United States Environmental Protection Agency | Prevention, Pesticides And Toxic Substances (7505C) | EPA-730-F-99-009 August 1999

New Pesticide Fact Sheet

Lithium Perfluorooctane Sulfonate (LPOS)

Description of the Chemical

Generic Name: Lithium perfluorooctane sulfonate

Common Name: LPOS

Trade Name: Sulfotine, RAID TVK

EPA Shaughnessy Code (OPP Chemical Code): 075004

Chemical Abstracts Service (CAS) Number: 29457-72-5

Year of Initial Registration: August 1999

Pesticide Type: Insecticide

Manufacturer: S.C. Johnson & Son, Inc.
1525 Howe Street
Racine, WI 53403

Use Patterns and Formulations

Application Sites:	Outdoor, non-food use (residential homes)
Types of Formulation:	For Manufacturing Use in the formulation of wasp/hornet bait stations.
Target Pest:	Wasps, hornets, yellow jackets
Use Patterns:	Wasp and hornet bait stations for use outdoors around patios, decks, fruit trees, trash containers, doors, and windows.

Science Findings

Summary Statement:

LPOS is a non-food and non-agricultural use chemical, is unlikely to contaminate drinking water, and when used according to the labeling presents a negligible potential for consumer dermal or inhalation exposure. Therefore, it was not necessary to determine or assign dietary, short-, intermediate- or chronic-term dermal or inhalation endpoints or address FQPA considerations for LPOS. The toxicological data base for LPOS is adequate to support this terrestrial outdoor, non-food use. All studies were acceptable with the exception of the acute dermal and the 90-day subchronic study, which were unacceptable. The deficiencies of the two unacceptable tox studies (acute dermal and sub-chronic toxicity) do not affect the overall risk characterization of this chemical. These studies must be upgraded or repeated before any additional uses can be granted. LPOS is classified as Toxicity Category II (moderately toxic) based on acute oral and inhalation toxicity. It is not mutagenic. Based on the findings of the 90-day subchronic toxicity study, it appears that LPOS suppresses the formation of blood in males. This endpoint is not of concern because subchronic or chronic exposure is not expected from this

use. Based on the results of the developmental studies, there does not appear to be any increased sensitivity of the pups in comparison to the maternal parents.

The proposed use pattern for LPOS poses minimal to no aquatic or terrestrial animal exposure. Therefore, a risk assessment was not performed.. The end-use bait product may be attractive to honey bees. However, honeybee exposure is expected to be minimal because the bait unit contains a pad which soaks up the chemical material and makes it available to wasps and hornets, but not bees. (Wasps have sponge-like mouthparts for lapping up liquid food, but bees have an elongated tonguelike structure for sucking up liquid food). The proposed label cautions that the product is highly toxic to honey bees, and baits should be placed in areas away from flowers to mitigate attraction and exposure. EPA found the labeling precaution to be adequate.

Chemical Characteristics

Technical Grade. Note: The chemical information presented below is for information purposes only. The company is not registering or marketing technical LPOS. The characteristics of the manufacturing use product (26% LPOS) are presented in parenthesis.

Physical:	Powder (liquid)
Color:	Off white (pale yellow)
Odor:	Slight pungent odor (slight mercaptan odor)
Melting Point:	Decomposes at 308°
pH:	4.4 (7.7)
Density:	0.56 g/ml (9.6 lbs/gal)
Empirical Formula:	$C_8F_{17}LiO_3S$, mw = 506
Vapor Pressure:	N/A. melting point >30°

Human Health Assessment

TOXICOLOGY CHARACTERISTICS

Acute Toxicity

In studies using laboratory animals, LPOS technical is moderately toxic: based on acute oral and acute inhalation studies. The acute toxicity data is summarized below:

Guideline No.	Study type	Results	Tox Category
81-1	Acute Oral	M: LD50 = 154 mg/kg F: LD50 = 154 mg/kg	II
81-2	Acute Dermal	Unacceptable M: LD50 > 2,000 mg/kg F: LD50 > 2,000 mg/kg	III
81-3	Acute Inhalation	M: LC50 = 0.21 mg/L F: LC50 = 0.16 mg/L	II
81-4	Primary Eye Irritation	Severe but reversible ocular irritant.	II
81-5	Primary Skin Irritation	Slight dermal irritant	IV
81-6	Dermal Sensitization	Not a dermal sensitizer	neg.

Subchronic Toxicity

In an unacceptable subchronic oral toxicity study in rats, the LOAEL was found to be 0.60 mg/kg/day in females, based on increased liver weight and 0.30 mg/kg/day in males, based on decreased triglycerides and hepatocytic vacuolization. The NOAEL is 0.20 mg/kg/day in females. No NOAEL was determined in males. Iit appears that LPOS suppresses hematopoiesis (blood production) in males as indicated by significant decreases in RBCs, hemoglobin, hematocrit, and the finding of extramedullary hematopoiesis.

This study was classified as unacceptable for the following reasons: 1) a NOAEL was not determined in males; 2) an analysis of blood coagulation factors which is required for a subchronic study was not measured in the animals; 3) the mean food and water consumption calculated as g/week is not correct in the study (it is actually g/day) which raises the possibilities of potential errors in compound consumption, since the test substance was administered in drinking water; and 4) a range finding study was not performed in order to develop a rationale for the appropriate selection of doses in males and females.

Chronic Toxicity and Carcinogenicity

Because this use pattern is not expected to result in chronic human exposure, no chronic or carcinogenicity studies were required. At this time, LPOS has not been classified as to its carcinogenic potential.

Developmental Toxicity

In the developmental study in rabbits, maternal toxicity was observed at 1 mg/kg/day and above, based on reduced body weight gains during the dosing period, followed by a rebound in body weight gains post-dosing. Developmental toxicity was observed at the highest dose tested, 4 mg/kg/day. Effects included fetolethality, skeletal variations (unossified skull bones, sternebrae, talus, pubis and extra full rib) and decreased fetal body weights. A maternal NOAEL was not established and the maternal LOAEL was 1 mg/kg/day, based on reduced body weight gains. The developmental NOAEL was 2 mg/kg/day.

In the rat developmental study, maternal toxicity was observed at 6 mg/kg/day based on reductions in mean body weights, mean body weight gains, food consumption and clinical signs (hunched and few feces in one animal). The maternal NOAEL is 3 mg/kg/day. The developmental NOAEL is 6 mg/kg/day and the LOAEL is 12 mg/kg/day based on increased fetolethality, lower fetal body weights, external and soft tissue malformations, and skeletal variations.

Based on the results of the studies summarized above, there does not appear to be any increased sensitivity of the pups when compared to the maternal parents. However, if new food uses are submitted for registration, this assessment of differential sensitivity may change.

Mutagenicity

In a battery of five mutagenicity studies, LPOS was negative for mutagenicity and/or genotoxicity in all five studies. The five studies satisfied the new revised mutagenicity guideline requirements for a new chemical.

OCCUPATIONAL AND RESIDENTIAL EXPOSURE

Occupational Risk Estimates

LPOS is labeled for non-agricultural use. There will be no short-, intermediate- or chronic-term dermal or inhalation occupational exposure and therefore an occupational exposure and risk assessment is not required.

Residential Risk Estimates

The homeowner purchases this self-contained bait unit pre-assembled and is not involved in any mixing or loading of the active ingredient. There does not appear to be any potential for short- or intermediate-term dermal exposure to the homeowner other than by accidental minor leakage of liquid bait on to the hands during activation of the unit. Even if there were the potential for dermal exposure, it would more than likely be minimal due to the chemical's structure. LPOS is an isomeric mixture containing approximately 70% linear isomer and 30% branched isomers. The linear isomer consists of a highly water-soluble carbon fluoride chain with an ionized sulfonate function. These physical properties make it very difficult for the compound to be absorbed by the skin. Since the bait unit will be hung outdoors, there is negligible potential for inhalation exposure to the homeowner at any time. Thus no residential risk assessment is required.

Aggregate Risk Estimates and FQPA Considerations

EPA determined that it was not necessary to determine or assign dietary, short-, intermediate- or chronic-term dermal or inhalation endpoints or address FQPA considerations for LPOS. This decision was based on the fact that LPOS is a non-food and non-agricultural use chemical, and there is negligible potential for dermal or inhalation exposure to the homeowner.

Since there is no dietary, drinking water or residential exposure associated with the proposed formulation containing lithium perfluorooctane sulfonate, no endpoints were identified and aggregate risk assessments are not required.

Environmental Fate and Ecological Effects Characteristics

Minimal to no aquatic or terrestrial animal exposure is expected from the proposed end-use product RAID TVK. Therefore, risk assessments were not performed.

The end-use product contains a bait which may be attractive to honey bees, but the bait station design makes it difficult for honeybees to feed there. In addition, the label states that the product is highly toxic to bees, so baits should be placed in areas away from flowers. The labeling precaution is deemed adequate. No further risk reduction measures are needed.

ENVIRONMENTAL FATE

Ecological Effects

Birds, Acute and Subacute

Acceptable acute oral toxicity studies were submitted to establish the toxicity of LPOS to birds. Results are tabulated below.

Species	LD50 (mg/kg)	Toxicity Category
Northern bobwhite quail *(Colinus virginianus)*	42	highly toxic
Mallard duck *(Anas platyrhynchos)*	81	moderately toxic

Since one of the LD50 values falls in the range of 10 - 50 mg/kg, LPOS is categorized as highly toxic to avian species on an acute oral basis.

Two acceptable subacute dietary studies were submitted to establish the toxicity of LPOS to birds. The preferred test species are mallard duck and bobwhite quail. Results of these tests are tabulated below.

Species	5-Day LC50 (ppm)	Toxicity Category
Northern bobwhite quail *(Colinus virginianus)*	220	highly toxic
Mallard duck *(Anas platyrhynchos)*	324	highly toxic

Since the LC50 falls in the range of 51 - 500 ppm, lithium perfluorooctane sulfonate is categorized as highly toxic to avian species on a subacute dietary basis.

Insects

Since its intended use is to control related hymenopterons (wasps, hornets and yellow jackets) there is a potential for honey bee exposure. A honey bee acute contact study is not available for LPOS. However, results of efficacy testing on a hornet, *Dolichovespula maculata*, show a that a mean concentration of 1.5 *u*g per bee resulted in 93% mortality within 29 hours. These results indicate that LPOS is categorized as very highly toxic to bees on an acute contact basis. A honey bee acute contact study is not required, since the results of the efficacy test have been deemed adequate to demonstrate toxicity to honey bees.

Toxicity to Freshwater Aquatic Animals

Freshwater Fish, Acute

Two acceptable freshwater fish toxicity studies were submitted to establish the toxicity of LPOS to fish. Results of these tests are tabulated below.

Species	96-hour LC50 (ppm) (measured)	Toxicity Category
Rainbow trout *(Oncorhynchus mykiss)*	4.2	moderately toxic
Bluegill sunfish *(Lepomis macrochirus)*	49	slightly toxic

Since one of the LC50 values falls in the range of >1 - 10 ppm, LPOS is categorized as moderately toxic to freshwater fish on an acute basis.

Freshwater Invertebrates, Acute

A acceptable freshwater aquatic invertebrate toxicity test was submitted to establish the toxicity of LPOS to aquatic invertebrates. Results of this test are tabulated below.

Species/(Static or Flow-through)	**EC50 (ppm) (measured)**	**Toxicity Category**
Waterflea *(Daphnia magna)*	**67**	**slightly toxic**

Since the EC50 falls in the range of >10 - 100 ppm, LPOS is categorized as slightly toxic to aquatic invertebrates on an acute basis.

Environmental Fate

An acceptable hydrolysis study was submitted to support the registration of LPOS. LPOS did not hydrolyze in sterile buffered aqueous solutions (pH 5, 7, and 9).

Exposure and Risk Characterization

Minimal to no aquatic or terrestrial animal exposure is expected from the proposed end-use product RAID TVK. Therefore, risk assessments were not performed. The end-use product contains a bait which may be attractive to honey bees. The label states that the product is highly toxic to bees, which may eat the bait and that baits should be placed in areas away from flowers to minimize attraction. Honeybee exposure is expected to be minimized given the design of the bait station. The bait unit contains a pad which soaks the chemical material. Wasps have "sponge-like" mouthparts (for lapping-up liquid food), whereas the maxillae and labium of bees form an elongated tonguelike structure for sucking up liquid food (structure enables the bee to reach the nectar in flowers with a deep corolla). The labeling precaution is deemed adequate. No further risk reduction measured are needed.

Data Gaps

Toxicology

The toxicology data base on LPOS is adequate as defined for a residential outdoor non-food use chemical in 40 CFR Part 158. Two toxicology studies were unacceptable. However, the deficiencies of these studies will not affect the overall risk assessment characterization of this chemical. The acute dermal and the subchronic studies must be updgraded or repeated before any additional uses are granted.

Environmental Effects

There are no data gaps for this use pattern..

Environmental Fate

There are no data gaps for this use pattern.

Regulatory Conclusion

The Agency has determined that the database has been adequately addressed by the registrant to grant an unconditional Section 3(c)(5) registration on the manufacturing use product (Sulfotine) and the end-use product (Raid TVK).

For More Information

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