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

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Technical Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molecular Formula</td>
<td>C₁₂H₂₃F₉NO₃</td>
</tr>
<tr>
<td>Physical</td>
<td>Liquid</td>
</tr>
<tr>
<td>Color</td>
<td>Colorless</td>
</tr>
<tr>
<td>Odor</td>
<td>Nearly odorless</td>
</tr>
<tr>
<td>Melting Point</td>
<td>N/A</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>229.3 g/mole</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>0.3 kPa(2.25 mm Hg) at 20°C</td>
</tr>
<tr>
<td>Octanol-Water Partition Coefficient (Kₗ₀₤):</td>
<td>4.94 (86,000)</td>
</tr>
<tr>
<td>Solubility</td>
<td></td>
</tr>
<tr>
<td>In water: insoluble</td>
<td></td>
</tr>
<tr>
<td>In 2-propanol: miscible</td>
<td></td>
</tr>
<tr>
<td>In ethanol: miscible</td>
<td></td>
</tr>
</tbody>
</table>

### 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 |
|---------------|------------|---------|--------------|--------------|
|               |            |         |              |              |

2
| 81-1 | Acute Oral | Rat: LD₅₀ = 4743 mg/kg in males  
Rat: LD₅₀ = 2236 mg/kg in males | III |
| 81-2 | Acute Dermal | LD₅₀ >2000 mg/kg (Limit Test) | III |
| 81-3 | Acute Inhalation | LC₅₀ >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 inflammation)  
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 Toxicity/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.

**Endocrine 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.

**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: LC₅₀ >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 LC₅₀ = 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.

**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.