

diphacinone

Review Date: 02/15/2012

CAS #: 82-66-6

Type	Multiple feeding rodenticide.
Controls	Rats, mice, squirrels, voles, and gophers.
Mode of Action	Anticoagulant - effects blood's ability to clot.

Thurston County Review Summary:

The rodenticide active ingredient diphacinone is rated high in hazard and fails Thurston County's pesticide review criteria. Diphacinone is rated high in hazard to children, animals, or birds that eat bait products. There is also concern over secondary poisoning to animals that eat poisoned rodents. Diphacinone is not expected to be a mobile chemical although it is persistent with a moderate hazard for bioaccumulation. Diphacinone toxicity testing indicates that it is a developmental toxicant which is also rated high in hazard.

MOBILITY

Property	Value	Reference	Value Rating
Water Solubility (mg/L)	0.3	2	Low
Soil Sorption (Kd=mL/g)	Value not found		
Organic Sorption (Koc=mL/g)	2255	2	Moderate

Mobility Summary:

Diphacinone is not very soluble in water and is expected to bind moderately well to soil. The hazard of chemical mobility for diphacinone is rated moderate based on its chemical properties although the risk for diphacinone to move off the site of application has more to do with the individual bait formulation and how it is placed. Baits formulated with paraffin (wax-like) are resistant to weather conditions and can be anchored into a bait station whereas, small pelletized baits can be carried away by rodents.

PERSISTENCE

Property	Value	Reference	Value Rating
Vapor Pressure (mm Hg)	0.000000012	1	High
Biotic or Aerobic Half-life (days)	28 - 32	1	Moderate
Abiotic Half-life (days)	Value not found		
Terrestrial Field Test Half-life (days)	102	2	High
Hydrolysis Half-life (days)	Stable	2	High
Anaerobic Half-life (days)	Value not found		
Aquatic Field Test Half-life (days)	Value not found		

Persistence Summary:

Diphacinone was moderately persistent in soil that had air blown into it but highly persistent in soil field tests: it is not expected to dissipate into the air or break down with interaction with water. The hazard for chemical persistence is rated high (especially for paraffinized baits which resist degradation).

BIOACCUMULATION

Property	Value	Reference	Value Rating
Bioaccumulation Factor	Value not found		
Bioconcentration Factor	Value not found		
Octanol/Water Partition Coefficient	log Kow = 4.27	1	Moderate

Bioaccumulation Summary:

In metabolism studies with rats and mice, half of the diphacinone was eliminated from the animals in about one day - however the EPA rejected the study because not enough animals were tested, inadequate test design for calculating retention time in the liver, etc. Due to lack of liver retention data for diphacinone and the moderately-high octanol/water partition coefficient, the hazard for bioaccumulation potential is rated moderate.

ACUTE WILDLIFE TOXICITY VALUES and Risk Assessment

Test Subject	Value	Reference	Value Rating
Mammalian (LD50)	2.1 mg/kg	1	High
Avian (LD50)	3,158 mg/kg	2	Low
Honey bee or insect (LD50)	Value not found		
Annelida -worms (LC50)	Value not found		
Fish (LC50)	2.8 mg/L	2	Moderate
Crustacean (LC50)	1.8 mg/L	2	Moderate
Mollusk (LC50)	Value not found		
Amphibian (LD50 or LC50)	Value not found		

Acute Toxicity Testing and Ecotoxicity Summary:

Single-dose toxicity testing indicates that diphacinone is highly toxic to animals, moderately toxic to fish and other aquatic organisms, but low in toxicity to birds (References 1 and 2).

Toxicity or death can be expected if birds or animals eat diphacinone baits, however the risk is related to the availability of the bait products. Anchored, weather-resistant bait stations can greatly reduce the accessibility of bait to birds and larger animals. The use of paraffinized (wax-like) blocks instead of pellets limits rodents' ability to move bait to accessible locations. Risk from secondary poisoning to animals that eat poisoned rodents is rated high in hazard. The risk to birds of prey that eat poisoned rodents is unknown.

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	0.0013 mg/kg/day	0.025 mg/kg	None	1	High
Short-term dermal exposures were not evaluated						
Short-term applicator exposures not evaluated						
Other short-term exposures were not evaluated						

Acute Toxicity Risk Assessment Summary:

The EPA calculated that the approximate size of a single bite of rodenticide bait would be about 5 grams. Risk to a child that eats 5 grams of bait containing diphacinone is above the EPA's level of concern and is rated high in hazard by Thurston County.

CHRONIC HUMAN TOXICITY HAZARDS

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	Not listed	--	1 and 5	Data gap
Mutagenicity	Value not reported	None noted	1	Low
Neurotoxicity - (NOAEL)	Value not found			
Endocrine Disruption	Not a known endocrine disruptor	--	3 and 4	Low
Developmental Toxicity (NOAEL)	25 µg/kg/day	Fetus resorptions	1	High
Reproductive Toxicity (NOAEL)	25 µg/kg/day	Fetus resorptions	1	High
Chronic Toxicity (NOAEL)	< 10 µg/kg/day	Increases prothrombin	1	Check risk

Chronic Toxicity Hazard Summary:

Toxicity testing requirements for diphacinone registration did not include an evaluation for carcinogenicity potential (because there were no food or crop uses proposed). The International Agency for the Research on Cancer also did not evaluate diphacinone for carcinogenic potential. Lack of a carcinogenicity evaluation is considered a data gap for this review. Developmental toxicity testing with diphacinone produced maternal toxicity without toxicity to the developing fetuses. Diphacinone is not a known mutagen or endocrine disruptor.

CHRONIC HUMAN TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Value Rating
Long-term exposures were not evaluated						
Long-term exposures were not evaluated						
Long-term exposures were not evaluated						
Long-term exposures were not evaluated						

Chronic Toxicity Risk Assessment Summary:

Human risk assessments for long-term exposures were not required by the EPA and could not be located from another source.

Metabolites and Degradation Products:

Five metabolites of diphacinone were identified and include hydroxylated products of diphacinone occurring on the phenyl and indandionyl rings. In soil diphacinone degrades to diphenylglycolic acid and carbon dioxide (Reference 1).

Comments:

Diphacinone is a moderate eye irritant (EPA Toxicity Category III) but is not considered a skin irritant (EPA Toxicity Category IV) and is not a skin sensitizer (Reference 1).

References

- USEPA. Office of Prevention, Pesticides and Toxic Substances. Reregistration Eligibility Decision (RED) Rodenticide Cluster. July 1998.
- International Union of Pure & Applied Chemistry. Pesticide Properties Database. diphacinone. Accessed 2/14/2012. <http://sitem.herts.ac.uk/aeru/iupac/>
- Scorecard - The Pollution Information Site. Health Effects / Endocrine Toxicants (Accessed 2/14/2012). <http://www.scorecard.org/health-effects>.
- Illinois EPA. "Endocrine Disruptors Strategy". February, 1997.
- International Agency for Research on Cancer. Agents Classified by the IARC Monographs, Volumes 1-102. (Accessed 2/14/2012). <http://monographs.iarc.fr>