

Type	Carbamate insecticide and acaricide
Controls	Sowbugs, millipedes, centipedes, crickets, aphids, scales, spider mites, pillbugs, moths, etc.
Mode of Action	Acetylcholinesterase (AChE) inhibitor

Thurston County Review Summary:

Methiocarb is rated high in hazard and pesticide products containing it fail Thurston County's pesticide review criteria. Methiocarb is rated high in hazard due to its potential toxicity to birds and small animals that eat granular product or treated vegetation. Methiocarb is also rated high in hazard due to the lack of a risk assessment for potential human exposures to applied products.

MOBILITY

Property	Value	Reference	Value Rating
Water Solubility (mg/L)	27 mg/L	1	Moderate
Soil Sorption (Kd=mL/g)	12.5	1	Moderate
Organic Sorption (Koc=mL/g)	Value not found		

Mobility Summary:

Methiocarb is slightly soluble in water and adheres moderately to some soil types. The hazard for methiocarb to move off the site of application with rain or irrigation water is rated moderate.

PERSISTENCE

Property	Value	Reference	Value Rating
Vapor Pressure (mm Hg)	0.00000066	1	Moderate - low
Biotic or Aerobic Half-life (days)	17 to 111	1	Moderate to high
Abiotic Half-life (days)	88	1	High
Terrestrial Field Test Half-life (days)	35 to 92	3 and 1	High
Hydrolysis Half-life (days)	24	3	Moderate
Anaerobic Half-life (days)	64	1	High
Aquatic Field Test Half-life (days)	8.5	3	Moderate

Persistence Summary:

Degradation of methiocarb ranges from slow to moderately-slow, depending on the environmental conditions. The primary way methiocarb is degraded is by microbial activity in surface soil. The hazard of chemical persistence is conservatively rated high due to the potential for it to degrade to half of the applied concentration in more than 60 days.

BIOACCUMULATION

Property	Value	Reference	Value Rating
Bioaccumulation Factor	Value not found		
Bioconcentration Factor	75	3	Low
Octanol/Water Partition Coefficient	log Kow = 3.3	1	Moderate

Bioaccumulation Summary:

Based on the octanol/water partition coefficient (log Kow = 3.3), methiocarb has a moderate potential to bind and accumulate in fish or animal tissue. The calculated bioconcentration factor indicates that the potential for accumulation is low. The EPA waived the requirement for a fish accumulation study because they determined that methiocarb and its metabolites are not likely to accumulate in fish because they will likely kill the fish first. In a rat metabolism test, up to 80% of the methiocarb was eliminated from the animals within 48 hours (Reference 1). Thurston County considers this rate of elimination rapid with little potential for retention. Overall, the hazard for methiocarb to bioaccumulate and cause toxicity to another fish or animal is rated low.

ACUTE WILDLIFE TOXICITY VALUES and Risk Assessment

Test Subject	Value	Reference	Value Rating
Mammalian (LD50)	14 mg/kg/day	1	High
Avian (LD50)	2.47 mg/kg	1	High
Honey bee or insect (LD50)	0.375 ug/bee	1	High
Annelida -worms (LC50)	1,322 mg/kg	3	Low
Fish (LC50)	0.44 ppm	1	High
Crustacean (LC50)	0.019 ppm	1	High
Mollusk (LC50)	Value not found		
Amphibian (LD50 or LC50)	Value not found		

Acute Toxicity Testing and Ecotoxicity Summary:

The level of concern for mammals and birds was evaluated by the EPA by comparing potential environmental exposures to methiocarb to the lethal dose for a similar test species. The EPA determined that although there is indication that methiocarb repels birds, it would only take one granule of product to kill a small bird and 10 to 20 granules to kill a duck (Reference 1). An animal as small as a rat could ingest a lethal dose by eating only 5 to 10 granules (Reference 1). Birds and small animals may also consume a lethal dose of methiocarb from eating treated vegetation (at labelled application rates of wettable powder products). Risk to fish and aquatic invertebrates is of concern for non-residential uses where application areas are large and where there is a potential for chemical runoff getting into surface water.

ACUTE HUMAN TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Value Rating
Applicator exposures were not evaluated						
Post-application exposures were not evaluated						
Post-application exposures were not evaluated						
Combined exposures were not evaluated						

Acute Toxicity Risk Assessment Summary:

Risk to residential applicators (non-commercial applicators) is considered below the EPA's level of concern because homeowners cannot purchase granular products in packages larger than a 2 pound shaker can. The EPA's determination of residential applicator safety was not supported with a risk assessment. Risk to adults or children contacting granules or treated vegetation was not evaluated by the EPA and is considered a significant data gap.

CHRONIC HUMAN TOXICITY HAZARDS

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	Group D - Not carcinogenic up to 30 mg/kg/day	Inadequate testing did not find carcinogenicity	1	Low
Mutagenicity	Not mutagenic	--	1	Low
Neurotoxicity - (NOAEL)	0.125 mg/kg/day	Cholinesterase inhibition	1	High
Endocrine Disruption	Not listed	--	2	N/A
Developmental Toxicity (NOAEL)	50 mg/kg/day	Increased resorptions +	1	Moderate - high
Reproductive Toxicity (NOAEL)	Data gap			
Chronic Toxicity (NOAEL)	3.3 mg/kg/day	Plasma cholinesterase inhibition	1	Check risk

Chronic Toxicity Hazard Summary:

In carcinogenicity studies with rats, methiocarb was not carcinogenic and tests with mice were not sufficient to characterize carcinogenic potential. Methiocarb was not found to be mutagenic or genotoxic up to cytotoxic levels (Reference 1). Developmental toxicity in the form of increased embryonic resorptions and incomplete bone hardening were observed along with maternal weight loss (it is unknown if the slight maternal weight loss has any association with the observed developmental toxicity). Developmental toxicity without maternal toxicity is rated high in hazard, but this developmental toxicity may not be caused by the maternal weight loss. Overall, the hazard for developmental toxicity is unclear and is rated moderate to high. Methiocarb is a neurotoxicant.

CHRONIC HUMAN TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Value Rating
Applicator of wettable powder to 6 acres	Dermal	0.5 mg/kg/day	0.65 mg/kg/day	<1	1	High
Applicator of wettable powder to 6 acres with PPE	Dermal	0.5 mg/kg/day	0.13 mg/kg/day	3.9	1	Moderate
Applicator of wettable powder to 6 acres	Inhalation	0.5 mg/kg/day	0.072 mg/kg/day	6.9	1	Moderate
Applicator of wettable powder to 6 acres with PPE	Dermal + inhalation	0.5 mg/kg/day	0.2 mg/kg/day	2.5	1	Moderate

Chronic Toxicity Risk Assessment Summary:

The EPA evaluated the risk associated with the worst-case applicator scenario, which was identified as being from mixing and applying wettable powder products. The initial risk assessment evaluated an applicator of wettable powders to 6 acres of turf or ornamentals. The assessment began with the applicator mixing, loading and applying (with a handheld low pressure wand - backpack sprayer) and no other protective clothing. The risk assessment determined that the potential exposure exceeded the EPA's calculated exposure of concern. The same applicator has a potential exposure that is much less (moderate hazard rating) if the required Personal Protective Equipment (PPE) is worn. When this potential dermal exposure is combined with the potential inhalation exposure, the hazard is still rated moderate (if coveralls are worn). The EPA (and product labels) require the use of coveralls for occupational applications of wettable powder products containing methiocarb. To work in treated ornamental crops (nurseries and greenhouses), the EPA has determined that nobody can enter the area for 10-days and then from day 10 to day 25 people can only work in the treated area for 3-hours a day (or the risk to the worker exceeds the level of concern). Due to the types of protective clothing required for applications and the restrictions on entering treated areas, the hazard for occupational exposures is rated high.

Metabolites and Degradation Products:

The major degradation chemicals of methiocarb are methiocarb sulfoxide, methiocarb sulfoxide phenol, methiocarb phenol, and methiocarb sulfone (Reference 1).

Comments:

Methiocarb is not a skin or eye irritant (EPA Toxicity Category IV).

References

- USEPA. Office of Pesticide Programs. Reregistration Eligibility Decision Document, Methiocarb. List A Case 0577. March 30, 1994.
- Scorecard - The Pollution Information Site. Health Effects / Endocrine Toxicants (Accessed 9/27/2013). <http://www.scorecard.org/health-effects/>
- International Union of Pure & Applied Chemistry. Pesticide Properties Database. Methiocarb (Ref: OMS 93). Date accessed 9/30/2013.