

MCPA 2-ethylhexyl ester

Review Date: 6/18/2009

Type	Terrestrial - systemic, post-emergent herbicide.
Controls	Selective control of annual and perennial broad leaved weeds in cereals and other specific crops, grassland, turf, under fruit trees, along roadsides and embankments.
Mode of Action	MCPA interferes with protein synthesis, cell division, and ultimately the growth of non-resistant plants (Reference 2)

Thurston County Review Summary:

MCPA 2-ethylhexyl ester will quickly break down in the environment to create the herbicidally active chemical MCPA acid. MCPA acid is considered high in hazard for mobility, moderately persistent, and is not considered a hazard for bioaccumulation. The potential chemical exposures to adults mixing and applying herbicides containing MCPA 2-ethylhexyl ester and to women working in treated turf grass, are considered high in hazard for toxicity.

The risk to birds eating short grass that has been treated with MCPA exceeds the EPA's level of concern which Thurston County rates as high in hazard for non-target toxicity.

Herbicides containing MCPA 2-ethylhexyl ester fail Thurston County's review criteria due to the risks to non-target organisms at expected environmental concentrations.

MOBILITY

Property	Value	Reference	Rating
Solubility (mg/L)	825	2	Moderate
Soil Sorption (Kd=mL/g)	0.6	1	High
Organic Sorption (Koc=mL/g)	50-60	5	High

Mobility Summary:

MCPA 2-ethylhexyl ester will rapidly breakdown to MCPA acid which is moderately soluble in water and adheres poorly to all soil types. MCPA 2-ethylhexyl ester is considered high in hazard for mobility.

PERSISTENCE

Property	Value	Reference	Rating
Vapor Pressure (mm Hg)	0.000006	1	Moderate
Biotic or Aerobic Half-life (days)	24	1	Moderate
Abiotic Half-life (days)	Not found		
Terrestrial Field Test Half-life (days)	<30	2	Moderate
Hydrolysis Half-life (days)	Stable	6	High
Anaerobic Half-life (days)	Not found		
Aquatic Field Test Half-life (days)	>30	1	Moderate

Persistence Summary:

After a terrestrial application, MCPA acid will volatilize (evaporate) slightly but mainly will be degraded by soil organisms. In both aquatic and terrestrial settings, MCPA acid can be expected to degrade to half of the applied concentration between 14 and 60 days (Reference 1). MCPA acid is rated as moderately persistent in the environment.

BIOACCUMULATION

Property	Value	Reference	Rating
Bioaccumulation Factor	Not found		
Bioconcentration Factor	39	1	Low
Octanol/Water Partition Coefficient	log Kow = 2.8	1	Moderate

Bioaccumulation Summary:

MCPA acid has a moderate affinity to fats and oils although the bioconcentration rating by the EPA indicates that there is little potential for bioaccumulation. The bioaccumulation hazard for MCPA is considered low.

ACUTE TOXICITY

Test Subject	Value	Reference	Rating
Mammalian (LD50)	1,793 mg/kg	1	Moderate
Avian (LD50)	314 mg/kg	1	Moderate
Honey bee or insect (LD50)	104 ug/bee	2	Low
Annelida -worms (LC50)	Not found		
Fish (LC50)	117 mg/L	2	Low
Crustacean (LC50)	Highly toxic	1	High
Mollusk (LC50)	Not found		
Amphibian (LD50 or LC50)	Not found		

Acute Toxicity Summary:

In the single-dose developmental toxicity studies with MCPA 2-ethylhexyl ester, there was some concern over the potential for developmental neurotoxicity which resulted in an additional ten-times safety factor to be added to the acute risk assessments (which was later dropped down to a three-times safety factor).

Toxicity testing of MCPA acid also indicates that it is moderately toxic to animals and birds, practically non-toxic to bees and fish, but highly toxic to other aquatic organisms. Ecotoxicity studies show that there is a potential short-term exposure to birds that eat short grass that exceeds the EPA's level of concern at application rates of 1.5 pounds of active ingredient per acre or greater.

ACUTE TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Applicator applying herbicide to right of ways	Not provided	Not provided	<2	Dermal, ingestion inhalation	1	High
Adult mixing/applying with hose end sprayer	Not provided	Not provided	Calculated as <3	Dermal + inhalation	1	Moderate
Woman performing yardwork in treated turf	Not provided	Not provided	Calculated as <2	Dermal + incidental ingestion	1	High
Infant playing in treated turf grass	Not provided	Not provided	<1	Dermal + ingestion	1	High

Acute Toxicity Risk Assessment Summary

The EPA evaluated the potential worst-case exposures for 4 different occupational applicator scenarios. Since the minimum application area was 40 acres, the scenarios truly only reflect non-residential applicator exposures. Following all label safety precautions, the exposure to an applicator performing a right-of-way application is considered high in hazard. Groundboom and broadcast spreader applications are considered low in hazard to the applicator (aerial applications are not applicable).

Seven homeowner applicator scenarios were reviewed and two were considered low in hazard, applying granules with a broadcast spreader and applying liquids with a hand-held pump. All other homeowner application exposure scenarios (shaker can, belly grinder, hose-end sprayer, and ready-to-use sprayer) rated as a moderate hazard for toxicity.

The EPA's exposure evaluation to treated turf was confusing. The tables provided in the EPA review indicate that the exposure to both women and toddlers are above the calculated dose of concern. However, the EPA states that the skin absorption factor was overstated and exposures were recalculated and are likely to be at least 3 times less than what was listed in their tables (the uncertainty factor was lowered from 10 to 3). Even with this revision, the potential exposures to toddlers are still above the EPA dose of concern and are rated as high in hazard.

CHRONIC TOXICITY

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	"Not likely"	No human data suggesting potential for cancer	3	Low
Mutagenicity	Not mutagenic	- -	6	Low
Neurotoxicity - (NOAEL)	Data gap	- -	1	Moderate
Endocrine Disruption	Not listed	- -	4	Low
Developmental Toxicity (NOAEL)	50 mg/kg/day	"clinical signs"	1	Check risk
Reproductive Toxicity (NOAEL)	150 mg/kg/day	Decreased pup weight	1	Check risk
Chronic Toxicity (NOAEL)	4.4 mg/kg/day	Hepatotoxicity	1	Check risk

Chronic Toxicity Summary:

MCPA acid is not considered carcinogenic, mutagenic nor is it a known endocrine disruptor. Reproductive and developmental toxicity was seen at concentration above those that caused maternal toxicity.

CHRONIC TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Post-application contact exposure was not assessed						
Aggregate exposure not evaluated						
Drinking water exposure not evaluated						
Dietary exposures were not evaluated						

Chronic Toxicity Risk Assessment Summary:

The long-term exposures to MCPA acid from herbicidal use that were identified by the EPA involved using these products on food crops. Thurston County's pesticide reviews do not look at the potential exposures from food and no other long-term exposures are expected from County uses. The hazard for toxicity from long-term exposures to MCPA acid, from non-crop herbicidal use, is considered low.

Degradation Products:

In plants and animals, MCPA acid's major metabolite is 2-methyl-4-chlorophenol (Reference 2). 4-Chloro-o-cresol and 3-methyl-5-chlorocatechol are the two major metabolites of MCPA acid by microbial degradation in soil (Reference 5).

Comments:

MCPA 2-ethylhexyl ester is considered a SKIN SENSITIZER, but is not considered an eye or skin irritant (EPA toxicity category IV) - Reference 1.

References

- USEPA. Office of Prevention, Pesticides and Toxic Substances. Reregistration Eligibility Document (RED) ; MCPA, List A Case 0017. September 9, 2004.
- EXTOXNET PIP - MCPA. <http://extoxnet.orst.edu/pips/MCPA.htm>. Revised June 1996.
- USEPA. Science Information Management Branch, Health Effects Division, Office of Pesticide Programs. Chemicals Evaluated for Carcinogenic Potential. July 19, 2004.
- http://www.scorecard.org/health-effects/chemicals-2.tcl?short_hazard_name=endo&all_p=t
- Spectrum Laboratories, Inc. Chemical Fact Sheet, Chemical Abstract Number (CAS #) 94746, MCPA. <http://www.speclab.com/compound/c94746.htm>
- Federal-Provincial-Territorial Committee on Drinking Water, Health Canada. 2-Methyl-4-chlorophenoxyacetic Acid (MCPA) in Drinking Water. October 2006.