SAFETY DATA SHEET

Updated on 27/08/2024

1. Material Identification

Product Name : Phosphoric acid, 2-dichloroethenyl dimethyl ester
Catalog Number : io-2860
CAS Number : 62-73-7
Identified uses : Laboratory chemicals, manufacture of chemical compounds
Company : Ionz

>> R&D Use only

2. Hazards Identification

GHS Classification:

Flammable liquid (category 2)
Acute toxicity, oral (Category 3)
Acute toxicity, dermal (Category 3)
Acute toxicity, inhalation (Category 3)
Specific target organ toxicity, single exposure (Category 1)

Pictogram(s)

GHS Hazard Statements

>> H300 (52.25%): Fatal if swallowed [Danger Acute toxicity, oral]

>> H301 (47.75%): Toxic if swallowed [Danger Acute toxicity, oral]

>> H311 (92.79%): Toxic in contact with skin [Danger Acute toxicity, dermal]

>> H317 (100%): May cause an allergic skin reaction [Warning Sensitization, Skin]

>> H330 (53.15%): Fatal if inhaled [Danger Acute toxicity, inhalation]

>> H331 (46.85%): Toxic if inhaled [Danger Acute toxicity, inhalation]

>> H400 (100%): Very toxic to aquatic life [Warning Hazardous to the aquatic environment, acute hazard]

Precautionary Statement Codes

>> P260, P261, P262, P264, P270, P271, P272, P273, P280, P284, P301+P316, P302+P352, P304+P340, P316, P320, P321, P330, P333+P317, P361+P364, P362+P364, P391, P403+P233, P405, and P501

NFPA 704 Diamond

NFPA Health Rating

>> 3 - Materials that, under emergency conditions, can cause serious or permanent injury.

NFPA Fire Rating

>> 1 - Materials that must be preheated before ignition can occur. Materials require considerable preheating, under all ambient temperature conditions, before ignition and combustion can occur.

NFPA Instability Rating

>> 0 - Materials that in themselves are normally stable, even under fire conditions.

Health Hazards:

>> Dichlorvos is a very toxic compound with a probable lethal oral dose in humans between 50 and 500 mg/kg, or between 1 teaspoonful and 1 oz. for a 70 kg (150 lb.) person. However, brief exposure (30-60 minutes) to vapor concentrations as high as 6.9 mg/liter did not result in clinical signs or depressed serum cholinesterase levels. Toxic changes are typical of organophosphate insecticide poisoning with progression to respiratory distress, respiratory paralysis, and death if there is no clinical intervention. (EPA, 1998)

>> Toxic chloride fumes and phosgene formed if heated to decomposition or on contact with acid or acid fumes. Corrosive to iron and mild steel, acids or acid fumes. Hydrolyzes in water. (EPA, 1998)

>> Combustible. Gives off irritating or toxic fumes (or gases) in a fire. Liquid formulations containing organic solvents may be flammable. Risk of fire and explosion if formulations contain flammable/explosive solvents.

3. Composition/Information On Ingredients

Chemical name : Phosphoric acid, 2-dichloroethenyl dimethyl ester
CAS Number : 62-73-7
Molecular Formula : C4H7Cl2O4P
Molecular Weight : 220.9700 g/mol

4. First Aid Measures

First Aid:

>> Warning: Effects may be delayed up to 12 hours. Caution is advised.

>> Note: Dichlorvos is a cholinesterase inhibitor.

>> Signs and Symptoms of Acute Dichlorvos Exposure: Acute exposure to dichlorvos may produce the following signs and symptoms: sweating, pinpoint pupils, blurred vision, headache, dizziness, profound weakness, muscle spasms, seizures, and coma. Mental confusion and psychosis may occur. Excessive salivation, nausea, vomiting, anorexia, diarrhea, and abdominal pain may also occur. The heart rate may decrease following oral exposure or increase following dermal exposure. Chest pain may be noted. Hypotension (low blood pressure) may be observed, although hypertension (high blood pressure) is not uncommon. Respiratory symptoms include dyspnea (shortness of breath), pulmonary edema, respiratory depression, and respiratory paralysis.

>> Emergency Life-Support Procedures: Acute exposure to dichlorvos may require decontamination and life support for the victims. Emergency personnel should wear protective clothing appropriate to the type and degree of contamination. Air-purifying or supplied-air respiratory equipment should also be worn, as necessary. Rescue vehicles should carry supplies such as plastic sheeting and disposable plastic bags to assist in preventing spread of contamination.

>> Inhalation Exposure:

>> 1. Move victims to fresh air. Emergency personnel should avoid self-exposure to dichlorvos.

>> 2. Evaluate vital signs including pulse and respiratory rate, and note any trauma. If no pulse is detected, provide CPR. If not breathing, provide artificial respiration. If breathing is labored, administer 100% humidified oxygen or other respiratory support.

>> 3. Obtain authorization and/or further instructions from the local hospital for administration of an antidote or performance of other invasive procedures.

>> 4. Transport to a health care facility.

>> Dermal/Eye Exposure:

>> 1. Remove victims from exposure. Emergency personnel should avoid self-exposure to dichlorvos.

>> 3. Remove contaminated clothing as soon as possible.

>> 4. If eye exposure has occurred, eyes must be flushed with lukewarm water for at least 15 minutes.

>> 5. Wash exposed skin areas three times with soap and water.

>> 6. Obtain authorization and/or further instructions from the local hospital for administration of an antidote or performance of other invasive procedures.

>> 7. Transport to a health care facility.

>> Ingestion Exposure:

>> 1. Evaluate vital signs including pulse and respiratory rate, and note any trauma. If no pulse is detected, provide CPR. If not breathing, provide artificial respiration. If breathing is labored, administer 100% humidified oxygen or other respiratory support.

>> 2. Obtain authorization and/or further instructions from the local hospital for administration of an antidote or performance of other invasive procedures.

>> 3. Vomiting may be induced with syrup of Ipecac. If elapsed time since ingestion of dichlorvos is unknown or suspected to be greater than 30 minutes, do not induce vomiting and proceed to Step

>> 4. Ipecac should not be administered to children under 6 months of age.Warning: Ingestion of dichlorvos may result in sudden onset of seizures or loss of consciousness. Syrup of Ipecac should be administered only if victims are alert, have an active gag-reflex, and show no signs of impending seizure or coma. If ANY uncertainty exists, proceed to Step

>> 4.The following dosages of Ipecac are recommended: children up to 1 year old, 10 mL (1/3 oz); children 1 to 12 years old, 15 mL (1/2 oz); adults, 30 mL (1 oz). Ambulate (walk) the victims and give large quantities of water. If vomiting has not occurred after 15 minutes, Ipecac may be readministered. Continue to ambulate and give water to the victims. If vomiting has not occurred within 15 minutes after second administration of Ipecac, administer activated charcoal.

>> 4. Activated charcoal may be administered if victims are conscious and alert. Use 15 to 30 g (1/2 to 1 oz) for children, 50 to 100 g (1-3/4 to 3-1/2 oz) for adults, with 125 to 250 mL (1/2 to 1 cup) of water.

>> 5. Promote excretion by administering a saline cathartic or sorbitol to conscious and alert victims. Children require 15 to 30 g (1/2 to 1 oz) of cathartic; 50 to 100 g (1-3/4 to 3- 1/2 oz) is recommended for adults.

>> 6. Transport to a health care facility. (EPA, 1998)

First Aid Measures

Inhalation First Aid

>> Fresh air, rest. Refer immediately for medical attention.

Skin First Aid

>> Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer immediately for medical attention.

Eye First Aid

>> Rinse with plenty of water (remove contact lenses if easily possible). Refer for medical attention.

Ingestion First Aid

>> Rinse mouth. Do NOT induce vomiting. Refer immediately for medical attention.

5. Fire Fighting Measures

>> Vapors are heavier than air and will collect in low areas. Vapors in confined areas may explode when exposed to fire. Containers may explode in fire. Storage containers and parts of containers may rocket great distances, in many directions.

>> Use self-contained breathing apparatus with a full face piece operated on pressure-demand or other positive pressure mode. Prevent skin contact with protective clothing. Isolate area and deny entry. Fight fire from maximum distance. Dike fire control water for future disposal.

>> Use water in flooding quantities as fog, alcohol foam, dry chemical, or carbon dioxide. Do not scatter the material. (EPA, 1998)

>> Use water spray, foam, powder, carbon dioxide. In case of fire: keep drums, etc., cool by spraying with water.

6. Accidental Release Measures

Isolation and Evacuation:

Isolation and evacuation measures to take when a large amount of this chemical is accidentally released in an emergency.

>> Excerpt from ERG Guide 152 [Substances - Toxic (Combustible)]:

>> IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

>> SPILL: Increase the immediate precautionary measure distance, in the downwind direction, as necessary.

>> FIRE: If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

Spillage Disposal:

Methods for containment and safety measures to protect workers dealing with a spillage of this chemical.

>> Evacuate danger area! Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Do NOT wash away into sewer. Ventilation. Collect leaking liquid in sealable containers. Absorb liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

7. Handling And Storage

Safe Storage:

>> Store only in original container. Well closed. Keep in a well-ventilated room. Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs. Store in an area without drain or sewer access.

Storage Conditions:

>> Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Recommended storage temperature -20 °C.

8. Exposure Control/ Personal Protection

REL-TWA (Time Weighted Average)

>> 1 mg/m³

>> TWA 1 mg/m3 [skin]

>> 1.0 [mg/m3]

PEL-TWA (8-Hour Time Weighted Average)

>> 1 mg/m³

>> 0.1 [mg/m3], inhalable fraction and vapor

>> 0.1 mg/m

TLV-TWA (Time Weighted Average)

>> 0.1 mg/m³ (inhalable fraction and vapor) [1998]

MAK (Maximale Arbeitsplatz Konzentration)

>> 1 mg/m

Inhalation Risk:

>> A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20 °C , on spraying or dispersing much faster.

Effects of Short Term Exposure:

>> The substance is irritating to the skin. The substance may cause effects on the nervous system by a cholinesterase inhibiting effect. Exposure above the OEL could cause death. The effects may be delayed. Medical observation is indicated.

Effects of Long Term Exposure:

>> Repeated or prolonged contact with skin may cause dermatitis. Repeated or prolonged contact may cause skin sensitization. Cholinesterase inhibition. Cumulative effects are possible. See Acute Hazards/Symptoms. This substance is possibly carcinogenic to humans.

Fire Prevention

>> NO open flames.

Exposure Prevention

>> STRICT HYGIENE! AVOID EXPOSURE OF ADOLESCENTS AND CHILDREN! IN ALL CASES CONSULT A DOCTOR! FIRST AID: USE PERSONAL PROTECTION.

Inhalation Prevention

>> Use ventilation, local exhaust or breathing protection.

Skin Prevention

>> Protective gloves. Protective clothing.

Eye Prevention

>> Wear face shield or eye protection in combination with breathing protection.

Ingestion Prevention

>> Do not eat, drink, or smoke during work. Wash hands before eating.

Exposure Control and Personal Protection

Exposure Summary

>> Biological Exposure Indices (BEI) [ACGIH] - Acetylcholinesterase activity in red blood cells = 70% of individual's baseline; Butylcholinesterase activity in serum or plasma = 60% of individual's baseline; Sample at end of shift; [TLVs and BEIs]

Maximum Allowable Concentration (MAK)

>> 1.0 [mg/m3]

9. Physical And Chemical Properties

Molecular Weight:

>> 220.97

Exact Mass:

>> 219.9459011

Physical Description:

>> Dichlorvos appears as a colorless to amber liquid with an aromatic odor. When heated to high temperatures may emit toxic chloride fumes and phosgene gas. Toxic by inhalation, skin absorption or ingestion. Used as a pesticide. May be found in the form of a dry mixture where the liquid is absorbed onto a dry carrier.

>> COLOURLESS-TO-AMBER LIQUID WITH CHARACTERISTIC ODOUR.

Color/Form:

>> Colorless liquid

Odor:

>> Aromatic odor

Boiling Point:

>> 284 °F at 20 mmHg (EPA, 1998)

>> at 101.3kPa: 234 °C

Melting Point:

>> 183 °F (NTP, 1992)

Flash Point:

>> Greater than 175F (EPA, 1998)

>> 170 °C

Solubility:

>> 10 to 50 mg/mL at 68 °F (NTP, 1992)

>> Solubility in water, g/l at 20 °C: 10 (poor)

Density:

>> 1.415 at 77 °F (EPA, 1998) - Denser than water; will sink

>> Relative density (water = 1): 1.4

Vapor Density:

>> Relative vapor density (air = 1): 7.6

Vapor Pressure:

>> 0.01 mmHg at 86 °F (EPA, 1998)

>> Vapor pressure, Pa at 20 °C: 1.6

LogP:

>> log Kow = 1.43

>> 1.47

Stability/Shelf Life:

>> Stable under recommended storage conditions.

Decomposition:

>> Hazardous decomposition products formed under fire conditions - Carbon oxides, oxides of phosphorus, hydrogen chloride gas.

Corrosivity:

The ability of a chemical to damage or destroy other substances when it comes into contact.

>> Corrosive to iron & mild steel

Refractive Index:

>> Index of refraction = 1.451 at 25 °C/D

Collision Cross Section:

Collision cross section (CCS) represents the effective area for the interaction between an individual ion and the neutral gas through which it is traveling (e.g., in ion mobility spectrometry (IMS) experiments). It quantifies the probability of a collision taking place between two or more particles.

>> 133.97 Å² [M+H]+ [CCS Type: TW; Method: calibrated with polyalanine and drug standards]

10. Stability And Reactivity

>> More dense than water and slightly soluble in water.

11. Toxicological Information

Toxicity Summary:

>> IDENTIFICATION AND USE: Dichlorvos is a colorless to amber liquid. It is a contact and stomach insecticide with fumigant and penetrant action, which is used as household and public health fumigant. Dichlorvos as a "No Pest Strip" is used as an ectoparasiticide for small mammals. It is also used as a premise spray to keep fly populations controlled. HUMAN STUDIES: Potential symptoms of overexposure are miosis, aching eyes, rhinorrhea, headache, chest tightening, wheezing, laryngeal spasms and salivation, cyanosis, anorexia, nausea, vomiting and diarrhea, sweating, muscle fasciculation, paralysis, giddiness and ataxia, convulsions, low blood pressure, cardiac irregularities, and irritation of eyes and skin. Red blood cell (RBC) acetylcholinesterase activity was reduced in some residents exposed to an estimated level of 0.2 mg/cu m dichlorvos for about 15.8 hr, and some residents complained of headache. Suicide attempts with

dichlorvos have been described. Several cases of delayed extrapyramidal disorder described after acute dichlorvos poisonings. Dichlorvos did not cause sister chromatid exchange in vitro in human cells. ANIMAL STUDIES: In a guinea pig maximization test, induction with dichlorvos by intradermal injection and topical application and subsequent challenge with topical dichlorvos solutions showed sensitization. When rats were given single oral doses of 0.5, 35, or 70 mg/kg dichlorvos by gavage, the 35- and 70-mg/kg groups exhibited cholinergic signs within 15 min after dosing. Several animals in the 70-mg/kg group died. A saturated atmosphere of dichlorvos (230-341 mg/cu m) caused deaths in rats after 7 to 62 hr. RBC cholinesterase was inhibited in monkeys exposed to 12.9 mg/cu m. Cholinergic signs occurred within 7-15 min in dogs given a single oral dose of 11 or 22 mg/kg dichlorvos. Three of 12 dogs given 22 mg/kg died within 10-155 min of treatment. Three cynomolgus monkeys were given daily dermal doses of dichlorvos in xylene on a shaved area between the shoulder blades. A monkey receiving 100 mg/kg/day died after 4 days. A monkey given 50 mg/kg/day died after 8 doses over 10 days and a monkey given 75 mg/kg/day died after 10 doses over 12 days. Clinical signs in their order of appearance were nervousness, gritting of teeth, incoordination, muscle fasciculations, excessive salivation, labored breathing, miosis, and flaccidity. 90-day studies of dichlorvos in rats have shown that dietary levels up to 70 mg/kg/day do not result in overt cholinergic toxicity, although exposures inhibit RBC cholinesterase. Rabbits are more sensitive than rats or mice to dichlorvos vapor. Carcinogenicity was not reported in male or female mice given 58 or 95 mg/kg/day or 56 or 102 mg/kg/day, respectively, in their drinking water for 2 yr. No adverse effect occurred on fetuses when pregnant rabbits were administered doses of 0.1 to 7.0 mg/kg/day dichlorvos by gavage on gestation days 7 through 19 or when rabbits were exposed for 23 hr/day to 0.25 to 6.25 mg/ cu m dichlorvos vapor on gestation days 1 through 28. When dichlorvos (15 mg/kg/day) was administered to guinea pigs between day 42 and 46 of gestation, offspring exhibited severe reductions in brain weight. In a 3-generation reproduction study in weanling rats no effects on fertility, number and size of litters, body weight, or viability of the pups were found. Dichlorvos was a mutagen in the screening test for mutagenicity using a REC-assay procedure, with H17 REC(+) and M45 REC(-) strains of Bacillus subtilis and reversion assays on auxotrophic strains of Escherichia coli (WP2) and Salmonella typhimurium (Ames series). Dichlorvos increased the frequency of chromosomal damage and micronucleus formation in Chinese hamster ovary cells; induced sister chromatid exchange, chromosomal aberrations, and transformation in cultured rat tracheal epithelial cells; induced DNA single-strand breaks in isolated rat hepatocytes; and caused increases in cell transformation of hamster embryo cells. It was negative in the sex-linked lethal mutation test in Drosophila. ECOTOXICITY STUDIES: In mallards and pheasants the symptoms of acute oral toxicity included: goose-stepping ataxia, use of wings to aid in balance, tremors, convulsions. Various internal hemorrhages were found at autopsy in sacrificed survivors of both species. Exposure of white-footed mice to pelleted dichlorvos caused 3%, 20%, and 53% mortality in mice exposed to 1, 3, and 6 g dichlorvos per cage. Iberian toothcarp was able to tolerate high concentrations of dichlorvos, and resist high levels of brain and muscle ChE inhibition without mortality. Dichlorvos is not toxic to mussels or periwinkles at 1.0 ppm, for 1 hr exposure, but is toxic to larval lobsters, adult lobsters, zooplankton and phytoplankton. It was also toxic to bees.

Evidence for Carcinogenicity:

Evidence that this chemical does or may cause cancer. The information here is collected from various sources by the Hazardous Substances Data Bank (HSDB).

>> Cancer Classification: Suggestive Evidence of Carcinogenicity, but Not Sufficient to Assess Human Carcinogenic Potential

Carcinogen Classification:

This section provides the International Agency for Research on Cancer (IARC) Carcinogenic Classification and related monograph links. In the IARC Carcinogenic classification, chemicals are categorized into four groups: Group 1 (carcinogenic to humans), Group 2A (probably carcinogenic to humans), Group 2B (possibly carcinogenic to humans), and Group 3 (not classifiable as to its carcinogenicity to humans).

IARC Carcinogenic Agent

>> Dichlorvos

IARC Carcinogenic Classes

>> Group 2B: Possibly carcinogenic to humans

IARC Monographs

>> Volume Sup 7: Overall Evaluations of Carcinogenicity: An Updating of IARC Monographs Volumes 1 to 42, 1987; 440 pages; ISBN 92-832-1411-0 (out of print)

>> Volume 53: (1991) Occupational Exposures in Insecticide Application, and Some Pesticides

>> 2B, possibly carcinogenic to humans. (L135)

Health Effects:

>> Acute exposure to cholinesterase inhibitors can cause a cholinergic crisis characterized by severe nausea/vomiting, salivation, sweating, bradycardia, hypotension, collapse, and convulsions. Increasing muscle weakness is a possibility and may result in death if respiratory muscles are involved. Accumulation of ACh at motor nerves causes

overstimulation of nicotinic expression at the neuromuscular junction. When this occurs symptoms such as muscle weakness, fatigue, muscle cramps, fasciculation, and paralysis can be seen. When there is an accumulation of ACh at autonomic ganglia this causes overstimulation of nicotinic expression in the sympathetic system. Symptoms associated with this are hypertension, and hypoglycemia. Overstimulation of nicotinic acetylcholine receptors in the central nervous system, due to accumulation of ACh, results in anxiety, headache, convulsions, ataxia, depression of respiration and circulation, tremor, general weakness, and potentially coma. When there is expression of muscarinic overstimulation due to excess acetylcholine at muscarinic acetylcholine receptors symptoms of visual disturbances, tightness in chest, wheezing due to bronchoconstriction, increased bronchial secretions, increased salivation, lacrimation, sweating, peristalsis, and urination can occur. Certain reproductive effects in fertility, growth, and development for males and females have been linked specifically to organophosphate pesticide exposure. Most of the research on reproductive effects has been conducted on farmers working with pesticides and insecticdes in rural areas. In females menstrual cycle disturbances, longer pregnancies, spontaneous abortions, stillbirths, and some developmental effects in offspring have been linked to organophosphate pesticide exposure. Prenatal exposure has been linked to impaired fetal growth and development. Neurotoxic effects have also been linked to poisoning with OP pesticides causing four neurotoxic effects in humans: cholinergic syndrome, intermediate syndrome, organophosphate-induced delayed polyneuropathy (OPIDP), and chronic organophosphate-induced neuropsychiatric disorder (COPIND). These syndromes result after acute and chronic exposure to OP pesticides.

Exposure Routes:

>> The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

>> inhalation, skin absorption, ingestion, skin and/or eye contact

Inhalation Exposure

>> Pupillary constriction, muscle cramp, excessive salivation. Muscle twitching. Convulsions. Dizziness. Sweating. Wheezing. Laboured breathing. Unconsciousness.

Skin Exposure

>> MAY BE ABSORBED! Redness. Further see Inhalation.

Eye Exposure

>> Redness. Pain. Pupillary constriction. Blurred vision.

Ingestion Exposure

>> Excessive salivation. Nausea. Vomiting. Abdominal cramps. Diarrhoea. Further see Inhalation.

>> irritation eyes, skin; miosis, ache eyes; rhinorrhea (discharge of thin nasal mucus); headache; chest tightness, wheezing, laryngeal spasm, salivation; cyanosis; anorexia, nausea, vomiting, diarrhea; sweating; muscle fasciculation, paralysis, dizziness, ataxia; convulsions; low blood pressure, cardiac irreg

Target Organs:

Organs that are affected by exposure to this chemical. Information in this section reflects human data unless otherwise noted.

>> Cancer, Gastrointestinal (Stomach and Intestines, part of the digestive system), Neurological (Nervous System)

>> Nervous

Cancer Sites:

The site in which cancer develops due to exposure to this compound. Cancers are casually referred to based on their primary sites (e.g., skin, lung, breasts, prostate, colon and rectum).

>> Endocrine

>> Gastrointestinal

>> Hematologic

Adverse Effects:

An adverse effect is an undesired harmful effect resulting from a medical treatment or other intervention.

>> Neurotoxin - Predominantly motor

>> Other Poison - Organophosphate

>> Skin Sensitizer - An agent that can induce an allergic reaction in the skin.

>> IARC Carcinogen - Class 3: Chemicals are not classifiable by the International Agency for Research on Cancer.

>> ACGIH Carcinogen - Not Classifiable.

Toxicity Data:

>> LD50: 56 mg/kg (Oral, Rat) (L1170) LC50: 198 mg/m3 (Inhalation, Rat) (L1170) LD50: 205 mg/kg (Dermal, Rabbit) (L1170)

Treatment:

Treatment when exposed to toxin

>> If the compound has been ingested, rapid gastric lavage should be performed using 5% sodium bicarbonate. For skin contact, the skin should be washed with soap and water. If the compound has entered the eyes, they should be washed with large quantities of isotonic saline or water. In serious cases, atropine and/or pralidoxime should be administered. Anti-cholinergic drugs work to counteract the effects of excess acetylcholine and reactivate AChE. Atropine can be used as an antidote in conjunction with pralidoxime or other pyridinium oximes (such as trimedoxime or obidoxime), though the use of '-oximes' has been found to be of no benefit, or possibly harmful, in at least two meta-analyses. Atropine is a muscarinic antagonist, and thus blocks the action of acetylcholine peripherally.

Interactions:

>> /The study objective was/ to evaluate the reproduction toxicity of the mixture composed of dichlorvos, dimethoate and malathion synergistic effect on male mice, and further explore its possible mechanisms. The 105 male mice were divided into 7 groups, including control (0 mg/kg), mix low (10.8 mg/kg), mix medium (21.5 mg/kg), mix high dose (43.0 mg/kg), dichlorvos (5.1 mg/kg), dimethoate (12.6 mg/kg) and malathion (25.3 mg/kg) group. The oral gavage for successive 35 days, and the mice were sacrificed on the 36(th) day. The body weight, and the quantity, activity and morphology of sperms were examined. The levels of sexual hormone were measured, including testosterone (T), follicle stimulating hormone (FSH), luteinizing hormone (LH) and estradiol (E(2)). Pathological changes of testicle and epididymis were observed by morphology, pathology and electron microscope. After 14 days exposure, the body weights of the mice were lower in the mix-high dose group ((22.40 +/- 3.07) g) than those in control group ((26.73 +/- 2.82) g) ($P < 0.05$). After 28 days exposure, the body weights of the mice were also lower in the mix-medium dose group ((30.00 +/- 4.93) g) than those in control group ((33.13 +/- 3.29) g) ($P < 0.05$). The sperm counts and sperm motility decreased significantly as the toxic concentration arised. Comparing to control group ((373.33 +/- 14.65)x10(6)/g weight of epididymis and (75.17 +/- 7.68)%), the spermatozoa count and sperm motility had decreased in mix-medium and mix-high dose groups ((321.17 +/- 18.19)x10(6)/g weight of epididymis, (225.00 +/- 19.67)x10(6)/g weight of epididymis, and (64.67 +/- 9.91)%, (57.83 +/- 9.66)%), and the sperm abnormality rates were higher in mix-medium and mix-high groups ((43.33 +/- 8.66) per mil and (55.00 +/- 13.80) per mil) comparing to those in control group ((32.67 +/- 8.17) per mil). Compared to those in control group (FSH (1.41 +/- 0.20), E(2)(17.32 +/- 2.72), LH (8.75 +/- 1.32) and T (3.45 +/- 0.80) nmol/L), the serum level of FSH (3.14 +/- 0.62) and (3.85 +/- 0.37) nmol/L, E(2) (36.81 +/- 6.68) and (43.76 +/- 9.82) nmol/L in mix-medium and mix-high dose group increased ($P < 0.01$), while the level of LH (5.21 +/- 1.23) and (4.27 +/- 1.09) nmol/L and T (1.37 +/- 0.38) and (0.73 +/- 0.18) nmol/L decreased ($P < 0.01$). The morphological and ultramicrostructure results of testicle and epididymis indicated that the mature sperm numbers were decreased, and the cacoplastic sperm head and the tail of spermatozoon were observed in mix-high dose groups. The dichlorvos, dimethoate and malathion mixture had synergistic reproductive toxicity to the testicle and epididymis structure and function, and thus leading to the process of generation cell cytopoiesis abnormalities, simultaneously the hypothalamus-pituitary-gonad axis were also affected and thus resulted in parasecretion.

Antidote and Emergency Treatment:

>> Immediate first aid: Ensure that adequate decontamination has been carried out. If patient 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 the left side (head-down position, if possible) to maintain an open airway and prevent aspiration. Keep patient quiet and maintain normal body temperature. Obtain medical attention. /Organophosphates and related compounds/

Human Toxicity Excerpts:

>> /HUMAN EXPOSURE STUDIES/ ... Single doses of dichlorvos (PVC-resin formulations) were administered orally 2 hours before breakfast to 705 adults found to be harboring infections of Trichuris, hookworm, or Ascaris. Six or 12 mg dichlorvos/kg body weight resulted in infection cure rates of approximately 70-100%. ... Minimum to modest plasma /cholinesterase/ (ChE) depression and zero to minimum erythrocyte ChE depression occurred at both dose levels. No clinical symptoms or alterations in hematology or in liver and kidney function were observed.

Non-Human Toxicity Excerpts:

>> /LABORATORY ANIMALS: Acute Exposure/ Dichlorvos is an important insecticide used largely. Some studies have demonstrated that organophosphate pesticide has effects on erythrocyte membrane structures, which is critical to erythrocyte function and hemorheology. The aim of the present study was to explore the effect of oxidative stress on hemorheological changes during dichlorvos poisoning in rabbits. Data indicated that after dichlorvos exposure the hematocrit adjusted viscosity at high shear rate increased and erythrocyte membrane fluidity decreased. Data obtained from plasma showed that lipid peroxidative substance-malonaldehyde was elevated and superoxide dismutase was reduced. In summary, oxidative stress does occur in dichlorvos poisoning and may lead to hemorheological alterations. The changes of hemorheology may be responsible for the pathophysiology of the dichlorvos poisoning.

Non-Human Toxicity Values:

>> LD50 Rat oral 17 mg/kg

National Toxicology Program Studies:

Reports from the National Toxicology Program, an interagency program supported by three government agencies (NIH, FDA, and CDC) within the Department of Health and Human Services. This program plays a critical role in generating, interpreting, and sharing toxicological information about chemicals of public health concerns.

>> Two yr studies of dichlorvos were conducted by admin 0, 4, or 8 mg/kg dichlorvos by gavage 5 days/wk for 103 wk, to groups of 50 F344/N rats of each sex. Groups of 50 male B6C3F1 mice were admin 0, 10, or 20 mg/kg dichlorvos on the same schedule, and groups of 50 B6C3F1 female mice were admin 0, 20, or 40 mg/kg dichlorvos. Body Weight and Survival in the Two Year Studies: Mean body weights of dosed and vehicle control rats and mice were similar. No significant differences in survival were observed between any groups of rats or mice of either sex (Rats male: vehicle control, 31/50; low dose, 25/50; high dose, 24/50; Rats female: 31/50; 26/50; 26/50; Mice male: 35/50; 27/50; 29/50; Mice female: 26/50; 29/50; 34/50). Neoplastic Effects in the Two Year Studies: Adenomas of the exocrine pancreas occurred at greater incidence in dosed rats than in vehicle controls (male: vehicle control, 25/50; low dose, 30/49; high dose 33/50; female: 2/50; 3/47; 6/50). Mononuclear cell leukemia in both dosed groups of male rats occurred more frequently than in vehicle controls (11/50; 20/50; 21/50). Mammary gland fibroadenomas and fibroadenomas or adenomas (combined) in dosed female rats occurred at increased incidence relative to the vehicle controls (9/50; 19/50; 17/50). Multiple fibroadenomas occurred in dosed female rats but not in vehicle controls (0/50; 6/50; 3/50); carcinomas occurred in two vehicle control and two low dose female rats. In mice, incidence of squamous cell papillomas of the forestomach was increased in the high dose groups compared with those in the vehicle controls (1/50; 1/50; 5/50; female: 5/49; 6/49; 18/50). Two high dose female mice developed forestomach carcinomas. Conclusions: Under the conditions of these 2 yr gavage studies, there was some evidence of the carcinogenic activity of dichlorvos for male F344/N rats as shown by increased incidence of adenomas in the exocrine pancreas and mononuclear cell leukemia. There was equivocal evidence of carcinogenic activity of dichlorvos in female F344/N rats as shown by increased incidence of adenomas of the exocrine pancreas and mammary gland fibroadenomas. There was some evidence of the carcinogenic activity of dichlorvos for male B6C3F1 mice as shown by increased incidence of forestomach squamous cell papillomas. There was clear evidence of carcinogenic activity of dichlorvos for female B6C3F1 mice as shown by increased incidence of forestomach squamous cell papillomas.

Populations at Special Risk:

>> ... Persons with a history of reduced pulmonary function, convulsive disorders, or recent exposure to anticholinesterase agents would be expected to be at increased risk from exposure.

12. Ecological Information

Resident Soil (mg/kg)

>> 1.90e+00

Industrial Soil (mg/kg)

>> 7.90e+00

Resident Air (ug/m3)

>> 3.40e-02

Industrial Air (ug/m3)

>> 1.50e-01

Tapwater (ug/L)

>> 2.60e-01

MCL (ug/L)

>> 5.00e+00

Risk-based SSL (mg/kg)

>> 8.1e-05

Oral Slope Factor (mg/kg-day)-1

>> 2.90e-01

Inhalation Unit Risk (ug/m3)-1

>> 8.3e-05

Chronic Oral Reference Dose (mg/kg-day)

>> 5.00e-04

Chronic Inhalation Reference Concentration (mg/m3)

>> 5.00e-04

Volatile

>> Volatile

Mutagen

>> Mutagen

Fraction of Contaminant Absorbed in Gastrointestinal Tract

>> 1

Fraction of Contaminant Absorbed Dermally from Soil

>> 0.1

ICSC Environmental Data:

>> The substance is very toxic to aquatic organisms. This substance does enter the environment under normal use. Great care, however, should be taken to avoid any additional release, for example through inappropriate disposal.

Sediment/Soil Concentrations:

Concentrations of this compound in sediment/soil.

>> SEDIMENT: Sediment samples collected Sep 2000 from the River Wuchuan in southeast China contained dichlorvos at a range and mean concentration of 0.05-0.23 and 0.14 ng/g, respectively(1). Dichlorvos was not detected (detection limit 4 ug/kg) in sediment samples taken from Shin River, Niigata, Japan(2).

Fish/Seafood Concentrations:

Concentrations of this compound in fish or seafood.

>> None of the 92 samples of farmed salmon analyzed as part of a farmed fish surveillance in the U.K. between Oct 1987 and Feb 1989 contained residues of dichlorvos(1). Dichlorvos was not detected (detection limit 0.01 mg/kg) in Australian farmed yellowtail kingfish (Seriola lalandi) or Mulloway (Argyrosomus hololepidotus); fish were collected Sept 2003 to July 2004(2).

Animal Concentrations:

Concentrations of this compound in animals.

>> Dichlorvos, a degradation product of trichlorfon, was found in sheep organs and in the tissue of cattle, 7 days and 15-22 days after application of trichlorfon, respectively.

Average Daily Intake:

The average amount of the compound taken into the body through eating, drinking, or breathing.

>> In FDA's Total Diet Study (1986-1991) in which foods prepared for consumption from different regions of the country are analyzed and mean daily intakes for diet for a variety of age-sex groups determined, the mean daily intake per unit body weight of dichlorvos was <0.0001 ug/kg(1). The average daily air intake of dichlorvos was determined to be 1.25 ug in Jacksonville, FL (assuming a weighted estimate of average daily air concentrations of 62.4 ng/cu m) and 0.066 ug in Springfield/Chicopee, MA (assuming a weighted estimate of average daily air concentrations of 3.3 ng/cu m)(2).

13. Disposal Considerations

Spillage Disposal

>> Evacuate danger area! Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Do NOT wash away into sewer. Ventilation. Collect leaking liquid in sealable containers. Absorb liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

Disposal Methods

>> SRP: Recycle any unused portion of the material for its approved use or return it to the manufacturer or supplier. Ultimate disposal of the chemical must consider: the material's impact on air quality; potential migration in air, soil or water; effects on animal, aquatic and plant life; and conformance with environmental and public health regulations. If it is possible or reasonable use an alternative chemical product with less inherent propensity for occupational harm/injury/toxicity or environmental contamination.

>> SRP: Wastewater from contaminant suppression, cleaning of protective clothing/equipment, or contaminated sites should be contained and evaluated for subject chemical or decomposition product concentrations. Concentrations shall be lower than applicable environmental discharge or disposal criteria. Alternatively, pretreatment and/or discharge to a permitted wastewater treatment facility is acceptable only after review by the governing authority and assurance that "pass through" violations will not occur. Due consideration shall be given to remediation worker exposure (inhalation, dermal and ingestion) as well as fate during treatment, transfer and disposal. If it is not practicable to manage the chemical in this fashion, it must be evaluated in accordance with EPA 40 CFR Part 261, specifically Subpart B, in order to determine the appropriate local, state and federal requirements for disposal.

>> Product: Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber; Contaminated packaging: Dispose of as unused product.

>> Fifty percent hydrolysis is obtained in pure water in 25 min at 70 °C and in 61.5 days at 20 °C. A buffered solution yields 50% hydrolysis (37.5 °C) in 301 min at pH 8, 462 min at pH 7, 620 min at pH 5.4. Hydrolysis yields no toxic residues. Incineration in a furnace equipped with an afterburner and alkaline scrubber is recommended as is alkaline hydrolysis followed by soil burial. In accordance with 40CFR165, follow recommendations for the disposal of pesticides and pesticide containers. Must be disposed properly by following package label directions or by contacting your local or federal environmental control agency or by contacting your regional EPA office.

>> For more Disposal Methods (Complete) data for Dichlorvos (11 total), please visit the HSDB record page.

14. Transport Information

DOT

Phosphoric acid, 2-dichloroethenyl dimethyl ester
6.1
UN Pack Group: II
Reportable Quantity of 10 lb or 4

IATA

Phosphoric acid, 2-dichloroethenyl dimethyl ester
6.1,
UN Pack Group: II

15. Regulatory Information

Clean Water Act Requirements:

The Clean Water Act (CWA) of 1972 establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. Under CWA, the U.S. Environmental Protection Agency (EPA) developed the Toxic Pollutant List (40 CFR Part 401.15) and the Priority Pollutant List (40 CFR Part 423, Appendix A). These lists are to be used by EPA and States to develop the Effluent Guidelines regulations and ensure water quality criteria and standards.

>> Dichlorvos is designated as a hazardous substance under section 311(b)(2)(A) of the Federal Water Pollution Control Act and further regulated by the Clean Water Act Amendments of 1977 and 1978. These regulations apply to discharges of this substance. This designation includes any isomers and hydrates, as well as any solutions and mixtures containing this substance.

Regulatory Information

New Zealand EPA Inventory of Chemical Status

>> Dichlorvos: HSNO Approval: HSR002838 Approved with controls

16. Other Information

Toxic Combustion Products:

Toxic products (e.g., gases and vapors) produced from the combustion of this chemical.

>> Poisonous gases, including hydrogen chloride and phosphoric acid, arfe produced in fire.

Other Safety Information

Chemical Assessment

>> IMAP assessments - Phosphoric acid, 2,2-dichloroethenyl dimethyl ester: Human health tier I assessment

>> IMAP assessments - Phosphoric acid, 2,2-dichloroethenyl dimethyl ester: Environment tier I assessment

"The information provided is believed to be accurate but is not comprehensive and should be used as a reference. It reflects our current knowledge and is intended for safety guidance related to the product. This document does not constitute a warranty of the product's properties. Ionz is not responsible for any damages resulting from handling or contact with the product incorrectly."