

Mosquito Control and Preventing Diseases They Transmit

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With spring comes mosquitoes. In addition to being a nuisance and causing severe reactions to bites in some people, mosquitoes can also transmit diseases including malaria and St. Louis encephalitis in humans, equine encephalomyelitis in horses, heartworm disease in dogs and cats, and West Nile virus in many species.

What are mosquitoes?

Mosquitoes are insects, thus related to lice, fleas, and flies. Mosquitoes have six legs, a pair of wings, compound eyes, large antennae, and that problematic proboscis with which the females suck blood. (Male mosquitoes eat nectar.)



To make them even more pesky, it is no help that some female mosquitoes can hibernate during the winter and lay their eggs in spring. They generally travel for about 2 miles from their breeding grounds, or even further if blown by the wind.

What is the life cycle of the mosquito?

All mosquitoes need water as a place where they can lay their eggs one at a time, or in "rafts" of up to 200 eggs, depending upon the species. The eggs hatch into larvae about 2 days after being laid. The larvae (also called 'wigglers') live in the water for 7-10 days while maturing into the pupal (also called 'tumbler') stage. In 2-3 days, these pupae have developed into adults and fly away and mate. (If you are wondering how a male and female mosquito find each other, the female's buzzing which is made by her wings is a higher pitch than that of the male.)

Adding up the days necessary for each stage of development, you can see it only takes about 2 weeks (less if it is really warm) for the life cycle to be completed. Add the fact that each female can lay 100-400 eggs, and you can see why you can have so many mosquitoes in a very short time.

How can mosquitoes be controlled?

We can try to eliminate or reduce mosquitoes in several ways, and combining methods is best. We need to:

- ✓ Reduce reproduction by eliminating breeding sites
- ✓ Reduce the adult population and our exposure to them
- ✓ Keep the remaining mosquitoes away from us and our pets through repellents

Eliminate Breeding Sites

One of the most important things to remember is that mosquitoes need stagnant water to reproduce. No water, no reproduction. Control then, is based on removing standing water, which can serve as a breeding site. Think of the things that can hold water:

- Destroy or dispose of tin cans, old tires, buckets, unused plastic swimming pools or other containers that collect and hold water. Do not allow water to accumulate in the saucers of flowerpots, cemetery urns, or in pet dishes for more than 2 days.
- In areas where standing water cannot be avoided, use a product such as "Pre-Strike™" pouches, which contain the insect growth regulator (IGR) S-methoprene. This stops the development of young mosquitoes into adults.
- Clean debris from rain gutters and remove any standing water under or around structures, or on flat roofs.
- Check around faucets and air conditioner units and repair leaks or eliminate puddles that remain for several days.
- Change the water in birdbaths and wading pools at least twice a week.
- Reduce mosquito breeding in ornamental ponds.
 - Stock ornamental pools with top feeding predacious minnows. Mosquito fish, for example, can eat 100 to 500 larvae per day. Koi or goldfish can be added to smaller ponds.
 - Treat the pool with products containing biorational larvicides such as *Bacillus thuringiensis* subsp. *israelensis* (Bti). Products include "Mosquito Dunks," and "Quick Kill Mosquito Bits," which will not harm plants or fish.
 - Add a feature such as a waterfall, fountain, or aerator. These options will not only enhance the pond's beauty, but will also prevent it from becoming a breeding ground for mosquitoes, since they prefer to breed in stagnant, not moving water.
- Fill or drain puddles, ditches, and swampy areas, and either remove, drain, or fill tree holes and stumps with sand or

mortar. These areas may be treated with the above Bti or S-methoprene products also.

- Eliminate seepage from cisterns, cesspools, and septic tanks.
- Eliminate standing water around animal watering troughs. Flush livestock water troughs twice a week.
- Check for trapped water in plastic or canvas tarps used to cover boats, pools, etc. Arrange the tarp to drain the water.
- Check around construction sites or do-it-yourself improvements to ensure that proper backfilling and grading prevent drainage problems.
- Irrigate lawns and gardens carefully to prevent water from standing for several days.
- Repair potholes in driveways and private roads.
- If ditches do not flow, and contain stagnant water for one week or longer, they can produce large numbers of mosquitoes. Report such conditions to a Mosquito Control or Public Health Office. Do not attempt to clear these ditches because they may be protected by wetland regulations.
- Check to see if there is an organized mosquito control program in your area. If no program exists, work with your local government officials to establish a program. The American Mosquito Control Association* (AMCA) can provide advice, and their book *Organization for Mosquito Control* is a useful reference. Another source of information about pesticides and repellents is the National Pesticide Information Center*, which also operates a toll-free information line: 1-800-858-7378 (check their web site for hours).

Reduce Exposure to Adult Mosquitoes

- Place mosquito netting over infant carriers when you are outdoors with infants.
- Install or repair window and door screens so that mosquitoes cannot get indoors.
- The hours from dusk to dawn are peak mosquito biting times. Consider avoiding outdoor activities during these times – or take *extra* care to use repellent and protective clothing during evening and early morning.
- Reduce light at night since light tends to attract mosquitoes.
- Mosquitoes are a favorite food for bats, so placing bat houses in your area would be another way to decrease the mosquito population.
- Adult mosquitoes prefer to rest where it is cool, dark, and damp, so keeping grass cut and weeds and brush under control, may encourage mosquitoes to find shelter elsewhere. There are insecticides that can be sprayed on shaded areas around buildings or the yard. Remember not to spray when or where runoff could go into lakes or rivers. Read the label on all insecticides thoroughly and apply them as directed. Remember that insecticides may kill beneficial insects as well as those we do not wish to have around.
- Since mosquitoes can fly long distances, think about getting others in your area to also control mosquitoes on their premises. Some municipalities have even hired professional mosquito control services to protect large areas from mosquitoes.
- Consider a mosquito trap: Many insect electrocutors (bug zappers) are on the market. The jury is still out on whether 'bug zappers' are effective against mosquitoes. Yes, they may kill some mosquitoes, but the light also attracts more mosquitoes. The question is 'Does the device kill more than it attracts?' According to the AMCA, the scientific data relative to the effectiveness of these devices is sparse, so be sure to review all the information available before purchasing one of these. In addition, there are mosquito traps. These devices emit various combinations of vibrations, carbon dioxide, scent, heat, and moisture, which attract mosquitoes and other insects. A vacuum device then sucks the insects into a net or cylinder where they dehydrate and die, or the insects fly into an adhesive strip. The AMCA has a position paper on mosquito traps. (<http://www.mosquito.org/MosqInfo/Traps.htm>)
- In addition to light, mosquitoes are attracted to warmth, perspiration, body odor, and carbon dioxide. So you see, the more you wave your arms around in a frenzy, the better target you will make.



Use of Repellents

Repellents are chemical substances that mosquitoes will avoid. Repellents are useful to people working or playing in mosquito-infested areas, as a way to reduce the risk of being bitten. Repellents are formulated and sold as aerosols, creams, solids (sticks), and liquids. Be sure to read the label carefully and use the product according to the manufacturer's recommendations. Some are for use in the environment, others for clothing, and still others can be used on the skin.

Oil of citronella repellents for the environment: Products containing oil of citronella are used to repel mosquitoes in the space around you. The active ingredient is found in candles, torches, or coils. When burned, they produce a smoke that repels mosquitoes. These should only be used outdoors in ventilated areas. They are only effective when used under windless conditions. Although helpful, they are not as effective as DEET (N,N-diethyl-meta-toluamide) or permethrin-type repellents.

Permethrin-containing repellents for clothing: Repellents containing permethrin are recommended for use on articles such as clothing, shoes, bednets, and camping gear. Permethrin repels and kills mosquitoes as well as ticks and other arthropods. Do NOT use permethrin products on human skin.

Repellents for pets: Permethrins and pyrethrins formulated for pets can be used as repellents to protect your dog. Pyrethrin, which is in many flea powders and the Flea Halt Towelettes in Bio Spot[®] for Cats, is a safe repellent for cats and ferrets. **Permethrins are NOT safe for cats.** Another reason to protect your cat from mosquitoes is that some cats have a mosquito bite hypersensitivity. Since no repellent is 100% effective, heartworm preventives are still necessary even if a mosquito repellent is used.

DEET-type repellents for human skin: Repellents with ingredients such as diethyl phthalate; diethyl carbate; N,N-diethyl-meta-toluamide, also known as N,N-diethyl-3-methylbenzamide (DEET); and ethyl hexanediol are effective products to use on the skin. There are newer products available that contain microencapsulated repellent, which is less likely to harm plastics and synthetic fibers. There are some other products, such as Avon's Skin-So-Soft[®] and herbal remedies which are reported to repel mosquitoes, however, their efficacy does not offer the same level of protection, or that protection does not last as long as products containing DEET.

Using Human Skin Repellents

- When possible, wear long-sleeves, long pants and socks when outdoors. Treating clothes with repellents containing permethrin or DEET will give extra protection, since mosquitoes may bite through thin clothing. Do not apply repellents containing permethrin directly to skin.
- Apply insect repellent containing DEET sparingly to exposed skin whenever you are outdoors.
- Keep repellents away from eyes, nostrils, and lips. Do NOT inhale or ingest repellents or get them into the eyes.
- Use care when applying insect repellents to children.
 - DEET is NOT recommended for use on children under 2 months of age.
 - Avoid applying repellents to portions of childrens' hands that are likely to have contact with eyes or mouth.
 - When using repellent on a child, apply it to your own hands and then rub them on your child. Avoid childrens' eyes and mouth and use it sparingly around their ears.
 - Do not apply repellent to childrens' hands. (Children tend to put their hands in their mouths.)
 - Do not allow young children to apply insect repellent to themselves; have an adult do it for them. Keep repellents out of reach of children.
 - Avoid applying high-concentration (greater than 30% DEET) products to the skin, particularly of children.
- Do not apply repellent to skin under clothing. If repellent is applied to clothing, wash treated clothing before wearing again.
- Pregnant and nursing women should minimize use of repellents.
- Never use repellents on cuts, wounds, or irritated skin.
- Wash repellent-treated skin with soap and water after coming indoors.
- Do not spray aerosol or pump products in enclosed areas.
- Do not use DEET near food.
- Do not apply aerosol or pump products directly to your face. Spray your hands and then rub them carefully over the face, avoiding eyes and mouth.
- If a suspected reaction to insect repellents occurs, wash treated skin, and call a physician. Take the repellent container to the physician.
- Use repellent sparingly; one application will last approximately 4-6 hours. Saturation does not increase efficacy. The more DEET a repellent contains, the longer time it can protect you from mosquito bites. A higher percentage of DEET in a repellent does not mean that your protection is better – just that it will last longer. DEET concentrations higher than 50% do not increase the length of protection. Based on a recent study:
 - A product containing 23.8% DEET provided an average of 5 hours of protection from mosquito bites.
 - A product containing 20% DEET provided almost 4 hours of protection.
 - A product with 6.65% DEET provided almost 2 hours of protection.
 - Products with 4.75% DEET and 2% soybean oil were both able to provide roughly 1 and a half hours of protection.

