metaldehyde

Review Date: 10/20/2010
CAS #: 108-62-3

Type	molluscicide
Controls	Controls slugs and snails.
Mode of Action	Causes slugs and snails to produce too much mucus which eventually causes their death.

Thurston County Review Summary:

Pesticide products containing metaldehyde as an active ingredient fail the Thurston County review criteria. Metaldehyde is rated as high in hazard for mobility (potential to move off the site of application), persistence, and for potential toxicity to domestic animals and wildlife. It is also rated high in hazard for the potential exposures to children in treated areas.

MOBILITY

Property	Value	Reference	Rating
Solubility (mg/L)	222	1	Moderate
Soil Sorption (Kd=mL/g)	<1	4	High
Organic Sorption (Koc=mL/g)	84.8	4	High

Mobility Summary:

Metaldehyde is somewhat soluble in water and does not adhere well to soil with or without organic material. The hazard of metaldehyde moving off the site of application with rain or irrigation water is rated high.

PERSISTENCE

Property	Value	Reference	Rating
Vapor Pressure (mm Hg)	0.000011	1	Moderate
Biotic or Aerobic Half-life (days)	67	1	High
Abiotic Half-life (days)	Stable	2	High
Terrestrial Field Test Half-life (days)	About 2 months	2	High
Hydrolysis Half-life (days)	Stable	4	High
Anaerobic Half-life (days)	>200	4	High
Aquatic Field Test Half-life (days)	Not found		

Persistence Summary:

The major route of dissipation for metaldehyde is metabolic breakdown in the upper soil column (top 18 inches of soil). There are a number of published reports that provide information on how quickly metaldehyde breaks down, unfortunately, the values cover a broad range of time. The time it takes for metaldehyde to break down to half of the applied concentration on soil can range from 5 to over 60 days. The EPA used a half-life of 60 days for the 2006 reregistration, and so that is what Thurston County used to rate persistence. The hazard for persistence is rated high.

BIOACCUMULATION

Property	Value	Reference	Rating
Bioaccumulation Factor	Not found		
Bioconcentration Factor	11	4	Low
Octanol/Water Partition Coefficient	0.12	4	Low

Bioaccumulation Summary:

Metaldehyde does not have a strong attraction to fats and oil and laboratory testing indicates that it does not accumulate in fish tissue. The hazard for bioaccumulation is rated low.

ACUTE TOXICITY HAZARD - ECOTOXICITY

Test Subject	Value	Reference	Rating
Mammalian (LD50)	283 mg/kg	2	Moderate
Avian (LD50)	196 mg/kg	4	Moderate
Honey bee or insect (LD50)	>87.5	4	Low
Annelida -worms (LC50)	>1,000	4	Low
Fish (LC50)	75 mg/L	4	Moderate
Crustacean (LC50)	>78.4 mg/L	4	Moderate
Mollusk (LC50)	Not found		
Amphibian (LD50 or LC50)	Not found		

Acute Toxicity Summary:

The risk of toxicity to domestic animals from ingesting granular products containing metaldehyde, especially dogs, is of concern to the EPA (Reference 2). There are specific label requirements to prohibit metaldehyde use in residential settings unless children and animals can be excluded from the treated area until the product is no longer visible (Reference 3). Since non-target toxicity can result from exposures occuring at labeled application rates, granular products containing metaldehyde as an active ingredient are rated high in hazard. Risk to non-target wildlife (birds and mammals) exceeds the EPA's level of concern for all uses of metaldehyde and is also rated high in hazard.

ACUTE TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Occupational handler using maximum rate	0.03 mg/kg/day	0.002 mg/kg/day	15	Inhalation	1	Low
Residential handler and applicator of granules	0.03 mg/kg/day	0.0005 mg/kg/day	56	Inhalation	1	Low
Child hand and object-to-mouth + ingesting soil	0.03 mg/kg/day	0.018 mg/kg/day	<2	Ingestion	1	High
Combined exposures were not evaluated.						

Acute Toxicity Risk Assessment Summary

Short-term (one month) and intermediate-term (one to six months) occupational exposures were calculated for inhalation exposures. These assessments assumed maximum application rates using tractor-drawn spreaders, hand applications, belly grinders, and push spreaders. The highest exposure was considered low in hazard because it was at least 15 times less than the calculated dose of concern. Expected exposures to residential applicators were at least 56 times less than the dose of concern.

Potential exposures to toddlers was evaluated by combining hand-to-mouth activities with object-to-mouth activities and incidental soil ingestion. This type of exposure could reach a dose that is more than half of the calculated dose of concern and is rated high in hazard by Thurston County's review criteria. Exposures to children eating applied granular products (2 to 15 granules) exceeds the EPA's level of concern. In 2003, the EPA made manufacturers increase the amount of bittering agent to discourage its ingestion (children are expected to spit out the bitter granules).

CHRONIC TOXICITY HAZARDS

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	"Suggestive evidence of carcinogenic potential"	- -	1	High
Mutagenicity	- -	Data suggests non-mutagenicity	2	Low
Neurotoxicity - (NOAEL)	10 mg/kg/day	Ataxia, partial paralysis, etc.	2	Check risk
Endocrine Disruption	Not listed	- -	5 and 6	Low
Developmental Toxicity (NOAEL)	75 mg/kg/day	Mortality, ataxia, etc.	2	Check risk
Reproductive Toxicity (NOAEL)	Not found	- -	2	Low
Chronic Toxicity (NOAEL)	10 mg/kg/day	Death	2	Check risk

Chronic Toxicity Summary:

Due to suggestive evidence of neurotoxicity, and lack of a developmental toxicity study, the EPA retained an additional 10x safety factor to protect developing fetuses although the tests for 2-generation reproductive toxicity and developmental toxicity did not demonstrate increased susceptibility to developing fetuses (Reference 1). No numerical data was provided for the reproductive toxicity testing, but the EPA stated that there was no indication of increased susceptibiity to the developing fetus due to reproductive toxicity - which indicates that if toxicity to the fetus was found, it must have been associated with maternal toxicity. The EPA states that there is "suggestive evidence of carcinogenic potential" which is rated high in hazard by Thurston County's review criteria.

CHRONIC TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Skin contact exposures were not evaluated						
Combined long-term exposures were not evaluated						
Drinking contaminated water was not evaluated						
Dietary exposures were not evaluated						

Chronic Toxicity Risk Assessment Summary:

Exposures from skin contact were not evaluated by the EPA because toxicity testing indicated that no adverse effects were induced from skin (dermal) exposures (Reference 2). Long-term exposures (>6 months) from non-dietary sources are not expected from the labeled uses of metaldehyde and were not evaluated. Residential and Thurston County uses are not expected to produce long-term dietary or drinking water exposures, so they were not evaluated.

DegradationProducts:

Known metabolites of metaldehyde include paraldehyde (0.4%) and acetaldehyde (5%) Reference 4. "Acetaldehyde is a relatively short-lived metabolite in the environment, and is readily oxidized to acetic acid and ultimately to carbon dioxide and water." (Reference 2)

Comments:

Metaldehyde is not considered a skin irritant (EPA toxicity category IV) but is considered a mild eye irritant (EPA toxicity category III). It is unknown if metaldehyde is a skin sensitizer.

References

1. Health Canada. April 25, 2008. Proposed Re-evaluation Decision, Metaldehyde. [PRVD2008-15].
2. USEPA. Office of Prevention, Pesticides and Toxic Substances (7508P). July 27, 2006. Reregistration Eligibillty Decision for Metaldehyde.
3. USEPA. Office of Pesticide Programs. June 22, 2007. Memorandum - Ammendment to RED for Metaldehyde.
4. International Union of Pure & Applied Chemistry (IUPAC). Pesticide Properties Database (Accessed 10/19/2010). http://sitem.herts.ac.uk/aeru/iupac/
5. Illinois EPA. "Endocrine Disruptors Strategy" February 1997.
6. Scorecard - The Pollution Information Site. Health Effects / Endocrine Toxicants (Accessed 10/20/2010). http://www.scorecard.org/health-effects/