disorders
Bone marrow disorders

DECONTAMINATION
• Wear positive-pressure SCBA and protective equipment specified by references such as the DOT Emergency Response Guidebook or the CANUTEC Initial Emergency Response Guide. If special chemical protective clothing is required, consult the chemical manufacturer or specific protective clothing compatibility charts.
• Delay entry until trained personnel and proper protective equipment are available.
• Remove patient from contaminated area.
• Quickly remove and isolate patient’s clothing, jewelry, and shoes.
• Gently brush away dry particles and blot excess liquids with absorbent material.
• Rinse patient with warm water, 30°C/86°F, if possible.
• Wash patient with Tincture of Green soap or a mild liquid soap and large quantities of water.
• Leather absorbs pesticides and should be isolated and properly disposed of.
• Refer to decontamination protocol in Section Three.

IMMEDIATE FIRST AID
• Ensure that adequate decontamination has been carried out.
• If victim is not breathing, start artificial respiration, preferably with a demand-valve resuscitator, bag-valve-mask device, or pocket mask as trained. Perform CPR if necessary.
• Immediately flush contaminated eyes with gently flowing water.
• Do not induce vomiting. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain an open airway and prevent aspiration.
• Keep victim quiet and maintain normal body temperature.
• Obtain medical attention.

BASIC TREATMENT
• Establish a patent airway. Suction if necessary.
• Watch for signs of respiratory insufficiency and assist ventilations if necessary.
· Administer oxygen by nonrebreather mask at 10 to 15 L/min.
· Monitor for pulmonary edema and treat if necessary (refer to pulmonary edema protocol in Section Three).
· Anticipate seizures and treat if necessary (refer to seizure protocol in Section Three).
· For eye contamination, flush eyes immediately with water. Irrigate each eye continuously with normal saline during transport (refer to eye irrigation protocol in Section Three).
· Do not use emetics. For ingestion, rinse mouth and administer 5 ml/kg up to 200 ml of water for dilution if the patient can swallow, has a strong gag reflex, and does not drool. Administer activated charcoal (refer to ingestion protocol in Section Three and activated charcoal protocol in Section Four).

ADVANCED TREATMENT
· Consider orotracheal or nasotracheal intubation for airway control in the patient who is unconscious or in respiratory arrest.
· Positive-pressure ventilation techniques with a bag-valve-mask device may be beneficial.
· Monitor cardiac rhythm and treat arrhythmias if necessary (refer to cardiac protocol in Section Three).
· Start an IV with lactated Ringer’s to maintain hydration and adequate urine flow. Watch for signs of fluid overload and pulmonary edema.
· Consider drug therapy for pulmonary edema (refer to pulmonary edema protocol in Section Three).
· Treat seizures with diazepam (Valium) (refer to diazepam protocol in Section Four).
· Use proparacaine hydrochloride to assist eye irrigation (refer to proparacaine hydrochloride protocol in Section Four).

INITIAL EMERGENCY DEPARTMENT CONSIDERATIONS
· Useful initial laboratory studies include complete blood count, serum electrolytes, blood urea nitrogen (BUN), creatinine, glucose, urinalysis, and baseline biochemical profile, including serum aminotransferases (ALT and AST), calcium, phosphorus, and magnesium. Determination of anion and osmolar gaps may be helpful. Arterial blood gases (ABGs), chest radiograph, and electrocardiogram may be required.
· If rhabdomyolysis is suspected, monitor urine for myoglobin. If myoglobinuria is present, maintain adequate hydration status and urine flow. Alkalization of the urine may be indicated to prevent renal damage.
· Positive end-expiratory pressure (PEEP)-assisted ventilation may be necessary in patients with acute parenchymal injury who develop pulmonary edema or adult respiratory distress syndrome.
· Obtain toxicological consultation if necessary.

SPECIAL CONSIDERATIONS
· Avoid epinephrine and related beta agonists (unless patient is in cardiac arrest or has reactive airways disease refractory to other treatment) because of the possible irritable condition of the myocardium. Use of these medications may lead to ventricular fibrillation.
· These fat-soluble compounds accumulate in adipose tissue. They are excreted in breast milk and cross the placenta. Also found as contaminants in air and water.
· Additional toxicity may result from the hydrocarbon solvent.
· Ascertaining the identity of the solvent and consult the appropriate guideline.