chlorothalonil

Review Date: 05/11/2011
CAS #: 1897-45-6

Type	Insecticide, acaricide.
Controls	Mites and insects.
Mode of Action	"The exact mechanism of action is not known." Reference 1

Thurston County Review Summary:

Chlorothalonil fails Thurston County's pesticide review criteria because the risk to birds, small animals, fish, oysters, and other aquatic organisms is considered high in hazard from potential exposures following certain turf grass uses. It also fails the review criteria because it is considered a probable human carcinogen. Chlorothalonil is rated moderate in hazard for persistence, mobility, and bioaccumulation potential.

MOBILITY

Property	Value	Reference	Value Rating
Water Solubility (mg/L)	0.6	1	Low
Soil Sorption (Kd=mL/g)	25	1	Moderate
Organic Sorption (Koc=mL/g)	900 - 7000	1	Moderate to low

Mobility Summary:

Chlorothalonil is not soluble in water and adheres moderately to most soil types (with greater attraction to soil with increasing organic material). In soil with a great deal of organic material, chlorothalonil is not expected to be mobile but the overall rating for mobility is rated moderate.

PERSISTENCE

Property	Value	Reference	Value Rating
Vapor Pressure (mm Hg)	0.0097	2	High
Biotic or Aerobic Half-life (days)	19	1	Moderate
Abiotic Half-life (days)	20 - 200	1	Moderate to high
Terrestrial Field Test Half-life (days)	10 - 60	1	Moderate
Hydrolysis Half-life (days)	Stable	1	High
Anaerobic Half-life (days)	5 - 15	1	Low to moderate
Aquatic Field Test Half-life (days)	<1	1	Low

Persistence Summary:

The half-life for chlorothanonil ranges from low in persistence (less than one week) to high (more than 60 days) depending on where it is applied. When it is used on vegetation and soil, it will likely dissipate slightly into the air and degrade to half of the applied concentration in less than one month (moderate persistence), in water or sediment it will likely take less than a week to reach half of the applied concentration (low persistence). Since chlorothalonil products are intended for use on land, the persistence is rated moderate in hazard.

BIOACCUMULATION

Property	Value	Reference	Value Rating
Bioaccumulation Factor	425	2	Moderate
Bioconcentration Factor	75 (edible) 264 (whole)	1	Moderate
Octanol/Water Partition Coefficient	log Kow = 1.32	2	Low

Bioaccumulation Summary:

The low octanol / water partition coefficient indicates that chorothalonil does not have much potential to accumulate in fish or animal tissue. Bioconcentration studies indicate that chlorothalonil will accumulate slightly in the edible fish tissue and moderately in the inedible fish tissue. Bioconcentration studies with oysters indicate that the metabolites of chlorothalonil accumulate more significantly but their long-term effects are unknown (Reference 1). The rating for bioaccumulation potential is moderate.

ACUTE WILDLIFE TOXICITY VALUES and Risk Assessment

Test Subject	Value	Reference	Value Rating
Mammalian (LD50)	>10,000 mg/kg	1	Low
Avian (LD50)	>2,000 mg/kg	1	Low
Honey bee or insect (LD50)	>181 ug/bee	1	Low
Annelida -worms (LC50)	268.5 mg/kg	6	Moderate
Fish (LC50)	0.042 ppm	1	Very high
Crustacean (LC50)	0.068 ppm	1	Very high
Mollusk (LC50)	0.0036 ppm	1	Very high
Amphibian (LD50 or LC50)	Not found		

Acute Toxicity Testing and Ecotoxicity Summary:

Single-dose toxicity testing indicates that chlorothalonil is low in toxicity to mammals, birds, and bees, moderately toxic to worms, and very highly toxic to fish and other aquatic organisms. Broadcast applications of fungicide products containing chlorothalonil to turf grass are rated high in hazard for wildlife (birds, small mammals, aquatic organisms), although, broadcast applications to turf grass for insect control are rated low in hazard. The difference in hazard rating is because products used for insect conltrol are applied to turf grass at a much smaller application rate per acre. The risk of toxicity from insecticide products containing chlorothalonil as a sole active ingredient are rated low in hazard to birds and mammals but there is still a moderate concern over chemical runoff from application areas and its potential effect on aquatic organisms.

ACUTE HUMAN TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Value Rating
Adult gardening with ornamentals	Dermal (skin)	2 mg/kg/day	1.1 mg/kg/day	<2 (@ 8.7 lb ai/Acre)	1	High
Adult harvesting vegetables in sprayed garden	Dermal (skin)	2 mg/kg/day	0.16 mg/kg/day	12.5 (@ 0.74 lb ai/Acre)	1	Low
Child drinking contaminated groundwater	Ingestion	0.58 mg/kg/day	0.0016 mg/kg/day	>360	1	Low
Child eating treated soil	Ingestion	0.58 mg/kg/day	0.00044 mg/kg/day	>1,000	1	Low

Acute Toxicity Risk Assessment Summary:

After reviewing several short-term exposure risk assessments, the EPA identified several potential exposures that exceeded their level of concern. The potential residential exposures of concern included home applicators and children contacting treated vegetation. To remove the known exposures of concern to adult residential applicators and to children from post-application exposures, the EPA removed the use of chlorothalonil products for residential turf grass (eliminating these exposures of concern). However, Thurston County found two products labelled for use on residential turf grass for insect control (application rates were not to exceed 0.5 pounds of active ingredient per acre).

Potential residential exposures to adults working in treated ornamental plants (sprayed at a rate of 8.7 pounds of active ingredient per acre or greater) are rated high in hazard. Potential exposures to adults harvesting vegetables in a treated garden are considered low in hazard when the application rate is less than 1 pound of active ingredient per acre.

Risk of toxicity, from short-term ingestion of drinking groundwater contaminated from chlorothalonil fungicide use, is expected to be low in hazard. The risk is considered low because of the very small amount of chlorothalonil calculated to reach groundwater.

The EPA evaluated over 35 different potential occupational exposures to chlorothalonil from mixing / loading / and applying fungicides. There were several exposures of concern regarding potential handler and applicator exposures and post-application exposures from commercial turf grass and greenhouse use. The EPA approved label changes that lessened these potential exposures through the use of specific personal protective equipment. Where there is a potential for skin contact, chemically resistant gloves are required, and respirators are required for work with potential inhalation exposures. Wettable powder products are required to be packaged in water soluble bags (or be used only in closed mixing systems). The potential exposures to workers using the new protective clothing requirement were not quantified and cannot be rated by Thurston County. But, based on the concerns noted by the EPA over dermal and inhalation exposures - Thurston County perceives that measures should be taken to prevent any skin contact and inhalation of chlorothalonil.

CHRONIC HUMAN TOXICITY HAZARDS

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	Group B	Probable human carcinogen	3	High
Mutagenicity	"Not clastogenic or aneugenic"	A weak non-reproducible effect	1	Low
Neurotoxicity - (NOAEL)	Not found			
Endocrine Disruption	Not listed	- -	4 and 5	Low
Developmental Toxicity (NOAEL)	115 mg/kg/day	Lower neonatal body weights	1	Low
Reproductive Toxicity (NOAEL)	100 mg/kg/day	Related increase in post-implantation loss	1	Check risk
Chronic Toxicity (NOAEL)	1.8 mg/kg/day	Increase in kidney vacuolated epithelium	1	Check risk

Chronic Toxicity Hazard Summary:

Chlorothalonil is considered a probable human carcinogen, which is an unacceptable hazard according to Thurston County's review criteria. Developmental toxicity was seen at maternally toxic doses and reproductive toxicity was only observed after maternal toxicity. Mutagenicity testing had one weak positive test that could not be reproduced and so the EPA's overall conclusion was that chlorothalonil is not "clastogenic or aneugenic in rats, mice or Chinese hamsters" (Reference 1).

CHRONIC HUMAN TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Value Rating
Adult mixing and applying with a low pressure wand	Dermal + inhalation	Not calculated	0.000038 mg/kg/day	>10	1	Low
Adult mixing and applying with a hose-end sprayer	Dermal + inhalation	Not calculated	0.000012 mg/kg/day	>10	1	Low
Child drinking contaminated groundwater	Ingestion	0.02 mg/kg/day	0.0016 mg/kg/day	12.5	1	Low
Adult working with treated ornamentals	Dermal	Not calculated	0.000023	>10	1	Low

Chronic Toxicity Risk Assessment Summary:

Risk of toxicity, from long-term ingestion of drinking groundwater contaminated from chlorothalonil fungicide use, is expected to be low in hazard. The risk is considered low because of the very small amount of chlorothalonil calculated to reach groundwater. All of the long-term residential exposures evaluated by the EPA appear to be low in hazard [although they did not provide the calculations for the combined Margin of Exposure (MOE) for dermal and inhalation exposures].

Metabolites and Degradation Products:

Metabolites are identified as SDS-3701, SDS-47523/47524 (isomers combined), SDS-19221, SDS-47525, and SDS-46851 (Reference 1).

Comments:

Hexachlorobenzene and pentachlorobenzonitrile are known impurities in the production of chlorothalonil. In 1984 the EPA required that all products contain less than 0.05% (500 parts per million) of hexachlorobenzene for registration. In the 1999 reregistration the EPA lowered the allowable amount of hexachlorobenzene to 40 parts per million (Reference 1).

Chlorothalonil is considered a severe eye irritant (EPA Toxicity Category I) and a slight skin irritant (EPA Toxicity Category IV) but is not considered a skin sensitizer (Reference 1).

References

1. USEPA. Prevention, Pesticides and Toxic Substances. Reregistration Eligibility Document (RED) Chlorothalonil. EPA 738-R-99-004. April 1999.
2. Extension Toxicology Network. Pesticide Information Profile, Chlorothalonil. Publication Date: 5/94. (Accessed 2/25/2011). http://pmep.cce.cornell.edu
3. International Agency for Research on Cancer. Agents Classified by the IARC Monographs, Volumes 1,100. (Accessed 2/25/2011). http://monographs.iarc.fr
4. Scorecard - The Pollution Information Site. Health Effects / Endocrine Toxicants (Accessed 2/8/2011). http://www.scorecard.org/health-effects.
5. Illinois EPA. "Endocrine Disruptors Strategy". February, 1997.
6. International Union of Pure & Applied Chemistry. Pesticide Properties Database. chlorothalonil (Ref: DS 2787) Accessed 5/27/11. http://sitem.herts.ac.uk/aeru/iupac/150.htm.