MARYLAND COOPERATIVE EXTENSION
UNIVERSITY OF MARYLAND
COLLEGE PARK•EASTERN SHORE

Fact Sheet

Fact Sheet 811

Protecting Yourself from Mosquito Bites

Biting mosquitoes are at the least very annoying. At worst, their bites may spread serious disease. West Nile Virus has been transmitted from mosquitoes to humans, resulting in almost 10,000 cases in the U.S. with more than 260 known deaths since the virus was first identified in New York in 1999.

How can I reduce my risk of bites?

Taking simple steps to limit the number of emerging adult mosquitoes and using personal protection can greatly limit the number of bites.

Immature mosquitoes (larvae) develop in water but they don't need a pond or lake; many species, including the extremely annoying Asian tiger mosquito, can transform from egg to biting adult female within a week in as little as a teaspoonful of water. These mosquitoes are responsible for the majority of complaints in urban and suburban Maryland. While this ability to prosper in tiny reservoirs is a tremendous advantage for mosquitoes, it is also their greatest weakness. **If you remove standing water at least once every six days, you will halt the production of the biting adults.** This approach is known as "source reduction" because you eliminate the source of the pests. Empty water from plant saucers, children's toys, watering cans, tires, buckets, outdoor statuary, rain barrels, pet food dishes, containers for recycling and yard equipment, and drain, scrub and refill birdbaths. Keep your gutters clean and in good repair so they drain completely. Water that sits in gutters for a week after a rain, whether due to improper slope or minor blockage, is one of the primary sources of mosquitoes in an urban/suburban landscape. Do you temporarily store mulch or other soil amendments in plastic bags? Bags can easily trap enough water in pockets or wrinkles to allow mosquitoes to flourish.

What if the water sources can't be eliminated?

An extremely safe product is available to kill mosquito larvae before they turn into biting adults. The active ingredient is the bacterium *Bacillus thuringiensis israelensis* (Bti) and it is formulated in granules or long lasting donut-shaped tablets that can be put in the water with no harm to reptiles, amphibians, fish, or plants.

Methoprene is another product that can be used in standing water with minimal risk to the environment. This compound is a growth regulator that prevents the immature larvae from molting into adults.

Bti and methoprene products are available at hardware stores, home and garden centers, and on the web.

What will protect me?

When you are outdoors during mosquito season wear protective clothing (long sleeves, pants, socks, etc.) if possible and use a repellent. Hundreds of formulations and devices are sold that are absolutely ineffective or work for only a few minutes. There are, however, two active ingredients that have been exhaustively tested, work very well, and are **safe if applied according to package directions.** Permethrin can be purchased as a spray to apply to clothing in advance of use (not while you are wearing it!). DEET (N, N-dethyl-3-methylbenzamide) is the best performing repellent on the market. Formulations over 35% DEET (listed as an active ingredient on the label) are unnecessary because there is no significant additional benefit to higher concentrations. Microencapsulated formulations allow for sustained, slow release of the active ingredient and are preferred because of their persistence and lower absorption by the skin. DEET-containing repellents can be applied to most clothing and to **uncovered skin.** If you put DEET on your skin, that skin cannot safely have clothing over it (for example, do not apply it to your arms, then roll your sleeves down). Most of the rare adverse reactions to millions of applications of DEET have been the result of inappropriate use, so follow label directions! Properly using a combination of permethrin-treated clothing and DEET repellent will give close to 100% protection from biting mosquitos in our area. Products containing Picaridin or BioUD have also been shown to be effective when compared to DEET.

EPA has guidelines to maximize effectiveness and minimize side effects when using repellents:

- Use just enough to lightly cover but not saturate skin.
- Repellents should be applied to exposed skin, clothing, or both, but not under clothing.
- Apply to the face by dispensing a small amount into the palms, rubbing hands together, and then applying to face, avoiding the eye area.
- Repellent should be washed from the palms after application to prevent contact with the eyes, mouth, and genitals.
- Do not apply repellents over cuts, wounds, inflamed, irritated, or eczematous skin.
- Do not inhale aerosols or get them into the eyes.
- Frequent reapplication should not be necessary.
- Areas treated with repellent should be washed with soap and water as soon as the repellent is no longer needed.

What about all those mechanical devices?

Insect electrocuters do not work on mosquitoes. Buzz imitators do not frighten away mosquitoes. Electronic pest repellers do not affect mosquitoes (or any other pest). The jury is still out on whether mosquito traps employing propane or CO_2 tanks are effective in the suburban environment. Initial and maintenance costs are high, placement

is critical, and all species of biting mosquitoes may not be caught in numbers that will actually reduce the chances of being bitten. Trap designs are improving all the time but they are unlikely to ever offer a complete "silver-bullet" solution. The only mechanical devices that work well are fans to keep the air moving. Biting insects prefer still air to breezes so if you are entertaining on your deck or patio, use outdoor fans to keep the air moving. Personal protection and source reduction strategies are still the best approach and will always be needed.

Can I use plants to discourage mosquitos?

Adult mosquitos like dense foliage and cool, shady places to rest so pruning shrubbery to allow more airflow may be beneficial but will never completely eliminate biting adults. Contrary to advertising claims there are no plants available that will actually repel all mosquitoes from your yard.

Bats, purple martins and dragonflies, Oh my!

Bats prefer moths but will eat an occasional mosquito. Don't depend on them to protect you from bites. Purple martins are swift, elegant, insect-eating birds but they will only colonize housing in specific habitats and they won't eat many mosquitoes (they prefer larger insects, including dragonflies). Smaller songbirds actually eat more mosquitoes but they won't control populations enough to prevent bites. Dragonflies are great mosquito eaters but they will not get all of them. If you have a pond for dragonflies, make sure the sides are straight rather than sloped so fish can patrol all areas, and that it is appropriately stocked with fish or treated with Bti to avoid producing even more mosquitoes.

The eight simple steps to fewer bites:

- Eliminate standing water at least every 6 days.
- Use the environmentally safe Bti products to kill mosquito larvae before they become biting adults.
- Make sure gutters are clean and drain completely.
- Prune dense vegetation to allow air movement and discourage resting adults.
- If you must be outside when mosquitoes are biting:
  - Wear protective clothing.
  - Use a product containing up to 35% DEET on clothing or uncovered skin. Microencapsulated formulations decrease skin absorption, repel longer, and need fewer applications. If you can't tolerate DEET use a product containing Picaridin or BioUD.
  - Pretreat your clothing with a product containing permethrin.
  - In small areas (deck or patio), use fans blowing in the same general direction to keep the air moving.

More information

Mosquito traps:

http://www.mosquitomagnet.com/resource/documents/MM_Research/HawaiiTestingSummaryrev2.pdf

http://ddr.nal.usda.gov/dspace/bitstream/10113/3005/1/IND23290717.pdf

Repellents:

http://www.aafp.org/afp/20021101/tips/1.html

http://npic.orst.edu/factsheets/DEETgen.pdf

http://www.cdc.gov/ncidod/dvbid/westnile/qa/insect_repellent.htm

http://www.epa.gov/pesticides/factsheets/chemicals/deet.htm

http://www.epa.gov/oppsrrd1/REDs/factsheets/permethrin_fs.htm

http://www.epa.gov/pesticides/health/mosquitoes/insectrp.htm

http://www.cdc.gov/ncidod/dvbid/westnile/prevention_info.htm

http://www.annals.org/cgi/content/full/128/11/931

http://www.bioud.com/

Travel precautions:

http://wwwn.cdc.gov/travel/contentInsectProtection.aspx

West Nile Virus:

http://www.cdc.gov/ncidod/dvbid/westnile/site_index.htm

http://www.cdc.gov/ncidod/dvbid/westnile/qa/insect_repellent.htm

http://www.hgic.umd.edu/_media/documents/publications/west_nile_virus.pdf

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