



R.E.D. FACTS

Pesticide Reregistration

Limonene

All pesticides sold or distributed in the United States must be registered by EPA, based on scientific studies showing that they can be used without posing unreasonable risks to people or the environment. Because of advances in scientific knowledge, the law requires that pesticides which were first registered years ago be reregistered to ensure that they meet today's more stringent standards.

In evaluating pesticides for reregistration, EPA obtains and reviews a complete set of studies from pesticide producers, describing the human health and environmental effects of each pesticide. The Agency imposes any regulatory controls that are needed to effectively manage each pesticide's risks. EPA then reregisters pesticides that can be used without posing unreasonable risks to human health or the environment.

When a pesticide is eligible for reregistration, EPA announces this and explains why in a Reregistration Eligibility Decision (RED) document. This fact sheet summarizes the information in the RED document for reregistration case 3083, limonene.

Use Profile

Limonene is a naturally occurring chemical which is used in many food products, soaps and perfumes for its lemon-like flavor and odor. Limonene also is a registered active ingredient in 15 pesticide products used as insecticides, insect repellents, and dog and cat repellents.

Pesticide products containing limonene are used for flea and tick control on pets, as an insecticide spray, an outdoor dog and cat repellent, a fly repellent tablecloth, a mosquito larvicide, and an insect repellent for use on humans. Formulations include ready-to-use solutions, emulsifiable concentrates, granulars and impregnated material. Limonene is applied by hand as needed, both indoors and outdoors. Use practice limitations include a label prohibition against use on weanling kittens and a caution against use of undiluted product.

Regulatory History

Limonene was first registered as an insecticide in the U.S. in 1958. It was registered as an antimicrobial in 1971, and as a dog and cat repellent in 1983. In May 1988, EPA announced that limonene is considered an inert rather than an active ingredient when used in antimicrobial products (please see 40 CFR 153.139(a)). In April 1994, limonene was granted an exemption from the requirement of a tolerance (or maximum residue limit) when it is an inert ingredient used as a solvent or fragrance in pesticide formulations (please see 40 CFR 180.1001(c), (e)). The Food and Drug Administration (FDA) lists limonene as Generally Recognized as Safe (GRAS) as a food additive or flavoring and a fragrance additive (please see 21 CFR 182.60). Currently, 15 limonene pesticide products are registered.

Human Health Assessment

Limonene is among those pesticide active ingredients for which a reduced set of generic data requirements is appropriate for registration or reregistration. Limonene is naturally occurring, has been established as an inert, is exempt from the requirement of a tolerance, and is recognized as safe by FDA. Its effects are well known and documented in scientific literature; additional testing would not likely provide any new findings. Adequate information is available to characterize its risks to humans and animals.

Toxicity

Limonene is of relatively low acute toxicity taken orally. It is a dermal irritant when applied at high concentrations and may cause dermal sensitization. A 90-day dermal toxicity study using the formulated product is required as confirmatory data to support reregistration of the insect repellent that is to be applied directly to human skin.

A subchronic study by the National Toxicology Program (NTP) using rats and mice resulted in decreased body weights, kidney disease and mortality at the highest dose tested. A chronic toxicity study by NTP using rats resulted in decreased body weight, kidney disease and kidney tumors, which occurred due to a species-specific mechanism. Limonene is not considered a human carcinogen, a developmental toxicant or mutagenic.

Dietary Exposure

Limonene occurs naturally in citrus and other fruits, vegetables, meats and spices. It also is used in a variety of foods and beverages (as well as in soaps and perfumes) to add lemon-like flavor and aroma. FDA considers limonene Generally Recognized as Safe (GRAS) as a food additive or flavoring, and as a fragrance additive. EPA has granted limonene an exemption from the requirement of a tolerance when it is used as an inert ingredient in pesticide formulations, and when used as an insect repellent tablecloth.

As a pesticide active ingredient, limonene is not registered for food or feed crop uses and is not expected to result in dietary exposure.

Occupational and Residential Exposure

People and pets may be exposed to limonene during and after application in household settings. Human exposure may occur during application of pet flea products, animal repellent granules or insecticide sprays, or during use of insect repellent impregnated tablecloths. Toxicologic concerns for humans from these exposures include skin irritation and sensitization. Ocular irritation also may occur if limonene products accidentally enter the eye and are not washed away.

Limonene is used in several shampoo, dip and spray products applied dermally to domestic animals to control fleas and ticks. Adverse reactions have been reported in a small percentage of animals, especially cats, following exposure to limonene products. Kittens and young cats seem to be most sensitive. Product labels bear precautionary statements warning of the potential for dermal irritation, prohibiting use on weanling kittens, and cautioning against use of undiluted product on pets.

Human Risk Assessment

Dietary exposure to limonene is not a concern. Limonene occurs naturally in foods, is used as a flavoring agent, is generally recognized as safe by FDA, and has only one food-related pesticide use (as an insect repellent impregnating tablecloths) that EPA has exempted from tolerance requirements.

People may be exposed to limonene when applying flea and tick control shampoos, dips or sprays to their pets, when applying animal repellent granules or insecticide sprays, or when using impregnated tablecloths. Skin irritation and sensitization or eye irritation may occur from these uses. In addition, adverse reactions may occur in some pets, especially cats, treated with the flea and tick control products. Additional precautionary statements are required on limonene product labeling to reduce the potential for adverse effects among users and treated pets.

Environmental Assessment

Environmental Fate

Limonene is insoluble and is expected to be stable in water.

Ecological Effects

Technical limonene is practically nontoxic to birds on a subacute dietary basis, and is slightly toxic to freshwater fish and invertebrates on an acute basis. The formulated product is practically nontoxic to birds on an acute and subacute dietary basis. It is practically nontoxic to freshwater fish and slightly toxic to freshwater invertebrates on an acute basis. Based on acute toxicity data using rats, limonene is practically nontoxic to mammals.

Ecological Effects Risk Assessment

Potential risk to birds might occur from ingesting limonene granules spread on lawns, sidewalks or driveways, or from consuming insects contaminated with limonene. However, based on the lack of toxicity of limonene to birds, little risk is anticipated.

Similarly, mammals are not likely to ingest a sufficient quantity of limonene granules to be at risk, particularly since limonene is practically nontoxic to mammals.

The mosquito larvicide use of limonene produces an oily film that is expected to dissipate rapidly, posing no major ecological concern for freshwater invertebrates or other aquatic species. Minimal risks to aquatic species, including endangered aquatic species, are expected from runoff into pond water from applications of the granular product.

Additional Data Required

EPA is requiring a 90-day dermal toxicity study for the recently registered limonene personal insect repellent product, to confirm its regulatory assessments and conclusions. The Agency also is requiring product-specific data including product chemistry and acute toxicity studies, revised Confidential Statements of Formula (CSFs) and revised labeling for reregistration.

Product Labeling Changes Required

All limonene end-use products must comply with EPA's current pesticide product labeling requirements, and with the following:

Environmental Hazard Statements

End-use products with the mosquito larvicide use must bear the following statement:

"Do not contaminate water when disposing of equipment washwater or rinsate. Consult with your State Agency in charge of fish and game before applying to public waters to determine if a permit is needed."

End-use products without the mosquito larvicide use must bear the following statement:

"Do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high-water mark. Do not contaminate water when disposing of equipment washwater or rinsate."

Precautionary Statements

To reduce the risk of adverse effects which occasionally occur in pets exposed to limonene flea and tick control products, and to reduce risks of skin irritation/ sensitization to product users, the following strengthened statements are required on labels of products intended for use on domestic animals:

Add: "Applicators of flea and tick dip (concentrates), spray or shampoo products are to use protective gloves to reduce the risk of dermal irritation or dermal sensitization."

Add: "Flea dip concentrates may harm animals when used at greater strength than specified on the label."

Change the age for product use on kittens/puppies to several months or a year.

Change the statement, "Use with care on nursing animals," to "Do not use on nursing animals or any animal which is in poor health."

Provide a list of symptoms which may occur when animals are sensitive to the product, to the precautionary statement, "Individual animals may be more sensitive to the product."

Regulatory Conclusion

The use of currently registered pesticide products containing limonene in accordance with approved labeling will not pose unreasonable risks or adverse effects to humans or the environment. Therefore, all uses of these products are eligible for reregistration.

These limonene products will be reregistered once the required confirmatory data, product-specific data, revised Confidential Statements of Formula and revised labeling are received and accepted by EPA.

For More Information

EPA is requesting public comments on the Reregistration Eligibility Decision (RED) document for limonene during a 60-day time period, as announced in a Notice of Availability published in the Federal Register. To obtain a copy of the RED document or to submit written comments, please contact the Pesticide Docket, Public Response and Program Resources Branch, Field Operations Division (7506C), Office of Pesticide Programs (OPP), US EPA, Washington, DC 20460, telephone 703-305-5805.

Following the comment period, the limonene RED document will be available from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161, telephone 703-487-4650.

For more information about EPA's pesticide reregistration program, the limonene RED, or reregistration of individual products containing limonene, please contact the Special Review and Reregistration Division (7508W), OPP, US EPA, Washington, DC 20460, telephone 703-308-8000.

For information about the health effects of pesticides, or for assistance in recognizing and managing pesticide poisoning symptoms, please contact the National Pesticides Telecommunications Network (NPTN). Call toll-free 1-800-858-7378, between 8:00 am and 6:00 pm Central Time, Monday through Friday.