chlorsulfuron

Review Date: 6/11/2010
CAS #: 64902-72-3

Type	Pre-emergent and post-emergent systemic herbicide (root absorption)
Controls	Selective control of many most broadleafed weeds and certain grass species.
Mode of Action	Inhibits the activity of acetolactate synthase, which is an enzyme required for plant cell growth.

Thurston County Review Summary:

Herbicides containing chlorsulfuron as the sole active ingredient are rated as high in hazard for the potential to move off the site of application with rain or irrigation water. Chlorsulfuron breakdown is dependent on environmental conditions (the lower the pH the quicker it breaks down), but it is likely to reach half of the applied concentration within 60 days and is rated as moderate in hazard for persistence. It is not expected to accumulate in fish or animals and is considered low in toxicity to animals, fish, bees, and birds. It may be moderately toxic to earthworms and some aquatic crustaceans, but the risk of injury to aquatic organisms is considered low. Risk of toxicity to occupational handlers and applicators is considered low but the risk to toddlers and adult applicators interacting with treated turf is considered moderate.

There are no long-term exposures to chlorsulfuron expected from non-agricultural use of chlorsulfuron containing herbicides but toxicity testing indicated that chlorsulfuron can produce reproductive toxicity which is an unacceptable hazard for Thurston County's IPM Policy.

MOBILITY

Property	Value	Reference	Rating
Solubility (mg/L)	12500	2	High
Soil Sorption (Kd=mL/g)	0.42	2	High
Organic Sorption (Koc=mL/g)	36.3	2	High

Mobility Summary:

Chlorsulfuron is very soluble in water and binds poorly to soil with or without organic matter. The mobility hazard for chorsulfuron is rated as high.

PERSISTENCE

Property	Value	Reference	Rating
Vapor Pressure (mm Hg)	4.6 E-6	1	Moderate
Biotic or Aerobic Half-life (days)	160	2	High
Abiotic Half-life (days)	51	2	Moderate
Terrestrial Field Test Half-life (days)	36	2	Moderate
Hydrolysis Half-life (days)	Stable at pH = 7	2	High
Anaerobic Half-life (days)	26	2	Moderate
Aquatic Field Test Half-life (days)	21	2	Moderate

Persistence Summary:

Persistence tests in the field and in the laboratory indicate that chlorsulfuron can breakdown to half of the applied concentration as quickly as 10 days or it may take over 180 days (depending on the environmental conditions). In field test the data indicates that it is a moderate hazard for persistence but laboratory tests indicate that it has the potential to be high hazard for persistence. Overall, the peristence hazard for chlorsulfuron is rated as moderate due to the field tests ranging from 11 days to 70 days (with 60 days being the cut off for high persistence).

BIOACCUMULATION

Property	Value	Reference	Rating
Bioaccumulation Factor	Not found		
Bioconcentration Factor	75	2	Low
Octanol/Water Partition Coefficient	0.045	1	Low

Bioaccumulation Summary:

The octanol / water partition coefficient for chlorsulfuron is very low, which indicates that this chemical is not likely to bind to fatty tissue and oils within an organism and accumulate. Metabolism studies indicate that chlorsulfuron is rapidly absorbed, metabolized and eliminated from the body (about 60% - 70% in urine and 20% - 30% in feces). The bioaccumulation potential is rated low in hazard.

ACUTE TOXICITY

Test Subject	Value	Reference	Rating
Mammalian (LD50)	5,500 mg/kg	1	Low
Avian (LD50)	>5,000 ppm	1	Low
Honey bee or insect (LD50)	25 ug/bee	1	Low
Annelida -worms (LC50)	>750 mg/kg	2	Moderate
Fish (LC50)	>122 mg/L	2	Low
Crustacean (LC50)	89 mg/L	1	Moderate
Mollusk (LC50)	Not found		
Amphibian (LD50 or LC50)	Not found		

Acute Toxicity Summary:

Short-term toxicity testing of chlorsulfuron indicates that it is low in toxicity to mammals, birds, fish and bees but may be moderately toxic to earthworms and certain crustaceans. Risk to these organisms after the use of a chlorsulfuron containing herbicide is considered low in hazard because the expected exposures are at least 100 times less than the calculated dose of concern.

Chlorsulfuron is a potential threat to non-target vegetation from spray drift and runoff. Because this chemical is considered mobile and persistent and because it can adversely effect the reproduction process of plants (fruit and seed production) at very low concentrations, it is very possible that non-target plants may be injured or killed if they are near an area that has been sprayed.

ACUTE TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Occupational handler and applicator	0.25 mg/kg/day	< 0.0025 mg/kg/day	>100	Skin absorption and inhalation	1, 3	Low
Toddlers interacting with spot treated turf	0.25 mg/kg/day	0.097 mg/kg/day	2.6	Skin and incidental ingestion	3	Moderate
Adult residentail applicator	0.25 mg/kg/day	0.034 mg/kg/day	7.4	Skin absorption (possible ingestion)	3	Moderate
Drinking contaminated water was not calculated						

Acute Toxicity Risk Assessment Summary

Risk of toxicity from one-day exposures to chlorsulfuron from herbicidal use is considered low for occupational applicators (wearing appropriate protective clothing). Residential use on turf can result in an exposure to a toddler playing in the yard that is almost half of the calculated dose of concern. Potential exposures to adults applying herbicide in a residential setting can have an exposure that is about 7 times less than the dose of concern. Both of the worst-case scenarios for exposure from use in a residential setting is rated as moderate in hazard.

CHRONIC TOXICITY

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	Group E	No evidence of human carcinogenicity	1	Pass
Mutagenicity	- -	"no evidence of chromasomal abberations"	3	Pass
Neurotoxicity - (NOAEL)	Not found			
Endocrine Disruption	Not listed	- -	4	Low
Developmental Toxicity (NOAEL)	200 mg/kg/day	Decreased fetal weight	3	Low
Reproductive Toxicity (NOAEL)	25 mg/kg/day	Decreased fertility	3	High
Chronic Toxicity (NOAEL)	5 mg/kg/day	Decreased body weights	3	Check risk

Chronic Toxicity Summary:

Developmental toxicity was seen at concentrations above the maternally toxic doses, although in multigenerational reproductive testing there was decreased fertility observed without any other toxicity noted. The reproductive toxicity test was not acceptable by the EPA's current registration standards and is rated as high in hazard by Thurston County due to reproductive toxicity without maternal toxicity.

CHRONIC TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Long-term residential exposures are not expected						
Long-term occupational risk was not evaluated						
Exposures from drinking water are not calculated						
Other long-term exposure were not evaluated						

Chronic Toxicity Risk Assessment Summary:

Long-term risk assessments that were evaluated by the EPA included dietary and drinking water exposures only. The drinking water exposure scenario was considered to be below the EPA level of concern and was not mathmatically presented in the text (so it could not be evaluated). County use of herbicides would not result in a dietary exposure so it is no evaluated.

Long-term exposures to chlosulfuron from herbicidal use by the County is rated as low in hazard.

DegradationProducts:

2-chlorobenzenesulfonamide, N-demethyl triazine amine, and N-[(N-carbamoylcarbamimidoyl)carbamoyl]-2-chlorobenzenesulfonamide are all considered major degredation products of chlorsulfuron.

Comments:

Chlorsulfuron is not considered an eye or skin irritant but it is unknown if it is a skin sensitizer.

References

1. USEPA. Revised Reregistration Eligibility Decision for Chlorsulfuton. May 20, 2005.
2. International Union of Pure & Applied Chemistry (IUPAC). Pesticide Properties Database, chlorsulfuron. (Accessed 6/11/2010). Http://sitem.herts.ac.uk/aeru/iupac/
3. USEPA. Chlorsulfuron; Pesticide Tolerance. Federal Register: August 14, 2002 (Volume 67, Number 157).
4. Scorecard - The Pollution Information Site. Health Effects (Accessed 6/11/2010). http://www.scorecard.org/health-effects/