United States Environmental Protection Agency | Prevention, Pesticides And Toxic Substances (7505C) | May 2005

New Pesticide Fact Sheet

Picaridin

Description of the Chemical

Generic Name: 2-(2-hydroxyethyl)-1-piperidinecarboxylic acid 1-methylpropyl ester

Common Name: Picaridin

Trade Name: KBR 3023

EPA Shaughnessy Code (OPP Chemical Code): 070705

Chemical Abstracts Service (CAS) Number: 119515-38-7

Year of Initial Registration: 2001

Pesticide Type: Insect Repellent

Chemical Family: Piperidines

Manufacturer: Lanxess Corp.
111 Park West Drive
Pittsburgh, PA 15275-1112

Use Patterns and Formulations

Application Sites:	Human body
Types of Formulation:	Insect and acarid repellent products only.
Formulation Types Registered:	96.8% a.i. Technical; 5% & 7% pump sprays; 10% aerosol spray and 5.75% towelette wipes There are no combination Picaridin/Sunscreen products.
Target Pest:	Biting flies, mosquitoes, chiggers, ticks, and fleas
Use Patterns:	Household floors, walls, bathroom and other non-food contact surfaces.

Science Findings

Summary Statement

Technical grade Picaridin has low acute oral, dermal and inhalation toxicity. It is classified as Toxicity Category IV for acute inhalation toxicity and primary dermal irritation and Toxicity Category III for acute oral, acute dermal and primary eye irritation. It is not a dermal sensitizer. No developmental toxicity was observed and effects in the offspring were observed only at or above dosage levels which resulted in evidence of maternal toxicity. Picaridin was not shown to be mutagenic in a battery of tests. The toxicology data base is complete and no additional studies are required.

Based on the use pattern, skin applied insect repellent, picaridin is unlikely to result in measurable exposures to the environment. Under environmental pH and

temperature conditions, picaridin is stable to hydrolysis, therefore, hydrolysis is not expected to contribute to degradation of picaridin in the environment.

Chemical Characteristics

	Technical Grade
Molecular Formula:	$C_{12}H_{23}F_9NO_3$
Physical:	Liquid
Color:	Colorless
Odor:	Nearly odorless
Melting Point:	N/A
Molecular Weight:	229.3g/mole
Vapor Pressure:	0.3 kPa(2.25 mm Hg) at 20 C
Octanol-Water Partition Coefficient (K_{OW}):	4.94 (86,000)
Solubility:	In water: insoluble In 2-propanol: miscible In ethanol: miscible

Human Health Assessment

TOXICOLOGY CHARACTERISTICS

Technical Grade

Acute Toxicity

In studies using laboratory animals, Picaridin technical is of relatively low acute toxicity: Toxicity Category III for acute oral and acute dermal; and Toxicity Category IV for primary eye and skin irritation. The technical is not a dermal sensitizer.

[NOTE: For acute oral, dietary, mammalian:

Category I = very highly or highly toxic

Category II = moderately toxic

Category III = slightly toxic

Category IV = practically non-toxic]

The acute toxicity profile table below represents Picaridin technical grade/MUP based on the following table of study results:

Guideline No.	Study type	Results	Tox Category

81-1	Acute Oral	Rat: LD_{50} = 4743 mg/kg in males Rat: LD_{50} =2236 mg/kg in males	III
81-2	Acute Dermal	LD_{50} >2000 mg/kg (Limit Test)	III
81-3	Acute Inhalation	LC_{50} >4.364 mg/L.	IV
81-4	Primary Eye Irritation	Moderate ocular irritant	III
81-5	Primary Skin Irritation	Not a dermal irritant	IV
81-6	Dermal Sensitization	not a sensitizer	
81-8	Acute Neurotoxicity	NOEL = >2000 mg/kg (HDT) NOAEL = 2000 mg/kg	

Subchronic Toxicity

14-Week Feeding -Rat:

NOAEL = 301 mg/kg/day

LOAEL = 1033 mg/kg/day based on decreased body weight/weight gain in both sexes, and effects on the male kidneys including increased relative kidney weights and increased incidence of protein droplet degenerative nephropathy.

Dermal Subcronic -Rat:

NOAEL (systemic) = 200 mg/kg/day

LOAEL (systemic) = 500 mg/kg/day (slight to minimal diffuse liver hypertrophy, individual necrotic liver cells, slight hyaline degeneration in the kidneys, increased incidence of foci of tubular regeneration, and chronic kidney inflamation)

NOAEL (dermal irritation) = <80 mg/kg/day

LOAEL (dermal irritation) = 80 mg/kg/day (scabs, red foci, and exfoliation at the dosing site). Complete reversal was seen after a 4-week recovery period.

Dermal Developmental Toxicity - Rat:

NOAEL (maternal) = 400 mg/kg/day (HDT; slight increases in absolute and relative liver weights; 9% and 5%, respectively.

LOAEL (maternal) >400 mg/kg/day.

NOAEL (developmental) = 400 mg/kg/day (delayed ossification attributed to maternal stress due to the dermal dosing regimen).

LOAEL (developmental)= 400 mg/kg/day. No developmental toxicity was observed and effects in the offspring were observed only at or above dosage levels which resulted in evidence of maternal toxicity.

Dermal Developmental Toxicity - Rabbit:

NOAEL (systemic) >200 mg/kg/day (HDT)

NOAEL (developmental) >200 mg/kg/day

NOAEL (dermal irritation) = <50 mg/kg/day

LOAEL (dermal irritation) = 50 mg/kg/day (LDT) No developmental toxicity was observed.

Dermal Reproductive Toxicity - Rat:

NOEL (systemic) = 200 mg/kg/day

NOAEL (systemic) >200 mg/kg/day

NOEL (reproductive) = 200 mg/kg/day

NOAEL (reproductive) >200 mg/kg/day. No systemic or reproductive toxicity was found.

Chronic Toxicity and Carcinogenicity

Dermal Chronic Toxicity - Dog:

NOAEL (systemic) = 200 mg/kg/day (HDT)

NOAEL (dermal irritation) = 200 mg/kg/day. No toxicity was observed.

Dermal Carcinogenicity - Mouse (18 months):

NOEL = 200 mg/kg/day

NOAEL = 200 mg/kg/day. There is no evidence of carcinogenicity.

Dermal Chronic Toxicty/Carcinogenicity - Rat:

NOAEL = 200 mg/kg/day (HDT; liver cystic degeneration with no corroborating liver weight or clinical pathology anomalies). There is no evidence of carcinogenicity.

Carcinogenicity:

The Agency determined that Picaridin is not likely to be a human carcinogen by the dermal route.

Endodrine Disruption:

The Agency found no evidence that Picaridin is an endocrine disruptor.

Dietary Exposure

Because of its use pattern, people are not exposed to residues of Picaridin.

OCCUPATIONAL AND RESIDENTIAL EXPOSURE

Occupational Exposure

Based on Picaridin's residential use pattern, handlers (mixers, loaders, and applicators) are not exposed to Picaridin.

Residential Exposure

Picaridin generally is of low acute toxicity, and based on the available toxicological data, the Agency believes that the normal use of Picaridin does not present a health concern to the general U.S. population (the Agency's human risk

assessment has identified no toxicologically significant effects in animal studies.) Picaridin has been classified as **not likely to be a human carcinogen.**

Because of Picaridin's unusual use pattern (direct application to human skin), the Agency believes it is prudent to require clear, common sense use directions and restrictions on Picaridin product labels. These directions include how to apply and when to reapply, restrictions on how often to apply and directions for using on children.

Environmental Fate and Ecological Effects Characteristics

Technical Grade

The Agency has reviewed the proposed Section 3 registrations for the use of Picaridin as an insect repellent. Based on the ecological effects data submitted by the registrant, the Agency concluded that the product should pose no risks to terrestrial and aquatic organisms from the proposed use pattern. The use should provide non-target organisms extremely limited access to the chemical.

ENVIRONMENTAL FATE

Hydrolysis:

Under environmental pH and temperature conditions, Picaridin is stable to hydrolysis.

ECOLOGICAL EFFECTS

Likelihood of Adverse Effects on Non-Target Organisms

Terrestrial Organism Toxicity

Avian Dietary: Non-toxic

Bobwhite quail: LC_{50} >5000 ppm a.i.-diet. Based on the results of this study, Picaridin can be considered as non-toxic to birds.

Aquatic Organism Toxicity

Freshwater Fish: Moderately Toxic

Rainbow trout: 96-hr LC_{50} = 173 mg/l

Freshwater Invertebrates

Daphnia Magna: Picaridin was tested at five concentrations ranging from 10 mg/l to 100 mg/l at 24 and 48 hours. No effects were found at any concentration.

Green algae:

Scenedesmus subspicatus: The study was of 72 hour endurance and included 6 nominal concentrations ranging from 5.6 mg/l to 100 mg/l. Effects were determined within the range of 56 mg/l and 100 mg/l. The NOEC and LOEC were determined to be 56 mg/l.

For More Information

CONTACT PERSON:

Joseph M. Tavano Biologist, PM Team 10
Insecticide Branch , Registration Division (7505C)

Office of Pesticide Programs
U.S. EPA, Ariel Rios Building
1200 Pennsylvania Avenue NW
Washington, DC 20460

Office Location and Telephone Number:
Room 222, Crystal Mall #2
1801 South Bell Street
(703) 305-6411

Electronic copies of the this fact sheet are available on the Internet. See http://www.epa.gov/opprd001/factsheets/

DISCLAIMER: The information in this Pesticide Fact Sheet is for information only and is not to be used to satisfy data requirements for pesticide registration. The information is believed to be accurate as of the date on the document.