

Type	Terrestrial herbicide with pre-emergent and post-emergent control
Controls	Selective control of broadleaf weeds in grass plants.
Mode of Action	Inhibition of the enzyme 4-hydroxyphenylpyruvate dioxygenase (HPPD), disruption of carotenoid production and plant bleaching.

Thurston County Review Summary:

Mesotrione is considered high in hazard for the potential for chemical mobility although moderate in hazard for persistence and low in hazard for bioaccumulation. Short-term toxicity testing indicates that it is low in toxicity to almost all organisms although long-term toxicity testing produced developmental toxicity (toxicity to the offspring without affecting the mother). Risk assessments indicate that there is little risk from long-term exposures to mesotrione from herbicidal use (because the calculated exposure is so small), however, the hazard of developmental toxicity results in mesotrione receiving a conditional rating.

MOBILITY

Property	Value	Reference	Rating
Solubility (mg/L)	160	2	Moderate
Soil Sorption (Kd=mL/g)	Not found		
Organic Sorption (Koc=mL/g)	29-390	2	High

Mobility Summary:

Mesotrione is not very soluble in water and adheres poorly to soil. The potential to move off the site of application is rated as high.

PERSISTENCE

Property	Value	Reference	Rating
Vapor Pressure (mm Hg)	4.3 E-8	3	High
Biotic or Aerobic Half-life (days)	6-27	2	Low to moderate
Abiotic Half-life (days)	81-97 (photolysis)	2	High
Terrestrial Field Test Half-life (days)	5-18	1	Low to moderate
Hydrolysis Half-life (days)	Stable	2	High
Anaerobic Half-life (days)	4	2	Low
Aquatic Field Test Half-life (days)	4-7	2	Low

Persistence Summary:

Mesotrione is not expected to dissipate into the air or break down rapidly in sunlight. Laboratory testing indicates that degradation of mesotrione varies based on soil pH. It can take up to four weeks to degrade to half of the original concentration in soils with a pH below 6, but it usually takes less than two weeks in soils with pH values greater than (Reference 4). Thurston County soils tend to be more basic (pH values greater than 7) and therefore the hazard for persistence is rated as low to moderate.

BIOACCUMULATION

Property	Value	Reference	Rating
Bioaccumulation Factor	Not found		
Bioconcentration Factor	Not found		
Octanol/Water Partition Coefficient	Kow = 1.3	3	Low

Bioaccumulation Summary:

Testing indicates that mesotrione has no evidence of accumulating in mammals and is about 70% eliminated from the body within three days of ingestion. The hazard for bioaccumulation is considered low.

ACUTE TOXICITY HAZARD - ECOTOXICITY

Test Subject	Value	Reference	Rating
Mammalian (LD50)	>5,000 mg/kg	2	Low
Avian (LD50)	>2,000 mg/kg	2	Low
Honey bee or insect (LD50)	>11 ug/bee	2	Low
Annelida -worms (LC50)	437 mg/kg	2	Moderate
Fish (LC50)	>120 mg/L	2	Low
Crustacean (LC50)	>900 mg/L	2	Low
Mollusk (LC50)	Not found		
Amphibian (LD50 or LC50)	Not found		

Acute Toxicity Summary:

Single-dose toxicity testing of mesotrione indicates that it is low in toxicity to mammals, birds, bees, fish and other aquatic organisms - it is considered moderate in toxicity to worms.

ACUTE TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Adult applying to 80 - 1200 acres daily	0.33 mg/kg/day (calculated)	0.011 mg/kg/day (calculated)	30	Dermal + inhalation	3	Low
Worker contacting treated vegetation (scouting)	0.33 mg/kg/day (calculated)	0.002 mg/kg/day (calculated)	140	Dermal + inhalation	3	Low
Exposures from drinking water was not evaluated						
Combined routes of exposure were not evaluated						

Acute Toxicity Risk Assessment Summary

The risk of toxicity to workers mixing, loading and applying mesotrione herbicides is considered low in hazard. Also, the risk to people from exposures to treated vegetation is considered low in hazard.

CHRONIC TOXICITY HAZARDS

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	Not likely to be carcinogenic to humans	--	1	Low
Mutagenicity	--	"no concern"	1	Low
Neurotoxicity - (NOAEL)	Highest dose tested	No evidence	1	Low
Endocrine Disruption	Not found			
Developmental Toxicity (NOAEL)	2.1 mg/kg/day (LOAEL)	Delayed ossification in fetuses	1	High
Reproductive Toxicity (NOAEL)	0.3 mg/kg/day	Decreased litter size.	2	Check risk
Chronic Toxicity (NOAEL)	2.1 mg/kg/day (LOAEL)	Delayed ossification in fetuses	1	Check risk

Chronic Toxicity Summary:

Long-term toxicity testing produced developmental toxicity to the fetus in the form of reduced/delayed bone ossification (bone development or hardening) without maternal toxicity at the lowest dose tested. Active ingredients that cause developmental or reproductive toxicity to the fetus without toxicity to the parent results in a conditional or fail rating based on Thurston County's review criteria. Since there is more than a ten times safety factor between the calculated exposure and the dose of concern, mesotrione receives a conditional rating. Reproductive toxicity was observed at concentrations that caused maternal toxicity.

Mesotrione is considered not likely to be a carcinogen and is not considered a neurotoxin or mutagen (Reference 1).

CHRONIC TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Long-term skin contact exposures are not expected						
Combined routes of exposure were not evaluated						
Drinking water exposures were not evaluated						
Infant eating treated crops	0.0007mg/kg/day	0.00003 mg/kg/day	>20	Ingestion - diet	1	Low

Chronic Toxicity Risk Assessment Summary:

Although the use of herbicides by Thurston County would not include treating crops, exposures from eating treated food are shown because they represent the worst-case exposure and smaller exposures were not calculated.

Potential exposures to infants eating food from treated crops was calculated to be twenty times below the calculated dose of concern (Reference 1). Dietary exposures to adults were fifty times below the dose of concern. Exposures to treated vegetation are not expected to be long-term (longer than 30 days) and were not calculated. The long-term risk assessment used the lowest observable adverse effect level (LOAEL) of 2.1 mg/kg/day for developmental toxicity and added a safety factor of 3000 to get a exposure of concern value of 0.0007 mg/kg/day. All calculated long-term exposures were considered low in hazard.

Degradation Products:

AMBA [2-amino-4-(methylsulfonyl)benzoic acid]

MNBA [4-(methylsulfonyl)-2-nitrobenzoic acid]

Comments:

Mesotrione is considered a mild eye irritant, but is not a skin irritant or a skin sensitizer (Reference 1).

References

1. USEPA, Office of Prevention, Pesticides and Toxic Substances. Pesticide Fact Sheet: Mesotrione. June 4, 2001.
2. European Commission, Health & Consumer Protection Directorate-General. Mesotrione - SANCO/1416/2001 - Final. 14 April 2003.
3. New York State Department of Environmental Conservation, Division of Solid & Hazardous Materials. Mesotrione - Registration of Callisto Herbicide. June 10, 2002.
4. Dyson, Buelke, Brown, and Lane. Organic Compounds in the Environment - Adsorption and Degradation of the Weak Acid Mesotrione in the Soil and Environmental Fate Implications. Journal of Environmental Quality, Volume 31. March-April 2002.