difethialone

Review Date: 11/11/2011

CAS #: 104653-34-1

Type	Single-feeding rodenticide.
Controls	Mainly used to control mice and rats.
Mode of Action	Anticoagulant that slows or stops blood clotting resulting in hemorrhaging and death.

Thurston County Review Summary:

Rodenticide products containing difethialone as an active ingredient are rated high in hazard and fail Thurston County's pesticide review criteria. Difethialone products are considered high in hazard due to their risk to children or animals that eat bait products and to predators that eat rodents that have consumed bait. The EPA stated that compared to other rodenticide active ingredients, difethialone is one of four anticoagulant baits that represent the highest level of risk to wildlife (Reference 1).

MOBILITY

Property	Value	Reference	Value Rating
Water Solubility (mg/L)	0.39	4	Low
Soil Sorption (Kd=mL/g)	Value not found		
Organic Sorption (Koc=mL/g)	54,000,000	2	Low

Mobility Summary:

Difethialone is not soluble in water and binds very well to soil. The hazard for difethialone to move from the site of application is based on the size and material used in making the bait products and their accessibility to wildlife. When these products are placed in secured, plastic bait stations; the hazard for mobility is low - if these products are not secured within a bait station the hazard is high, although it is not expected to be a concern for drinking water contamination.

PERSISTENCE

Property	Value	Reference	Value Rating
Vapor Pressure (mm Hg)	0.00000056	7	High
Biotic or Aerobic Half-life (days)	635	2	High
Abiotic Half-life (days)	No degradation after 181 days	7	High
Terrestrial Field Test Half-life (days)	204	7	High
Hydrolysis Half-life (days)	> 154	7	High
Anaerobic Half-life (days)	Value not found		
Aquatic Field Test Half-life (days)	Value not found		

Persistence Summary:

Defethialone is not expected to dissipate into the air and can take nearly two years to degrade to half of the applied application in the environment. The hazard for persistence is rated high.

BIOACCUMULATION

Property	Value	Reference	Value Rating
Bioaccumulation Factor	Value not found		
Bioconcentration Factor	555 (EPA) to 39,974 (EU)	7 and 2	High
Octanol/Water Partition Coefficient	log Kow = 6.29	2	High

Bioaccumulation Summary:

Difethialone has a high octanol/water partition coefficient value (greater than log = 5) which indicates that it may accumulate in fish or animals. The bioconcentration value calculated by the EPA indicates a moderate hazard for bioaccumulation potential and the European Union calculates the hazard as being high. Metabolism studies with difethialone show that it is retained in the liver with a half life of about 74 to 108 days (References 6 and 7). The hazard for difethialone to bioaccumulate is rated high.

ACUTE WILDLIFE TOXICITY VALUES and Risk Assessment

Test Subject	Value	Reference	Value Rating
Mammalian (LD50)	0.56 mg/kg	2	High
Avian (LD50)	0.26 mg/kg	2	High
Honey bee or insect (LD50)	Value not found		
Annelida -worms (LC50)	>1,000 mg/lkg	2	Low
Fish (LC50)	0.051 mg/L	2	High
Crustacean (LC50)	0.0044 mg/L	2	High
Mollusk (LC50)	Value not found		
Amphibian (LD50 or LC50)	Value not found		

Acute Toxicity Testing and Ecotoxicity Summary:

Single-dose toxicity testing indicates that difethialone is highly toxic to animals, birds, fish and other aquatic organisms (Reference 2).

There have been many reported poisonings of pets from exposures to anticoagulant rodenticides. The EPA states that the most common causes of poisoning are due to careless bait placement, overuse of baits, failure to discard poisoned rodents, and intentional poisoning. The risk of toxicity to pets and wildlife that consume bait containing difethialone is rated high. The risk of toxicity or death to fish and other aquatic organisms from the use of difethialone products is considered low (because these products are not soluble in water and are not expected to get into water bodies).

Difethialone and other second generation anticoagulant baits can kill rodents with one feeding but it takes several days for them to die. There is real potential for the rodents to feed on the baits multiple times and get a combined dose that is much higher than the lethal dose. Several published studies show that birds and animals that eat poisoned rodents can get a dose that is lethal to them (Reference 1). Risk of toxicity or death to predators (coyotes, owls, etc.) that consume rodents that have eaten bait with difethialone is rated high.

ACUTE HUMAN TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Value Rating
Child eating 5 gram bait	Ingestion	Unknown	Unknown	None	1	High
Risk from handling baits was not calculated						
Risk from breathing bait dust was not evaluated						
Other exposures were not calculated						

Acute Toxicity Risk Assessment Summary:

The risk of toxicity to children who eat bait is rated high in hazard because one bite of a bait could cause toxicity or kill the child.

Due to the potential risk from repeated exposures from handling and placing baits, the EPA requires the use of protective equipment (respirators and eye protection) for occupational handlers.

CHRONIC HUMAN TOXICITY HAZARDS

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	Not listed	- -	5	Data gap
Mutagenicity	Value not found			Data gap
Neurotoxicity - (NOAEL)	Value not found			
Endocrine Disruption	Not listed	- -	3 and 4	Low
Developmental Toxicity (NOAEL)	Value not found	- -	7	Data gap
Reproductive Toxicity (NOAEL)	Value not found	- -	7	Data gap
Chronic Toxicity (NOAEL)	Value not found	- -	7	Data gap

Chronic Toxicity Hazard Summary:

Long-term toxicity testing specific to difethialone is lacking (Reference 7) and is considered a significant data gap for this review.

CHRONIC HUMAN TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Value Rating
Long-term risk assessments were not performed						
Long-term risk assessments were not performed						
Long-term risk assessments were not performed						
Long-term risk assessments were not performed						

Chronic Toxicity Risk Assessment Summary:

Long-term risk assessments can not be performed without chronic toxicity data that establishes an exposure (dose) of concern. Lack of a risk assessment is considered a data gap for this review.

Metabolites and Degradation Products:

Difethialone degrades very slowly in the environment and no degradation chemicals were identified in environmental fate studies (Reference 7).

Comments:

Difethialone is not considered a skin sensitizer.

References

1. USEPA. Office of Prevention, Pesticides and Toxic Substances. "Risk Mitigation Decision for Ten Rodenticides." May 28, 2008.
2. International Union of Pure & Applied Chemistry. Pesticide Properties Database. difethialone (Ref: OMS 3053). Accessed 11/11/2011. http://sitem.herts.ac.uk/aeru/iupac/
3. Scorecard - The Pollution Information Site. Health Effects / Endocrine Toxicants (Accessed 11/11/2011). http://www.scorecard.org/health-effects.
4. Illinois EPA. "Endocrine Disruptors Strategy". February, 1997.
5. International Agency for Research on Cancer. Agents Classified by the IARC Monographs, Volumes 1-102. (Accessed 11/11/2011). http://monographs.iarc.fr
6. J. C. Lechevin and Richard M. Poche. "Activity of LM 2219 (DIFETHIALONE), A New Anticoagulant Rodenticide, in Commensal Rodents." Proceedings of the Thirteenth Vertebrate Pest Conference (1988). University of Nebraska - Lincoln.
7. USEPA. Risk of Difethialone Use to Federally Threatened Alemeda Whip Snake, and the Federally Endangered Salt Marsh Harvest Mouse, and San Joaquin Kit Fox. September 30, 2011.