



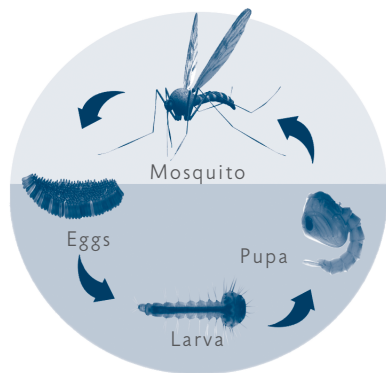
INTEGRATED PEST MANAGEMENT: MOSQUITOES

Mosquitoes are small flying insects that have been around for millions of years. Female mosquitoes bite because they need blood to nourish their eggs. While their bites are annoying to humans, mosquitoes provide food for fish, birds and bats, and they even pollinate flowers.

When are mosquitoes a problem?

Mosquito bites can cause allergic reactions, pain, irritation, redness and itching. Children who scratch their bites a lot, especially with dirty fingers, may also develop secondary bacterial infections. In some areas, mosquitoes spread serious diseases such as West Nile virus and Western equine encephalomyelitis virus. These diseases are rare but can be serious in children, people with weakened immune systems and the elderly, and can lead to death.

Characteristics and habits



Life cycle of a mosquito

Mosquitoes go through several stages. Female mosquitoes lay their eggs in still or standing water in surface pools, tree holes and even old tires (like those used in a tire swing). The mosquito larvae, or wigglers, swim in this water and soon develop into pupae. When the pupae develop into winged adults, they leave the water and become flying land insects. Adult mosquitoes normally live less than a week or two.

How do mosquitoes find you?

Female mosquitoes bite people, pets and livestock. The males don't bite at all. Female mosquitoes can detect chemicals in your sweat and heat from your body. They also notice when you move, especially when you wear clothing that's a different color from your surroundings. Most mosquitoes come out at dusk.

IPM strategies

It's impossible to eliminate mosquitoes. The goal is to reduce mosquitoes to a tolerable level for humans. Sprays do not necessarily keep mosquitoes away and they expose everyone to pesticides and solvents.

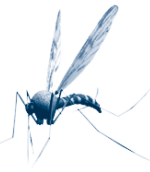
1 KEEP MOSQUITOES OUT

- ▶ Make sure windows and doors are covered by mesh screens that don't have holes.
- ▶ Avoid places with lots of mosquitoes.
- ▶ Avoid being outdoors at dusk.
- ▶ Wear protective clothing outdoors.

2 REMOVE MOSQUITOES' WATER AND SHELTER

Any object that can hold water for more than a few days should be drained, discarded, filled with soil or cement, treated with *Bacillus thuringiensis israelensis* (a safe microbial insecticide usually called Bti) or stocked with mosquito fish.

- ▶ Eliminate standing water that mosquitoes breed in.
 - ▷ Check small containers like cinder blocks, flower pot saucers, old tires or crotches of trees for water present more than a few days.
 - ▷ Remove toys that collect water.
 - ▷ Change water in pet dishes, watering troughs and bird baths at least weekly.
 - ▷ Avoid overwatering lawns and gardens, which lead to standing water.
 - ▷ Keep litter and garden debris out of street gutters.
 - ▷ Fill open tree holes with sand or mortar.



[IPM strategies continued]

- ▶ Cut down tall grass and weeds in outside areas where mosquitoes rest during the day when it's hot and dry.
- ▶ Don't use electric bug zappers because they kill beneficial and neutral insects, but very few mosquitoes.

3 KEEP MOSQUITOES AWAY

- ▶ Use insect repellents if mosquitoes are really bothersome and you have to be outdoors. Some effective repellents are:
 - ▷ Picaridin is as effective as DEET, but with fewer health risks. Unlike DEET, Picaridin is odorless, does not feel greasy or sticky and is less likely to irritate the skin.

- ▷ Products containing DEET (N,N-diethyl-metatoluamide) are also effective, but may be more toxic at high doses. Some people dislike the odor and that it irritates the skin. DEET confuses the chemical receptors of mosquitoes, making it harder for the mosquito to find you. Special formulations for children contain low concentrations of DEET in an oil-based medium that slowly releases the compound and limits the absorption.
- ▷ Other effective repellents include the biopesticides oil of lemon, eucalyptus and IR3535, which are derived from natural materials.
- ▶ Repellents are effective for only 4 hours or less depending on wind, temperature, humidity and sweating.

ACTION PLAN FOR MOSQUITOES

WHEN TO TAKE ACTION	NONPESTICIDE PRACTICES	LEAST HARMFUL PESTICIDE	LAST RESORT
<ul style="list-style-type: none"> ▶ When mosquitoes become bothersome. 	<ul style="list-style-type: none"> ▶ Keep window screens in good repair. ▶ Wear long pants and sleeves. ▶ Eliminate standing water. ▶ Use a flyswatter or newspaper to individually kill mosquitoes. ▶ Report problem to your mosquito abatement district. Call the California Mosquito and Vector Control Association at (916) 440-0826. 	<ul style="list-style-type: none"> ▶ Use safe insect repellents (see above). ▶ Treat water with mosquito fish or environmentally friendly bacteria such as Bti, that target just mosquitoes. ▶ Mosquito fish are most effectively used in small, man-made bodies of water, such as ponds that cannot be drained and don't connect with natural waters. Never put fish in a natural pond, lake, creek or river. 	<ul style="list-style-type: none"> ▶ Contact a pest management professional (PMP) for pesticide application. ▶ Outdoor insecticide sprays can temporarily reduce the number of adult mosquitoes, but they don't last long. Some also have harmful health effects.

RESOURCES

University of California Statewide IPM Program:
Mosquitoes

www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7451.html

Mosquito and Vector Control Association of California
mvcac.org

EPA: *Active Ingredients Found in Insect Repellents*
www.epa.gov/pesticides/health/mosquitoes/ai_insectrp.htm

EPA: *How to Use Insect Repellents Safely*
www.epa.gov/pesticides/health/mosquitoes/insectrp.htm

Center for Disease Control: *Updated Information Regarding Mosquito Repellents*

www.cdc.gov/ncidod/dvbid/westnile/resources/upreinfo.pdf

EPA: *Insect Repellent: Use and Effectiveness*
cfpub.epa.gov/oppre/insect/index.cfm

eXtension School Integrated Pest Management Action Plans
www.extension.org/pages/School_Integrated_Pest_Management:_Action_Plans

California Childcare Health Program, University of California, San Francisco School of Nursing • www.ucsfchildcarehealth.org



Funding for this project has been provided in full or in part through a grant awarded by the California Department of Pesticide Regulation (DPR). The contents of this document do not necessarily reflect the views and policies of DPR nor does mention of trade names or commercial products constitute endorsement or recommendation for use.