difenacoum

Review Date: 01/15/2012

CAS #: 56073-07-5

Type	Single dose rodenticide.
Controls	Rats and mice.
Mode of Action	Disrupts the ability of blood to clot (anticoagulant).

Thurston County Review Summary:

Difenacoum is a second-generation anticoagulant rodenticide. The first-generation anticoagulant baits required multiple feedings and the second-generation baits require a single feeding. All anticoagulant baits take over 3 to 5 days to kill which allows rodents to potentially eat multiple lethal doses of a second-generation anticoagulant bait. Difenacoum bait products are rated high in hazard for their potential to cause toxicity or kill birds or animals that eat these bait products or if they eat rats or mice that have eaten these bait products. Difenacoum is rated high in hazard for the potential to cause toxicity to a child that eats a bait product containing it. It is also considered a chemical mutagen that is persistent with a high potential to bioaccumulate.

MOBILITY

Property	Value	Reference	Value Rating
Water Solubility (mg/L)	1.7	1	Low
Soil Sorption (Kd=mL/g)	Value not found		
Organic Sorption (Koc=mL/g)	170,700	2	

Mobility Summary:

Difenacoum is not soluble in water and is expected to bind strongly to soil with organic material. The hazard of difenacoum to move off the site of application with rain is rated low.

PERSISTENCE

Property	Value	Reference	Value Rating
Vapor Pressure (mm Hg)	0.0000000067	1	High
Biotic or Aerobic Half-life (days)	439	2	High
Abiotic Half-life (days)	Value not found		
Terrestrial Field Test Half-life (days)	290	2	High
Hydrolysis Half-life (days)	1,000	1	High
Anaerobic Half-life (days)	Stable (aquatic)	1	High
Aquatic Field Test Half-life (days)	Value not found		

Persistence Summary:

Difenacoum will not dissipate into the air and degrades very slowly in the environment. Difenacoum is likely to take much more than 60 days to degrade to half of the applied concentration (if it has not been eaten) and is rated high in hazard for persistence.

BIOACCUMULATION

Property	Value	Reference	Value Rating
Bioaccumulation Factor	Value not found		
Bioconcentration Factor	9010	2	
Octanol/Water Partition Coefficient	7.6	2	

Bioaccumulation Summary:

Difenacoum is rapidly metabolised in rats and up to 50% eliminated in about a week but the remainder appears to get retained in the liver and accumulates (Reference 1). The high octanol/water partition coefficient (log Kow >5) indicates that difenacoum may accumulate in fish or animal tissue. A bioconcentration factor greater than 5,000 also indicates that difenacoum is likely to accumulate in fish or animal tissue. The hazard for difenacoum to bioaccumulate is rated high.

ACUTE WILDLIFE TOXICITY VALUES and Risk Assessment

Test Subject	Value	Reference	Value Rating
Mammalian (LD50)	1.8 mg/kg	2	High
Avian (LD50)	56 mg/kg	2	Moderate - high
Honey bee or insect (LD50)	Value not found		
Annelida -worms (LC50)	Value not found		
Fish (LC50)	0.064 mg/l	2	High
Crustacean (LC50)	0.52 mg/l	2	High
Mollusk (LC50)	Value not found		
Amphibian (LD50 or LC50)	Value not found		

Acute Toxicity Testing and Ecotoxicity Summary:

Single dose testing of difenacoum indicates that it is highly toxic to animals, fish and other aquatic organisms but moderately toxic to birds.

The EPA has concluded that use of difenacoum and other second-generation anticoagulant baits exceeds the level of concern for primary poisoning and secondary poisoning to birds, pets and other animals. Primary poisoning occurs when a bird or other non-target animal eats a bait product. Secondary poisoning occurs when a bird or animal eats a mouse or rat that has eaten bait. Thurston County rates the risk to non-target organisms from the use of difenacoum bait as high in hazard.

ACUTE HUMAN TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Value Rating
Adult applicator of pellet without gloves	Dermal	0.00005 mg/kg/day	0.0000026 mg/kg/day	19	1	Low
Adult applicator of place packs without gloves	Dermal	0.00005 mg/kg/day	0.0000011 mg/kg/day	45	1	Low
Child eating 5 gram bait	Ingestion	0.00005 mg/kg/day	0.0 17 mg/kg/day	<1	1	High
Other short-term exposures were not rated						

Acute Toxicity Risk Assessment Summary:

Risk of toxicity for adults handling baits while placing them in bait stations (without gloves) is 19 to 45 times below the EPA's level of concern and is rated low in hazard.

Risk to a child that eats 5 grams of bait is above the EPA's level of concern and is rated high in hazard by Thurston County. The EPA's level of concern is exceeded when a person eats more than 10% of a bait (Reference 4).

CHRONIC HUMAN TOXICITY HAZARDS

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	Not evaluated by IARC or EPA	- -	1 and 3	N/A
Mutagenicity	in vitro tests	Chromosomal abberations	1	High
Neurotoxicity - (NOAEL)	Evaluation not found			
Endocrine Disruption	Evaluation not found			
Developmental Toxicity (NOAEL)	0.09 mg/kg/day	None observed	1	Low
Reproductive Toxicity (NOAEL)	Reproductive toxicity testing not found			
Chronic Toxicity (NOAEL)	0.005 mg/kg/day	Changes in blood coagulant	1	Check risk

Chronic Toxicity Hazard Summary:

Mutagenicity testing with difenacoum caused chromasomal abberations in both human and hamster cells (Reference 1). Thurston County rates chemical mutagens high in hazard.

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:

Risk from long-term exposures to difenacoum from handling baits has not been evaluated by the EPA and so it could not be rated.

Metabolites and Degradation Products:

Metabolites and degradation chemicals of difenacoum have not been identified.

Comments:

Difenacoum is a mild eye irritant (EPA Toxicity Category IV), is not a skin irritant (EPA Toxicity Category IV) and is not a skin sensitizer (Reference 1).

References

1. USEPA. Office of Prevention, Pesticides, and Toxic Substances. Pesticide Fact Sheets, Difenacoum. September 2007.
2. International Union of Pure & Applied Chemistry. Pesticide Properties Database. Difenacoum. Accessed 2/1/2012. http://sitem.herts.ac.uk/aeru/iupac/
3. International Agency for Research on Cancer. Agents Classified by the IARC Monographs, Volumes 1-102. (Accessed 2/9/2012). http://monographs.iarc.fr
4. USEPA. Office of Prevention, Pesticides, and Toxic Substances. Difenacoum: Human Health Risk Assessment for Proposed Uses on Commensal Rodents. July 20, 2007.