

boric acid

Review Date: 7/17/2009

Type	Insecticide and acaricide
Controls	Insects and spiders
Mode of Action	Stomach poison against spiders and insects.

Thurston County Review Summary:

Boric acid's toxicity is based on its boron content. Boron is generally considered low in toxicity due to its prevalence in the environment and people's ingestion of boron daily. However, like most pesticide ingredients, it can be used in applications that can create an exposure of concern. The risks associated with the use of borate products are related to the potential exposure the application can have.

1. Boric acid products used to pressure-treat wood for fungus or insect control has the potential to cause an exposure that is rated as moderate in hazard for toxicity. Products used to pressure treat wood are given a conditional rating - because they do not pass or fail Thurston County's review criteria, but pose a moderate hazard.
2. Boric acid products used to treat lumber by directly spraying them (like treating a deck's surface) has the potential to cause an exposure that is rated as high in hazard for toxicity. Insecticide products containing boric acid that are registered for use as a surface treatment on exposed wood, fail the review criteria.

MOBILITY

Property	Value	Reference	Rating
Solubility (mg/L)	47,000	1	High
Soil Sorption (Kd=mL/g)	<1	5	High
Organic Sorption (Koc=mL/g)	Not found		

Mobility Summary:

Boric acid is very soluble in water and adheres poorly to soil. The mobility hazard of boric acid is considered high.

PERSISTENCE

Property	Value	Reference	Rating
Vapor Pressure (mm Hg)	0.0001	2	Moderate
Biotic or Aerobic Half-life (days)	Not found		
Abiotic Half-life (days)	Not found		
Terrestrial Field Test Half-life (days)	Not found		
Hydrolysis Half-life (days)	Not found		
Anaerobic Half-life (days)	Not found		
Aquatic Field Test Half-life (days)	Not found		

Persistence Summary:

"Borates do not degrade but complex with organic matter and sod mineral surfaces and can be altered by water leaching and pH changes" (Reference 6). Boric acid and its breakdown chemicals are considered persistent but have not been identified as a concern for groundwater contamination.

BIOACCUMULATION

Property	Value	Reference	Rating
Bioaccumulation Factor	"low potential"	2	Low
Bioconcentration Factor	Not found		
Octanol/Water Partition Coefficient	log Kow = 0.175	5	Low

Bioaccumulation Summary:

The low octanol / water partition coefficient (log Kow = 0.175) indicates that boric acid has a much greater attraction to water than it does to oils and fat, therefore the risk for bioaccumulation is considered low in hazard.

ACUTE TOXICITY

Test Subject	Value	Reference	Rating
Mammalian (LD50)	>631 mg/kg	1	Moderate
Avian (LD50)	>2,510 mg/kg	2	Low
Honey bee or insect (LD50)	>362 ppm	2	Low
Annelida -worms (LC50)	Not found		
Fish (LC50)	>1,021 ppm	2	Low
Crustacean (LC50)	133 ppm	2	Low
Mollusk (LC50)	Not found		
Amphibian (LD50 or LC50)	Not found		

Acute Toxicity Summary:

Single dose toxicity testing indicates that boric acid is moderately toxic to mammals and low in toxicity to birds, bees, fish, and other aquatic organisms.

ACUTE TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Exposure from applying deck spray wasn't evaluated						
Child playing on surface treated deck	0.088 mg/kg/day	0.05 mg/kg/day	<2	Ingestion	1	High
Child playing on pressure treated deck	0.088 mg/kg/day	0.015 mg/kg/day	5.9	Ingestion	1	Moderate
Combined routes of exposure were not evaluated						

Acute Toxicity Risk Assessment Summary

The potential exposure to a child playing on a deck surface treated with a boric acid insecticides or fungicide is more than half of the calculated dose of concern and is rated as high in hazard. The same hand-to-mouth activities on a deck that was pressure treated with a boric acid product is considered moderate in hazard.

Exposures to applicators of sprayed on products or from pressure treatment was not evaluated by the EPA.

CHRONIC TOXICITY

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	E	Evidence of non-carcinogenicity for humans	3	Low
Mutagenicity	Negative	- -	4	Low
Neurotoxicity - (NOAEL)	>8.8 mg/kg/day	None observed	1	Low
Endocrine Disruption	Not listed	- -	7	Low
Developmental Toxicity (NOAEL)	78 mg/kg/day	Enlarged brain ventricles	2	Check risk
Reproductive Toxicity (NOAEL)	8.8 mg/kg/day	Testicular toxicity	1	Check risk
Chronic Toxicity (NOAEL)	8.8 mg/kg/day	Testicular toxicity	1	Check risk

Chronic Toxicity Summary:

Long-term toxicity testing of boric acid produced neurotoxicity in test animals at concentrations above levels that caused other toxicity (Reference 1). The USEPA believes that endocrine disruption is addressed by assessing the potential for testicular atrophy with a "no observable adverse effect level" of 8.8 mg/kg/day. Further endocrine disruption testing may be required when the agency's Endocrine Disruption Screening Program is developed (Reference 1).

CHRONIC TOXICITY - Risk Assessment

Subject and Scenario	Dose of Concern	Exposure	Margin of Safety	Route	Reference	Rating
Exposures longer than 6 months were not evaluated						
Combined exposures were not evaluated						
Drinking water exposure not evaluated	- -	Not evaluated	- -	Ingestion	1	Waived
Dietary exposure was not evaluated	- -	Not able to be calculated	- -	Ingestion	1	Waived

Chronic Toxicity Risk Assessment Summary:

Long-term exposure risk assessments for boric acid included intermediate exposures (1 to 6 months) but longer exposure assessments were considered unrealistic and were not calculated (Reference 1). All dietary and drinking water risk assessment scenarios were waived for boric acid and sodium borate salts (Reference 1).

Since the EPA chose the same dose of concern for short-term and intermediate term exposures, the risk assessment conclusion was combined with the acute toxicity assessment. So, the only long-term assessment was the post application exposures to treated decks (which is listed in the acute toxicity section).

Degradation Products:

Boron

Comments:

Boric acid is considered corrosive to the eyes and can cause eye irritation that clears in 4 days (Reference 1). Boric acid is considered a skin irritant.

"References to the terms boric acid and sodium borate salts, and or boric acid/sodium borate salts in this document refer to boric acid and several borate salts including sodium tetraborate decahydrate, sodium tetraborate pentahydrate, sodium tetraborate anhydrous, disodium octaborate tetrahydrate, disodium octaborate anhydrous, and sodium metaborate. Risks summarized in this document are from boric acid and these sodium borate salts only." (Reference 1).

References

1. USEPA. Office of Prevention, Pesticides and Toxic Substances. Report of the Food Quality Protection Act (FQPA) Tolerance Reassessment Eligibility Decision (TRED) for Boric Acid/Sodium Borate Salts. July 2006.
2. USEPA. Office of Prevention, Pesticides and Toxic Substances. Reregistration Eligibility Decision (RED) Boric Acid and its Sodium Salts. September 1993.
3. USEPA. Science Information Management Branch, Health Effects Division, Office of Pesticide Programs. Chemicals Evaluated for Carcinogenic Potential. July 19, 2004.
4. Swirsky Gold, L., Slone, T. II, Manley, N.B., Garfinkel, G.B., Ames, B.N. Carcinogenic Potency Project. <http://potency.berkeley.edu/chempages/BORIC%20ACID.html>
5. USEPA. Office of Prevention, Pesticides and Toxic Substances. Boric Acid: residential Exposure Assessment for the Tolerance Reassessment Eligibility Decision Document. August 31, 2005.
6. World Health Organization (WHO). Environmental Health Criteria 204: Boron. International Programme on Chemical Safety. Prepared by: Ms. C. Smallwood, USEPA. 1998.
7. S. Kegley, B. Hill, S. Orme, PAN Pesticide Database, Pesticide Action Network, North America (San Francisco, CA. 2007), <http://www.pesticideinfo.org>