

Mosquitoes and Disease: What the Homeowner Can Do

Excerpts from article by Mississippi Department of Health

[Controlling Mosquitoes](#)

[Mosquito repellants](#)

There are basically two ways to prevent problems from mosquito bites. The first is to **control or reduce mosquito populations** as much as possible. If you reduce the number of mosquitoes, you reduce the chance of being bitten. Obviously, if you don't get bitten, then you can't get infected with a mosquito-borne disease. This can be done by physical means such as source reduction and trapping, or by chemical and biological means such as larviciding and adulticiding. The second prevention tool is to **avoid being bitten** by any remaining adult mosquitoes. It is important to remember that mosquitoes can be controlled in an area, but probably never eliminated.

Controlling Mosquitoes

The best mosquito control program is an integrated one including point source reduction of breeding areas, routine larviciding (killing the baby mosquitoes) in those breeding areas that cannot be eliminated, and adulticiding (killing adult mosquitoes) only when and where necessary. In this day of environmental consciousness, we must try to use integrated methods of mosquito control and not just routinely spray with a fogging truck.

The best control comes from careful elimination of both larval and adult mosquitoes.

Mosquitoes have four life stages – eggs, larvae, pupae, and adults. Since three of the stages (eggs, larvae, pupae) are found in water, eliminating water sources that can breed mosquitoes eliminates the chances of mosquitoes biting, and thus disease transmission. Source reduction includes the following:

- Pick up and haul away all trash piles, broken down washing machines, junk cars, bottles and cans, and related items from around houses.
- Avoid having open water areas or containers around the house such as puddles, open water tanks, damaged water pipes, tires, etc. that might breed mosquitoes.
- Fill tree holes with mortar.
- Drill holes in the bottom of tire swings.
- Empty or change water in pet dishes, birdbaths, horse troughs, etc. at least once a week.
- Keep roof gutters clean.
- Avoid accumulation of decaying material and garbage in and around the home.
- Cover water tanks.
- Support natural enemies of insects like birds, frogs, lizards, and fish.
- Fix any low spots in the yard that hold water for long-term control.

Larviciding

Larviciding is one of the most commonly employed methods of mosquito control used today and is considered the best course of action after source reduction. When mosquitoes are in their immature stages, they are concentrated in a relatively small or fixed area (like a captive audience). The kill occurs before mosquitoes get out flying around, capable of causing biting nuisances and transmitting diseases to people, pets, and domestic animals. However, every place containing standing water need not be larvicided. It is best to larvicide only areas where standing cannot be eliminated and in which larvae are actually found.

There are all kinds of larvicides, but some of the safest to people and the environment are methoprene products and bacteria called "Bti". Bti (*Bacillus thuringiensis israelensis*) is a strain of bacteria that was isolated from a dead mosquito larva found in Israel in 1977. Bti has since been developed into wettable powder, liquid, granular, capsule, and briquette formulations that are commercially available to mosquito control personnel. It is also available to homeowners at local garden stores as dunks (donut-looking objects) and bits (granules).

The safest larvicides are **methoprene** products and the bacteria **Bti**.

Mosquito dunks

The dunks (Mosquito Dunks®) are sustained-release products that float on water and release a long-term larvicide at the water's surface that must be eaten by the mosquito larvae. Under typical environmental conditions it will work for 30 days or longer. See the package directions to determine the appropriate number of dunks to use for amount of water you are treating. These dunks can be used in water sources such as birdbaths, flowerpots, tree holes, rain barrels and roof gutters, unused swimming pools, old automobile tires, and water gardens. The bits, sold as Mosquito Bits™, provide a fast kill (within 24 hours) versus the dunks that generally take longer to kill since they have a lower dose of Bti. However, the bits do not provide long-term control. Another option is to use the bits for a quick kill and then use a dunk for sustained control. The dunks and bits can be found in a combination pack called Mosquito Bits™ & Mosquito Dunks®. This pack contains 8 oz. of Mosquito Bits™ and two Mosquito Dunks®.

Methoprene

Methoprene is an insect growth regulator and is sold at pet stores or garden stores for larviciding as Zodiac® Preventative Mosquito Control. Zodiac® can be used in bird baths, old tires, flower pots, ornamental fountains, urns, rain barrels, roof gutters, abandoned swimming pools, tree holes, water gardens, pool covers, and other water holding receptacles. These granules also offer long-lasting control for up to 21 days. When used as directed, this product will not adversely affect humans, animals, fish, or vegetation.

It is very important when using pesticides of any kind that you read and follow all label directions. The label is the law. Following directions will ensure that you and the environment around you are protected and safe while using the product.

Advantages to both Bti and methoprene are that they can provide long-lasting, environmentally friendly, cost-effective mosquito control even in areas that flood intermittently. One disadvantage is that larvae must eat these products for them to work. So if the larvae are at a stage where they are about to emerge as adults, then the products will not be ingested (older larvae and pupae don't eat).

Fish and mosquitoes

Fish can also help get rid of larval mosquitoes. Mosquito fish (*Gambusia affinis*) have been called "the perfect fish" because they can live in just about any type of water, are extremely tolerant to pollution and changes in salinity, and will eat available vegetation (you don't have to feed them). The females are livebearers having 50-100 babies at a time. These babies begin feeding on mosquito larvae the day they are born. The female can have babies every 6 weeks and they can live 2-3 years. Mosquito fish are native to MS and can be put in any waters. They can be collected from local streams, creeks, lakes and ponds or you can call the MS Department of Health at 601-576-7725 or the Natural Science Museum to find out local mosquito fish breeders. Internet suppliers can ship them directly to your home.

Mosquito Repellants and Prevention

First and foremost, the Department of Health recommends the following "physical" personal protection measures to prevent mosquito bites. These can be used with or without biological/chemical products.

- Wear long pants and long sleeve shirts to prevent insect bites.
- Use bed nets when sleeping outdoors.
- Use wire gauze screening in windows and doors to avoid invasion of flying insects.
- Avoid outdoor activities during peak mosquito biting times — the hours from dusk to dawn.

Killing adult mosquitoes should be a backup system, used when mosquito populations have gotten out of hand for some reason or another, such as an unseasonable emergence of mosquitoes during a spell of warm weather or an encephalitis outbreak like WNV.

Space sprays, strips and candles

There are sprays called "space sprays" for killing mosquitoes. Sprays are either water-based or oil-based, and are mainly used for control of insects such as mosquitoes and flies. If applied in a room, an immediate effect on mosquitoes and flies is achieved. The insect comes in contact with aerosolized droplets of insecticide and there is immediate knockdown and kill. Usually no residual effect occurs from this application. However, there are flying insect killer preparations that will continue killing for days to weeks when the insect contacts a surface treated by the product.

Water based aerosols may provide a more environmentally friendly product and improved product safety. These sprays may be labeled for indoors (such as Ortho® Flying Insect Killer or Deep 6™ Flying Insect Killer), outdoors (such as Raid® Yard Guard), or indoors and outdoors (such as Bengal® Flying Insect Killer or Spectracide® Insect Killer). Outdoor applications are often formulated as spray concentrates that you dilute using your garden hose (Cutter® Bug Free Backyard or Ortho® Mosquito-B-Gon Concentrate Tree and Shrub spray). Foggers, such as Bengal® Outdoor Fogger and Raid® Yard Guard are also available to treat outdoor areas for mosquitoes. Indoor formulations usually come in a spray can, such as Hot Shot® Flying Insect Killer or t hose listed above. The most important thing to consider when trying deciding which brand to use is whether the product is labeled for the area you want to treat. For instance you never want to treat the inside of your house with something labeled for your yard. Also, products that kill cockroaches will not be effective for mosquitoes.

There are also coils, lamps, no-pest strips, and lanterns that release insecticides formulated to repel or kill mosquitoes around the patio, picnic table, or backyard. Control may last from 4-8 hours. Refills are available for each of these systems. Examples include: Coghlan's Mosquito coils and Off® Mosquito Lamp. They can be easily found in either the garden center or camping area of your local retail chain or discount store.

Citronella candles may be mildly effective mosquito repellants. One research study compared 3% citronella candles to plain candles in preventing bites from the Aedes mosquito. Persons near the citronella candles had 42% fewer bites than unprotected persons; however, ordinary candles provided a 23% reduction. In the same study, citronella incense was no more effective than plain candles in repelling mosquitoes.

Repellants and DEET

Repellants can help reduce mosquito bites as well. One of the most effective mosquito repellants on the market is DEET (N,N-diethyl-3-methylbenzamide or N, N-diethyl-meta-toluamide). DEET is available under many different brand names including Off®, Cutter®, Repel®, and Chase MM®. They should all be equally effective at the same percentage of DEET. DEET is actually a repellant rather than an insecticide. It keeps mosquitoes away from you so they won't bite, and has been used safely for over 40 years. The limited number of health problems reported with DEET have usually been because someone misused it. It should always be used according to the label directions. There is probably no reason for an average adult to use more than 35% DEET, although there are

One of the most effective mosquito repellants on the market is DEET.

100% DEET products which are legal. The 100% DEET products will not protect much better than 50% products, just a little longer. The Department of Health suggests the following guidelines for DEET repellants:

- Read and follow instructions on the label to avoid excessive use and over-application. In most circumstances products with 25% - 35% DEET provide adequate protection for adults.
- The American Academy of Pediatrics recommends no more than 10% DEET for children.
- Do not allow children to apply DEET repellent themselves, and do not use DEET on children under two years of age.
- Use just enough repellent to cover exposed skin and/or clothing.
- Do not spray DEET directly on the face. Rather, spray repellent onto the hands and use them to apply it to the face, avoiding sensitive areas like the eyes, mouth and nasal membranes.
- Do not apply over cuts, wounds, irritated skin, or under clothing.
- To find out if you have a reaction to DEET, apply repellent to a small area of an arm or leg before general use.
- To prevent damage, avoid spraying repellents on plastic (such as watch crystals and eyeglasses), synthetic fabrics, leather, or painted or varnished surfaces.
- Do not spray DEET repellents in enclosed areas.
- Upon returning indoors, wash any treated skin with soap and water.
- Wash any DEET treated clothing before wearing them again.

IR-3535

Another repellent is IR3535®, which has recently been approved for use by the World Health Organization and the Environmental Protection Agency. It has been used in Europe for 20 years with no reported adverse effects on human health and is now being marketed in the U.S. as an alternative to DEET. IR3535® is synthetic biochemical, meaning it is a chemical that closely resembles a naturally occurring substance, in this case B-alanine. It can be effective from 15 minutes to 10 hours depending on conditions of use. The Avon Skin-So-Soft Bug Guard Plus IR3535® line has spray and lotion formulations available with and without sunscreen. This appears to be a good alternative for individuals reluctant to use DEET or who have had skin reactions to DEET.

Plant-based repellents

There are various plant-based repellents. Bite Blocker® was first marketed in 1997 containing soybean oil, geranium oil and coconut oil, has shown to be a good repellent for up to 3 ½ hours against Aedes mosquitoes. Other repellents derived from plants such as citronella, geranium, basil, garlic and peppermint generally provide only temporary protection from mosquitoes, if any at all. A scientific study of Buzz Away® (containing citronella, cedar wood, eucalyptus, and lemongrass) and Green Ban® (citronella, cajuput, lavender, safrole-free sassafras, peppermint, bergapten-free bergamot, calendula, soy and tea tree oils) showed essentially no effect against mosquitoes. Other studies with Buzz Away®, however, indicated that the product can repel mosquitoes for about two hours.

Permethrin

Permethrin, sold as a repellent, is actually a pesticide rather than a repellent. It is not for use on skin, but intended for clothing only. Permethrin products are sold in lawn, garden or sporting goods stores under names such as Permanone Repel®. Unlike DEET, permethrin can retain its potency for at least two weeks — even through several launderings. It can be applied to clothing, tent walls, and mosquito nets. Permethrin-sprayed mosquito nets have been used successfully in malaria prevention campaigns in Africa. The combination of permethrin-treated clothing and DEET-treated skin creates almost complete protection against mosquito bites.

Mosquito traps

Lately, there has been a lot of interest in mosquito traps to reduce mosquito numbers around a home. These devices, such as the Mosquito Magnet and the American Biophysics ABC trap, will attract, then either trap or kill mosquitoes. Most of these products trap lots of mosquitoes, but the big question is whether or not they reduce

mosquito biting in an area. Also, these traps may serve as an attractant to mosquitoes and should not be placed close to your home. Mosquito traps are an evolving control technology that looks very promising. Please don't overestimate their effectiveness at this time and avoid relying on them as a sole means of control. Unfortunately, there is no single control method. Effective mosquito control requires integrating a variety of available control strategies (listed above).

Protect yourself

Human illnesses from mosquito-borne viruses are uncommon in the United States, even in areas where the viruses have been reported. The chance that any one person is going to become ill from a mosquito bite is low. However, you can further reduce your chances of becoming ill by protecting yourself from mosquito bites.

© Mississippi Department of Health - October 3, 2006

Find this page at <http://www.msdh.state.ms.us/msdhsite/index.cfm/14,1097,93,html>