lambda cyhalothrin

Review Date: 12/20/2010
CAS #: 91465-08-6

Type	Contact insecticide with some stomach action (also has repellent properties).
Controls	Controls a variety of indoor and outdoor insects.
Mode of Action	A pyrethroid neurotoxin that interferes with the sodium channel within nerve cells causing paralysis and death.

Thurston County Review Summary:

Insecticide products containing lambda cyhalothrin as a sole active ingredient are considered low in hazard and pass Thurston County's review criteria. Lambda cyhalothrin is not soluble in water and all products also contain a petroleum solvent which may increase the overall toxicity of the product.

Lambda cyhalothrin is considered low in potential to move off the site of application, likely to degrade to half the applied concentration within 60 days on land and within one week in water. It is considered a moderate hazard for the potential to accumulate in fish or animal tissue. The risk of toxicity to pets and wildlife from lambda cyhalothrin insecticide applications is considered low (except to bees and other beneficial insects). Risk of toxicity to people from exposures to lambda cyhalothrin during applications, and after it is applied, is considered low in hazard (not including risk from dietary sources).

MOBILITY

Property	Value	Reference	Rating
Water Solubility (mg/L)	0.005	2	Low
Soil Sorption (Kd=mL/g)	1,970 to 7,610	3	Low
Organic Sorption (Koc=mL/g)	180,000	3	Low

Mobility Summary:

Lambda cyhalothrin is not water soluble and adheres very strongly to all soil types. The hazard for lambda cyhalothrin to move off the site of application with rain or irrigation water is rated low.

PERSISTENCE

Property	Value	Reference	Rating
Vapor Pressure (mm Hg)	0.0000000015	2	High
Biotic or Aerobic Half-life (days)	25	2	Moderate
Abiotic Half-life (days)	65	2	High
Terrestrial Field Test Half-life (days)	10 to 84	3	Moderate
Hydrolysis Half-life (days)	5	5	Low
Anaerobic Half-life (days)	5 - 11	3	Low
Aquatic Field Test Half-life (days)	1 to 2.7	3	Low

Persistence Summary:

Lambda cyhalothrin is unlikely to dissipate into the air because of its low vapor pressure, and when it is introduced to water it is not likely to persist for more than a week. For applications to vegetation or onto the ground, it will likely breakdown to half of the applied concentration in less than 60 days. The hazard for chemical persistence is rated moderate.

BIOACCUMULATION

Property	Value	Reference	Rating
Bioaccumulation Factor	Not found		
Bioconcentration Factor	1950 to 5000	2 and 3	Moderate to high
Octanol/Water Partition Coefficient	6.9	2	High

Bioaccumulation Summary:

Lambda cyhalothrin has a very strong attraction to organic solvents and a poor attraction to water, indicating that there is a potential for it to bind to fish or animal tissue. Bioconcentration studies also indicate that it has a moderate potential to accumulate in fish. In rat metabolism studies, it was determined that the amount of time for ingested lambda cyhalothrin to be 50% eliminated from the entire body is about 10 hours. This fast elimination indicates that prolonged exposures to mammals are not likely to result in very much accumulation (Reference 3).

Based on the high accumulation potential along with fast metabolism and elimination from mammals, the hazard for bioaccumulation is rated moderate.

ACUTE TOXICITY HAZARD - ECOTOXICITY

Test Subject	Value	Reference	Rating
Mammalian (LD50)	20 mg/kg	2	High
Avian (LD50)	> 3950 mg/kg	2	Low
Honey bee or insect (LD50)	0.038 ug/bee	2	High
Annelida -worms (LC50)	>1,000 mg/kg	2	Low
Fish (LC50)	0.00021 mg/L	2	Very high
Crustacean (LC50)	0.00036 mg/L	2	Very high
Mollusk (LC50)	>0.59 mg/L	3	High
Amphibian (LD50 or LC50)	Not found		

Acute Toxicity Testing and Ecotoxicity Summary:

Single-dose toxicity testing indicates that lambda cyhalothrin is highly toxic to mammals and insects, very highly toxic to fish and other aquatic organisms, and low in toxicity to birds and worms. Risk to non-target insects is considered high, and risk to birds and mammals is not likely to be substantial (Reference 3). Risk to aquatic invertebrae is considered high only if a water body gets directly sprayed. Since lambda cyhalothrin is an insecticide and not expected to be directly sprayed to a waterbody from residential or Thurston County uses, risk of toxicity to non-target organisms is rated low. Use of lambda cyhalothrin insecticides in agricultural settings is not part of this assessment.

ACUTE TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
See the acute risk summary						
See the acute risk summary						
See the acute risk summary						
See the acute risk summary						

Acute Toxicity Risk Assessment Summary:

The acute (one-day) exposure assessment included ingesting treated food and contaminated water combined with indoor and outdoor residential exposures (inhalation, skin contact, and incidental ingestion). Although the calculations were not included in the EPA report, the inputs from food and drinking water were included as well as the sum of all the inputs. Subtracting the inputs for food and water from the total exposure provided the input from residential post-application exposures. Because the inputs from inhalation, skin contact, and ingestion exposures each had a different numerical dose of concern that they were compared to, and the numerical inputs for each route were not provided, the exposures could not be numerically calculated. However, there was enough information to determine that the combined potential exposures from inhalation, skin contact, and incidental ingestion are at least 100 times less than the EPA's dose of concern. The input from contaminated drinking water alone was also more than 100 times less than the dose of concern. These potential exposures are rated low in hazard.

Short-term (1-7 days) and intermediate-term (7 days to several months) exposures were evaluated for post-application exposures to lambda cyhalothrin. The worst case exposure was calculated to be 63 times less than the calculated dose of concern and included the combined inputs from treated food, contaminated drinking water, inhalation, incidental ingestion and skin contact from indoor and outdoor insecticide use. These potential exposures are rated low in hazard.

Specific short-term and intermediate-term post-application exposures from lawn care product use includes the inputs from inhalation, incidental ingestion, skin contact, and inputs from treated food and contaminated water. The worst-case exposure was calculated to be 70 times less than the EPA's dose of concern (for toddlers) and is rated low in hazard.

CHRONIC TOXICITY HAZARDS

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	Group D	Not classifiable as to human carcinogenicity	1	Low
Mutagenicity	- -	Mixed results	1, 3, and 5	Low
Neurotoxicity - (NOAEL)	0.5 mg/kg/day	Ataxia	1	Check risk
Endocrine Disruption	- -	Mixed results	3 and 4	Moderate
Developmental Toxicity (NOAEL)	10 mg/kg/day	None	3	Low
Reproductive Toxicity (NOAEL)	0.5 mg/kg bw/day	Reduced body weights	3	Low
Chronic Toxicity (NOAEL)	0.1 mg/kg/day	Walking abnormalities	1	Check risk

Chronic Toxicity Hazard Summary:

Lambda cyhalothrin is neurotoxic although neurotoxicity is not the first adverse effect observed in long-term exposure toxicity testing. The EPA concluded that there is no evidence that lambda cyhalothrin induces endocrine disruption, however, other test data indicate that it may have estrogenic effects (Reference 3). Lambda cyhalothrin is classified in EPA Group D - not classifiable as to human carcinogenicity and long-term exposure testing produced no signs of reproductive or developmental toxicity. Mutagenicity studies seem to have conflicting data. There are studies that are referenced that observed positive evidence of DNA strand breaks, chromasome abberations, and suggestive evidence of genotoxicity (Reference 3), however, there are also several studies that did not observe mutagenic effects. When contrasting data is encountered, the County tries to assess the quality of the studies to make a determination. Based on the evaluation of the mutagenicity studies by the World Health Organization (WHO) and the EPA, it was concluded that the standard protocols for mutagenicity testing were not strictly followed in the tests with positive evidence of mutagenicity. The tests that did not produce mutagenic effects followed the protocols. Thurston County accepts the opinion of the EPA and WHO in the determination that lambda cyhalothrin does not appear to be a mutagenic chemical.

CHRONIC TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Long-term non-diet exposures not assessed by EPA						
Long-term non-diet exposures not assessed by EPA						
Long-term non-diet exposures not assessed by EPA						
Long-term non-diet exposures not assessed by EPA						

Chronic Toxicity Risk Assessment Summary:

There were no risk assessments evaluated for long-term exposures to lambda cyhalothrin from inputs other than from treated food and contaminated drinking water. Since this is a pesticide used by commercial applicators, it seems that there should have been a long-term exposure assessment for occupation exposures. This lack of assessment is considered a data gap by Thurston County. Since residential and Thurston County uses are not expected to include ongoing use of lambda cyhalothrin insecticides throughout the year (for multiple years), long-term application exposures are not expected and the data gap for that assessment will not be used to influence the outcome of the review rating.

Metabolites and Degradation Products:

Hydroxylated lambda-cyhalothrin XV has been identified as a metabolite of lambda cyhalothrin (Reference 2).

Comments:

Lambda cyhalothrin is considered an eye irritant (EPA Toxicity Category II) but not a skin irritant (EPA Toxicity Category IV). It is not considered a skin sensitizer, although skin contact may cause numbness or tingling in the skin (Rference 3).

Lambda cyhalothrin is a reaction product comprising equal quantities of (S)-α-cyano-3-phenoxybenzyl (Z)-(1R,3R)-3-(2-chloro-3,3,3-trifluoroprop-1-enyl)-2,2-dimethylcyclopropanecarboxylate and (R)-α-cyano-3-phenoxybenzyl (Z)-(1S,3S)-3-(2--chloro-3,3,3-trifluoroprop-1-enyl)-2,2-dimethylcyclopropanecarboxylate [(Reference 2).

References

1. USEPA. Federal Register 68 FR 52354 Document Number 03-22315. 9/3/2003. Lambda Cyhalothrin; Pesticide Tolerances for Emergency Exemptions.
2. International Union of Pure & Applied Chemistry. Pesticide Properties Database, lambda-cyhalothrin (Ref: OMS 3021). Accessed 12/17/2010.
3. Syracuse Environmental Research Associates, Inc., SERA TR-052-21-03a. Lambda-Cyhalothrin Human Health Risk and Ecological Risk Assessment. February 35, 2010.
4. USEPA. Federal Register 63 (30), 7291-7299. Lambda Cyhalothrin; Pesticide Tolerances. February 13, 1998.
5. World Health Organization. WHO Specifications and Evaluations for Public Health Pesticides, LAMBDA-CYHALOTHRIN.