Material Safety Data Sheet

Chlorpyrifos

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IENTIFICATION

Chemical product name: Chlorpyrifos

Common chemical name: phosphorothioic acid, o,o-diethyl o-(3,5,6-trichloro-2-pyridinyl)ester; phosphorothioic acid, o,o-diethyl o-(3,5,6-trichloro-2-pyridyl) ester; o,o-diethyl o-3,5,6-trichloro-2-pyridyl phosphorothioate; o,o-diethyl o-(3,5,6-trichloro-2-pyridyl) phosphorothioate; o,o-diethyl o-(3,5,6-trichloro-2-pyridinyl) phosphorothioate; diethyl 3,5,6-trichloro-2-pyridyl phosphorothionate; chloropyriphos; chloropyrifos; chlorpyriphos; corban; dowco 179; dursban; killmaster; lorsban; oms 971; ent 27311; stcc 4941124; c9h11cl3no3ps; pst04910

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SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS

Hazardous Component Name	CAS-No.	Percentage
Chlorpyrifos	2921-88-2	100

SECTION 3 - HAZARDS IDENTIFICATION

CERCLA RATINGS (SCALE 0-3): HEALTH=3 FIRE=U REACTIVITY=1
PERSISTENCE=3
NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=U REACTIVITY=1

EMERGENCY OVERVIEW:
White crystalline solid with a mild mercaptan odor
Harmful if swallowed. Causes skin and eye irritation. May affect the nervous system. May cause convulsions. May affect the central nervous system. Containers may violently rupture at elevated temperatures.
Keep away from heat and flame. Avoid breathing dust. Avoid contact with eyes, skin and clothing. Keep container tightly closed. Wash thoroughly after handling. Use only with adequate ventilation. Handle with caution.

POTENTIAL HEALTH EFFECTS:
INHALATION:
SHORT TERM EFFECTS: May cause coughing, nose bleed, paleness, sweating, tearing, drooling, nausea, vomiting, diarrhea, stomach pain, involuntary defecation and/or urination, difficulty speaking, chest pain, difficulty breathing, headache, weakness, dizziness, confusion, loss of reflexes, twitching, mental disorders, blurred vision, dilated pupils or pin-point pupils, bluish skin color, lung congestion, paralysis, convulsions, unconsciousness, coma and heart failure.
LONG TERM EFFECTS: In addition to effects from short term exposure, lack of appetite, speech disorders, drowsiness, disorientation, sleeplessness and loss of memory may occur.

SKIN CONTACT:
SHORT TERM EFFECTS: May cause irritation. Additional effects may include sweating and twitching.
LONG TERM EFFECTS: May cause effects as reported in short term exposure.

EYE CONTACT:
SHORT TERM EFFECTS: May cause irritation. Additional effects may include tearing, twitching of the eyelid, muscle spasm and dilated pupils or pin-point pupils.

LONG TERM EFFECTS: May cause effects as reported in short term exposure.

INGESTION:

SHORT TERM EFFECTS: May cause lack of appetite, nausea, vomiting, diarrhea and stomach pain. May also cause reproductive effects.

LONG TERM EFFECTS: May cause effects as reported in short term exposure.

CARCINOGEN STATUS:

OSHA: N

NTP: N

IARC: N

SECTION 4 - FIRST AID MEASURES

INHALATION:

FIRST AID- Remove from exposure area to fresh air immediately. Perform artificial respiration if necessary. Maintain airway, blood pressure and respiration. Keep warm and at rest. Treat symptomatically and supportively. Get medical attention immediately. Qualified medical personnel should consider administering oxygen.

SKIN CONTACT:

FIRST AID- Remove contaminated clothing immediately. Wash contaminated areas with soap and water followed by alcohol (Arena, Poisoning, 4th Ed.). Emergency personnel should wear gloves and avoid contamination. Treat respiratory difficulty with artificial respiration. Get medical attention immediately.

EYE CONTACT:

FIRST AID- Irrigate eyes with water or saline solution. If symptoms of poisoning occur, treat respiratory difficulty with artificial respiration and oxygen. Observe patient for at least 24-36 hours (Gosselin, Clinical Toxicology of Commercial Products, 5th Ed.). Get medical attention immediately. Oxygen should be administered by qualified medical personnel.

INGESTION:

FIRST AID- If person is alert and respiration is not depressed, give syrup of ipecac followed by water (if vomiting occurs, keep head below hips to prevent aspiration). If consciousness level declines or vomiting has not occurred in 15 minutes empty stomach by gastric lavage with the aid of cuffed endotracheal tube using isotonic saline or 5% sodium bicarbonate follow with activated charcoal. Establish and maintain airway. Treat

respiratory difficulty with artificial respiration and oxygen. Do not give morphine, aminophylline, phenothiazines, reserpine, furosemide, or ethacrynic acid (Morgan, Recognition and Management of Pesticide Poisonings, 3rd Ed.). Treat symptomatically and supportively. Administration of oxygen and lavage must be performed by qualified medical personnel. Get medical attention immediately.

NOTE TO PHYSICIAN

ANTIDOTE:

The following antidote(s) have been recommended. However, the decision as to whether the severity of poisoning requires administration of any antidote and actual dose required should be made by qualified medical personnel.

FOR CHOLINESTERASE INHIBITORS:

Establish clear airway and tissue oxygenation by aspiration of secretions, and if necessary, by assisted pulmonary ventilation with oxygen. Improve tissue oxygenation as much as possible before administering atropine to minimize the risk of ventricular fibrillation. Administer atropine sulfate intravenously, or intramuscularly if iv injection is not possible. In moderately severe poisoning administer atropine sulfate, 0.4-2.0 mg repeated every 15 minutes until atropinization is achieved (tachycardia, flushing, dry mouth, mydriasis). Maintain atropinization by repeated doses for 2-12 hours, or longer, depending on the severity of poisoning. The appearance of rales in the lung bases, miosis, salivation, nausea, bradycardia, are all indications of inadequate atropinization. Severely poisoned individuals may exhibit remarkable tolerance to atropine; two or more times the dosages suggested above may be needed. Persons not poisoned or only slightly poisoned, however, may develop signs of atropine toxicity from such large dosages: Fever, muscle fibrillations, and delirium are the main signs of atropine toxicity. If these signs appear while the patient is fully atropinized, atropine administration should be discontinued, at least temporarily. Observe treated patients closely at least 24 hours to insure that symptoms (possibly pulmonary edema) do not recur as atropinization wears off. In very severe poisonings, metabolic disposition of toxicant may require several hours or days during which atropinization must be maintained. Markedly lower levels of urinary metabolites indicate that atropine dosage can be tapered off. As dosage is reduced, check the lung bases frequently for rales. If rales are heard or other symptoms return, re-establish atropinization promptly (Morgan, Recognition and Management of Pesticide Poisonings, 3rd Ed.). Administration of antidote must be performed by qualified medical personnel. In cases of severe poisoning by organophosphate pesticides in which

respiratory depression, muscle weakness and twitchings are severe, give pralidoxime (Protopam-Ayerst, 2-PAM), 1.0 gram intravenously at no more than 0.5 gram per minute. Dosage of pralidoxime may be repeated in 1-2 hours, then at 10-12 hour intervals if needed. In very severe poisonings, dosage rates may be doubled. Treatment with pralidoxime will be most effective if given within thirty-six hours after poisoning (Morgan, Recognition and Management of Pesticide Poisonings, 3rd Ed.). Antidote should be administered by qualified medical personnel.

SECTION 5 - FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARD:
Unknown fire and explosion hazard.

EXTINGUISHING MEDIA:
Dry chemical, water spray or regular foam
(1993 Emergency Response Guidebook, RSPA P 5800.6).
For larger fires, use water spray, fog or regular foam
(1993 Emergency Response Guidebook, RSPA P 5800.6).

FIREFIGHTING:
Move container from fire area if you can do it without risk. Fight fire from maximum distance. Stay away from ends of tanks. Dike fire-control water for later disposal; do not scatter the material (1993 Emergency Response Guidebook, RSPA P 5800.6, Guide Page 55).
Extinguish only if flow can be stopped; use flooding amounts of water as fog, solid streams may be ineffective. Cool containers with flooding amounts of water from as far a distance as possible. Use water spray to absorb toxic vapors. Avoid breathing toxic vapors; keep upwind. Consider evacuation of downwind area if material is leaking.

HAZARDOUS COMBUSTION PRODUCTS:
Thermal decomposition may release toxic and/or hazardous gases.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

OCCUPATIONAL SPILL:
Do not touch spilled material. Stop leak if you can do it without risk. Use water spray to reduce vapors. For small spills, take up with sand or other absorbent material and place into containers for later disposal. For small

dry spills, with a clean shovel place material into clean, dry containers and cover. Move containers from spill area. For larger spills, dike far ahead of spill for later disposal. Keep unnecessary people away. Isolate hazard area and deny entry. Ventilate closed spaces before entering.
Reportable Quantity (RQ): 1 pound
The Superfund Amendments and Reauthorization Act (SARA) Section 304 requires that a release equal to or greater than the reportable quantity for this substance be immediately reported to the local emergency planning committee and the state emergency response commission (40 CFR 355.40). If the release of this substance is reportable under CERCLA Section 103, the National Response Center must be notified immediately at (800) 424-8802 or (202) 426-2675 in the metropolitan Washington, D.C. area (40 CFR 302.6).
SOIL SPILL:
Dig holding area such as lagoon, pond or pit for containment.
Use protective cover such as a plastic sheet to prevent material from dissolving in fire extinguishing water or rain.
WATER SPILL:
Trap spilled material at bottom in deep water pockets, excavated holding areas or within sand bag barriers.
Use activated carbon to absorb spilled substance that is dissolved.
Use suction hoses to remove trapped spill material.
Use mechanical dredges or lifts to extract immobilized masses of pollution and precipitates.

SECTION 7 - HANDING AND STORAGE

Observe all federal, state and local regulations when storing this substance.
Store in accordance with 40 CFR 165 recommended procedures for the disposal and storage of pesticides and pesticide containers.
Store away from incompatible substances.
Threshold Planning Quantity (TPQ):
The Superfund Amendments and Reauthorization Act (SARA) Section 302 requires that each facility where any extremely hazardous substance is present in a quantity equal to or greater than the TPQ established for that substance notify the state emergency response commission for the state in which it is located. Section 303 of SARA requires these facilities to participate in local emergency response planning (40 CFR 355.30).

SECTION 8 - EXPOSURE CONTROLS, PERSONAL, PROTECTION

EXPOSURE LIMITS:
CHLORPYRIFOS:
0.2 mg/m3 OSHA TWA (skin)
0.2 mg/m3 ACGIH TWA (skin)
1 pound CERCLA Section 103 Reportable Quantity
OSHA revoked the final rule limits of January 19, 1989 in response to the 11th Circuit Court of Appeals decision (AFL-CIO v. OSHA) effective June 30, 1993. See 29 CFR 1910.1000 (58 FR 35338)**
VENTILATION:
Provide local exhaust or process enclosure ventilation to meet published exposure limits.
EYE PROTECTION:
Employee must wear splash-proof or dust-resistant safety goggles and a faceshield to prevent contact with this substance.
Emergency wash facilities:
Where there is any possibility that an employee's eyes and/or skin may be exposed to this substance, the employer should provide an eye wash fountain and quick drench shower within the immediate work area for emergency use.
CLOTHING:
Employee must wear appropriate protective (impervious) clothing and equipment to prevent any possibility of skin contact with this substance.
GLOVES:
Employee must wear appropriate protective gloves to prevent contact with this substance.
RESPIRATOR:
The following respirators are recommended based on information found in the physical data, toxicity and health effects sections. They are ranked in order from minimum to maximum respiratory protection.
The specific respirator selected must be based on contamination levels found in the work place, must be based on the specific operation, must not exceed the working limits of the respirator and must be jointly approved by the National Institute for Occupational Safety and Health and the Mine Safety and Health Administration (NIOSH-MSHA).
Any type 'C' supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure mode or with a full facepiece, helmet or hood operated in continuous-flow mode.
Any self-contained breathing apparatus with a full facepiece operated in

pressure-demand or other positive pressure mode.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.
Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

DESCRIPTION: White crystalline solid with a mild mercaptan odor
MOLECULAR WEIGHT: 350.57
MOLECULAR FORMULA: C9-H11-CL3-N-O3-P-S
MELTING POINT: 106-108 F (41-42 C)
VAPOR PRESSURE: 0.0000187 mmHg 25 C
SPECIFIC GRAVITY: 1.398 @ 43 C
WATER SOLUBILITY: 2 ppm @ 25 C
SOLVENT SOLUBILITY: Soluble in acetone, benzene, chloroform, ethanol, isooctane, methanol, and organic solvents

SECTION 10 - STABILITY AND REACTIVITY

REACTIVITY:
May undergo violent exothermic decomposition above 130 C (266 F). The increase in temperature and pressure may result in the violent rupture of the container.

CONDITIONS TO AVOID:
None reported.
INCOMPATIBILITIES:

CHLORPYRIFOS:
ALKALINE CONDITIONS: May cause hydrolysis.
BRASS: May be corroded.
COPPER: May be corroded.

HAZARDOUS DECOMPOSITION:
Thermal decomposition may release toxic and/or hazardous gases.

POLYMERIZATION:
Hazardous polymerization has not been reported to occur under normal temperatures and pressures.

SECTION 11 - TOXICOLOGICAL INFORMATION

CHLORPYRIFOS:

TOXICITY DATA: >200 mg/m3/4 hours inhalation-rat LC50; 2000 mg/kg skin-rabbit LD50; 202 mg/kg skin-rat LD50; 300 mg/kg oral-man TDLo; 82 mg/kg oral-rat LD50; 60 mg/kg oral-mouse LD50; 1000 mg/kg oral-rabbit LD50; 504 mg/kg oral-guinea pig LD50; 100 mg/kg subcutaneous-guinea pig LDLo; 192 mg/kg intraperitoneal-mouse LD50; 150 mg/kg unreported-rat LD50; 163 mg/kg unreported-mammal LD50; mutagenic data (RTECS); reproductive effects data (RTECS).

CARCINOGEN STATUS: None.
LOCAL EFFECTS: Irritant- skin, eye.
ACUTE TOXICITY LEVEL: Toxic by ingestion; moderately toxic by dermal absorption.
TARGET EFFECTS: Cholinesterase inhibitor.
AT INCREASED RISK FROM EXPOSURE: Persons with respiratory ailments, recent exposure to cholinesterase inhibitors or impaired cholinesterase production, or liver malfunction.*
ADDITIONAL DATA: May cross the placenta. High environmental temperatures or exposure of the chemical to visible or ultraviolet light may enhance the toxicity. Interactions with medications may occur.*
* May be based on general information on organophosphates.
HEALTH EFFECTS
INHALATION:
CHLORPYRIFOS:
See information on organophosphates.
ORGANOPHOSPHATES:

CHOLINESTERASE INHIBITOR.
ACUTE EXPOSURE- When inhaled, the first effects of cholinesterase inhibitors are usually respiratory and may include nasal hyperemia

and watery discharge, cough, chest discomfort, dyspnea, and wheezing due to increased bronchial secretions and bronchoconstriction. If sufficient amounts are absorbed, other systemic effects may begin within a few minutes or be delayed for up to 12 hours. Symptoms may include pallor, nausea, vomiting, diarrhea, abdominal cramps, headache, dizziness, ocular pain, blurred vision, miosis or in some cases, especially initially, mydriasis, lacrimation, salivation, sweating, and confusion. Other reported central nervous system or neuromuscular effects may include ataxia, slurred speech, areflexia, weakness, fatigue, fasciculations, twitching, tremors possibly of the tongue and eyelids, and eventually paralysis of the extremities and possibly of the respiratory muscles.
In severe cases there may also be involuntary defecation and urination, cyanosis, psychosis, hyperglycemia, acute pancreatitis, cardiac irregularities, pulmonary edema, unconsciousness, convulsions, and coma. Death is primarily due to respiratory failure, although cardiovascular effects including cardiac arrest may also be implicated. Long term sequelae are rare but may include neuropsychiatric disorders and myopathy with muscle tenderness.
CHRONIC EXPOSURE- Repeated or prolonged exposure may result in the effects of acute exposure. Other effects reported in workers repeatedly exposed include impaired memory and concentration, acute psychosis, severe depressions, irritabilty, confusion, apathy, emotional lability, social withdrawal, confusion, headache, speech difficulties, delayed reaction times, spatial disorientation, nightmares, sleepwalking, and drowsiness or insomnia. An influenza-like condition with headache, nausea, weakness, anorexia and malaise has also been reported.
SKIN CONTACT:
CHLORPYRIFOS:
IRRITANT.
May cause irritation. Four doses of 25 mg/kg applied to the skin of humans or 12 hours each produced depressed plasma cholinesterase levels. See nformation on orhanophosphates.

ORGANOPHOSPHATES:
CHOLINESTERASE INHIBITOR.
ACUTE EXPOSURE- Localized sweating and fasciculations may occur at the site of contact. If sufficient amounts are absorbed, other effects of cholinesterase inhibition as described in acute inhalation may occur. Symptoms may be delayed 2-3 hours, but usually no more than 12 hours.

The rate of absorption is increased by the presence of dermatitis or high ambient temperatures.
CHRONIC EXPOSURE- Repeated or prolonged exposure may cause effects as described in acute exposure. Some organophosphates may cause sensitization.

EYE CONTACT:
CHLORPYRIFOS:
IRRITANT.
May cause irritation. See information on organophosphates.
ORGANOPHOSPHATES:

CHOLINESTERASE INHIBITOR.
ACUTE EXPOSURE- Direct contact may cause pain, hyperemia, lacrimation, twitching of the eyelids, miosis, and ciliary muscle spasm with loss of accomodation, blurred or dimmed vision and browache. Sometimes mydriasis may occur instead of miosis. With sufficient exposure, other symptoms of cholinesterase inhibition as described in acute inhalation may occur.
CHRONIC EXPOSURE- Repeated or prolonged exposure may cause effects as described in acute exposure. Some compounds have caused toxic effects on the crystalline lens, conjunctival thickening and obstruction of the nasolacrimal canals when used as miotic eyedrops.

INGESTION:
CHLORPYRIFOS:

TOXIC.
A dose of 0.1 mg/kg ingested daily for four weeks produced significant cholinesterase inhibition in several human volunteers. In a delayed neurotoxicity study in hens, the results were negative. Fetotoxicity and fetal developmental abnormalities were observed in a chronic ingestion study of pregnant mice, but the same dose produced severe maternal toxicity. See information on organophosphates.
ORGANOPHOSPHATES:
CHOLINESTERASE INHIBITOR.
ACUTE EXPOSURE- When ingested, the first effects may be nausea, vomiting, anorexia, abdominal cramps and diarrhea. Gastrointestinal absorption may cause the symptoms of cholinesterase inhibition as described in acute inhalation. Symptoms may begin within minutes or be delayed.

CHRONIC EXPOSURE- Repeated ingestion may cause effects as described in Acute exposure.

SECTION 12 - ECOLOGICAL INFORMATION

ENVIRONMENTAL IMPACT RATING (0-4): no data available
ACUTE AQUATIC TOXICITY: no data available
DEGRADABILITY: no data available
LOG BIOCONCENTRATION FACTOR (BCF): no data available
LOG OCTANOL/WATER PARTITION COEFFICIENT: no data available

SECTION 13 - DISPOSAL CONSIDERATIONS

Observe all federal, state and local regulations when disposing of this substance.
Disposal must be in accordance with 40 CFR 165 Recommended Procedures for the disposal and storage of pesticides and pesticide containers.

SECTION 14 - TRANSPORT INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION SHIPPING NAME-ID NUMBER, 49 CFR 172.101:
Organophophorus pesticides, solid, toxic, n.o.s.-UN 2783
U.S. DEPARTMENT OF TRANSPORTATION HAZARD CLASS OR DIVISION, 49 CFR 172.101:
6.1 - Poisonous materials
U.S. DEPARTMENT OF TRANSPORTATION PACKING GROUP, 49 CFR 172.101:
PG II
U.S. DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS, 49 CFR 172.101
AND SUBPART E:
Poison
U.S. DEPARTMENT OF TRANSPORTATION PACKAGING AUTHORIZATIONS:
EXCEPTIONS: None
NON-BULK PACKAGING: 49 CFR 173.212
BULK PACKAGING: 49 CFR 173.242
U.S. DEPARTMENT OF TRANSPORTATION QUANTITY LIMITATIONS 49 CFR 172.101:
PASSENGER AIRCRAFT OR RAILCAR: 25 kg
CARGO AIRCRAFT ONLY: 100 kg

SECTION 15 - REGULATORY INFORMATION

TSCA STATUS: N

CERCLA SECTION 103 (40CFR302.4): Y 1 POUND RQ

SARA SECTION 302 (40CFR355.30): N

SARA SECTION 304 (40CFR355.40): N

SARA SECTION 313 (40CFR372.65): N

OSHA PROCESS SAFETY (29CFR1910.119): N

CALIFORNIA PROPOSITION 65: N

SARA HAZARD CATEGORIES, SARA SECTIONS 311/312 (40 CFR 370.21)

ACUTE HAZARD: Y

CHRONIC HAZARD: Y

FIRE HAZARD: N

REACTIVITY HAZARD: Y

SUDDEN RELEASE HAZARD: N

SECTION 16 - OTHER INFORMATION

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