



# Board of Chosen Freeholders

## County of Burlington

### New Jersey



#### DEPARTMENT of PUBLIC WORKS

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## Burlington County Mosquito Control FAQs

### What is Burlington County Mosquito Control's Objective?

As the largest county in New Jersey, Burlington County has large areas that have potential to breed mosquitoes. These areas include, farm land, wetlands (fresh and salt water), home yards, storm water facilities, and sewer plants. These areas need to be addressed in unison to control mosquitoes and the viruses they can spread. One of the best ways to control a pest over a large area is by approaching the area as an area-wide integrated pest management (IPM). IPM is using a combination of different techniques (biology, chemical, etc.) to control a pest. Area-wide IPM is defined as IPM applied against an entire pest population within a specific geographic area. This method requires coordination with all parties within that area for the entire breeding season.

There are some proven techniques to control mosquitoes:

1. Chemical control – Use of pesticides
2. Biological control – Use of other animals (fish, other insects, bacteria, etc.)
3. Environmental control – The reduction of breeding habitat
4. Cultural control – Education and outreach to schools and communities
5. Disease and Population Surveillance – NJ light trap monitor populations and species while CDC and gravid traps are used to test mosquitoes for Eastern Equine Encephalitis (EEE), West Nile Virus (WNV), St. Louis Encephalitis (SLE), and Chikungunya

By using all these techniques we can hope to reduce the risk of mosquito borne disease, as well as reduce the nuisance mosquitoes cause.

### What are some general symptoms of overexposure to pesticides?

Some general symptoms are headache, dizziness, nausea, diarrhea, and trembling.

### How can you avoid exposure to pesticides?

Make sure to follow the label on pesticides. If someone is applying pesticides in your area stay inside till the fog or mist subsides. Remember all pesticides used by Burlington County are registered with both the EPA and NJDEP, which means they are legal to be used for mosquito control in the State of New Jersey.

### Where can I get more information?

The Burlington County Mosquito Control website, [www.co.burlington.nj.us/mosquitocontrol](http://www.co.burlington.nj.us/mosquitocontrol), is a great source to start with. You can also call us at 609-265-5064.



## Resident Frequently Asked Questions

### COMMUNITY RELATIONS

When it comes to threats of mosquito-borne diseases, communities look to local leaders for action and information. A quality community relations program allows mosquito abatement districts and public health officials to educate the public, keeping them aware of programs and treatments to ensure their safety.

#### Why are you spraying our community for mosquitoes?

Mosquito populations are controlled with integrated programs that focus on breeding habitats and control of the adult mosquito. When mosquito populations increase, experts in the field determine that spraying an adulticide is the best way to control the adults that can carry mosquito-borne diseases.

#### What is a mosquito-borne disease?

A mosquito-borne disease is a disease transmitted through a mosquito bite. Female mosquitoes feed on humans and other mammals for the protein they need to reproduce. When they do, they can transfer diseases such as West Nile virus, malaria, yellow fever, dog heartworm and viral encephalitis. Mosquito-borne diseases are among the world's leading causes of illness and death.

#### Why do you spray after dusk or before dawn?

Most mosquitoes are active just after dusk and right before dawn. These times offer the best opportunity to reach active mosquitoes and achieve the most coverage for decreasing the adult mosquito population.

#### What are you spraying?

Zenivex® adulticide is highly effective and the only mosquito adulticide product that is classified as reduced risk by the Environmental Protection Agency (EPA). The product delivers a molecule called Etofenprox in a formulation that does not require any synergist such as a PBO to enhance its efficacy.

#### Does Zenivex® adulticide pose a risk to humans?

The active ingredient in Zenivex® adulticide has been tested and approved through the EPA for use in outdoor residential and recreational areas. It is the only mosquito adulticide on the market today that has received a reduced risk classification from the EPA. The product also has a low toxicity profile for mammals, avians and plants.

#### What can I (the consumer) do?

Everyone can help control mosquitoes. By minimizing the amount of standing water around the home and community, families can significantly reduce mosquito populations.

- Turn over pails, planters or anything that can hold stagnant water, allowing mosquitoes to breed.
- Treat standing water in ornamental ponds, birdbaths, gutters and pool covers with a larvicide.
- Remove litter from your yard. Mosquitoes can lay eggs in small, discarded items that hold water such as cans, bottles and wrappers.

## RUTGERS COOPERATIVE EXTENSION

NEW JERSEY AGRICULTURAL EXPERIMENT STATION

# Frequently Asked Questions About Mosquitoes

Wayne J. Crans  
Research Professor in Entomology

## How many kinds of mosquitoes are there?

About 3,000 species of mosquitoes have been described on a world-wide basis. Approximately 150 are known to occur in North America. The term "Mosquito State" is appropriate for New Jersey because 63 species of mosquitoes have been found within its boundaries. Scientists group species by genus on the basis of the physical characteristics they share. The 3,000 mosquito species found in the world are divided among 28 different genera. The genus *Aedes* contains some of the worst pests. Many members of the genus *Anopheles* have the ability to transmit human malaria. Ten different genera occur in New Jersey, including: *Aedes*, *Anopheles*, *Culex*, *Culiseta*, *Coquillettidia*, *Psorophora*, *Orthopodomyia*, *Uranotaenia*, *Toxorhynchites*, and *Wyeomyia*. It is sometimes more convenient to group mosquitoes by the breeding habitat they use. The major habitat groups found in New Jersey include: "Snowpool Mosquitoes," "Floodwater Mosquitoes," "Swamp-Breeding Mosquitoes," and "Container-Breeding Mosquitoes."

## Why do mosquitoes bite?

Mosquitoes belong to a group of insects that requires blood to develop fertile eggs. Males do not lay eggs, thus, male mosquitoes do not bite. The females are the egg producers and "host-seek" for a blood meal. Female mosquitoes lay multiple batches of eggs and require a blood meal for every batch they lay. Few people realize that mosquitoes rely on sugar as their main source of energy. Both male and female mosquitoes feed on plant nectar, fruit juices, and liquids that ooze from plants. The sugar is burned as fuel for flight and is replenished on a daily basis. Blood is reserved for egg production and is imbibed less frequently.

## Why do mosquito bites leave welts?

When a female mosquito pierces the skin with her mouthparts, she injects a small amount of saliva into the wound before drawing blood. The saliva makes penetration easier and prevents the blood from clotting in the narrow channel of her food canal. The welt that appears after the mosquito leaves is not a reaction to the wound, but an allergic reaction to the saliva injected to prevent clotting. In most cases, the itching sensation and swellings subside within several hours. Some people are highly sensitive, and symptoms persist for several days. Scratching the bites can result in infection if bacteria from the fingernails are introduced to the wounds.

## Why are some people more attractive to mosquitoes than others?

Scientists are still investigating the complexities involved with mosquito host acceptance and rejection. Some people are highly attractive to mosquitoes and others are rarely bothered. Mosquitoes have specific requirements to satisfy, and process many different factors before they feed. Many of the mosquito's physiological demands are poorly understood and many of the processes they use to evaluate potential blood meal hosts remain a mystery. Female mosquitoes use the CO<sub>2</sub> we exhale as their primary cue to our location. A host-seeking mosquito is guided to our skin by following the slip stream of CO<sub>2</sub> that exudes from our breath. Once they have landed, they rely on a number of short-range attractants to determine if we are an acceptable blood meal host. Folic acid is one chemical that appears to be particularly important. Fragrances from hair sprays, perfumes, deodorants, and soap can cover these chemical cues. They can also function to either enhance or repel the host-seeking drive. Dark colors capture heat and make most



people more attractive to mosquitoes. Light colors refract heat and are generally less attractive. Detergents, fabric softeners, perfumes, and body odor can counteract the effects of color. In most cases, only the mosquito knows why one person is more attractive than another.

### How long do mosquitoes live?

Mosquitoes are relatively fragile insects with an adult life span that lasts about two weeks. The vast majority meet a violent end by serving as food for birds, dragonflies, and spiders; or are killed by the effects of wind, rain, or drought. The mosquito species that only have a single generation each year are longer lived and may persist in small numbers for as long as 2-3 months if environmental conditions are favorable. Mosquitoes that hibernate in the adult stage live for 6-8 months but spend most of that time in a state of torpor. Some of the mosquito species found in arctic regions enter hibernation twice and take more than a year to complete their life cycle.

### Where do mosquitoes go in the winter?

Mosquitoes, like all insects, are cold-blooded creatures. As a result, they are incapable of regulating body heat, and their temperature is essentially the same as their surroundings. Mosquitoes function best at 80° F, become lethargic at 60° F, and cannot function below 50° F. In tropical areas, mosquitoes are active year round. In temperate climates, mosquitoes become inactive with the onset of cool weather and enter hibernation to live through the winter. Some kinds of mosquitoes have winter-hardy eggs, and hibernate as embryos in eggs laid by the last generation of females in late summer. The eggs are usually submerged under ice and hatch in spring when water temperatures rise. Other kinds of mosquitoes overwinter as adult females that mate in the fall; enter hibernation in animal burrows, hollow logs, or basements; and pass the winter in a state of torpor. In spring, the females emerge from hibernation, blood feed, and lay the eggs that produce the next generation of adults. A limited number of mosquitoes overwinter in the larval stage, often buried in the mud of freshwater swamps. When temperatures rise in spring, these mosquitoes begin feeding, complete their immature growth, and eventually emerge as adults to continue their kind.

### Can mosquitoes carry diseases?

Any insect that feeds on blood has the potential of transmitting disease organisms from human to human.

Mosquitoes are highly developed blood-sucking insects and are the most formidable transmitters of disease in the animal kingdom. Mosquito-borne diseases are caused by human parasites that have a stage in their life cycle that enters the blood stream. The female mosquito picks up the blood stage of the parasite when she imbibes blood to develop her eggs. The parasites generally use the mosquito to complete a portion of their own life cycle and either multiply, change in form inside the mosquito, or do both. After the mosquito lays her eggs, she seeks a second blood meal and transmits the fully developed parasites to the next unwitting host. Malaria is a parasitic protozoan that infects the blood cells of humans and is transmitted from human to human by *Anopheles* mosquitoes. Encephalitis is a virus of the central nervous system that is passed from infected birds to humans by mosquitoes that feed on birds as well as people. Yellow fever is a virus infection of monkeys that can either be transmitted from monkey to human or from human to human. Dengue is a sub-tropical virus that is passed directly from one human to the next. Dog heartworm is a large filarial worm that lives in the heart of dogs but produces a blood stage small enough to develop in a mosquito. The dog heartworm parasite does not develop properly in humans and is not regarded as a human health problem. In some tropical areas of the world, a closely related parasite produces human elephantiasis—a debilitating mosquito-borne affliction that results in grossly swollen arms, legs, and genitals.

### Can mosquitoes transmit AIDS?

The HIV virus that produces AIDS in humans does not develop in mosquitoes. If HIV-infected blood is taken up by a mosquito, the virus is treated like food and digested along with the blood meal. If the mosquito takes a partial blood meal from an HIV-positive person and resumes feeding on a non-infected individual, insufficient particles are transferred to initiate a new infection. If a fully engorged mosquito with HIV-positive blood is squashed on the skin, there is still insufficient transfer to produce infection. The virus diseases that use insects as agents of transfer produce tremendously high levels of parasites in the blood. The levels of HIV that circulate in human blood are so low that, in most cases, HIV antibody must be used as the indicator to diagnosis infection.

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**RUTGERS COOPERATIVE EXTENSION  
N.J. AGRICULTURAL EXPERIMENT STATION  
RUTGERS, THE STATE UNIVERSITY OF NEW JERSEY  
NEW BRUNSWICK**

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# RUTGERS COOPERATIVE EXTENSION

NEW JERSEY AGRICULTURAL EXPERIMENT STATION

## Controlling Mosquitoes Around the Home

Wayne J. Crans, Associate Research Professor  
Farida Mahmood, Research Associate

More than 60 different kinds of mosquitoes have been identified in New Jersey. All require water in their immature stages but the kind of water the female selects for her eggs varies considerably from one species to the next. The major pest species in coastal areas come from the tidal water that collects on salt marsh wetlands. At inland areas, many important pest mosquitoes develop in rainpools formed by summer thunderstorms. Permanent swamps are an important source for mosquitoes throughout the state.

Many of the mosquitoes that cause annoyance must be eliminated by authorized county mosquito control agencies because of restrictions regarding work conducted in wetland habitats. Several important pest mosquitoes, however, breed around the home, and homeowners can substantially reduce mosquito nuisance caused by these species. This fact sheet describes the habits of the most common mosquito pests that breed around the home and suggests methods to keep your property mosquito-free.

### The Mosquito Life Cycle

All mosquitoes develop from eggs deposited by females that have previously fed on blood. The female mosquito is very specific about where she lays her eggs and searches diligently for water that will be suitable for her offspring. Most of the mosquitoes that breed around the home require stagnant water rich in decomposing organic material. This is not true of all mosquitoes; most pest species require clean, clear breeding habitats.

Having located a suitable water source, the female mosquito deposits the 100-200 eggs that will produce the next generation. Some species lay their eggs directly on the water's surface; others leave their eggs in an area that will flood at a later date. Mosquitoes are aquatic in their immature stages and, without exception, require water to complete their development. Mosquitoes do not breed in tall grass as many people have been led to believe.

Each egg that the female lays hatches into an aquatic organism that is termed a "mosquito larva." The larval

stage is wingless, legless and wormlike in appearance. Mosquito larvae are very active and move almost continuously as they shuttle to the surface to obtain oxygen and dive to the bottom to find food. Larval mosquitoes feed on organic matter in the water and grow rapidly during this stage of their life. Within days, they enter a stage termed the "mosquito pupa" to allow formation of the legs, wings and other characteristics used in the adult stage. When this process is complete, the fully formed adult emerges from the pupal case. The entire life cycle from egg to adult can be completed in less than 10 days during periods of favorable temperatures.

Mosquitoes are expert fliers and many species can range great distances from their breeding sites. Flight, however, expends energy and most mosquito species have exceptionally high energy requirements. Mosquitoes obtain energy by feeding on flowers and convert the sugar from nectar as a source of fuel. Both male and female mosquitoes feed regularly on flowers but females require blood to produce fertile eggs. As a result, a female mosquito must find a host and blood feed before she can lay her eggs. Male mosquitoes do not lay eggs and, therefore, do not feed on blood.

Most of the mosquitoes that emerge in the wild never have contact with humans and obtain blood from the most common animals in their habitats. Some species prefer birds as blood meal hosts and rarely function as pests of humans. Others accept a wide range of animal hosts, including humans, and function as pests whenever they occur in numbers in areas frequented by humans. The mosquito species that breed around the home are considered "domestic species" and rarely range far from human habitations. All accept humans as a blood meal host, many will enter houses to feed and most are regarded as significant pests by the average homeowner.

### Mosquitoes that Breed Around the Home

The northern house mosquito, *Culex pipiens*, is the most common mosquito found in urban and suburban areas. This mosquito will lay its eggs in virtually any



receptacle containing water rich in decomposing organic material. Breeding habitats around the home include: discarded tires, unwashed bird baths, clogged rain gutters and plastic wading pools allowed to stagnate through disuse. The mosquito will not lay its eggs in any of these habitats if the water is too clear. Grass clippings, dead leaves and algae, however, quickly produce an infusion that is highly attractive to the female mosquito. Once the water begins to foul, the northern house mosquito will readily lay her eggs and will use any receptacle containing decaying organic material that is found on your property.

The eastern tree-hole mosquito, *Aedes triseriatus*, is another fairly common pest around the home. This mosquito lays its eggs in tree-holes that form in a variety of shade trees. Tree-holes are actually rot-outs in the tree trunk. They often form in a crevice where several branches meet or in an area where a branch has been lost. The water that accumulates in tree holes becomes exceedingly foul from the decomposition of wood accompanying the rotting process. The female eastern tree-hole mosquito is highly attracted to tree-hole water and glues her eggs just above the water line within the rot hole. The eggs hatch when rain raises the water level within this unique habitat. Discarded tires that trap decomposing leaves simulate the tree-hole habitat and are highly attractive to the eastern tree-hole mosquito as an egg-laying site. A single discarded tire in your yard can produce tens of thousands of tree-hole mosquitoes over the course of a season.

The white-dotted mosquito, *Culex restuans*, and the mottled wing Anopheles, *Anopheles punctipennis*, can also cause annoyance around the home. These species share habitat with both of the mosquitoes mentioned above and will enter your home to obtain a blood meal.

## Reducing Mosquito Annoyance Around the Home

Mosquito breeding around the home can be reduced significantly by reducing the amount of standing water available for mosquito breeding.

- Dispose of tin cans, plastic containers, ceramic pots or similar water-holding containers that have accumulated on your property. Do not overlook containers that have become overgrown by aquatic vegetation.
- Pay special attention to discarded tires that may have accumulated on your property. The used tire has become the most important domestic mosquito producer in this country.
- Drill holes in the bottom of recycling containers that

are left out of doors. Drainage holes that are located on the sides collect enough water for mosquitoes to breed in.

- Clean clogged roof gutters on an annual basis, particularly if the leaves from surrounding trees have a tendency to plug up the drains. Roof gutters are easily overlooked but can produce millions of mosquitoes each season.
- Turn over plastic wading pools when not in use. A wading pool becomes a mosquito producer if it is not used on a regular basis.
- Turn over wheelbarrows and do not allow water to stagnate in bird baths. Both provide breeding habitat for domestic mosquitoes.
- Aerate ornamental pools or stock them with fish. Water gardens are fashionable but become major mosquito producers if they are allowed to stagnate.
- Clean and chlorinate swimming pools that are not being used. A swimming pool that is left untended by a family that goes on vacation for a month can produce enough mosquitoes to result in neighborhood-wide complaints. Be aware that mosquitoes may even breed in the water that collects on swimming pool covers.
- Use landscaping to eliminate standing water that collects on your property. Mosquitoes will develop in any puddle that lasts more than 4 days.

## Obtaining Additional Information on Mosquitoes and Their Control

If the methods outlined in this fact sheet do not significantly alleviate mosquito annoyance around your home, the mosquitoes causing the problem are probably coming from breeding habitat that is not located on your property. Mosquitoes that breed in permanent swamp habitats will travel 1-2 miles in quest of a blood meal. Mosquitoes that emanate from floodwater habitats can cause nuisance 10-20 miles from their breeding source. Mosquito control is organized by county in New Jersey and your county mosquito control agency has the expertise to inspect your property, collect biting adults and determine the source of the problem. Your county mosquito control agency can also provide additional information on mosquitoes, the diseases they transmit and the best methods for their control.

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# RUTGERS COOPERATIVE EXTENSION

NEW JERSEY AGRICULTURAL EXPERIMENT STATION

## Products and Promotions That Have Limited Value for Mosquito Control

Wayne J. Crans

Associate Research Professor in Entomology

Virtually every year, a new product appears on the market that claims to be the answer for the elimination of mosquito nuisance. In nearly every case, the promotion is accompanied by a great deal of advertising, but the merits of the product are rarely backed with scientific testing. The American public has invested billions of dollars in zappers, repellents, and plants that claim they will keep mosquitoes from biting. Products and promotions for mosquito control are big business; unfortunately most have limited value in reducing mosquito annoyance.

### Electronic Repellers

Hand-held electronic devices that rely on high-frequency sound to repel mosquitoes have become surprisingly popular in recent years. Prices range from \$9.95 to \$29.95 for units advertised in magazines. Heavy-duty repellents that claim to keep away spiders, hornets, and rats, in addition to mosquitoes may sell for more than \$100.00. The manufacturer's rationale for using sound as a repelling factor varies from one device to the next. Some claim to mimic the wing beat frequency of a male mosquito. This, supposedly, repels females who have already mated and do not wish to be mated a second time. Others claim to mimic the sound of a hungry dragonfly, causing mosquitoes to flee the area to avoid becoming the predator's next meal. Most of the electronic repellents on the market hum on a single frequency. Top of the line devices allow for adjustment by the user to achieve the most effective frequency for the mosquito causing the problem. Scientific studies have repeatedly shown that electronic mosquito repellents do not prevent host seeking mosquitoes from biting. In most cases, the claims made by distributors border on fraud. Mated female mosquitoes do not flee from amorous males, and mosquitoes do not vacate an area hunted by dragonflies. Electronic mosquito repellents do little in the way of reducing mosquito annoyance.

### Bug Zappers

Electrocuting devices, popularly known as *Bug Zappers*, are the most popular device on the market for reducing mosquitoes around the home. Most rely on ultraviolet light to draw insects through an electrified wire grid. A resounding pop followed by a series of sizzling sounds signals the homeowner that an insect has passed through the electrocuting device. Most homeowners keep the machine on a timer that turns the units off during the daylight hours, but some run the traps day and night during the summer season. Bug zappers kill a lot of insects, but very few of the insects killed function as pests. Most of the popping sounds are night-flying moths tricked into the trap while attempting to navigate by the moon. The long drawn-out sizzles are usually beetles, because they are heavier than most night flying insects and have considerably more bulk to fry. Scientific studies indicate that mosquitoes make up a very small percentage of bug zapper collections. Comparison trapping has also shown no significant difference in mosquito populations in yards with and without the traps. Biting insects, in general, make up less than 1 percent of the insects killed in zappers. Unfortunately, beneficial insects are usually well represented in an average night's catch. The continued popularity of these traps is probably due to the never-ending sound effects, which remind owners that their investment is working. Most trap operators are unaware that their zappers are killing harmless insects that would otherwise serve as food for wildlife.

### Citrosa Plants

The Citrosa plant is a genetically engineered houseplant created by incorporating tissue cultures of the grass that produces citronella oil into hybrid varieties of geranium to produce a cultivar that emits a citronella aroma. Citronella oil is known to have mosquito-repel-



ling properties, and the concept of allowing a plant to emit a barrier of repellent vapor appears sound. Unfortunately, the claims made by the distributors have not stood up to scientific testing. Tests conducted in Florida indicated that Citrosa plants did not reduce the number of bites received by test subjects. Moreover, mosquitoes landed freely on the leaves indicating that the plant does not emit enough citronella oil to repel the insects. Crushing the leaf and rubbing it into the skin did not keep mosquitoes from biting and mixing the leaves into a slurry did not help. The idea of engineering a plant with mosquito repelling properties should be encouraged. Advertising and selling that plant before its effectiveness is documented takes advantage of the American consumer.

## Insectivorous Bats

Every so often, a well-meaning conservation group promotes bats to eliminate mosquitoes from areas where nuisance has become intolerable. This undoubtedly leads to rediscovery of research conducted in the 1950s indicating that bats released in a room filled with mosquitoes could catch up to 10 mosquitoes per minute. The research was conducted to measure the effectiveness of echolocation in insectivorous bat species. The results have been extrapolated to suggest that wild bats can consume 600 mosquitoes per hour. Using that figure, a colony of 500 bats will remove 250,000 mosquitoes each hour and theoretically afford mosquito control for an entire neighborhood. Research since that time has shown that insectivorous bats are opportunistic feeders and that mosquitoes make up a very small percentage of their natural diet. Bats' behavior when locked in a room with nothing to feed upon but mosquitoes has no bearing on their behavior in the wild. Bats feed on the same insects that turn up in bug zappers and are no more effective for controlling mosquitoes than their electronic equivalent. Providing habitat to enhance bat populations is an admirable activity for conservation purposes. Using mosquito control as the reason to initiate public interest is misleading at best.

## Purple Martins

The average person truly believes that Purple Martins control mosquitoes. No other form of biological control

has been so broadly publicized, and the concept of using a colonial bird is easy to accept. Purple Martins are lovely birds and having a colony nearby is educational and aesthetic. Purple Martins, however, do not control mosquitoes and should not be propagated if eliminating mosquitoes is the central issue. Proponents of the Purple Martin cite the oft-quoted statement that a Purple Martin will eat 2,000 mosquitoes a day and up to 14,000 when the insects are extremely plentiful. The quote is based on an anecdotal account in the literature that was based on body weight of the bird and the number of mosquitoes that would be required to sustain its metabolism. Most ornithologists realize that mosquitoes form an insignificant portion of the Purple Martin's diet and would agree that the birds play a limited role controlling mosquito populations. If mosquitoes are plentiful, the birds will feed on them, but an adult Purple Martin that is foraging in mosquito territory will accept a dragonfly in place of a mosquito without hesitation. Purple Martins, as well as other insectivorous birds, should be encouraged to nest and be provided with housing whenever possible. Do not, however, believe that the birds will significantly diminish mosquito populations in your community. The manufacturers of Purple Martin houses cite mosquito control potential for their own economic gains. The birds do not need this hoax to retain public acceptance.

There are products on the market that will provide relief from mosquito attack. Commercial repellents that contain DEET can be highly effective for short periods. Many people, however, dislike the oily consistency or object because of health concerns connected with the product. Products that rely on fragrance to repel mosquitoes show considerable promise and have been under intense investigation since the Avon product, *Skin-So-Soft* showed proven repellent properties. Predacious fish feed on the immature stages of mosquitoes and are extremely efficient in terms of control. In salt marsh areas, native killifish can be managed to eliminate mosquitoes from some types of marshland. In upland areas, pond-raised mosquito fish can be stocked to eliminate mosquitoes. Electronic repellents, bug zappers, and mosquito-fighting plants represent hoaxes that are marketed solely for economic gain. The American consumer, should be aware that these products have little value for mosquito control.

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N.J. AGRICULTURAL EXPERIMENT STATION

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# Fact sheet

## Prevent Tick Bites: Prevent Lyme Disease

*Deborah Smith-Fiola, Former Ocean County Agricultural Agent & George C. Hamilton, Ph.D., Extension Specialist in Pest Management*

**L**yme disease is spread by the deer tick (now called the black legged tick). Ticks feed on the blood of animals, and *infected* ticks transmit the disease as they feed. Although the black legged tick prefers to feed on wild animals, especially mice and deer, they will also feed on dogs, cats, livestock, and humans.

The black legged tick is found in the shrubby understory of the forest, in high grassy areas, and in open fields. Ticks do not jump or fly—they crawl up vegetation and wait for an animal to brush against them. They then climb upon the animal and insert their mouth parts. They will feed on blood for 3 to 5 days. Following a blood meal, the tick swells to more than four times its normal size and then drops to the ground.

When people visit or live near the woods and other black legged tick habitats, they run a high risk of contracting Lyme disease. Ehrlichiosis and Babesiosis are other diseases vectored by ticks. For your own safety, become familiar with tick habits and habitats, and learn how to prevent tick bites.

### Life Cycle

After hatching from an egg in late spring, the black legged tick goes through three life stages: larva, nymph, and adult. Each stage feeds only once and requires a different animal host. Black legged ticks take 2 years to complete their life cycle.

**Larvae -** are very small (about the size of a pin head). They feed in late summer on mice, shrews, chipmunks, voles, and other small animals. People rarely come in contact with larvae, as they live near ground level. Larvae pick up the disease from an infected animal.  
**Actual Size** Peak activity: August.

**Nymphs-**

  
**Actual Size**

are the size of a poppy seed. They sometimes appear translucent, with a dark head. Nymphs feed from mid-May through August on larger animals including birds, racoons, opossum, squirrels, cats, dogs, and humans. Peak activity: late May to June.

**Adults-**

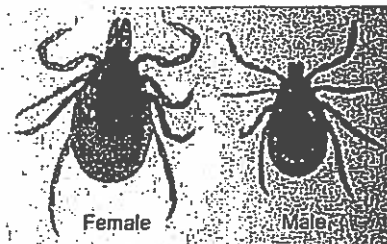


**Actual Size**

are the size of a sesame seed. Males are black; females have a brick-red abdomen. Females swell to 1/4 inch when fully engorged after feeding. Adults are active all winter, as long as temperatures are above freezing. They feed primarily on deer, but will also attack cattle, horses, dogs, and large animals. Humans are accidental hosts. Peak activity: October/November and again in April.

As long as temperatures are above freezing, black legged ticks are active the entire year. Peak activity months are May to June (nymphs), and October/November and again in April (adults).

*Note: Seventy percent or more of all Lyme disease cases occur from the bite of ticks in the nymph stage.*



*Black legged Tick (enlarged to show detail)*



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## Tick Identification

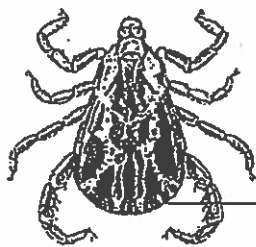
All ticks go through three growth stages (larva, nymph, adult) which differ in size. The easiest way to distinguish the black legged tick from other ticks is by size, shape, and coloration. All stages of the black legged tick have a black head and a black dorsal shield behind the head. The previous page has descriptions of each black legged tick lifestage.

All ticks have distinctive features that separate the tick species. The following drawings are greatly enlarged to show characteristics used for identification of hard ticks. Observing these features requires magnification.

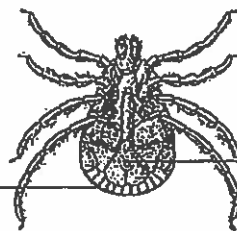
**Festoons**—ridges on the edge of the lower abdomen. Black legged ticks do not have festoons. Other common ticks do have festoons.

**Anal Opening**—looks like a "belly button" on the under side of a tick. It tends to be in the center of the body of most ticks. On the black legged tick, the anal opening is near the lower edge of the abdomen AND lies within a horseshoe-shaped ridge (see illustration).

### A. Ticks that are *not* primary vectors of Lyme disease (American Dog Tick and Lone Star Tick)



Dorsal



Ventral

Festoons

Anal opening

### B. Black legged tick (*Ixodes*; primary vector of Lyme disease; also vectors H. G. Ehrlichiosis)



Dorsal



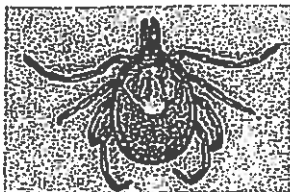
Ventral

No Festoons

Horseshoe-shaped ridge

Anal opening

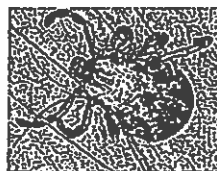
(greatly enlarged drawings of adult females)



Lone Star Tick

*Amblyomma americanum*

(Vector of "Lyme-like" disease; H.M. Ehrlichiosis) Common south of Freehold, New Jersey. Very fast and aggressive. Red brown in color, tear drop shaped.



American Dog Tick

*Dermacentor variabilis*

(Vector of Rocky Mountain Spotted Fever) The largest tick found in New Jersey. Solid brown with mottled white dorsal shield. Oblong in shape.



Brown Dog Tick

*Rhipicephalus sanguineus*

An indoor species. It can survive outdoors during the summer.



## Favorite Tick Habitats

Black legged ticks prefer to live in the woods. Dense, mature woods with a thick under growth of shrubs and small trees are their favorite habitat (85%). They are also found, to a lesser degree, along the edge of woods, where woods meet lawns, fields or landscaped beds. Very few (4 to 8%) are found in lawns, because properly mowed lawns are too hot and dry to sustain the tiny black legged tick. Ticks prefer the cool, moist woodlands where they have a better chance of finding an animal host.

Where you live, your hobbies, and your habits may influence your risk of a tick bite. Notice in particular these high risk factors:

- yard surrounded by dense woods
- bird baths, bird feeders
- outdoor pets that come indoors
- woodpiles, brush piles, rock walls
- swingsets; treehouses in the woods
- outdoor occupations: landscapers, utility line workers, farmers, etc.
- outdoor recreation: freshwater fishing, camping, hiking, hunting, etc.
- viewing deer in the yard

Many of these factors encourage wildlife near the home, and these animals may carry ticks. Mice, in particular, are known hosts of immature black legged ticks and carriers of Lyme disease. Reduce, remove, or avoid these risk factors as much as possible.

## Ticks: Disease Cycle

The risk of being bitten by an infected black legged tick is greatest in the summer months, especially in late May and June, when the nymph stage is active. This is the time of year when people, notably children, are most active outdoors. Make a habit of thoroughly checking yourself and others daily for the tiny nymph after outdoor activities and vacations.

About 20 to 45% of the black legged ticks in New Jersey (depending on the lifestage and where they are found) are infected with and able to transmit Lyme disease. Newly hatched black legged ticks do not initially carry this disease; they pick it up from an infected animal. A preferred animal host is the white-footed mouse, the

primary reservoir host of the Lyme disease bacterium. Once a tick picks up the bacterium, it will retain it to its next stage, and be able to infect future host animals. Each lifestage of the black legged tick feeds on only one animal host.

## Know the Early Signs of Lyme Disease

- headache
- flulike symptoms
- "bull's-eye" rash (>2" in diameter)
- swelling and pain in the joints
- fatigue

Lyme disease symptoms mimic many other diseases. About 70% of Lyme disease victims will develop a rash within 2 days to 4 weeks. If untreated, more severe symptoms may develop—sometimes months to years later.

If you suspect Lyme disease, consult a physician immediately. Symptoms that progress very quickly could be the result of Ehrlichiosis (H.G.E.), another tick-borne disease.

## Finding and Removing Ticks

Infected black legged ticks must feed for at least 24 hours before they can begin to transmit the Lyme disease bacterium. Therefore, you should remove ticks as soon as possible. Take a shower after outdoor activity and put clothes in the dryer (dry heat will kill ticks). Check your body thoroughly, paying close attention to the armpits, the groin, and neck. Use the buddy system! Look for ticks nightly, especially if you have young children.

Remove ticks with tweezers only (bent, "needle-nose" tweezers are best). Apply steady backward force until the tick is dislodged. Do not use alcohol, nail polish, hot matches, petroleum jelly, or other methods to remove ticks. These methods may actually traumatize ticks, causing them to regurgitate their gut contents, which may include the Lyme disease bacterium.

Save the live tick for identification by the Rutgers Cooperative Research & Extension office in your county.

## Personal Protection

Outdoor pursuits need not be discontinued as long as precautions are taken to prevent a tick bite:

- avoid tall grass and shrubby areas
- wear light-colored clothing (ticks are easier to see)
- wear long pants *tucked into socks*
- widen trails through woods (to 6 feet)
- remove brushpiles
- keep turfgrass mowed
- thin out low shrub vegetation in woods
- wear a tick repellent

## Repellents

Repellents are applied to clothing and/or skin and repel 82 to 100% of ticks. Repellents contain either the active ingredient permethrin (Duranon, Permethrin Tick Repellent, Permanone) labeled for clothing, or N,N-diethylmeta-tolamide, commonly called DEET (Off, Cutters, Muskol, etc) labeled for skin or clothing. *Follow label directions:* Apply to clothing until damp and allow to dry. Some slow release repellents are also available (Skeedattle) as well as botanical extracts (citronella, oil of peppermint).

## Pesticides

If avoiding tick-infested areas is not possible, pesticide use may be justified. Reducing high risk factors should be the first alternative, including the use of deer repellents, deer resistant plants, and deer fencing.

If ticks are present, treat edge areas of the property (where turfgrass and woods meet) plus 12 feet into the woods to create a protective barrier. Shady areas of the lawn adjacent to the woods may also be treated.

READ AND FOLLOW ALL DIRECTIONS ON THE LABEL. Some insecticides authorized for tick control include:

SEVIN (carbaryl)  
PERMETHRIN (a pyrethroid)  
TEMPO II (a pyrethroid)\*

Granular insecticides provide good control of nymphs, since it penetrates foliage (liquids, if used, must be applied with enough pressure to disturb the leaf litter) Apply once a year (late May). Research shows >90% control of nymphs targeted in this lifestage with one properly timed granular treatment.

Liquid insecticides provide good control of adult ticks. Thoroughly spray on vegetation until run off. Apply after leaves have dropped from the trees in November, and/or in April before leaves appear. Control levels have reached 95% during these times.

DAMMINIX is a product that provides insecticide-laced nesting material to mice. It kills immature ticks feeding on mice in their burrows. Place it only in areas where mice frequent. Damminix may also be used in combination with the above insecticides and habitat modification.

For more information on Lyme disease, see your health care provider or call the N.J. Dept. of Health Lyme Disease Hotline: (800) 792-8831; the Lyme Disease Foundation (800) 886-LYME ([www.lyme.org](http://www.lyme.org)); or the American Lyme Foundation (914) 277-6970 ([www.aldf.com](http://www.aldf.com)); and information is also available on the Lyme Disease Network Website ([www.lymenet.org](http://www.lymenet.org)).

*\*This insecticide is for use only by professional applicators.*

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RUTGERS COOPERATIVE RESEARCH & EXTENSION  
N.J. AGRICULTURAL EXPERIMENT STATION  
RUTGERS, THE STATE UNIVERSITY OF NEW JERSEY  
NEW BRUNSWICK

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## Pesticide Information

This sheet answers some basic questions about mosquito control products in use in our County. Your Burlington County Mosquito Control, along with several other resources (listed at the end of this sheet), can provide more detailed information if requested.

### What pesticides are used and how are they used?

**Scourge** is an insecticide product that is recommended for mosquito control in New Jersey by Rutgers, The State University of New Jersey. It contains the pesticides called Resmethrin and Piperonyl Butoxide. The US Environmental Protection Agency's (EPA) current evaluation considers Resmethrin and Piperonyl Butoxide containing products to be slightly toxic with minimal potential risk to people when used properly as part of a complete mosquito control program.

**Atrapa or Fyfanon** is an insecticide product that is recommended for mosquito control in New Jersey by Rutgers, The State University of New Jersey. It contains the pesticides called Malathion. The US Environmental Protection Agency's (EPA) current evaluation considers Malathion containing products to be slightly toxic with minimal potential risk to people when used properly as part of a complete mosquito control program.

**Zenivex E20** is an insecticide product that is recommended for mosquito control in New Jersey by Rutgers, The State University of New Jersey. It contains the pesticides called Etofenprox. The US Environmental Protection Agency's (EPA) current evaluation considers Etofenprox containing products to be slightly toxic with minimal potential risk to people when used properly as part of a complete mosquito control program.

These pesticides are used for the control of adult mosquitoes. While habitat management and measures to control immature mosquitoes in water are the preferred routine approaches, the spraying of adult mosquitoes is called for when biting populations reach critical levels or when a disease organism is present in adult mosquitoes. A very fine mist is sprayed into the air since flying mosquitoes must directly contact the pesticide for it to be effective.

### How can I avoid exposure to pesticides?

Risk to the general public from the use of these pesticides are minimal. Avoiding exposure is always the safest course of action, particularly for populations that may be at higher risk such as pregnant women, children, the elderly and those with chronic illnesses. Any possible exposure risk can be reduced by following some common sense actions:



- Pay attention to notices about spraying found in newspapers, websites, and automated telephone messages.
- Plan your activities to limit time spent outside during possible pesticide treatments.
- Move children's toys out of application areas.
- Move animals and their food and water dishes out of application areas.
- Stay away from application equipment, whether in use or not.
- Whenever possible, remain indoors with windows closed and window AC units on non-vent.
- Avoid direct contact with surfaces that are still wet from pesticide spraying. Do not allow children to play in areas that have been sprayed until they have completely dried (about 1 hour)
- If you must remain outdoors, avoid eye and skin contact with the spray. If you get spray in your eyes or on your skin, immediately flush and rinse with water.

#### **What are the symptoms of exposure to pesticides?**

Symptoms of exposure to Atrapa or Fyfanon can include headache, nausea, dizziness, excessive sweating, salivation, excessive tearing, and a runny nose.

Symptoms of exposure to Scourge include irritation or sensitization causing an asthmatic condition or skin rash.

Symptoms of exposure to Zenivex can include headache, nausea, dizziness, salivation, excessive tearing, and a runny nose.

The chance of experiencing symptoms of exposure from any of these pesticides with proper use is low. You should contact your physician, other medical providers, or the New Jersey Poison Information and Education System (NJPIES) at 1-800-222-1222 if you experience these symptoms following a pesticide spraying.

#### **How long will these pesticides last in the environment?**

These pesticides will stay in the air for a short time until they land on surfaces. They have a low persistence and last no longer than 25 days in water and soil. Sunlight helps to break down the chemicals faster.

#### **Where can I get more information?**

- For overall pesticide-specific information – 9:30am-7:30pm  
**National Pesticide Information Center** 800-858-7378
- For pesticide health information & possible exposures – 24 Hrs  
**New Jersey Poison Information & Education Center** 800-222-1222
- For New Jersey pesticide regulation & misuse complaints  
**NJDEP Pesticide Control Program** 609-984-6507



- For federal pesticide regulation  
**USEPA Region 2 Office of Pesticide Programs**      **732-321-6759**
- For state-wide mosquito control information  
**NJDEP Office of Mosquito Control Coordination**      **609-292-3649**
- For local mosquito control information – 7:30am-4pm  
**The County Mosquito Control**      **609-265-5064**
- For mosquito control recommendation  
**Rutgers University, Department of Entomology**      **732-932-9437**

# Zenivex® E4

RTU

For use only by federal, state, tribal, or local government officials responsible for public health or vector control, or by persons certified in the appropriate category or otherwise authorized by the state or tribal lead pesticide regulatory agency to perform adult mosquito control applications, or by persons under their direct supervision.

- FOR THE CONTROL OF ADULT MOSQUITOES, NON-BITING MIDGES, AND BLACK FLIES
- FOR USE AS A SPACE SPRAY BY AIR AND GROUND APPLICATION TO CONTROL ADULT MOSQUITOES
- APPROVED FOR USE OVER AGRICULTURAL CROPS (INCLUDING THOSE INTENDED FOR HUMAN CONSUMPTION), PASTURE AND RANGELAND
- READY TO USE WITHOUT DILUTION
- CONTROLS ADULT MOSQUITOES THAT MAY CARRY WEST NILE VIRUS, EASTERN EQUINE ENCEPHALITIS, ST. LOUIS ENCEPHALITIS
- CONTROLS NON-BITING MIDGES, NUISANCE AND BITING FLIES
- QUICK, PERMANENT KNOCKDOWN OF ADULT MOSQUITOES

## SPECIMEN LABEL

ACTIVE INGREDIENT:  
 Etofenprox (CAS #80844-07-1)..... 4%  
 OTHER INGREDIENTS\*:..... 96%  
 Total:..... 100%

\*Contains petroleum distillates  
 Contains 0.30 lbs etofenprox per gallon

EPA Reg. No. 2724-807      EPA Est. No. 2724-TX-1

KEEP OUT OF REACH OF CHILDREN

**CAUTION**

See additional Precautionary Statements,

**PRECAUTIONARY STATEMENTS  
 HAZARDS TO HUMANS AND  
 DOMESTIC ANIMALS  
 CAUTION**

Harmful if swallowed. Causes moderate eye irritation. Avoid contact with eyes, skin, or clothing. Applicators and other handlers must wear long-sleeved shirt, long pants, socks and shoes. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco, or using the toilet. Remove contaminated clothing and launder before reuse. Repeated exposure to etofenprox can cause

### FIRST AID

If swallowed • Immediately call a poison control center or doctor. • Do not induce vomiting unless told to do so by a poison control center or doctor. • Do not give any liquid to the person. • Do not give anything by mouth to an unconscious person.

If in eyes • Hold eye open and rinse slowly and gently with water for 15-20 minutes. • Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eyes. • Call a poison control center or doctor for treatment advice.

Have the product container or label with you when calling a poison control center or doctor or going for treatment. You may also contact 1-800-248-7763 for emergency medical treatment information.

**NOTE TO PHYSICIAN:** May pose an aspiration pneumonia hazard. Contains petroleum distillate.

### ENVIRONMENTAL HAZARDS

This pesticide is toxic to aquatic organisms, including fish and aquatic invertebrates. Runoff from treated areas or deposition into bodies of water may be hazardous to fish and other aquatic organisms. Do not apply over bodies of water (lakes, rivers, permanent streams, natural ponds, commercial fish ponds, swamps, marshes or estuaries), except when necessary to target areas where adult mosquitoes are





present, and weather conditions will facilitate movement of applied material away from water in order to minimize incidental deposition into the water body. Do not contaminate bodies of water when disposing of equipment rinsate or washwaters.

This product is highly toxic to bees exposed to direct treatment on blooming crops or weeds. Time applications to provide the maximum possible interval between treatment and the next period of bee activity. Do not apply to blooming crops or weeds when bees are visiting the treatment area, except when applications are made to prevent or control a threat to public and/or animal health determined by a state, tribal, or local health or vector control agency on the basis of documented evidence of disease-causing agents in vector mosquitoes or the occurrence of mosquito-borne disease in animal or human populations, or if specifically approved by the state or tribe during a natural disaster recovery effort.

**PHYSICAL/CHEMICAL HAZARDS**

Combustible. Do not use or store near heat or open flame.

**DIRECTIONS FOR USE**

It is a violation of Federal law to use this product in a manner inconsistent with its labeling. **READ AND FOLLOW ALL LABEL DIRECTIONS.** Before making the first application of the season, it is advisable to consult with the state or tribal agency with primary responsibility for pesticide regulation to determine if other regulatory requirements exist.

**GENERAL**

**ZENIVEX® E4 RTU** is an effective insecticide used at low volumes to control adult mosquitoes, non-biting midges, biting and non-biting flies. Use **Zenivex® E4 RTU** undiluted as UltraLow Volume (ULV) for the control of pest species in or near residential, industrial, commercial, urban, recreational areas, woodlands, golf courses, and other areas where these pests are a problem. **Zenivex® E4 RTU** may be applied over agricultural areas prior to or following harvest for the control of adult mosquitoes within or adjacent to these areas. In the treatment of corrals, feedlots, swine lots, and zoos, cover any exposed drinking water, drinking water fountains, and animal feed before application. Apply **Zenivex® E4 RTU** aerially (both fixed and rotary aircraft) for low volume applications or through mist-blowers, backpack, and handheld sprayers for ground applications. **Zenivex® E4 RTU** will control mosquitoes and flies and can be used as part of a total integrated pest management program for controlling disease vectors. Apply **Zenivex® E4 RTU** at rates from 0.00175 to 0.0070 pounds of etofenprox per acre by ground ULV. Use this product undiluted only; do not mix with water. Apply when wind is  $\geq 1$  mph. Do not apply when wind speeds exceed 10 mph. A temperature inversion is preferable to keep the fog close to the ground and applications should be made when labeled insects are most active.

Do not spray more than 0.18 lbs etofenprox per acre per site per year. Do not make more than 25 applications per site per year. More frequent treatments may be made to prevent or control a threat to public and/or animal health determined by a state, tribal, or local health or vector control agency on the basis of documented evidence of disease-causing agents in vector mosquitoes or the occurrence of mosquito-borne disease in animal or human populations, or if specifically approved by the state or tribe during a natural disaster recovery effort.

**GROUND APPLICATION**

Use a vehicle-mounted cold aerosol ULV sprayer to apply the product. Direct the spray equipment nozzle to provide even distribution of the product. For best results, apply perpendicular to the wind direction using a swath width of 300 ft. Spray equipment must be adjusted so that the volume median diameter (VMD) is between 10-30 microns ( $10\mu \leq D_{v0.5} \leq 30\mu$ ) and that 90% of the spray is contained in droplets smaller than 50 microns ( $D_{v0.9} < 50\mu$ ). Directions from the equipment manufacturer or vendor, pesticide registrant, or test facility using a laser-based measurement instrument must be used to adjust equipment to produce acceptable droplet size spectra. Application equipment must be tested at least annually to confirm that pressure at the nozzle and nozzle flow rate(s) are properly calibrated.

The appropriate application rate can be achieved by using the following table. Refer to the following chart for examples.

Application rate pound A.I. per acre	Flow rates		Vehicle Speed
	Undiluted		
	Oz/Acre	Oz/Minute	
0.00175	0.75	2.25	5
		4.50	10
		7.00	15
0.00350	1.5	4.50	5
		9.00	10
		13.50	15
0.00700	3.0	9.00	5
		18.00	10

Use the higher label rates when spraying areas where dense vegetation is present. Conduct applications when temperatures are between 50-95° F.

**Backpack Sprayer ULV Application**

Apply **Zenivex® E4 RTU** undiluted through non-thermal ULV backpack sprayer capable of applying the product in the 10 to 30 micron range. Apply product to the area as evenly as possible. Apply at the rate of 0.00175 to 0.0070 pounds etofenprox per acre.

**Urban ULV Mosquito Control Applications**

For control of resting or flying adult mosquitoes, biting flies and non-biting midges in areas such as utility



To the extent consistent with applicable law, seller makes no warranty, expressed or implied, concerning the use of this product other than indicated on the label. Buyer assumes all risks of use and handling of this material when such use and handling are contrary to label instructions.

In case of an emergency or for product use information, call 1-800-248-7763.

[www.zenivex.com](http://www.zenivex.com)

**Wellmark International**  
1501 East Woodfield Road 200W  
Schaumburg, Illinois 60173



tunnels, sewers, storm drains and catch basins, pipe chases, underground basements, underground passages, parking decks, crawl spaces or uninhabited buildings, apply Zenivex® E4 RTU using mechanical foggers, hand-held or truck-mounted ULV equipment, thermal foggers or other spray equipment suitable for this application. Apply Zenivex® E4 RTU at rates up to but not exceeding 0.0070 pounds of etofenprox per acre.

#### **Thermal Fogging Application**

Apply using a truck, dolly mounted, handheld, or other thermal fogging equipment. Following the equipment manufacturer's instructions, apply this product at a rate of 0.00175 to 0.0070 pounds etofenprox per acre. Direct fog to areas where mosquitoes and other pests are located. The volume median diameter (VMD) of droplets produced by thermal foggers is less than 60 microns ( $D_{v0.5} < 60\mu$ ) and 90% of the spray is contained in droplets smaller than 100 microns ( $D_{v0.9} < 100\mu$ ).

#### **AERIAL APPLICATION**

Apply Zenivex® E4 RTU aerially, undiluted, by fixed wing or rotary aircraft. Apply at the rate of 0.00175 to 0.0070 pounds of etofenprox per acre. Apply using ULV equipped and capable aircraft. Spray equipment must be adjusted so that the volume median diameter (VMD) produced is less than 60 microns ( $D_{v0.5} < 60\mu$ ) and that 90% of the spray is contained in droplets smaller than 100 microns ( $D_{v0.9} < 100\mu$ ). The effects of flight speed and, for non-rotary nozzles, nozzle angle on the droplet size spectrum must be considered. Directions from the equipment manufacturer or vendor, pesticide registrant, or test facility using a wind tunnel and laser-based measurement instrument must be used to adjust equipment to produce acceptable droplet size spectra. Application equipment must be tested annually to confirm that pressure at the nozzle and nozzle flow rate(s) are properly calibrated. Do not apply Zenivex® E4 RTU at altitudes below 100 feet. Apply at altitudes from 100-300 feet. Apply when wind speed on the ground is  $\geq 1$  mph. Apply when labeled insects are most active. For best results, use Global Positioning System (GPS) equipped aircraft.

**IN FLORIDA:** Do not apply by aircraft except with the approval of the Florida Department of Agriculture and Consumer Services.

#### **APPLICATIONS OVER CROPS OR TO AREAS FAVORING DRIFT OVER CROPS**

Zenivex® E4 RTU may be applied over crops (including row, tree, fruit, citrus, pasture and other areas where agricultural enterprises take place) or to areas, where drift over cropland could occur. Zenivex® E4 RTU can be applied to these areas by either ground or aerial application. Use label rates and follow directions for use as directed in this label. Applications over crops or where drift may occur over crops are limited to 4

applications per month to the same site but no more than two applications within a seven day interval. Do not apply more than 0.028 pounds of active ingredient per month to the same site within a month. Do not spray more than 0.18 lbs etofenprox per acre per site per year. Do not make more than 25 applications per site per year.

#### **PESTICIDE STORAGE AND DISPOSAL**

Do not contaminate water, food, or feed by storage or disposal.

**STORAGE AND SPILL PROCEDURES:** Store upright at room temperature. Avoid exposure to extreme temperatures. In case of spill or leakage, soak up with an absorbent material such as sand, sawdust, earth, fuller's earth, etc. Dispose of with chemical waste.

**PESTICIDE DISPOSAL:** Wastes resulting from the use of this product must be disposed of on site or at an approved waste disposal facility.

**CONTAINER DISPOSAL: Refillable 30 Gallon Drums, 120 Gallon Mini-Tote and 275 Gallon Tote:** Refillable container. Refill this container with pesticide only. Do not reuse this container for any other purpose. Cleaning the container before final disposal is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller. If not refilled, offer for recycling if available, or puncture and dispose of in a sanitary landfill, or by incineration. To clean the container before final disposal, triple rinse (or equivalent) promptly after emptying. Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container  $\frac{1}{4}$  full with mineral oil or other suitable oil diluents. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand the container on its end and tip it back and forth several times. Turn the container over onto its other end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Repeat this procedure two more times. **Non-refillable 2.5 gallon containers: Non-refillable container.** Triple rinse (or equivalent), promptly after emptying. Triple rinse as follows: Empty the remaining contents into application equipment or mix tank and drain container for 10 seconds after the flow begins to drip. Fill the container  $\frac{1}{4}$  full of with mineral oil or other suitable oil diluents and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank. Drain container for 10 seconds after the flow begins to drip. Repeat this procedure two more times. Once triple rinsed, recycle if available, or puncture and dispose of in a sanitary landfill, or by incineration.



# FYFANON<sup>®</sup> ULV MOSQUITO

INSECTICIDE

## ULTRA LOW VOLUME CONCENTRATE INSECTICIDE

FOR USE ONLY BY FEDERAL, STATE, TRIBAL, OR LOCAL GOVERNMENT OFFICIALS RESPONSIBLE FOR PUBLIC HEALTH OR VECTOR CONTROL, OR BY PERSONS CERTIFIED IN THE APPROPRIATE CATEGORY OR OTHERWISE AUTHORIZED BY THE STATE OR TRIBAL LEAD PESTICIDE REGULATORY AGENCY TO PERFORM ADULT MOSQUITO CONTROL APPLICATIONS, OR BY PERSONS UNDER THEIR DIRECT SUPERVISION.

**ACTIVE INGREDIENT:**

\*Malathion ..... 96.5%

**INERT INGREDIENTS:** ..... 3.5%

**TOTAL:** ..... 100.0%

\* O,O-dimethyl phosphorodithioate of diethyl mercaptosuccinate  
Contains 9.9 lbs. malathion per gallon

**KEEP OUT OF REACH OF CHILDREN  
CAUTION**

**IN CASE OF A MEDICAL EMERGENCY INVOLVING THIS PRODUCT,  
CALL TOLL FREE, DAY OR NIGHT: 1-866-303-6950**

**FIRST AID:**

This product is an organophosphate and is a cholinesterase inhibitor.

<b>IF SWALLOWED:</b>	<ul style="list-style-type: none"> <li>• Call a poison control center or doctor immediately for treatment advice.</li> <li>• Have person sip a glass of water if able to swallow.</li> <li>• Do not induce vomiting unless told to do so by a poison control center or doctor.</li> <li>• Do not give anything by mouth to an unconscious person.</li> </ul>
<b>IF INHALED:</b>	<ul style="list-style-type: none"> <li>• Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth-to-mouth, if possible.</li> <li>• Call a poison control center or doctor for further treatment advice.</li> </ul>
<b>IF ON SKIN OR CLOTHING:</b>	<ul style="list-style-type: none"> <li>• Take off contaminated clothing.</li> <li>• Rinse skin with plenty of water for 15-20 minutes.</li> <li>• Call a poison control center or doctor for treatment advice.</li> </ul>
<b>IF IN EYES:</b>	<ul style="list-style-type: none"> <li>• Hold eye open and rinse slowly and gently with water for 15-20 minutes.</li> <li>• Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.</li> <li>• Call a poison control center or doctor for treatment advice.</li> </ul>

Have the product container or label with you when calling a poison control center or doctor or going for treatment. You may also contact 1-866-303-6950 for emergency medical treatment information.

**NOTE TO PHYSICIAN:** This product is a cholinesterase inhibitor. Treat symptomatically. Atropine is antidotal.

EPA Reg. No. 67760-34

EPA Est. No. 4787-DN-1

Cheminova, Inc.  
One Park Drive, Suite 150  
P.O. Box 110566  
Research Triangle Park, NC 27709  
Product of Denmark

 **CHEMINOVA**  
HELPING YOU GROW

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## PRECAUTIONARY STATEMENTS HAZARDS TO HUMANS AND DOMESTIC ANIMALS

Harmful by swallowing, inhalation or skin contact. Avoid contact with skin. Avoid breathing spray mist.

### PERSONAL PROTECTIVE EQUIPMENT

Some materials that are chemical-resistant to this product are barrier laminate, butyl rubber, nitrile rubber, and viton. If you want more options, follow the instructions for category F on an EPA chemical-resistance category selection chart.

For all formulations and use patterns – mixers, loaders, applicators, flaggers, and other handlers must wear:

- Long-sleeved shirt and long pants
- Chemical-resistant gloves
- Shoes plus socks

Follow manufacturer's instructions for cleaning and maintaining PPE. If no such instructions exist, use detergent and hot water. Keep and wash PPE separately from other laundry.

### ENGINEERING CONTROLS STATEMENTS

Pilots must use an enclosed cockpit in a manner that is consistent with the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240 (d)(4-6)]. Pilots must wear the PPE required on this labeling for applicators.

### USER SAFETY RECOMMENDATIONS

User should:

- Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.
- Remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

### ENVIRONMENTAL HAZARDS

This pesticide is toxic to aquatic organisms, including fish and invertebrates. Use care when applying in or to an area which is adjacent to any body of water, and do not apply when weather conditions favor drift from target area. Poorly draining soils and soils with shallow water tables are more prone to produce runoff that contains this product.

When applying as a wide area mosquito adulticide, before making the first application in a season, it is advisable to consult with the state or tribal agency charged with primary responsibility for pesticide regulation to determine if other regulatory requirements exist.

This product is highly toxic to bees exposed to direct treatment on blooming crops or weeds. Do not apply or allow to drift onto blooming crops or weeds while bees are actively visiting the treatment area, except when applications are made to prevent or control a threat to public and/or animal health determined by a state, tribal or local public health or vector control agency on the basis of documented evidence of disease-causing agents in vector mosquitoes or the occurrence of mosquito-borne disease in animal or human populations, or if specifically approved by the state or tribe during a natural disaster recovery effort. When applying as a wide area mosquito adulticide, do not apply over bodies of water (lakes, rivers, permanent streams, natural ponds, commercial fish ponds, swamps, marshes or estuaries), except when necessary to target areas where adult mosquitoes are present, and weather conditions will facilitate movement of applied material away from the water in order to minimize incidental deposition into the water body.

Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans, or other waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) permit and the permitting authority has been notified in writing prior to discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the local sewage treatment plant authority. For guidance contact your State Water Board or Regional Office of the EPA.

### PHYSICAL OR CHEMICAL HAZARDS

Do not use or store near heat or open flame.

### STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage and disposal.

**PESTICIDE STORAGE:** Fyfanon ULV Mosquito should be stored in the original unopened container in a secure, dry place. Do not contaminate with other pesticides or fertilizers. Fyfanon ULV Mosquito should never be heated above 55° C (131° F), and should not be stored for long periods of time at a temperature in excess of 25° C (77° F). **PESTICIDE DISPOSAL:** To avoid wastes, use all material in this container by application according to label directions. If wastes cannot be avoided, offer remaining product to a waste disposal facility or pesticide disposal program (often such programs are run by state or local governments or by industry).

#### CONTAINER DISPOSAL:

**Refillable containers:** Refill this container with pesticide only. Do not reuse this container for any other purpose. Cleaning the container before final disposal is the responsibility of the person disposing of the container. Cleaning before refilling is the responsibility of the refiller. To clean the container before final disposal, empty the remaining contents from this container into application equipment or mix tank. Fill the container about 10 percent full with water. Agitate vigorously or recirculate water with the pump for 2 minutes. Pour or pump rinsate into application equipment or rinsate collection system. Repeat this rinsing procedure two more times.

**Nonrefillable containers (equal to or less than 5 gallons):** Nonrefillable container. Do not reuse or refill this container. Offer for recycling if available. Triple rinse container (or equivalent) promptly after emptying. Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank and drain for 10 seconds after the flow begins to drip. Fill the container ¼ full with water and recap. Shake for 10 seconds. Pour rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Drain for 10 seconds after the flow begins to drip. Repeat this procedure two more times.

**Nonrefillable containers (greater than 5 gallons):** Nonrefillable container. Do not reuse or refill this container. Offer for recycling if available. Triple rinse container (or equivalent) promptly after emptying. Triple rinse as follows: Empty the remaining contents into application equipment or a mix tank. Fill the container ¼ full with water. Replace and tighten closures. Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds. Stand the container on its end and tip it back and forth several times. Turn the container over onto its other end and tip it back and forth several times. Empty the rinsate into application equipment or a mix tank or store rinsate for later use or disposal. Repeat this procedure two more times.

### DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling. For use by federal, state, tribal, or local government officials responsible for public health or vector control, or by persons certified in the appropriate category or otherwise authorized by the state or tribal lead pesticide regulatory agency to perform adult mosquito control applications, or by persons under their direct supervision.

## MOSQUITO CONTROL IN POPULATED AND RURAL AREAS

### PRECAUTIONS AND RESTRICTIONS

Before making the first application in a season, it is advisable to consult with the state or tribal agency with primary responsibility for pesticide regulation to determine if other regulatory requirements exist.

#### RESTRICTIONS

- Do not apply more than 0.23 lb/ai /A/day.
- Only treat when mosquitoes are swarming or biting. Do not re-treat a site more than 3 times in any one week. However, more frequent treatments may be made to prevent or control a threat to public and/or animal health determined by a state, tribal or local health or vector control agency on the basis of documented evidence of disease-causing agents in vector mosquitoes or the occurrence of mosquito-borne diseases in animal or human populations, or if specifically approved by the state or tribe during a natural disaster effort.
- Apply when wind speed is greater than or equal to 1 mph.
- Do not apply by fixed wing aircraft at height less than 100 feet, or by helicopter at a height less than 75 feet unless specifically approved by the state or tribe based on public health needs.

#### PRECAUTIONS

- **IMPORTANT: IN AREAS WHERE AUTOMOBILES, TRAILERS, TRUCKS AND PLEASURE BOATS ARE PRESENT, undiluted spray droplets of Fyfanon ULV Mosquito will permanently damage vehicle paint finishes unless the aircraft used for the ultra low volume application meets all of the specifications listed under AERIAL APPLICATION.**

### AERIAL APPLICATION

**Adult Mosquitoes on Rangeland, Pasture, and Other Uncultivated Non-Agricultural Areas (Wastelands, Roadsides)**

Spray equipment must be adjusted so that the volume median diameter produced is less than 60 microns ( $D_v 0.5 < 60 \mu m$ ) and that 90% of the spray is contained in droplets smaller than 100 microns ( $D_v 0.9 < 100 \mu m$ ). The effects of flight speed and, for non-rotary nozzles, nozzle angle on the droplet size spectrum must be considered. Directions from the equipment manufacturer or vendor, pesticide registrant or test facility using a wind tunnel and laser-based measurement instrument must be used to adjust equipment to produce acceptable droplet size spectra. Application equipment must be tested at least annually to confirm that pressure at the nozzle and nozzle flow rate(s) are properly calibrated. Adult mosquito control over cities, towns, and other areas where automobiles, trailers, trucks, and pleasure boats are present: Apply 2.6 to 3.0 fluid ounces of Fyfanon ULV Mosquito per acre. Apply only when weather conditions are favorable. Wind and rising air currents may cause undesirable spray drift and reduce insect control. See Precautions and Restrictions for additional instructions.

### GROUND-BASED APPLICATION

Spray equipment must be adjusted so that the volume median diameter is less than 30 microns ( $D_v 0.3 < 30 \mu m$ ) and that 90% of the spray is contained in droplets smaller than 50 microns ( $D_v 0.9 < 50 \mu m$ ). Directions from the equipment manufacturer or vendor, pesticide registrant or test facility using laser-based measurement instrument must be used to adjust equipment to produce acceptable droplet size spectra. Application equipment must be tested at least annually to confirm that pressure at the nozzle and nozzle flow rate(s) are properly calibrated.

#### Thermal Aerosols or Fogs

For control of adult mosquitoes with thermal aerosols or fogs. Apply Fyfanon ULV Mosquito at the rate of 3.9 - 5.2 gallons Fyfanon ULV Mosquito in 100 gallons of finished solution by ground equipment delivering 40 gallons per hour at a vehicle speed of 5 miles per hour to treat a swath width of 300 feet (equivalent to 180 acres per hour). At 3.9 gallons Fyfanon per 100 gallons of finished solution this is equivalent to 0.08 lb. active/acre. At 5.2 gallons per 100 gallons of finished solution, this is equivalent to 0.11 lb. active/acre.

\*There is a great variation in the chemical composition of fuel oils which may be used as thermal fog solvents. These differences may cause sludge and/or affect the solubility of the Fyfanon ULV Mosquito.

#### Nonthermal Aerosols

Adult Mosquito Control - Control of adult mosquitoes over a 300-foot swath can be obtained with nonthermal aerosols of Fyfanon ULV Mosquito using the following rates at the indicated vehicle speeds:

**Rates for Fyfanon ULV Mosquito**

Undiluted  
Apply as follows:

Lbs.A.I./Acre/Day	Application Rates Fluid Ounces per Minute at Vehicle Speeds				Fluid Ounces of Fyfanon ULV Mosquito per acre
	5 mph	10 mph	15 mph	20 mph	
0.03 - 0.06*	1.0 - 2.1	2.0 - 4.3	3.0 - 6.3	4.0 - 8.6	0.38 - 0.75

\*Use higher rate of application when vegetation is dense and/or mosquito populations are heavy.

### OPERATING EQUIPMENT

Each nonthermal aerosol generator used for dispersal of Fyfanon ULV Mosquito to control adult mosquitoes must have minimum capability of producing the droplet spectrum described under GROUND-BASED APPLICATION. The initial determination of droplet size is made after the unit is installed in a vehicle and prior to its use in mosquito control operations. Recheck the unit frequently to insure that proper droplet size is maintained for each operation. Determination of droplet size every two months is usually sufficient if the unit has been maintained in good operating condition. Equipment manufacturer's instructions setting forth cleaning and maintenance of the unit must be followed. The unit must be inspected before each operation to correct any leaks or obstructions in the spray system; to detect whether the nozzle, hoses, or other parts are worn and need replacement; to insure that the flow meter is properly calibrated and to determine that the pressure recommended by the manufacturer is being maintained.

- Flow Rate**
  - Must be regulated by accurate flow meter
  - Not greater than 1 gallon per hour at 5 mph; 2 gallons per hour at 10 mph; 3 gallons per hour at 15 mph, or 4 gallons per hour at 20 mph
- Nozzle Direction**
  - Rear of the vehicle
  - Upward at an angle of 45° or more
- Vehicle Speed**
  - Not greater than 20 mph
  - Shut off spray equipment when vehicle is stopped

**IMPORTANT:** Spray droplets of undiluted Fyfanon ULV Mosquito will permanently damage automobile paint unless all the conditions described and recommended in this label are met. If accidental exposure does occur, the vehicle should be washed at once.



### **WARRANTY DISCLAIMER**

Cheminova warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes stated on the label when used in strict accordance with the directions, subject to the inherent risks set forth below. TO THE EXTENT CONSISTENT WITH APPLICABLE LAW, CHEMINOVA MAKES NO OTHER EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER EXPRESS OR IMPLIED WARRANTY.

### **INHERENT RISKS OF USE**

It is impossible to eliminate all risks associated with use of this product. Crop injury, lack of performance, or other unintended consequences may result because of such factors as use of the product contrary to label instructions (including conditions noted on the label, such as unfavorable temperatures, soil conditions, etc.), abnormal conditions (such as excessive rainfall, drought, tornadoes, hurricanes), presence of other materials, the manner of application, or other factors, all of which are beyond the control of Cheminova or the Seller. All such risks shall be assumed by Buyer and User. Buyer and User agree to hold Cheminova and the Seller harmless for any claims related to such factors.

### **LIMITATION OF REMEDIES**

To the extent consistent with applicable law, the exclusive remedy for losses or damages resulting from this product (including claims based on contract, negligence, strict liability, or other legal theories), shall be limited to one of the following, at Cheminova's election:

- (1) Refund of purchase price paid by buyer or user for product bought, or
- (2) Replacement of amount of product used.

To the extent consistent with applicable law, Cheminova shall not be liable for consequential, incidental, or special damages or losses in any matter.

The terms of the Warranty Disclaimer above and this Limitation of Remedies cannot be varied by any written or verbal statements or agreements. No employee or sales agent of Cheminova or the Seller is authorized to vary or exceed the terms of the Warranty Disclaimer or this Limitation of Remedies in any manner.