Facts About
Mosquito Barrier TREATMENTS

We all love a pleasant backyard, but we do not love the mosquitoes that go with it. Many companies offer services to control mosquitoes on private property. This fact sheet examines these services and why you should exercise caution when using them.

What is a Mosquito Barrier Treatment?

Private companies that sell services to control mosquitoes in your yard most often use barrier treatments. Barrier treatments are insecticide applications designed to remain active for an extended period on surfaces where mosquitoes rest and feed. They are generally applied as a mist or spray directly to plant leaves, turf, mulch or other surfaces to create a "barrier" around a space. Adult mosquitoes that encounter insecticide residues on treated surfaces usually die.

Another form of adult mosquito control involves ultra-low-volume (ULV) insecticide applications. Typically, specially trained and licensed mosquito control personnel apply ULV insecticides with a truck-mounted sprayer that quickly kills flying adult mosquitoes on contact. Unlike barrier treatments, ULV treatments break down rapidly and are not intended to persist in the environment or leave behind residues on surfaces. Both barrier and ULV treatments commonly use insecticides containing pyrethroids, one of the most widely used classes of insecticides, to kill adult mosquitoes.

Problems with Barrier Treatments and Insecticides

Inefficient

To maximize the effectiveness of barrier treatments, applicators must thoroughly apply the insecticide to the many mosquito resting and feeding spaces of shrubs, trees and plants, while trying to avoid flowers, blooms, food crops or drift of the product into adjacent areas as required by insecticide labels. In addition, barriers require repeated treatments each year to remain effective, because the product's toxicity begins decreasing immediately after application. These thorough and frequent barrier applications on outdoor surfaces increase the potential for exposure for humans, pets, pollinators and other beneficial insects.

A more effective and targeted way to control mosquitoes involves killing them before they develop into adults. Mosquitoes usually lay their eggs in standing water, or areas that will hold standing water for several days after a rain.

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Immature mosquitoes, or larvae, hatch from these eggs, swimming and feeding on algae, fungi and other organisms in the water before becoming biting adults. Control of mosquito larvae is more efficient than adult control, because standing water is generally limited in size and number of locations. Less use of insecticides decreases the potential for exposure or impacts on people, pets and beneficial insects.

Continued on next page

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Problems with Barrier Treatments and Insecticides (cont.)

Human Health

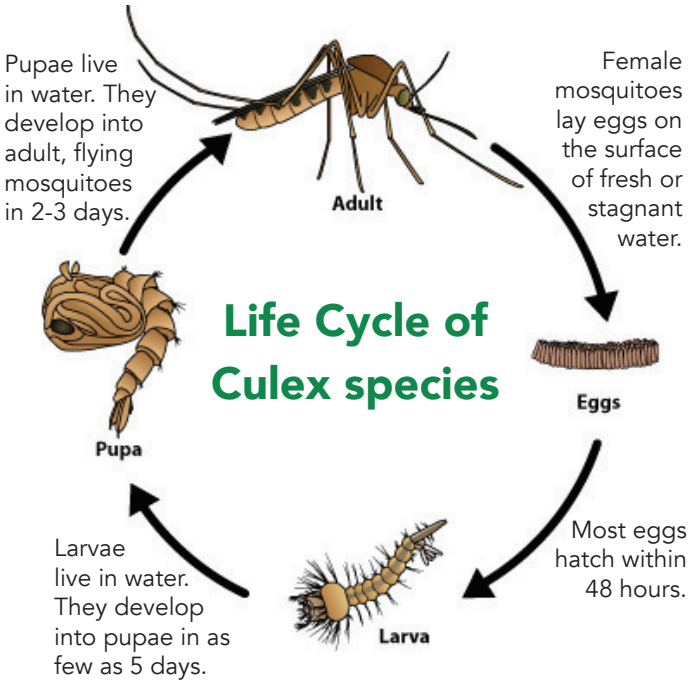
The Environmental Protection Agency regulates pyrethroids and other insecticides. The agency has determined that the benefits of managing mosquitoes that carry diseases such as West Nile Virus, dengue and Zika outweigh the risks of these chemicals to human health. However, the EPA mentions the potential for human health risks of pyrethroids used in barrier treatments by including statements on product labels such as, "excessive use or accidents may pose risks" or "Only protected handlers may be in the area during application". Studies have linked high and prolonged exposure to pyrethroids to effects on the human reproductive, skeletal, cardiovascular, immune and endocrine systems.[1] If you or your neighbor decides to use a barrier treatment, limit your exposure and risk by staying indoors and shutting windows during application. Insist that a properly licensed individual makes the application and follows the product label for instructions on dose, personal protective equipment, application timing, application frequency, and application location.

Resistance

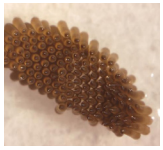
The pyrethroid class of insecticides has become less effective over time in controlling mosquitoes, because mosquitoes have developed resistance to these chemicals. A Loyola University-Chicago lab sampled Culex pipiens mosquitoes, which can carry West Nile Virus, in the North Chicago Suburbs in 2018 and 2019 for resistance to public health ULV adult control insecticides. The lab exposed 1,151 mosquitoes to the pyrethroid Sumithrin in treated bottles and 1,463 to the pyrethroid permethrin in treated bottles. After 45 minutes, approximately 78.5% of mosquitoes died in the Sumithrin treated bottles and 83.3% died in the Permethrin treated bottles. These results failed to match US Centers for Disease Control (CDC) expectations that 100% of the mosquitoes would die under these conditions. The surviving mosquitoes pass their resistance to the next generation decreasing the ability of pyrethroids to control mosquitoes and disease outbreaks over time. We need to limit the use of pyrethroids to times when they are truly needed to prevent mosquitoes from developing greater resistance.

Collateral Damage

The toxicity of barrier treatments poses risks to non-target species and the environment. While pyrethroids and other common mosquito control products have low toxicity to mammals and birds when applied correctly, these products can be toxic to aquatic life and insects that serve as a primary food source for these animals.[2] Also, the extended length of time these barrier insecticides remain toxic increases the potential for harm to beneficial insects, pollinators and mosquito predators such as dragonflies.



EGGS



- Adult, female mosquitoes lay eggs on the surface of fresh or stagnant water. Water sources can include barrels, ornamental ponds, unmaintained swimming pools, puddles, creeks, ditches, and marshy areas.
- A female Culex mosquito lays eggs one at a time. Eggs stick together to form a raft of 100 to 300 eggs. The raft floats on the water

LARVA

- Larvae hatch from mosquito eggs and live in water.
- Larvae can be seen in the water. They are very active and are often called "wigglers."
- They feed on a variety of things found in the water.
- Larvae shed their skin (molt) several times during this stage.

PUPA

- Pupae live in water. Pupae do not have external mouthparts and do not feed during this stage.
- An adult mosquito emerges from a pupa and flies away.

ADULT

- Adult female mosquitoes bite people and animals. Mosquitoes need blood to produce eggs.
- After blood feeding, female mosquitoes look for water sources to lay eggs. Several days pass between feeding and looking for a place to lay eggs.
- Culex mosquitoes don't fly long distances but have been known to fly up to 2 miles (3.2 km).

Diagram and images provided courtesy of the US Centers for Disease Control and Prevention.

[1] Chrustek et al. 2018. Current research on the safety of pyrethroids used as insecticides. Medicina 54, 61
[2] EPA. 2020. Permethrin, Resmethrin, d-Phenothrin (Sumithrin): Synthetic Pyrethroids for Mosquito Control.

Alternatives to Barrier Insecticides

Eliminate Standing Water

Any standing water can provide space for mosquitoes to breed. Monitor, eliminate, or treat these potential mosquito breeding sites:

- Dump out or drain toys, garden equipment, plant pots, buckets and other containers that can hold water once per week
- Cover rain and water barrels with fine-meshed screens to prevent adult mosquito access for egg-laying
- Clean clogged gutters
- Regularly clean pool covers, grill and furniture covers, swimming pools, hot tubs, birdbaths and other permanent water fixtures.
- Pick up trash and discarded debris. Mosquitoes can breed in an area as small as a bottle cap!
- Stock ornamental ponds with fish that eat mosquito larvae or use a bubbler to keep water moving
- Change the water in pet bowls daily
- Monitor flat roofs, such as car ports, without adequate drainage
- Remove hollow tree stumps or tree rot holes
- Fix leaky outdoor faucets
- Empty plant saucers, buckets and watering cans
- Drill a hole in the bottom of tire swings to allow drainage

Encourage Natural Predators

Diverse backyard ecosystems can keep mosquito populations in check, because many birds, bats, spiders and adult dragonflies eat adult mosquitoes. In water features, goldfish, guppies, fat-headed minnows, bass, bluegill, catfish and dragonfly nymphs consume mosquito larvae.

Prevent Contact with Mosquitoes

- Ensure that mosquitoes cannot enter indoors by using well-sealed screens and weather stripping.
- Use yellow, non-insect-attractive outdoor lighting.[3]
- Avoid being outdoors at dawn and dusk, when mosquitoes are most active.

Prevent Mosquito Bites

- Cover exposed skin with long-sleeved and light-colored shirts, long pants and socks. Dark colors such as black, navy blue and red stand out to mosquitoes, especially during dusk.[4]
- Many natural plant extracts and oils repel mosquitoes for up to several hours. The most popular, effective and EPA approved natural repellents include citronella and PMD from lemon eucalyptus.[5]
- To ensure the efficacy and longevity of a mosquito repellent, select formulations which are EPA approved and have an EPA registration number. Caution should be taken when applying a repellent, natural or synthetic, to children.

Know your Mosquito Abatement District

Whether you know it or not, you may live in a Mosquito Abatement District (MAD). Approximately 700 MADs exist across the U.S. with the sole purpose of controlling mosquitoes and limiting the spread of mosquito-borne diseases. Most of these districts implement Integrated Pest Management (IPM), a proven method that aims to employ mosquito prevention practices that cause the least harm to people and the environment.

MADs that practice effective IPM primarily control mosquitoes in their immature stages when they reside in readily identifiable locations such as catch basins, ditches and other flood prone areas. MADs eliminate these breeding grounds by dumping or draining standing water or by using a product to kill the larvae. Larval control commonly involves bacteria that damage the digestive or nervous system of mosquito larvae when consumed, without harming other organisms.

MADs that practice IPM will, also, monitor adult mosquito populations for abundance and potential to spread diseases to humans and animals. These MADs will choose to conduct adult control only after the surveilled mosquito population exceeds science-based abundance and disease thresholds. If needed to control adult mosquitoes, MADs employ trained and skilled technicians to apply adult mosquito control products as safely and effectively as possible. Typically, these applications involve ULV treatment, not barrier sprays.

To find out if you live in a MAD or how your community controls mosquitoes, contact your local public health department or the American Mosquito Control Association at **www.mosquito.org**. Here are some links to local MADs in Illinois:

North Shore Mosquito Abatement District
nsmad.com

Northwest Mosquito Abatement District
nwmadil.com

Des Plaines Valley Mosquito Abatement District
desplainesvalleymad.com

South Cook County Mosquito Abatement District
sccmad.org

[3] EPA. 2020. Tips to Prevent Mosquito Bites.; [4] Nierenberg, C. 2011. Why some people are mosquito magnets. NBC News;
[5] Ferreira Maia, M. & Moore, S. 2011. Plant-based insect repellents: a review of their efficacy, development and testing. Malaria Journal 10.