

Type	Synthetic pyrethroid insecticide and acaricide
Controls	Insects and spiders
Mode of Action	Neurotoxin - it interferes with nerve transmission which causes hyperactivity of the nervous system resulting in paralysis and death.

**Thurston County Review Summary:**

Cyfluthrin is the name given to an equal mixture of four chemical isomers (same chemical compound with different arrangements), whereas beta-cyfluthrin is an enrichment of these isomers resulting in a product with about 97% of the two most insecticidally active isomers (Reference 4). The EPA expects that the environmental fate and ecological effects of cyfluthrin and beta-cyfluthrin are similar, so they used data for cyfluthrin whenever specific data for beta-cyfluthrin was lacking.

Beta-cyfluthrin is rated high in hazard and products containing it fail Thurston County's pesticide review criteria. Beta-cyfluthrin is rated high in hazard because in toxicity testing it produced developmental toxicity and toxicity to offspring without toxicity to the parent.

## MOBILITY

Property	Value	Reference	Value Rating
Water Solubility (mg/L)	0.002	3	Low
Soil Sorption (Kd=mL/g)	1,116 - 1,793	3	Low
Organic Sorption (Koc=mL/g)	73,480 - 124,000	3	Low

**Mobility Summary:**

Beta-cyfluthrin is not soluble in water and binds well to all soil types. The hazard for beta-cyfluthrin 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)	0.000000015	3	High
Biotic or Aerobic Half-life (days)	74 - 95	3	High
Abiotic Half-life (days)	Value not found		
Terrestrial Field Test Half-life (days)	18 - <32	3	Moderate
Hydrolysis Half-life (days)	"Resistent" (neutral or acidic)	3	High
Anaerobic Half-life (days)	about 30 (soil)	3	Moderate
Aquatic Field Test Half-life (days)	32 - 42	3	Moderate

**Persistence Summary:**

Beta-cyfluthrin can break down rapidly in sunlight although in aquatic, field, and laboratory testing it is moderate to high in persistence. The overall hazard for chemical persistence is rated moderate (likely to degrade to half of the applied concentration within 60 days).

## BIOACCUMULATION

Property	Value	Reference	Value Rating
Bioaccumulation Factor	Value not found		
Bioconcentration Factor	854 whole fish	3	Moderate
Octanol/Water Partition Coefficient	log Kow = 5.97	3	High

**Bioaccumulation Summary:**

An octanol/water partition coefficient value larger than five indicates that the chemical has the potential to accumulate in fish or animal tissue. When fish were placed into treated water, the concentration of cyfluthrin in the fish was up to 854 times higher than the water concentration (which is considered moderate accumulation). When contaminated fish are moved to clean water, half of the cyfluthrin is flushed (depurated) from their bodies in less than 3 days (Reference 3). In rat metabolism studies, cyfluthrin was quickly absorbed and eliminated from the body in urine and feces (98% eliminated within 48 hours). Based on moderate accumulation in fish (with rapid depuration) along with complete metabolism and elimination in animals, the bioaccumulation hazard is rated low.

# ACUTE WILDLIFE TOXICITY VALUES and Risk Assessment

Test Subject	Value	Reference	Value Rating
Mammalian (LD50)	960 mg/kg bw	3	Moderate
Avian (LD50)	>5,000 mg/kg bw	3	Low
Honey bee or insect (LD50)	0.037 ug/bee	3	High
Annelida -worms (LC50)	>1,000 mg/kg	5	Low
Fish (LC50)	0.000068 mg/L	3	Very high
Crustacean (LC50)	0.00029 mg/L	3	Very high
Mollusk (LC50)	0.0027 mg/L	3	Very high
Amphibian (LD50 or LC50)	Value not found		

## Acute Toxicity Testing and Ecotoxicity Summary:

Single-dose toxicity testing indicates that beta-cyfluthrin is low in toxicity to birds and worms, moderately toxic to animals, and highly to very highly toxic to bees, fish, and other aquatic organisms. Use of beta-cyfluthrin on flowering plants can have adverse effects on beneficial pollinators. Although the EPA states that the ecological risk assessments for cyfluthrin and beta-cyfluthrin is incomplete, they note that the preliminary assessment indicates a concern for freshwater and estuarine/marine organisms (including sediment dwelling organisms). These risks are likely associated with large agricultural uses, overspray into waterbodies, or runoff from large broadcast applications. It is unlikely that residential uses of these insecticide products would produce enough runoff to create a significant risk to aquatic organisms - but care should be taken to keep these products from leaving your property (avoid using on impervious surfaces or bare soil). Based on the currently available data from the EPA, the hazard for toxicity to non-target aquatic organisms is rated moderate. This will be reassessed when the EPA publishes the results from an updated ecological risk assessment.

# ACUTE HUMAN TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Value Rating
Adult residential applicator to turf	Inhalation	0.0007 mg/kg/day	0.000011 mg/kg/day	64	4	Low
Infant playing in treated lawn	Inhalation	0.0007 mg/kg/day	0.000035 mg/kg/day	20	4	Low
Adult working in treated lawn	Inhalation	0.0007 mg/kg/day	0.000012 mg/kg/day	17	4	Low
Infant's combined turf exposure	Inhalation, dermal, oral	Combined value not provided	Combined value not provided	13.5	4	Low

## Acute Toxicity Risk Assessment Summary:

In reviewing incident reports, the EPA determined that there were moderately large numbers of exposure incidents involving cyfluthrin pesticides. Due to the large number of incidents (including those at registered application rates), the EPA has determined that it warrants further analysis during the risk assessment phase of the re-registration process (in about 2015). The following is a summary of the existing risk assessment for current registration.

Short-term (1 to 30 day exposure) risk assessments were performed by the EPA to evaluate the potential risk to humans for indoor and outdoor uses of cyfluthrin products. The EPA evaluated potential exposures from dermal (skin), inhalation, and incidental ingestion following a single application at the highest application rate. The worst-case exposures were calculated for adults applying product to turf, adults working in treated turf, infants playing in treated turf, and infants playing on treated carpets following a carpet application. Each potential short-term exposure from indoor and outdoor uses was calculated to be less than 10% of the dose of concern (rated low in hazard).

# CHRONIC HUMAN TOXICITY HAZARDS

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	"Not likely to be carcinogenic to humans"	- -	4	Low
Mutagenicity	Value not found	"No evidence"	4	Low
Neurotoxicity - (NOAEL)	0.024 mg/kg/day	Altered gait, posture +	4	Check risk
Endocrine Disruption	Value not reported	Affects to androgen system	2	Moderate
Developmental Toxicity (NOAEL)	Value not found	Decreased brain weights +	4	High
Reproductive Toxicity (NOAEL)	Value not found	Decreased viability	4	High
Chronic Toxicity (NOAEL)	0.024 mg/kg/day	Neurotoxicity - gait, posture	4	Check risk

## Chronic Toxicity Hazard Summary:

The EPA evaluated a preliminary set of toxicity test data to determine if cyfluthrin affects the endocrine system. They noted that cyfluthrin and beta-cyfluthrin may have the potential to interact with the androgen system and they are requiring more testing before a final evaluation is made (Reference 2). Based on the preliminary EPA review, which included a mixture of positive and negative results, the endocrine disruption hazard is rated moderate. In reproductive and developmental toxicity studies, adverse effects to the fetus were observed without parental toxicity - indicating the potential for an increased susceptibility to infants or developing fetuses. Developmental or reproductive toxicity without parental toxicity is considered high in hazard by Thurston County's pesticide review criteria. Beta-cyfluthrin is not considered a human carcinogen or a chemical mutagen.

# CHRONIC HUMAN TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Value Rating
Infant playing in treated lawn	Inhalation	0.0002 mg/kg/day	0.000035 mg/kg/day	5.6	4	Moderate
Adult residential applicator to turf	Inhalation	0.0002 mg/kg/day	0.000011 mg/kg/day	18	4	Low
Adult's combined carpet exposure	Inhalation, dermal, oral	Combined value not provided	Combined value not provided	5.4	4	Moderate
Infant's combined turf exposure	Inhalation, dermal, oral	Combined value not provided	Combined value not provided	5	4	Moderate

## Chronic Toxicity Risk Assessment Summary:

Intermediate-term (exposures from 1 to 6 months in duration) risk assessments were performed by the EPA to evaluate the potential risk to humans for indoor and outdoor uses of cyfluthrin products. The EPA evaluated potential exposures from dermal (skin), inhalation, and incidental ingestion following a single application at the highest application rate. The worst-case exposures were calculated for adults applying product to turf, adults working in treated turf, infants playing in treated turf, and infants playing on treated carpets following a carpet application. The intermediate exposures that were calculated to be between 10% and 20% of the dose of concern (rated moderate in hazard) include; adult's exposure to treated carpet, infant's combined exposure to treated carpet, infant or child's inhalation exposure (or combined exposure) while playing on treated turf. Other potential post-application exposures are rated low in hazard.

Occupational exposures were evaluated for large scale agriculture applications which are not reflective of Thurston County uses and are not rated for this review. Other long-term exposures were not evaluated by the EPA at this time but may be required for the future reregistration of beta-cyfluthrin (in about 2015).

## Metabolites and Degradation Products:

Beta-cyfluthrin is expected to degrade to the chemicals: 3-(2,2-dichlorovinyl)-2,2-dimethyl-cyclopropanecarboxylic acid (DCVA), 4-fluoro-3-phenoxybenzaldehyde (FPB-ald) and 4-fluoro-3-phenoxybenzoic acid (FPB-acid) (Reference 3).

## Comments:

Beta-cyfluthrin is a eye irritant (EPA Toxicity Category III), a mild skin irritant (EPA Toxicity Category IV), but not a skin sensitizer (Reference 4).

## References

1. USEPA. Docket Number EPA-HQ-OPP-2010-0684. Cyfluthrins Summary Document Registration Review: Initial Docket. September, 2010.
2. USEPA. Office of Chemical Safety and Pollution Prevention. Memorandum from: Greg Akerman Ph.D., Endocrine Disruptor Review Team. To: Yan Donovan, Pesticide Re-evaluation Division. Date: 11/4/2010. Subject: Cyfluthrin - Report of the Endocrine Disruptor Review Team - Test Order #: EDSP - 128831-74.
3. USEPA. Environmental Fate and Effects Division, Office of Pesticide Programs. "Environmental Fate and Ecological Risk Assessment Problem Formulation in Support of Registration Review for Cyfluthrin and Beta-cyfluthrin." July 29, 2010.
4. USEPA. Docket Number EPA-HQ-OPP-2010-0684-0003. Memorandum from: Dotson, D, et. al., Office of Pesticide Programs. To: Donovan, Y. et. al. Office of Pesticide Programs. Subject: Cyfluthrin and Beta-cyfluthrin. Human Health Assessment Scoping Document in Support of Registration Review. 7/1/2010.
5. International Union of Pure & Applied Chemistry. Pesticide Properties Database. cyfluthrin (Ref: OMS 2012). Accessed 12/16/2011. <http://sitem.herts.ac.uk/aeru/iupac/>