bromadiolone

Review Date: 10/21/2010
CAS #: 28772-56-7

Type	Single-dose rodenticide - categorized as one of the second generation anticoagulants
Controls	Controls rats and mice in and around buildings, inside transport vehicles, and in sewers.
Mode of Action	Interferes with blood clotting and results in death by uncontrolled bleeding.

Thurston County Review Summary:

Products containing bromadolone are produced in meal bait, paraffinized pellets, bait ready-to-use place packs, and paraffin blocks and contain 0.005 % active ingredient. All products containing bromadiolone as an active ingredient are rated high in hazard and fail the Thurston County review criteria.

Bromadiolone is considered high in hazard for the risk to children that eat bait products and to predators that eat rodents that have consumed bait.

MOBILITY

Property	Value	Reference	Rating
Solubility (mg/L)	12.5 mg/L	1	Moderate / low
Soil Sorption (Kd=mL/g)	5 -13	1	Moderate
Organic Sorption (Koc=mL/g)	688	2	Moderate

Mobility Summary:

With most pesticides, the chemical and physical properties of the active ingredient can help in understanding how it is likely to move off the site of application. Rodenticides containing bromadiolone must be formulated into products that are in block or pellet form (typically in a paraffin or wax-like material) and placed into tamper-resistant feeding stations or secured in place. These requirements influence these pesticides' potential to move more than the chemical properties of the active ingredient. So, even though bromadiolone doesn't bind well to soil - the hazard for rodenticides containing bromadiolone to move off the site of application is rated low.

PERSISTENCE

Property	Value	Reference	Rating
Vapor Pressure (mm Hg)	2.13 E5 mPa	2	
Biotic or Aerobic Half-life (days)	14	1	Moderate
Abiotic Half-life (days)	Not found		
Terrestrial Field Test Half-life (days)	4.6	2	Low
Hydrolysis Half-life (days)	30	2	Moderate
Anaerobic Half-life (days)	Not found		
Aquatic Field Test Half-life (days)	Not found		

Persistence Summary:

The required packaging of these pesticides ensures that they will not break down (unless ingested) to half of their applied concentration within 60 days, therefore the hazard for persistence is rated high.

BIOACCUMULATION

Property	Value	Reference	Rating
Bioaccumulation Factor	160 - 1658	1	Moderate - high
Bioconcentration Factor	867	2	Moderate
Octanol/Water Partition Coefficient	4.27	2	Moderate

Bioaccumulation Summary:

Bromadiolone binds moderately to organic matter (fats, oil) and bioconcentration studies indicate that it has a moderate to high chance to accumulate in fish tissue (with much more accumulation in non-edible tissue). Bromadiolone metabolised in the liver of rats, to half of the original concentration, in 16 days. It took an additional 318 days to metabolize the chemical to 25% (Reference 1). Because it takes a few days for a rodent that eats bromadiolone bait to die, a rodent can feed multiple times and eat much more that a lethal dose. The hazard for toxic loading (maybe not bioaccumulation) and potential for secondary poisoning to predators is rated high.

ACUTE TOXICITY HAZARD - ECOTOXICITY

Test Subject	Value	Reference	Rating
Mammalian (LD50)	0.56 - 0.84 mg/kg	1	Very high
Avian (LD50)	138 mg/kg	1	Moderate
Honey bee or insect (LD50)	Not found		
Annelida -worms (LC50)	Not found		
Fish (LC50)	2.6 ppm	1	Moderate
Crustacean (LC50)	0.24 ppm	1	High
Mollusk (LC50)	Not found		
Amphibian (LD50 or LC50)	Not found		

Acute Toxicity Summary:

The lethal dose (to half of the tested rats) for diet containing 0.005% bromadiolone is 1.1 mg/kg. Any pesticide with a lethal dose to mammals less than 50 mg/kg is considered high in hazard for acute toxicity by the Thurston County review criteria. Single-dose toxicity testing indicates that bromadiolone is moderately toxic to birds and fish but highly toxic to other aquatic organisms. Risk to fish and other aquatic organisms from the use of bromadiolone products is considered low. Risk of toxicity or death to predators (coyotes, owls, etc.) that consume rodents that have eaten bait is rated high.

There have been many reported poisonings to pets from the use of 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 that consume bait is rated high.

ACUTE TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Risk to applicators was not calculated						
Child eating bait	0.002 mg/kg	0.025 mg ai/kg for 5g bait	<1	Ingestion	1	High
Dermal and inhalation exposures were not evaluated						
Multiple routes of exposure were not evaluated						

Acute Toxicity Risk Assessment Summary

There was not enough data submitted to the EPA to evaluate potential exposures to people who handle and apply bromadiolone rodenticies. Both inhalation and dermal (skin transfer) exposure estimates are required to be submitted to the EPA by the registrants for future evaluation.

Exposures to children consuming bait products is a concern to the EPA and many risk reduction efforts are being made to try to minimize the chance of accidental poisoning. Even if these efforts (bittering agents, indicator dye, label changes, etc.) are successful in reducing the incidents of child poisoning, the risk of toxicity to chidren who eat bait is still rated high.

CHRONIC TOXICITY HAZARDS

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	Not listed	- -	5	Low
Mutagenicity	NOAEL = 50 ug/ml	No effect	1	Low
Neurotoxicity - (NOAEL)	0.0064 mg/kg LOAEL	Death	1	Check risk
Endocrine Disruption	Not listed	- -	3, 4	Low
Developmental Toxicity (NOAEL)	0.008 mg/kg/day	Maternal toxicity	1	Check risk
Reproductive Toxicity (NOAEL)	Not found			
Chronic Toxicity (NOAEL)	0.002 mg/kg	Bleeding	1	Check risk

Chronic Toxicity Summary:

Bromadiolone is not considered a mutagen and because it is not registered for use on food, dietary consumption is not expected and so, a cancer evaluation was not required by the EPA. Neurotoxicity was not found in testing and developmental toxicity tests produced maternal toxicity before toxicity to the fetus. Reproductive toxicity testing was not found.

CHRONIC TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Dermal and inhalation exposures were not evaluated						
Multiple routes of exposure were not evaluated						
Risk to applicators was not calculated						
Long-term residential exposure not evaluated						

Chronic Toxicity Risk Assessment Summary:

Because there are no registered food uses for these products, the EPA does not require a long-term exposure risk assessment. The hazard of toxicity from long-term exposures to bromadiolone rodenticides is not rated - but is not considered a data gap at this time.

Degradation Products:

[1,3-diphenyl-5(4'-bromo-biphenyl) pentane-1-ol], [1,3-diphenyl-5(4'-bromo-biphenyl) pentane-1,5-diol] and bromadiolone ketone (Reference 1).

Comments:

Bromadiolone is considered an eye irritant (EPA toxicity category III), a mild skin irritant (EPA toxicity category IV), but not a skin sensitizer (Reference 1).

References

1. USEPA RED
2. International Union of Pure & Applied Chemistry (IUPAC). Pesticide Properties Database, Bromadiolone. Accessed 10/21/2010. http://sitem.herts.ac.uk/aeru/iupac/
3. Illinois EPA. "Endocrine Disruptors Strategy" February 1997.
4. Scorecard - The Pollution Information Site. Health Effects / Endocrine Toxicants (Accessed 10/20/2010). http://www.scorecard.org/health-effects/
5. International Agency for Research on Cancer. Agents Classified by the IARC Monographs, Volumes 1,100. (Accessed 11/2/2010). http://monographs.iarc.fr