

Type	Biochemical insecticide
Controls	Flies, flea larvae, mosquitoes, beetles, moths, etc.
Mode of Action	Insect growth regulator - inhibits development of larvae.

**Thurston County Review Summary:**

Methoprene products are formulated in liquids, aerosol sprays, foggers, shampoos, animal collars, granulars, pellets, tablets, etc. The risk to non-target organisms is based on the product type and application area (high for water applications of slow-release products and low for all other applications), therefore, the rating is "conditional".

**MOBILITY**

Property	Value	Reference	Value Rating
Water Solubility (mg/L)	1.9	1	Low
Soil Sorption (Kd=mL/g)	Value not found		
Organic Sorption (Koc=mL/g)	23,000 (estimated)	6	Low

**Mobility Summary:**

Methoprene is not very soluble in water and is expected to adhere strongly to organic soil (clay, sediment, etc.). The hazard for methoprene to move off the application area with rain or irrigation water is rated low.

**PERSISTENCE**

Property	Value	Reference	Value Rating
Vapor Pressure (mm Hg)	0.000024	2	Moderate
Biotic or Aerobic Half-life (days)	< 7	1	Low
Photolysis Half-life (days)	<1 (photodegradation in air)	6	Low
Terrestrial Field Test Half-life (days)	10	2	Moderate
Hydrolysis Half-life (days)	Not expected to hydrolyze	1 and 2	High
Anaerobic Half-life (days)	10 - 14	1	Moderate
Aquatic Field Test Half-life (days)	<3	1	Low

**Persistence Summary:**

The formula type and location of the application greatly influence the persistence of methoprene (Reference 6). Solid products are intended to keep methoprene from dissipating or being degraded too quickly; products used indoors or on animals are also not expected to degrade at the rates determined from environmental conditions. Therefore, the rating of persistence is most reflective of liquid or dissolved solid products used outdoors.

Methoprene degrades up to 90% in water or water saturated soil within 3 days (Reference 1). On soil and in aquatic settings methoprene is likely to take about a week to degrade to half of the applied concentration. The hazard of chemical persistence is rated low, although pelletized or other slow release solid products are expected to be high in hazard for persistence.

**BIOACCUMULATION**

Property	Value	Reference	Value Rating
Bioaccumulation Factor	Value not found		
Bioconcentration Factor	457 (degradates) to 3,400	1 and 2	Moderate
Octanol/Water Partition Coefficient	log Kow = 5	2	High

**Bioaccumulation Summary:**

Methoprene and its metabolites are rapidly degraded in animals and incorporated into natural body constituents, however, these chemicals are not of toxicological concern (Reference 1). In fish, methoprene metabolites accumulated up to 950 times the water concentration but within 14 days nearly 95% was eliminated when the fish were moved to clean water (Reference 1). So, although there is potential for metabolites of methoprene to be retained in fish or animal tissue, the hazard associated with methoprene bioaccumulation is rated low.

# ACUTE WILDLIFE TOXICITY VALUES and Risk Assessment

Test Subject	Value	Reference	Toxicity Rating
Mammalian (LD50)	>10,000 mg/kg	1	Low
Avian (LD50)	>2,000 mg/kg	1	Low
Honey bee or insect (LD50)	<2 ug/bee	2	High
Annelida -worms (LC50)	Value not found		
Fish (LC50)	0.76 mg/L	2	High
Crustacean (LC50)	0.09 mg/L	1	Very high
Mollusk (LC50)	Value not found		
Amphibian (LD50 or LC50)	Value not found		

## Acute Toxicity Testing and Ecotoxicity Summary:

Single-dose toxicity testing indicates that methoprene is low in toxicity to animals and birds, and highly toxic to insects, fish, and other aquatic organisms.

Methoprene applied throughout a watershed along with malathion, resmethrin, and sumethrin for mosquito control resulted in a large decline of seasonal lobsters (Reference 3). Subsequent studies indicate that methoprene at concentrations as low as 1 part per billion (1 ppb) is toxic to stage II lobster larvae and may have contributed to the lobster deaths (Reference 3). The EPA later determined that long-term exposures to estuarine invertebrates may be a concern from use of briquette-style slow release products (Reference 1). Other aquatic formulated products do not pose a risk of concern to the EPA (Reference 1). The hazard to non-target aquatic invertebrates is rated high for direct aquatic applications of slow release products, but low in hazard for all other applications. Overall, the risk is rated conditional due to the risk being based on application type and location.

# ACUTE HUMAN TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Risk 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:

Due to the low dermal and inhalation toxicity of methoprene, the EPA did not require a risk assessment for potential short-term or long-term occupational exposures (Reference 1).

# CHRONIC HUMAN TOXICITY HAZARDS

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	No evidence of oncogenicity	Does not induce tumor formation	1	Low
Mutagenicity	Value not found	Not mutagenic	1	Low
Neurotoxicity - (NOAEL)	Value not provided	No evidence of neurotoxicity	1	Low
Endocrine Disruption	Value not provided	Affected testosterone metabolism in crustaceans	3 and 4	N/A
Developmental Toxicity (NOAEL)	600 mg/kg/day	No developmental toxicity	1	Low
Reproductive Toxicity (NOAEL)	2500 ppm	No evidence of reproductive toxicity	1	Low
Chronic Toxicity (NOAEL)	37.5 mg/kg/day	Liver pigmentation	1	Check risk

## Chronic Toxicity Hazard Summary:

Toxicity testing with methoprene indicates that it is not carcinogenic or mutagenic and does not cause reproductive or developmental toxicity (Reference 1). Methoprene is considered a juvenile insect hormone agonist which can disrupt events under endocrine control in aquatic crustaceans (References 3 and 4).

# CHRONIC HUMAN TOXICITY - Risk Assessment

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

## Chronic Toxicity Risk Assessment Summary:

Long-term exposures to methoprene are not expected from insecticide uses and so the EPA did not require a risk assessment for methoprene product registration (Reference 1).

## Metabolites and Degradation Products:

In a metabolism test with chickens, carbon dioxide is the main metabolite of methoprene (Reference 5). In mammals the major metabolites included: 7-methoxycitronellic acid, 11-methoxy-3,7,11-trimethyl-2,4-dodecadienoic acid, and 11-hydroxy-3,7,11-trimethyl-2,4-dodecadienoic acid (Reference 5).

## Comments:

Methoprene is not considered an eye or skin irritant (EPA Toxicity Category IV) and is not a human skin sensitizer (Reference 1).

## References

- USEPA. Office of Pesticide Programs. Reregistration Eligibility Decision Document, Isopropyl (2E, 4E) -11-Methoxy-3, 7, 11-Trimethyl-2, 4-Dodecadienoate (Referred to as Methoprene), List A, Case 0030. March 1991.
- International Union of Pure & Applied Chemistry. Pesticide Properties Database. Methoprene (Ref: OMS 1697). Date accessed 11/8/2013.
- Walker AN, Bush P, Puritz J, Wilson T, Chang ES, Miller T, Holloway K, Horst MN. Department of Pathology, School of Medicine, Mercer University, Macon, Georgia. Bioaccumulation and Metabolic Effects of the Endocrine Disruptor Methoprene in the Lobster, *Homarus americanus*. January 2005.
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