

Type	Pre-emergent and post-emergent selective terrestrial herbicide.
Controls	Selective for certain broadleaved and grass weeds in crop and non-crop areas (including turf grass).
Mode of Action	Stops cell division.

Thurston County Review Summary:

Herbicide products containing pendimethalin as an active ingredient are rated high in hazard and fail Thurston County's review criteria. Pendimethalin is considered high in hazard because the EPA classifies it as a possible human carcinogen, it tested positive for mutagenicity, and it is considered an endocrine disruptor. It is also rated high in hazard for chemical persistence and moderate in hazard for bioaccumulation potential.

MOBILITY

Property	Value	Reference	Value Rating
Water Solubility (mg/L)	0.3	1	Low
Soil Sorption (Kd=mL/g)	228	1	Low
Organic Sorption (Koc=mL/g)	17,581	1	Low

Mobility Summary:

Pendimethalin is not very soluble in water and binds well to all soil types. The hazard of pendimethalin to move off the site of application with rain or irrigation water is rated low.

PERSISTENCE

Property	Value	Reference	Value Rating
Vapor Pressure (mm Hg)	0.000003	1	Moderate
Biotic or Aerobic Half-life (days)	172 (high end average)	2	High
Abiotic Half-life (days)	Stable	2	High
Terrestrial Field Test Half-life (days)	34	2	Moderate
Hydrolysis Half-life (days)	Stable	1	High
Anaerobic Half-life (days)	6 to 105 (sediment)	2	High
Aquatic Field Test Half-life (days)	21 photolysis	2	Moderate

Persistence Summary:

Some of the applied pendimethalin will dissipate into the air but on the ground it is slowly degraded by soil microbes. Because it is likely to take more than 60 days to degrade to half of the applied concentration, it is rated high in hazard for persistence.

BIOACCUMULATION

Property	Value	Reference	Value Rating
Bioaccumulation Factor	Value not found		
Bioconcentration Factor	5,100	1	High
Octanol/Water Partition Coefficient	log Kow = 5.2	1	High

Bioaccumulation Summary:

Pendimethalin has a high octanol/water partition coefficient suggesting that it has a strong tendency to bind to organic solvents and therefore may accumulate in fish or animal tissue. Bioconcentration testing shows that pendimethalin accumulates readily in fish tissue although the EPA states that the chemical is rapidly removed when the fish are moved to clean water (depurated). Pendimethalin is quickly metabolized by rats with up to 90% eliminated from their bodies within 24 hours. Overall, pendimethalin is rated moderate for bioaccumulation potential because testing shows there is accumulation in fish but it is quickly depurated and it is rapidly eliminated from animals.

ACUTE TOXICITY HAZARD - ECOTOXICITY

Test Subject	Value	Reference	Value Rating
Mammalian (LD50)	1,050 mg/kg	2	Moderate
Avian (LD50)	1,421 mg/kg	1	Moderate
Honey bee or insect (LD50)	100 ug/bee	1	Low
Annelida -worms (LC50)	>1,000 mg/kg	1	Low
Fish (LC50)	0.138 mg/L	2	High
Crustacean (LC50)	0.28 mg/L	1	High
Mollusk (LC50)	0.21 mg/L	2	High
Amphibian (LD50 or LC50)	Value not found		

Acute Toxicity Testing and Ecotoxicity Summary:

Single-dose toxicity testing indicates that pendimethalin is low in toxicity to bees and worms, moderate in toxicity to animals and birds, but highly toxic to fish and other aquatic organisms. Ecological risk assessments calculate the worst-case post-application exposure to birds is from turf grass applications, which slightly exceeds the EPA's level of concern and is rated moderate in hazard. Risk to animals and bees is below the EPA's level of concern and is rated low in hazard. Risk to fish and aquatic organisms from post-application exposures to pendimethalin following applications to turf, landscape, ornamentals, and other non-crop areas is expected to be minimal.

ACUTE TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Value Rating
Adult applying to 1,000 sq ft with backpack spray	Dermal (skin)	0.1 mg/kg/day	0.0003 mg/kg/day	333	2	Low
Homeowner applying to 1 acre with handwand	Dermal	0.1 mg/kg/day	0.013 mg/kg/day	7.7	2	Moderate
Adult using drop spreader to apply to 1 acre	Dermal	0.1 mg/kg/day	0.012 mg/kg/day	8.3	2	Moderate
Child playing in treated lawn	Dermal	0.1 mg/kg/day	0.091 mg/kg/day	1.1	2	High

Acute Toxicity Risk Assessment Summary:

Homeowners applying herbicide with low pressure handwand (to 1,000 square foot area) or broadcast spreader (to 1 acre), can produce potential dermal exposures that are about 12% of the dose of concern and are rated moderate in hazard. Potential exposures to adults using a backpack spray applicator to a 1,000 square foot area are rated low in hazard (at least 300 times less than the calculated dose of concern). Potential exposures to children playing in grass on the day it was treated, and for the following 2 days, could reach over half of the dose of concern and are rated high in hazard (at the approved label application rate of 2 lbs/acre).

CHRONIC TOXICITY HAZARDS

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	Group C	Possible human carcinogen	2	High
Mutagenicity	50 to 5,000 ug/plate	Reverse gene assay dose-related mutation	2	High
Neurotoxicity - (NOAEL)	Data not found			
Endocrine Disruption	10 mg/kg/day	Thyroid toxicity	2	High
Developmental Toxicity (NOAEL)	60 mg/kg/day	No developmental toxicity	2	Low
Reproductive Toxicity (NOAEL)	25 mg/kg/day	Pup weight and possible decrease in survival	2	Moderate
Chronic Toxicity (NOAEL)	10 mg/kg/day	Thyroid toxicity	2	Check risk

Chronic Toxicity Hazard Summary:

The tests for developmental toxicity were negative but reproductive toxicity was observed along with maternal toxicity (which is rated moderate in hazard). Pendimethalin is considered a possible human carcinogen and is also toxic to the thyroid (which makes it an endocrine disruptor), both of these potential toxicities are rated high in hazard by Thurston County. Pendimethalin has tested positive in a dose-related reverse gene mutation assay which is also rated high in hazard by Thurston County.

CHRONIC TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Value Rating
Worker applying to 10 acre (no chemical gloves)	Dermal (skin)	0.1 mg/kg/day	0.069 mg/kg/day	1.4	2	High
Worker applying to 1 acre (with chemical gloves)	Dermal	0.1 mg/kg/day	0.023 mg/kg/day	4.35	2	Moderate
Adult working in treated turf	Dermal	0.1 mg/kg/day	0.003 mg/kg/day	33	2	Low
Non-dietary long-term exposures are not expected						

Chronic Toxicity Risk Assessment Summary:

Worker exposures to pendimethalin were evaluated for short-term and intermediate-term exposures (one week to several months in duration). Potential occupational dermal exposures from mixing and applying to 10-acres of right-of-way, with a right of way sprayer, is more than half of the dose of concern and is rated high in hazard. Occupational applicators that spot-treat to one acre (using backpack sprayer with no gloves or low pressure hand wand with chemically resistant gloves) can result in exposures that are rated moderate in hazard. Post-application risk to workers performing activities with treated turf are about 30 times less than the dose of concern and are rated low in hazard.

Long-term exposures (over one year in duration) were only calculated for dietary exposures because long-term post-application exposures to pendimethalin are not expected. Risk from dietary exposures are not considered in Thurston County's pesticide review criteria.

Metabolites and Degradation Products:

Metabolites of pendimethalin include 3,5-Dinitrobenzyl alcohol and 2,4-Dinitrobenzyl alcohol (Reference 2).

Comments:

Pendimethalin is considered a slight eye irritant (EPA Toxicity Category III) but is not considered a skin irritant (EPA Toxicity Category IV) and not a skin sensitizer (Reference 2).

References

1. International Union of Pure & Applied Chemistry. Pesticide Properties Database. Pendimethalin (Ref: AC 92553). Accessed 10/5/2011. <http://sitem.herts.ac.uk/aeru/iupac/>
2. USEPA. Prevention, Pesticides and Toxic Substances. Reregistration Eligibility Decision for Pendimethalin. EPA 738-R-07-007. June 1997.