ionz

SAFETY DATA SHEET

Updated on 26/09/2024

1. Material Identification

Product Name : Malathion
Catalog Number : io-2579
CAS Number : 121-75-5
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

>> H302 (97.2%): Harmful if swallowed [Warning Acute toxicity, oral]

>> H317 (98.1%): May cause an allergic skin reaction [Warning Sensitization, Skin]

>> H331 (17.3%): Toxic if inhaled [Danger Acute toxicity, inhalation]

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

>> H410 (100%): Very toxic to aquatic life with long lasting effects [Warning Hazardous to the aquatic environment, long-term hazard]

Precautionary Statement Codes

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

Health Hazards:

>> Exposure to fumes from a fire or to liquid causes headache, blurred vision, constricted pupils of the eyes, weakness, nausea, cramps, diarrhea, and tightness in the chest. Muscles twitch and convulsions may follow. The symptoms may develop over a period of 8 hours. (USCG, 1999)

>> Special Hazards of Combustion Products: Vapors and fumes from fires are hazardous. They include sulfur dioxide and phosphoric acid.

>> Behavior in Fire: Gives off hazardous fumes. Area surrounding fire should be diked to prevent water runoff. (USCG, 1999)

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

3. Composition/Information On Ingredients

Chemical name : Malathion
CAS Number : 121-75-5
Molecular Formula : C10H19O6PS2
Molecular Weight : 330.4000 g/mol

4. First Aid Measures

First Aid:

>> EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop.

>> SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. IMMEDIATELY call a hospital or poison control center even if no symptoms (such as redness or irritation) develop. IMMEDIATELY transport the victim to a hospital for treatment after washing the affected areas.

>> INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing.

>> INGESTION: DO NOT INDUCE VOMITING. If the victim is conscious and not convulsing, administer a slurry of activated charcoal in water and simultaneously call a hospital or poison control center. IMMEDIATELY transport the victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. (NTP, 1992)

First Aid Measures

Inhalation First Aid

>> Fresh air, rest. Half-upright position. 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

>> First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.

Ingestion First Aid

>> Rinse mouth. Refer immediately for medical attention.

5. Fire Fighting Measures

>> Containers may explode in fire.

>> Fire Extinguishing Agents: Dry chemical, carbon dioxide, water spray, foam (USCG, 1999)

>> Use foam, powder, carbon dioxide.

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.

>> Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. See Chemical Dangers. Absorb remaining 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 packaging. Separated from strong oxidants and food and feedstuffs. Keep in a well-ventilated room. 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 2 - 8 °C

8. Exposure Control/ Personal Protection

REL-TWA (Time Weighted Average)

>> 10 mg/m³

>> TWA 10 mg/m3 [skin]

>> 15.0 [mg/m3], total dust

PEL-TWA (8-Hour Time Weighted Average)

>> 15 mg/m³ (total dust)

>> 1.0 [mg/m3], inhalable fraction and vapor

>> 1 mg/m

TLV-TWA (Time Weighted Average)

>> 1 mg/m³ (inhalable fraction and vapor) [2000]

MAK (Maximale Arbeitsplatz Konzentration)

>> (inhalable fraction): 15 mg/m

Inhalation Risk:

>> A harmful contamination of the air will not or will only very slowly be reached on evaporation of this substance at 20 °C; on spraying or dispersing, however, much faster.

Effects of Short Term Exposure:

>> The substance may cause effects on the central nervous system. Cholinesterase inhibition. This may result in convulsions and respiratory depression. The effects may be delayed. Medical observation is indicated.

Effects of Long Term Exposure:

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

Acceptable Daily Intakes:

An estimate of the amount of a chemical in food or drinking water that can be consumed daily over a lifetime without presenting an appreciable risk to health. It is usually expressed as milligrams of the substance per kilogram of body weight per day and applies to chemicals such as food additives, pesticide residues and veterinary drugs.

>> An Acceptable Daily Intake (ADI), defined as the amount of a chemical to which humans can be exposed on a daily basis over an extended period of time (usually a lifetime) without suffering a deleterious effect, for malathion is 0.02 mg/kg bw/day for oral exposure.

Fire Prevention

>> NO open flames.

Exposure Prevention

>> AVOID ALL CONTACT! FIRST AID: USE PERSONAL PROTECTION.

Inhalation Prevention

>> Use ventilation, local exhaust or breathing protection.

Skin Prevention

>> Protective gloves. Protective clothing.

Eye Prevention

>> Wear safety goggles 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)

>> 15.0 [mg/m3], inhalable fraction[German Research Foundation (DFG)]

9. Physical And Chemical Properties

Molecular Weight:

>> 330.4

Exact Mass:

>> 330.03606767

Physical Description:

>> Malathion is a yellow to dark-brown liquid with a skunk-like odor. Sinks in water. Freezing point is 37 °F. (USCG, 1999)

>> YELLOW-TO-BROWN LIQUID WITH CHARACTERISTIC ODOUR.

Color/Form:

>> Colorless or slightly yellow

Odor:

>> Skunk-like odor

Boiling Point:

>> 313 to 315 °F at 0.7 mmHg (decomposes) (NTP, 1992)

Melting Point:

>> 37.1 °F (NTP, 1992)

>> 3 °C

Flash Point:

>> greater than 325 °F (NTP, 1992)

>> 163 °C c.c.

Solubility:

>> less than 1 mg/mL at 70.7 °F (NTP, 1992)

>> Solubility in water, mg/l: 143 (very slightly soluble)

Density:

>> 1.234 at 77 °F (USCG, 1999) - Denser than water; will sink

>> Relative density (water = 1): 1.2

Vapor Density:

>> Relative vapor density (air = 1): 11.4

Vapor Pressure:

>> 4e-05 mmHg at 86 °F (NTP, 1992)

>> Vapor pressure at 30 °C: negligible

LogP:

>> 2.89

Stability/Shelf Life:

>> Stable under recommended storage conditions.

Decomposition:

>> Hazardous decomposition products formed under fire conditions - Carbon oxides, sulfur oxides, oxides of phosphorus

Corrosivity:

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

>> Corrosive to iron and some other metals

Surface Tension:

>> 37.1 dynes/cm at 24 °C

Odor Threshold:

>> 1.00 ppm (detection in water, purity not stated)

Refractive Index:

>> Index of refraction: 1.4985 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.

>> 165.9 Å² [M+H]+ [CCS Type: TW; Method: Major Mix IMS/Tof Calibration Kit (Waters)]

10. Stability And Reactivity

>> Insoluble in water.

11. Toxicological Information

Toxicity Summary:

>> IDENTIFICATION AND USE: Malathion is a clear colorless liquid when pure. It has been employed for control of citrus orchard-destructive Mediterranean fruit flies and mosquitoes. Malathion is used for the topical treatment of head lice infestation. The drug also has been used for the topical treatment of pubic lice infestation, body lice infestation, and scabies (mite infestation). HUMAN EXPOSURE AND TOXICITY: Manifestations of acute intoxication may include a mix of muscarinic, nicotinic, and CNS effects. Following ingestion of malathion, symptoms may appear rapidly or may be delayed up to 12 hours. Initial signs and symptoms of malathion poisoning may be largely due to excessive muscarinic effects, which may predominate in milder cases; such effects may include nausea, vomiting, abdominal cramps, diarrhea, urinary and/or fecal incontinence, hyperhidrosis, sialorrhea, miosis (pinpoint pupils), bradycardia, lacrimation, and increased nasal, pharyngeal, and bronchial secretions. Nicotinic effects, including muscle fasciculation, muscle weakness, tachycardia, weakness or paralysis of respiratory muscles, and hypotonia, may occur in moderate and severe intoxications. CNS effects may include anxiety, restlessness, and headache. In more severe cases, tremors, confusion, dizziness, drowsiness, a reduction or loss of deep tendon reflexes, seizures, bradycardia, and coma also have been reported; death may occur. Respiratory failure may result from a combination of muscarinic, nicotinic, and CNS effects. In children, the signs and symptoms of poisoning may be predominantly related to the CNS (e.g., seizures, alterations in mental status including lethargy and coma). Hypotonia, muscle weakness, miosis, and excessive salivation also have occurred in children, while some of the typical cholinergic effects (e.g., bradycardia, muscular fasciculation, excessive lacrimation, sweating, bronchial secretion) may be observed less frequently than in adults. Concentrations of up to 400 ug/mL of 95% malathion failed to increase chromosomal aberrations in human hematopoietic cell cultures; however, others reported a positive result in human lymphocytes with 99% pure malathion. A significant increase in chromosomal aberrations was found in the lymphocytes of 14 people intoxicated with a commercial formulation of malathion, as compared with that in healthy controls. Aberrations observed included chromatid breaks, chromatid isobreaks, chromatid exchanges and unstable chromosomal and structural aberrations. There is limited evidence of malathion carcinogenicity in humans for non-Hodgkin lymphoma and prostate cancer. ANIMAL STUDIES: Undiluted malathion dropped on rabbit's eye caused slight immediate irritation. A daily dose of 46 mg/kg malathion ip for fifteen days affected the activity of the adrenal gland and liver glycogen in rats. Neurotoxicity, reflected by the occurrence of leg weakness in atropinized chickens given single, subcutaneous doses of 100 mg/kg malathion. A bioassay of malathion for possible carcinogenicity was conducted in rats. Groups of 49 or 50 rats of each sex were fed diets containing 2,000 or 4,000 ppm malathion for 103 weeks. All surviving rats were killed at 105 or 106 weeks. Malathion was not carcinogenic in male or female rats. Zebrafish larvae were used in order to determine the effects of malathion, on zebrafish behavior and AChE activity. Embryos and larvae were exposed to malathion during different time points in development and then tested at 5 days post-fertilization for behavioral, neurodevelopmental and AChE abnormalities. Malathion altered behaviors in the larvae such as swim speed and rest. Larvae treated with malathion also had significantly smaller forebrain and hindbrain regions compared to controls by 5 days post-fertilization. Malathion was ineffective in inducing sex linked recessive lethal mutations in Drosophila melanogaster. The clastogenic effect of malathion was studied in mice. At 230 mg/kg, increasing the frequencies of abnormal metaphases and chromosomal aberrations were noted in animals killed 6 or 24 hr after injection. Mice injected with 460 mg/kg, exhibited significant increments of abnormal metaphases, gaps, breaks, and chromatid exchanges in relation to controls. Malathion was tested by the plate incorporation assay with Salmonella typhimurium strains TA1535, TA1537, TA1538, TA98 and TA100 as well as with Escherichia coli strain WP2 uvrA-. No increases in revertants with any strain were reported. ECOTOXICITY STUDIES: Moribund mullet, Mugil cephalus, in an estuary sprayed with malathion (3 oz/acre) during a large scale mosquito control operation had about 98% inhibition of brain acetylcholinesterase. Inhibition of acetylcholinesterase and mortality were noted in pinfish 24, 48, and 72 hours at measured concentrations of 142, 92, and 58 ug/L, respectively. A concentration of 31 ug/L caused 34 percent acetylcholinesterase inhibition in pinfish but no deaths in 72 hours. Growth of oyster, Crassostrea virginica, was reduced 32% by 96 hr exposure to 1 mg/L. Bullfrogs (Rana catesbeiana) were exposed to malathion in water in a 28-day static renewal test. Survival was decreased at the level of 2,500 ug/L and higher. Development of tadpoles was significantly delayed by malathion exposure.

USGS Health-Based Screening Levels for Evaluating Water-Quality:

This section provides the USGS Health-Based Screening Levels for Evaluating Water-Quality data.

Chemical

>> Malathion

USGS Parameter Code

>> 65087

Noncancer HBSL (Health-Based Screening Level)[µg/L]

>> 60

Benchmark Remarks

>> steady-state adult population; 6/9/2016

Reference

>> Smith, C.D. and Nowell, L.H., 2024. Health-Based Screening Levels for evaluating water-quality data (3rd ed.). DOI:10.5066/F71C1TWP

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

>> Malathion

IARC Carcinogenic Classes

>> Group 2A: Probably carcinogenic to humans

IARC Monographs

>> Volume 30: (1983) Miscellaneous Pesticides

>> 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 112: (2017) Some Organophosphate Insecticides and Herbicides

>> 3, not classifiable as to its carcinogenicity 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.

Effects During Pregnancy and Lactation:

Drug effects during pregnancy and lactation.

>> ◉ Summary of Use during Lactation

>> Malathion appears to be poorly absorbed after topical application, so it is not likely to reach the breastmilk in large amounts. However, breastmilk excretion of malathion has not been studied after application of the 0.5% lotion. Until more data become available, an alternate agent is preferred.

>> ◉ Effects in Breastfed Infants

>> Relevant published information was not found as of the revision date.

>> ◉ Effects on Lactation and Breastmilk

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

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

Skin Exposure

>> MAY BE ABSORBED! Further see Inhalation.

Ingestion Exposure

>> Abdominal cramps. Diarrhoea. Vomiting. Further see Inhalation.

>> irritation eyes, skin; miosis, aching eyes, blurred vision, lacrimation (discharge of tears); salivation; anorexia, nausea, vomiting, abdominal cramps, diarrhea, dizziness, confusion, ataxia; rhinorrhea (discharge of thin nasal mucus), headache; chest tightness, wheezing, laryngeal spasm

Target Organs:

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

>> Neurological (Nervous System), Respiratory (From the Nose to the Lungs)

>> Nervous

Adverse Effects:

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

>> Other Poison - Organophosphate

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

>> IARC Carcinogen - Class 2: International Agency for Research on Cancer classifies chemicals as probable (2a), or possible (2b) human carcinogens.

>> ACGIH Carcinogen - Not Classifiable.

Toxicity Data:

>> Malathion is slightly toxic via the oral route, with reported oral LD₅₀ values of 1000 mg/kg to greater than 10,000 mg/kg in the rat. It is also slightly toxic via the dermal route, with reported dermal LD₅₀ values of greater than 4000 mg/kg in rats.

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:

>> An important characteristic of malathion acute toxicity is its potentiation by other organophosphates. When malathion and EPN were administered to rats separately, LD50s were 1400 and 65 mg/kg, respectively. However, when malathion and EPN were administered simultaneously at a ratio of about 25:1, oral LD50s were reduced to 167 and 7 mg/kg, respectively. The onset of symptoms for individual compounds was slow, and death usually occurred several hours after administration. However, when given together at or near the LD50, symptoms developed much more rapidly, and death usually occurred within 1 hour. In dogs, oral doses of 2000 or 4000 mg/kg malathion alone were not fatal; however, when EPN was given simultaneously (2 or 5 mg/kg) with malathion, doses of 50, 100, and 200 mg/kg were lethal. Potentiation of malathion toxicity is due to the inhibition of carboxyesterase by EPN (and other organophosphates), an enzyme important in detoxifying of malathion (as well as the more toxic metabolic product, malaoxon).

Antidote and Emergency Treatment:

>> If this chemical gets into the eyes, remove any contact lenses at once and irrigate immediately for at least 15 min, occasionally lifting upper and lower lids. Seek medical attention immediately. If this chemical contacts the skin, remove contaminated clothing and wash immediately with soap and water. Speed in removing material from skin is of extreme

importance. Shampoo hair promptly if contaminated. Seek medical attention immediately. If this chemical has been inhaled, remove from exposure, begin rescue breathing (using universal precautions, including resuscitation mask) if breathing has stopped and CPR if heart action has stopped. Transfer promptly to a medical facility.

Human Toxicity Excerpts:

>> /HUMAN EXPOSURE STUDIES/ In experimental study, malathion was found to be a weak contact sensitizer, inducing mild cutaneous reaction in high proportion of subjects.

Non-Human Toxicity Excerpts:

>> /LABORATORY ANIMALS: Acute Exposure/ It was established in experiments on noninbred albino rats that acute intoxication with malathion (0.75 LD50) /administered instramuscularly/ reduced the function of Th1 cells more significantly than the function of Th2 lymphocyte, decreases the activity of B cells and NK cells, blood levels of TNFa, IL-1b and IL-6, IFN-g, IL-2, and IL-4, while not significantly affecting the concentration of IL-10 and IL-13. Atropine (10 mg/kg) under conditions of acute malathion intoxication improved the function of T cells and B lymphocytes, NK cells, as well as the synthesis of immunoregulatory cytokines IFN-g, IL-2, and IL-4. At the same time, atropine in malathion intoxicated rats had no effect on suppression of the synthesis of proinflammatory cytokines TNF, IL-1g and IL-6 as well as the content of anti-inflammatory cytokines IL-10 and IL-13.

Non-Human Toxicity Values:

>> LD50 Mouse oral 1025 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.

>> A bioassay of technical grade malathion for possible carcinogenicity was conducted by admin the test chemical in feed to Osborne-Mendel rats and B6C3F1 mice. Groups of 50 rats of each sex were admin malathion at one of two doses for 80 wk, then observed for 33 wk. Time weighted avg doses were 4,700 or 8,150 ppm. Matched controls consisted of groups of 15 untreated rats of each sex; pooled controls consisted of the matched controls combined with 40 untreated male and 40 untreated female rats from similar bioassays of four other test chemicals. All surviving rats were /sacrificed/ at 108-113 wk. Groups of 50 mice of each sex were administered malathion at one of two doses, either 8,000 or 16,000 ppm, for 80 wk, then observed for 14-15 wk. Matched controls consisted of groups of 10 untreated mice of each sex; pooled controls consisted of the matched controls combined with 40 untreated male and 40 untreated female mice from similar bioassays of four other test chemicals. All surviving mice were /sacrificed/ at 94 or 95 wk. ... It is concluded that under the conditions of this bioassay, there was no clear evidence of the association of the tumor incidence with the admin of malathion to Osborne-Mendel rats or B6C3F1 mice. Levels of Evidence of Carcinogenicity: Male Rats: Negative; Female Rats: Negative; Male Mice: Negative; Female Mice: Negative.

TSCA Test Submissions:

Under the Toxic Substances Control Act (TSCA), EPA has broad authority to issue regulations designed to require manufacturers (including importers) or processors to test chemical substances and mixtures for health and environmental effects. This section provides information on test reports submitted for this chemical under TSCA.

>> Malathion (CAS # 121-75-5) was evaluated for cytotoxicity in study to evaluate the validity of in vitro testing for direct reuse water toxicity in mammalian systems. As a quick, inexpensive, reproducible, and sensitive means of detection, if this test is also a valid reflection of toxicity in mammals, it would be highly beneficial in assessing the potability of direct reuse water and in prescribing mode of water treatment. Continuous L-cell cultures (mouse or rat, 26 cultures/assay, >200,000 cells/culture) in minimal medium with 1% fetal bovine serum were exposed to 12 graded doses (unspecified) in ethanol solution for 72 to 96 hours. A reflection of effects on growth and reproduction of the indicator cells, the change in protein synthesis as determined by calorimetric Lowry method was chosen to quantify the cytotoxicity in 6 cultures/assay at 24, 48, 72 and 96 hours after initiation of study. A concentration of 32 mg/L was toxic to L-cells. Levels greater than 1 mg/L inhibited protein production in a time-dependent manner; cells exposed in vitro to 18 mg/L demonstrated static protein synthesis by the third day, with protein loss evident at Day 4. The effect was less pronounced in response to a 10 mg/L malathion exposure, although this level halved protein synthesis (LC50). An LC10 was 2.0 mg/L. The authors suggested that the timed response might be due to altered cellular metabolism or intracellular accumulation of malathion. The LC50 (10 mg/L) was both significantly lower than the NOEL in chronic animal studies (100-1000 and 100 ppm in rats and dogs, respectively) and higher than WHO/FAO's maximum daily intake standard (0.02 mg/kg/day). However, a positive relationship was established in both instances by a two-way ANOVA statistical method, indicating a relevant toxicological result with the cell culture bioassay. Malathion, a non-persistent (biodegradable) and poorly soluble insecticide of low relative mammalian toxicity that is rarely found in drinking water, bears no EPA-derived drinking water standard limit. Using an EPA convention for calculation of drinking water maximum limits and either the same historical minimal effect level or WHO/FAO data, the resultant standard (0.03 or 0.15 mg/L respectively) would be undetectable with the tissue culture bioassay.

Populations at Special Risk:

>> Patients with impaired hepatic function may be more susceptible to malathion toxicity because of diminished capacity to detoxify the drug.

12. Ecological Information

Resident Soil (mg/kg)

>> 1.30e+03

Industrial Soil (mg/kg)

>> 1.60e+04

Tapwater (ug/L)

>> 3.90e+02

MCL (ug/L)

>> 1.50e+01

Risk-based SSL (mg/kg)

>> 1.00e-01

Chronic Oral Reference Dose (mg/kg-day)

>> 2.00e-02

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. The substance may cause long-term effects in the aquatic environment. This substance may be hazardous to the environment. Special attention should be given to bees. 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.

>> SEDIMENTS: In a USA National Surface Water Monitoring Program conducted 1976-80, malathion was not detected in sediment samples(1). Sediment sampled from Salton Sea, CA had malathion concentrations of <0.15-7.2 ng/g dry weight from 3 sites in May 2000 and <0.15-2.0 ng/g dry weight from 5 sites sampled in May 2001(2). Malathion was not detected in 157 bottom sediment samples from the Lake Erie watershed sampled 1971-72(3). Malathion was detected at 2-5 ug/kg in 14% of sediment samples taken from Shin River, Niigata, Japan(4). Malathion was detected in sediment samples at one of 23 stations in Nissum Broad, Denmark(5). Sediment concentrations of malathion were reported as 0.06-0.49 ng/g in the Wuchuan River of China(6).

Fish/Seafood Concentrations:

Concentrations of this compound in fish or seafood.

>> Malathion residues in Channa striata (snakehead murrel) collected from Kolleru Lake, India were 0.81-1.26, 0.54-1.87 and 0.76-2.52 ug/g wet weight in the muscle, gills and liver, respectively(1). Malathion concentrations in Catla catla (catla) were 0.00085-0.69, 0.0085-0.89 and 0.0085-1.48 ug/g wet weight in muscle, gills and liver, respectively(1). Malathion 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). Malathion was detected at a maximum concentration of 35 ng/g in shrimp sampled from four shrimp farms located near the coast of Sonora, Mexico(3).

Animal Concentrations:

Concentrations of this compound in animals.

>> Malathion was detected in 58% of honeybee samples at 0.001-3.780 mg/kg; dead bees were collected in bags suspended under beehives (only worker bees were analyzed) in the district of Bologna, Italy(1). Malathion was detected at <25-2836.4 (median <25) and <25-116.0 (median 65.2) ng/g in the respective livers of 11 of 32 and 5 of 7 Nile monitors (Varanus niloticus) collected from Niger; malathion was not detected in 32 monitors collected from Mali(2).

Average Daily Intake:

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

>> USA Market basket surveys, Adult average daily malathion intake(1-7).[Table#1925]

13. Disposal Considerations

Spillage Disposal

>> Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. See Chemical Dangers. Absorb remaining 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; Contaminated packaging: Dispose of as unused product.

>> MALATHION MAY BE DISPOSED OF BY ABSORBING IN VERMICULITE, DRY SAND, EARTH, OR A SIMILAR MATERIAL ... & /DISPOSING OF SO AS TO MEET LOCAL, STATE, & FEDERAL REGULATIONS/.

>> For more Disposal Methods (Complete) data for MALATHION (10 total), please visit the HSDB record page.

14. Transport Information

DOT

Malathion
9
UN Pack Group: III
Reportable Quantity of 100 lb or 45

IATA

Malathion
9,
UN Pack Group: III

15. Regulatory Information

Federal Drinking Water Guidelines:

Federal drinking water guidelines (e.g. maximum containment level (MCL)) for this chemical. In general, these guidelines are recommendations and not legally enforceable.

>> EPA 500 ug/L

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.

>> Malathion 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

>> Malathion: HSNO Approval: HSR003011 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 sulfur dioxide and phosphoric acid, are produced in fire.

Other Safety Information

Chemical Assessment

>> IMAP assessments - Butanedioic acid, [(dimethoxyphosphinothioyl)thio]-, diethyl ester: Environment tier I assessment

>> IMAP assessments - Butanedioic acid, [(dimethoxyphosphinothioyl)thio]-, diethyl ester: Human health tier I assessment