

monosodium methanearsonate (MSMA)

Review Date: 5/13/2010

CAS #: 2163-80-6

Type	Selective contact herbicide
Controls	Post-emergent weed control in lawns, cotton and open areas.
Mode of Action	Interferes with ATP production and cell division.

Thurston County Review Summary:

All uses of monosodium methanearsonate (MSMA) in herbicides were not re-registered in the EPA's August 2006 review due to the high risk organic arsenical pesticides pose. However, the EPA allowed the use of MSMA on sod farms, golf courses, and highway rights-of-way until December 31, 2013 (and it still can be used for cotton). MSMA herbicides are rated as high in hazard for persistence, toxicity to non-target organisms, toxicity to adult applicators and to people interacting (playing or working) in treated vegetation. Herbicides containing MSMA as an active ingredient fail the County review criteria.

MOBILITY

Property	Value	Reference	Rating
Solubility (mg/L)	580,000	3	High
Soil Sorption (Kd=mL/g)	37	1	Moderate
Organic Sorption (Koc=mL/g)	1,680	2	Moderate

Mobility Summary:

MSMA is a salt of monomethyl methanearsonate (MMA) which MSMA dissociates to in water. The mobility of MSMA is based on the chemical properties of MMA, which adheres moderately to soils with or without organic matter. The risk for mobility is rated as moderate.

PERSISTENCE

Property	Value	Reference	Rating
Vapor Pressure (mm Hg)	Not found		
Biotic or Aerobic Half-life (days)	200	3	High
Abiotic Half-life (days)	Not found		
Terrestrial Field Test Half-life (days)	Not found		
Hydrolysis Half-life (days)	"stable"	3	High
Anaerobic Half-life (days)	Not determined	1	High
Aquatic Field Test Half-life (days)	Not found		

Persistence Summary:

MSMA is rated as high in hazard for persistence, especially since its degradation product (arsenic) is an element that will not break down or dissipate.

BIOACCUMULATION

Property	Value	Reference	Rating
Bioaccumulation Factor	Not found		
Bioconcentration Factor	Not found		
Octanol/Water Partition Coefficient	Log Kow = -3.1	3	Low

Bioaccumulation Summary:

The bioaccumulation potential of MSMA is rated as low.

ACUTE TOXICITY

Test Subject	Value	Reference	Rating
Mammalian (LD50)	2,449 mg/kg	1	Low
Avian (LD50)	1,667 mg/kg	2	Moderate
Honey bee or insect (LD50)	24 ug/bee	3	Low
Annelida -worms (LC50)	Not found		
Fish (LC50)	100 mg/L	3	Low
Crustacean (LC50)	58 mg/L	3	Moderate
Mollusk (LC50)	Not found		
Amphibian (LD50 or LC50)	Not found		

Acute Toxicity Summary:

Risk assessments for small animals and birds exposed to MSMA following herbicide applications to non-crop areas and to turf by ingesting a diet of insects or plants exceed the EPA's level of concern and are considered high in hazard.

ACUTE TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Residential handler and applicator	10 mg/kg/day	7.1 mg/kg/day	1.4 or more	Skin absorption	1	High
Toddler contact with treated turf not calculated						
Adult contact with treated turf not calculated						
Occupational applicator and handler	10 mg/kg/day	1.7 mg/kg/day	5.8	Skin absorption	1	Moderate

Acute Toxicity Risk Assessment Summary

Exposures to turf following an herbicide treatment containing MSMA combines skin absorption, hand-to-mouth, object-to-mouth and incidental soil ingestion for toddlers and skin absorption for adults. The EPA states that all scenarios tested were below the calculated dose of concern - but the calculation was not presented (so the safety factor is unknown). This lack of data results in a significant data gap.

Potential exposures to residential applicators that mix and load MSMA containing herbicide can reach over half of the calculated dose of concern. These exposures are rated high in hazard. Occupational exposures include workers who mix, handle, and apply these herbicides (according to labeled directions). These potential exposures are rated as moderate in hazard because they are nearly six times less than the calculated dose of concern.

CHRONIC TOXICITY

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	"no evidence for carcinogenicity"	--	1	Low
Mutagenicity	Not found	--	--	Data gap
Neurotoxicity - (NOAEL)	Not found	--	--	Data gap
Endocrine Disruption	"no evidence of endocrine disruption"	--	1	Low
Developmental Toxicity (NOAEL)	--	"no increased susceptibility"	1	Low
Reproductive Toxicity (NOAEL)	--	"no increased susceptibility"	1	Low
Chronic Toxicity (NOAEL)	3.2 mg/kg/day	histopathology of thyroid and G.I. tract	1	Check risk

Chronic Toxicity Summary:

There was very little data available for long-term exposure toxicity testing. MSMA is not considered a carcinogen and there is no evidence that suggests that it is a reproductive or developmental toxicant.

CHRONIC TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Long-term exposure to treated plants not expected						
Child (1-2 years) drinking treated water	0.03 mg/kg/day	0.004 mg/kg/day	7.5	Ingestion	1	Moderate
Infant drinking treated water	0.03 mg/kg/day	0.0088 mg/kg/day	3.4	Ingestion	1	Moderate
Dietary exposures were not evaluated						

Chronic Toxicity Risk Assessment Summary:

Long-term exposures were calculated for the potential of people drinking water that was contaminated from runoff after a turf grass application. Long-term exposures to people drinking treated runoff water is rated as moderate in hazard.

Exposures to MSMA through contact with treated vegetation from residential / recreational herbicide treatments are not expected to be long-term and risk assessments were not calculated.

Degradation Products:

The metabolite arsenic is classified as a human carcinogen. Other metabolites include volatile alkylarsines and carbon dioxide.

Comments:

MSMA can cause reversible conjunctival irritation in the eyes (EPA category III), it is a slight skin irritant (EPA category IV) but is not considered a skin sensitizer (Reference 1).

References

- USEPA. Revised Reregistration Eligibility Decision for MSMA, DSMA, CAMA, and Cacodylic Acid. August 10, 2006.
- Scorecard - The Pollution Information Site. Health Effects (Accessed 5/10/2010). <http://www.scorecard.org/health-effects/>
- International Union of Pure & Applied Chemistry (IUPAC). Pesticide Properties Database (Accessed 5/13/2010). [Http://sitem.herts.ac.uk/aeru/iupac/](http://sitem.herts.ac.uk/aeru/iupac/)