



## FAQs

### Does the world really need another insect repellent or insecticide?

#### **Insect repellent**

We know that the best way to prevent getting sick from a mosquito or tick bite is to use insect repellent. The most effective product is the one you or your family uses regularly. Our research also tells us that, for a variety of reasons, many people are reluctant to regularly use insect repellents.

We developed nootkatone as a product that we hope people will use. Nootkatone:

- Was originally derived from nature (e.g., grapefruit, Alaskan cedar tree)
- Smells like citrus
- Won't damage plastic
- Works as well as or better than other EPA-registered active ingredients on the market
- Could be made into a variety of consumer products (soaps, lotions, sprays).

The best insect repellent is the one you use. Having nootkatone will ultimately provide the public with a new option for protecting themselves from bites.

#### **Insecticide**

- As an insecticide, nootkatone appears to kill biting pests in a unique way, different from other insecticides already registered by the EPA.
- Nootkatone products can help in the fight against mosquitoes that have become resistant to currently used insecticides.

## **EPA Registration**

### **What is involved in EPA registration?**

For registration of an active ingredient the following are performed:

- Safety/toxicity assessment through the evaluation of acute (one dose and of limited duration) and sub-chronic (moderate or short-term duration) toxicity studies (by mouth, skin, and inhalation routes)
- Genotoxicity studies evaluate chemical properties that might damage genetic information within a cell
- Environmental studies
- Physico-chemical (parameters that define the properties of a chemical molecule) characterization

The process of registering a pesticide is a scientific, legal, and administrative procedure through which EPA examines:

- the key component of the pesticide;
- the particular site where it is to be used;
- the amount, frequency, and timing of its use; and
- storage and disposal practices.



In evaluating a pesticide registration application, EPA assesses a wide variety of potential human health and environmental effects associated with use of the product. A company that wants to produce the pesticide must provide data from studies that comply with EPA's testing guidelines.

EPA has registered nootkatone as an active ingredient. The next step is for manufacturers to develop insect repellents and insecticides that use nootkatone. Additional EPA studies and registration are required before end-use products become commercially available.

### **Mode of Action and Type of Active Ingredient**

#### **How does nootkatone work?**

- Nootkatone appears to kill biting pests in a unique way, different from other insecticides already registered by the EPA. This could help in the fight against mosquitoes that have become resistant to currently used insecticides.
- Nootkatone works differently from other insecticides, including pyrethroids, organophosphates, carbamates, cyclodienes.

#### **What type of insecticide is nootkatone?**

- Nootkatone is a biopesticide.

#### **What is a biopesticide?**

- According to the EPA, a biopesticide is a type of pesticide that comes from natural materials, including animals, plants, bacteria, or certain minerals.
- Nootkatone is a biopesticide. In nature, nootkatone is found in minute quantities in Alaska yellow cedar trees and grapefruit skin.
- For more information, see: <https://www.epa.gov/ingredients-used-pesticide-products/what-are-biopesticides>

### **Nootkatone Compared to Other Active Ingredients**

#### **Is nootkatone better than currently available active ingredients?**

Studies show that nootkatone is comparable to other active ingredients already on the market and can provide up to several hours of protection, although full evaluation cannot be completed until final end-use products are available.

#### **Is nootkatone the same as other types of insect repellents and insecticides already on the market?**

No. Nootkatone is a new active ingredient that manufacturers will use in new insect repellents and insecticides.

### **Nootkatone Development and Production**

#### **How is nootkatone produced?**

- It takes several tons of grapefruit to produce just 1 kg (2.2 lbs) of nootkatone.
- The production of NootkaShield™ nootkatone utilizes Evolva's innovative yeast fermentation process with a proprietary conversion technique. The result is a ≥99% pure source of nootkatone, which is highly reproducible and contaminant-free.



### **Why can't you grow grapefruits to make nootkatone?**

- It takes several tons of grapefruit to produce 1 kg (2.2 lbs) of nootkatone.
- It's not cost-effective to grow and harvest grapefruit to produce nootkatone.

### **Where is nootkatone being manufactured?**

- Nootkatone is being produced by manufacturers in the United States.

### **Can I make my own nootkatone insect repellent?**

- No. Evolva sells nootkatone to manufacturers, not the public. Additional work needs to be done to develop insect repellents for consumers to purchase.

### **Is nootkatone genetically modified?**

No.

## **End-use Product Development and Availability**

### **What are the next steps before nootkatone-containing products, such as insect repellents, become available to consumers?**

- After EPA registration, the next step is for manufacturers to develop insect repellents and insecticides that contain nootkatone.
- Manufacturers will then have to submit another registration package to EPA for review.
- Once final brand name products have been produced and registered with EPA, they will be commercially available, likely in 2022-2023.

### **Can I go to the store and buy insect repellents and insecticides with nootkatone?**

- Not quite yet. Now that EPA has granted registration, insect repellents and insecticides that contain nootkatone can be developed.
- We estimate that commercial products will be available to consumers in 2022 or 2023.

### **Why will this take so long for end-use products to become available?**

Companies interested in developing end-use products will still need additional time for research and development of products. Another EPA-registration process is also required before commercial products can be sold.

## **Nootkatone and Human Health**

### **Is nootkatone toxic to people?**

- As an active ingredient, EPA has evaluated nootkatone's toxicity and has determined that it is categorized as a Toxicity Category IV active ingredient (this is EPA's lowest level of toxicity).
- Now that EPA has granted registration to nootkatone, insect repellents and insecticides that include nootkatone can be developed. Companies developing end-use consumer products will submit another registration package to EPA for review.
- EPA will review the safety and effectiveness of the end-use product.

Once EPA registers final brand name products, they will be commercially available, likely in 2022-2023.



### **Will eating/applying grapefruit protect me from bites?**

No.

### **I am taking statins. Can I use products containing nootkatone?**

Nootkatone contained in pest control products will not be ingested, and therefore interaction with oral drugs is highly unlikely.

### **Nootkatone and Animals**

#### **Is nootkatone safe for animals?**

- Evolva is working with commercial partners to develop pet-protection products that contain nootkatone.
- Now that EPA has granted registration to nootkatone, pet-protection products containing nootkatone can be developed.
- Companies developing pet-protection products will submit another registration package to EPA for review.
- EPA will review the safety and effectiveness of the pet-protection product.
- Once EPA registers final brand name pet-protection products, they will be commercially available, likely in 2022-2023.

### **Nootkatone and the Environment**

#### **Is nootkatone safe for the environment?**

- Nootkatone is derived from nature (grapefruit, Alaskan cedar tree).
- EPA may require additional environmental studies after end-use products are developed.

### **Nootkatone and Agriculture**

#### **Will nootkatone be developed for agricultural use?**

Not at this time.

#### **For more information:**

- **CDC:** [Nootkatone for Insecticide and Repellent Development](#)
- **Evolva:** video explaining nootkatone:  
<https://www.bing.com/videos/search?q=nootkatone+video&view=detail&mid=CEAE58413281394A0DD2CEAE58413281394A0DD2&FORM=VIRE>

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## Photos

- [PHIL 9261](#): *Aedes aegypti* mosquito
  - Caption: *Aedes aegypti* mosquitoes spread viruses including dengue, Zika, chikungunya and yellow fever.
- [PHIL 1669](#): *Ixodes scapularis* tick (blacklegged tick)
  - Caption: The blacklegged tick can spread up to 7 types of pathogens, including the bacteria that cause Lyme disease.
- Grapefruit: <https://www.gettyimages.com/detail/photo/fresh-grapefruit-and-slices-royalty-free-image/184129838?adppopup=true>
  - Caption: Nootkatone gives grapefruit its characteristic citrus smell.

- Perfume: <https://www.gettyimages.com/detail/photo/perfume-bottles-in-store-display-shelf-royalty-free-image/830666646?adppopup=true>
  - Caption: Nootkatone is used widely in the flavor and fragrance industries.
- Insect repellent: <https://www.gettyimages.com/detail/photo/mother-applying-tick-repellent-on-son-royalty-free-image/956071366?adppopup=true>
  - Caption: The best way to protect yourself and family from mosquito and tick bites is to use insect repellent.
- Mosquito bites: <https://www.gettyimages.com/detail/photo/mosquito-bites-sore-on-child-legs-royalty-free-image/653481788?adppopup=true>
  - Caption: EPA registration of nootkatone paves the way for corporations to develop new insect repellents.