

MOSQUITOES: PRACTICAL ADVICE FOR HOMOWNERS

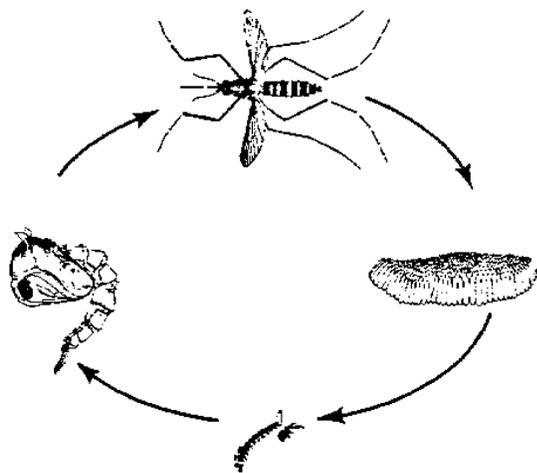
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Mosquitoes can make life miserable. Many recreational and work activities have been ruined by the constant annoyance and irritation caused by their bites. Also, some species can transmit serious diseases. While more than 50 mosquito species can be found in the Commonwealth, only a few are a significant nuisance and / or public health threat. This publication explains how and where mosquitoes breed and what can be done to reduce their numbers in and around the home and to protect yourself from bites.

MOSQUITO BIOLOGY

Successful long term mosquito control requires a knowledge of where and how they develop. All mosquitoes pass through four life stages: egg, larva, pupa, and adult. The number of days from egg to adult varies with species and temperature. Under ideal conditions, some mosquitoes can complete their cycle of development from egg to adult in less than a week.

The two major groups of mosquitoes in Kentucky, *Culex* sp. and *Aedes* (*Ochlerotatus*) sp., have somewhat different egg-laying habits. *Culex* mosquitoes lay groups of eggs on the surface of water in rain barrels, bird baths, tin cans, old tires, car bodies, cisterns, roof



gutters and any other containers which hold water. *Aedes* mosquitoes place their eggs at the base of vegetation in low lying areas that flood periodically. However, they also can deposit their eggs above the water line in artificial containers (such as tin cans, old tires, etc.) or in tree holes that hold water. These eggs

will hatch when inundated with rain water.

The larval stage begins at egg hatch. Mosquito larvae, called are "wigglers" because of their distinctive swimming style. They can be seen when they come to the surface of the water to breathe through a distinctive tube that extends from the end of their body. The larvae feed on microorganisms in the water and grow rapidly in warm weather. Full grown larvae become pupae, often called "tumbler" because they tumble end-over-end through the water. Pupae transform into adults after a few days.

Female mosquitoes are blood feeders and may live for more than a month. They generally require a blood meal before laying eggs. Mosquitoes rely on various cues to find potential hosts on which to feed. Heat, movement, exhaled carbon dioxide, and body scent allow hungry mosquitoes to home in on their prey from long and short distances. Some mosquito species feed on humans; many feed on wild and domestic birds and mammals. A few even feed on reptiles and amphibians. Adult male mosquitoes do not bite. They live 1 to 2 weeks and feed on nectar and plant juices.

MOSQUITO CONTROL

Unfortunately, there is no easy solution for managing mosquitoes. Countless products on the market claim to be effective and easy to use but few have appreciable value in lessening the annoyance and incidence of bites. Unlike most insects found around homes, mosquitoes are pervasive outdoor pests and there are limits to what can be done to minimize their abundance. Nonetheless, there are measures that can afford some relief.

Breeding Site Reduction

The most effective way to reduce the number of mosquitoes around homes and neighborhoods is to find and eliminate their breeding sites - standing water. Adults of some mosquito species remain near their breeding site. Others can travel long distances, even up to several miles. Because of this, problem mosquitoes may come from breeding sites some distance away.

Regardless of recent weather patterns - wet, dry, warm, or cool - there are plenty of potential places in which mosquitoes can develop. A neglected bird bath,

swimming pool, or clogged rain gutter can produce hundreds of new mosquitoes in a just a few days. Trees uprooted by storms leave soil depressions that collect seepage and rainwater. Large areas of standing water, such as from swamps, sluggishly moving streams or ditches may require efforts beyond those of individual property owners. However, there are effective steps that individuals can take to minimize mosquito breeding on their property,

1. Dispose of old tires, buckets, aluminum cans, plastic sheeting or other refuse that can hold water. Empty accumulated water from trash cans, boats, wheel barrows, pet dishes, and flower pot bottoms. If possible, turn these items over when they are not in use.

2. Clean debris from rain gutters and unclog obstructed downspouts. Clogged rain gutters are one of the most overlooked breeding sites for mosquitoes around homes. Remove any standing water on flat roofs or around structures. Repair leaking faucets and air conditioners that produce puddles for several days.

3. Change water in bird baths and wading pools at least once a week and keep swimming pools cleaned and chlorinated. Ornamental pools can be aerated or stocked with mosquito-eating fish. Aeration / water movement helps because mosquitoes prefer quiet, non-flowing water for egg-laying and development.

4. Fill or drain ditches and swampy areas, and other soil depressions and remove, drain, or fill tree holes and stumps with mortar or sealant to prevent accumulation of water. Eliminate standing water and seepage around animal watering troughs, cisterns, and septic tanks. Be sure that cistern screens are intact and that access covers fit tightly.

5. Irrigate lawns and gardens carefully to prevent water from standing for several days.

Larval Control

Use of a mosquito larvicide may be beneficial when it is impractical to eliminate a breeding site. Larvicides are insecticides which are used to control immature mosquitoes before they have a chance to develop into biting adults (Table 1).

Most larvicides sold to homeowners contain either the active ingredient methoprene or a toxin produced by the soil bacterium *Bacillus thuringiensis israelensis* (Bti). Methoprene prevents adult emergence by disrupting the development of mosquito larvae. Bti toxin attacks the digestive tract. It is lethal only to mosquito wigglers and the larvae of some aquatic gnats and black flies. Neither methoprene nor Bti toxin is harmful to fish, waterfowl, pets, or humans when used according to label directions.

Many products and formulations containing methoprene (Altosid) and Bti (Bactimos, Vectobac) are used by mosquito abatement agencies and other professionals. Homeowners can purchase methoprene as PreStrike. It is sold as granules in shaker bottles. Less than a dozen granules are needed to prevent mosquitoes from developing in a flower pot bottom or bird bath. Less than a teaspoon of PreStrike granules is needed to treat 100 feet of rain guttering. Mosquito development will be inhibited for up to a month in ornamental ponds and similar bodies of water; longer protection is provided in sites that periodically dry out.

Various products containing Bti are available to homeowners (e.g. Mosquito Dunks or Quick Kill Mosquito Granules). Typically, one donut-shaped Mosquito Dunk is recommended per 100 square feet of water surface. The dunk breaks down slowly when wet and releases the insecticide over about a 30 day period. The Mosquito Quick Kill product is a granular formulation that begins to release the Bti toxin more quickly than the dunks, resulting in faster action. While results come more quickly, the residual life of the treatment is generally not as long as the dunk formulation. Granular formulations may be more desirable when treating smaller areas, such as flower pots or tree holes.

With a little careful observation it is fairly easy to see mosquito larvae in clear, shallow water over light colored bottoms. They are harder to see in dark, stagnant water where there is a lot of debris or vegetation. Avoid casting a shadow over the water when inspecting for mosquitos because the larvae and pupae will dive in response to light changes. They can be captured by quickly plunging a long-handled dipper into the water.

Adult Mosquito Control

Mosquito breeding sites are not always obvious or accessible so some nearby sources will remain undetected or impractical to treat. Also, mosquitoes can fly in from some distance away. Therefore, it may be necessary to take additional measures against adults..

Mosquitoes prefer to rest in protected sites during the day. Yards with lots of trees, shrubs, and dense vegetation or properties adjoining such areas, can have nightmarish problems. Consequently, removal of tall weeds and overgrowth is part of an integrated mosquito management program.

To further reduce intolerable levels of biting mosquitoes, insecticides can be applied to the lower limbs of shade trees, shrubs, and other shaded areas, such as under decks and along foundations. Pyrethroid insecticides (Table 2.) are effective but will need to be reapplied periodically. A hose-end sprayer is usually most effective and convenient for such applications. Always read and follow label directions before

using any pesticide. Some homeowners may wish to enlist the services of a professional for this service.

Exclusion

Mosquitoes can be kept out of the home by keeping windows, doors, and porches tightly sealed and insect screens in good repair. The occasional mosquito that may enter can be eliminated with a fly swatter. Aerosol foggers and other indoor insecticides labeled for mosquitoes, gnats, and other flying insects seldom provide relief at dosages applied by householders.

Personal Protection From Bites

While some mosquitoes are daytime biters, most are more active in the evening. Staying indoors at dusk and during evening hours will lessen the chance of being bitten. Long-sleeved shirts and pants will provide protection when outdoors but bites can still occur through thin clothing and to exposed skin.

Topically applied mosquito repellents will help to prevent bites when spending time outdoors. The most effective mosquito repellents contain the active ingredient diethyl toluamide (DEET). The higher the percentage of DEET in the product, the longer the protection lasts. Low percentage formulations are available for use with young children.

Non-DEET containing repellents (e.g. Avon Skin-So-Soft with citronella oil) may provide some relief but generally to a lesser degree and for shorter duration than DEET products. It is often desirable to apply insect repellent on outer clothing as well as the skin. Always read and follow directions on the container. Mosquito repellent should not be applied to the hands of young children, and treated skin should be washed with soap and water after returning indoors.

Other Control Possibilities

Many consumer products claim to attract, repel or kill mosquitoes. Most of these devices do not appreciably reduce mosquito abundance or incidence of bites, or else are unproven. Electrocuting devices or "Bug zappers", using ultraviolet light as an attractant, are generally ineffective in reducing outdoor populations of mosquitoes or their biting activity. Studies indicate that mosquitoes make up only a tiny percentage of the insects captured in such traps. The majority are moths, beetles, and other harmless night flying insects.

Other types of mosquito traps use carbon dioxide, warmth, light, and various chemicals (e.g. octenol) as attractants and claim to capture tremendous numbers of mosquitoes. Such devices often cost hundreds of dollars and some sell for over \$1,000. Performance claims to the contrary, such devices seldom have been shown to actually reduce populations of biting mosquitoes on a property, or the incidence of bites. In

some situations they could even attract more mosquitoes into the area one is hoping to protect.

Advertisements for portable electronic devices that use high-frequency ultrasonic sound routinely appear in magazines and claim to keep mosquitoes and other pests at bay. Some supposedly repel mosquitoes by mimicking the wing beat frequency of a hungry dragonfly. Scientific studies have repeatedly shown these devices to be of negligible benefit in deterring mosquitoes and reducing bites. Companies that market such devices with unsubstantiated claims have been told to cease and desist by consumer protection agencies but others continue to appear hoping that consumers will buy them. Save your money, these devices seldom, if ever, provide any measure of relief.

Citronella oil does have mosquito repelling properties and the scented candles can provide a degree of protection. For maximum effect, use multiple candles placed close (within a few feet) of where people are sitting. A single candle at the center or edge of a picnic blanket probably won't provide much benefit other than atmosphere. Mosquito repellent plants like garlic and other oft-advertized botanicals generally are ineffective.

Bats and certain types of birds (purple martins) often are cited as effective natural agents for managing mosquitoes. Conservation groups and articles in nature magazines often suggest building bat and bird houses to promote nesting and to protect against mosquitoes. However, mosquitoes make up only a small portion of their natural diet. Much like "bug zappers", they capture all kinds of flying insects. Efforts to colonize and conserve these animals should not be done solely with the intent of significantly diminishing biting mosquitoes. When it comes to managing mosquitoes, a good rule of thumb is "if the device or method sounds too good to be true, then probably it is.

MOSQUITOS AND DISEASE

Apart from the annoyance, the blood-feeding habits of adult mosquitoes also can occasionally result in life-threatening diseases. Malaria and yellow fever used to be common diseases in Kentucky but they have been successfully eliminated through widespread public health efforts.

Currently, viral encephalitides are the most common mosquito-borne illnesses transmitted to people. "Encephalitis" simply means an inflammation of the brain and can be caused by a variety of viruses and bacteria in addition to those transmitted by mosquitoes. Mosquito-borne strains of viral encephalitis include eastern equine, St Louis, LaCrosse, and most notably, West Nile.

Birds and small mammals are important natural hosts

for these viruses which are transmitted to humans and horses through the bite of an infected mosquito. Symptoms of viral encephalitis in humans can include fever, headache, vomiting, drowsiness, and convulsions.

West Nile virus has been found virtually throughout Kentucky in recent years. Even areas where mosquitoes do carry the virus, very few mosquitoes-much less than 1%- are infected. If an infected mosquito bites you, you have less than 1% chance of severe illness. The chances of being severely ill from any one mosquito

bite are extremely small.

Canine Heartworm

Dogs are quite susceptible to canine heartworm, a nematode that can be transmitted by certain mosquitoes. Infected animals may develop severe circulatory problems and display symptoms such as coughing, labored breathing, and loss of vitality. Preventive drug treatment is available through your veterinarian.

Table 1. Registered larvicides for application to mosquito breeding sites		
Insecticide	Example Trade Name	Remarks
Bacillus thuringiensis israelensis (Bti)	Mosquito Dunks Mosquito Quick Kill Granules	Apply according to label directions.
Methoprene	PreStrike Granules	Apply according to label

Table 2. Registered insecticides for adult mosquito control on lawns and vegetation		
Insecticide	Formulation	Remarks
cyfluthrin	Bayer Advanced PowerForce Mosquito Killer	Ready To Use - connects to garden hose
lambda-cyhalothrin	Spectracide Triazicide	Available in Ready To Use or Concentrate formulations
permethrin	Ortho Mosquito B Gone Spectracide Mosquito Stop	Ready To Use - connects to garden hose Concentrate

West Nile Virus Web Site- Ky Cabinet for Health Services, Department for Public Health
This site provides the most up to date status of West Nile Virus in the Commonwealth
http://chs.ky.gov/publichealth/west_nile_virus1.htm

Division of Waste Management Tire Amnesty Program is a means of disposing of unwanted tires, a primary breeding site for some mosquito species.
<http://www.waste.ky.gov/programs/tires/tire%20amnesty.htm>