

Zika, Mosquitoes, and Repellents

Concerns over the Zika virus have been all over the news lately, so you may be getting questions about mosquito repellents and how customers can protect themselves from mosquitoes.

The Zika virus is spread to people mainly through the bite of an infected mosquito, mostly *Aedes aegypti* and *Aedes albopictus*. People can also get the Zika virus through sexual contact with an infected person, and the virus can also be passed from a pregnant woman to her developing fetus, which can cause a serious birth defect called microcephaly.

According to the Centers for Disease Control and Prevention (CDC), there is currently no vaccine to prevent the disease nor any drugs to treat it. The best way to prevent Zika and other mosquito-borne diseases, including West Nile virus, is to protect yourself and your family from mosquito bites. *Aedes* mosquitoes are considered day biters, so it's important to limit exposure to mosquitoes, which may include clothing and use of mosquito repellents. See the box on page 2 for tips on how to avoid mosquito bites.

Effective Mosquito Repellents

Consumer Reports, a nonprofit educational and consumer product research group, recently tested 16 mosquito repellent products containing a variety of ingredients to find out which were the most effective. Products tested included those with the active ingredients DEET,

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J. GATHANY, CDC

Adult female mosquito, *Aedes aegypti*.

Table 1. Select mosquito repellent ratings from Consumer Reports recent study.

Brand name	Rating	Active Ingredients	Effectiveness against (in hours)		
			<i>Aedes</i>	<i>Culex</i>	Deer ticks
Sawyer Picaridin	96	Picaridin 20%	8	8	8.5
Ben's 30% Deet Tick & Wilderness Formula	93	DEET 30%	7.5	8	8.5
Repel Lemon Eucalyptus	87	Oil of Lemon Eucalyptus 30% (Approx. 65% PMD)	7	8	7
Repel Scented Family	82	DEET 15%	5	8	8.5
Natrapel 8 hour	81	Picaridin 20%	8	8	6
Off Deepwoods VII	74	DEET 25%	8	8	5
Cutter Natural	29	Geraniol 5%, Soybean oil 2%, Sodium Lauryl Sulfate 0.4%, Potassium Sorbate 0.1%.	1	0.5	8
EcoSmart Organic	7	Geraniol 1.0%, Rosemary Oil 0.5%, Cinnamon Oil 0.5%, Lemongrass Oil 0.5%.	0.5	0.5	1.5

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picaridin, oil of lemon eucalyptus (also known as PMD or para-menthane-diol), as well as a variety of plant oils, such as cedar, citronella, geraniol, lemongrass, and rosemary. (See Table 1.)

The most effective products against *Aedes* mosquitoes were those containing 20% picaridin and 25% DEET. These concentrations of active ingredients kept mosquitoes from biting for about 8 hours. Furthermore, one product (Sawyer Fisherman's Formula Picaridin) was reportedly the only one among those tested that also kept *Culex* mosquitoes (which can spread West Nile virus), as well as deer ticks away for at least 8 hours.

DEET is the most effective mosquito repellent if you will be out for long periods where mosquitoes are abundant. However, DEET is an irritant to some people, and repellents containing high DEET concentrations can damage synthetic materials such as clothing or plastics.

Consumer Reports suggests avoiding products made with natural oils such as citronella, lemongrass oil, cedar oil, geraniol, rosemary oil, cinnamon oil, and others. According to their analyses, many of these products were only effective against *Aedes* mosquitoes for 1 hour or less. Read the full article and find the ratings of all products tested at consumerreports.org/insect-repellents/mosquito-repellents-that-best-protect-against-zika/.

Using Mosquito Repellent

The CDC recommends using products containing active ingredients registered by the U.S. Environmental Protection Agency (EPA) for use as repellents applied to skin and clothing. An EPA registration indicates the active ingredients of repellents have been tested for

Tips to protect yourself from mosquito bites:

- Wear long-sleeved shirts and long pants.
- Stay in places with air conditioning and window / door screens.
- Empty, cover, or clean up any items outside of your home that can hold water. For specific tips, see the resources at the end of this article.
- If traveling overseas to areas where mosquito-borne diseases are common, sleep under a mosquito bed net.
- Use EPA-registered insect repellents with one of the following active ingredients: DEET, picaridin, IR3535, oil of lemon eucalyptus (PMD).
 - ❖ Always follow the product label instructions.
 - ❖ Reapply insect repellent as directed.
 - ❖ Do not spray repellent on the skin under clothing.
- If you are also using sunscreen, apply sunscreen before applying insect repellent.
- To protect your child from mosquito bites:
 - ❖ Do not use insect repellent on babies younger than 2 months old.
 - ❖ For children younger than 3 years old, do not use products containing oil of lemon eucalyptus or PMD.
- Dress your child in clothing that covers arms and legs.
 - ❖ Cover cribs, strollers, and baby carriers with mosquito netting.
 - ❖ Do not apply insect repellent onto a child's hands, eyes, mouth, or cut or irritated skin.
 - ❖ Adults: Spray insect repellent onto your hands and then apply to a child's face.

human safety when applied according to the instructions on the label. When used as directed, EPA-registered insect repellents are proven safe and effective, even for pregnant and breast-feeding women.

To see if a mosquito repellent is registered by the EPA, look for its registration number on the package (which is usually written as "EPA Reg."), or check the EPA Web site <https://epa.gov/insect-repellents/find-insect-repellent-right-you>.

Learn more about the Zika virus and find information on prevention, symptoms, and risks on the CDC Web site at

cdc.gov/zika/index.html and on the American Mosquito Control Association Web site at mosquito.org/assets/amca-16-zika-flyer-final.pdf.

For general information about managing mosquitoes, reducing breeding habitats, and using insect repellent, see the UC IPM Pest Notes: *Mosquitoes* at ipm.ucanr.edu/PMG/PESTNOTES/pn7451.html.

—Karey Windbiel-Rojas, Area IPM Advisor, Sacramento, Yolo, & Solano counties, kwindbiel@ucanr.edu.

Revised Pest Notes

Lyme Disease in California, published in early May, is newly revised with new photos. It's available online and as a printable PDF at ipm.ucanr.edu/PMG/PESTNOTES/pn7485.html.

Asian Citrus Psyllid & Huanglongbing Disease has been newly

revised, as the range of this pest continues to spread within California. Find it online at ipm.ucanr.edu/PMG/PESTNOTES/pn74155.html.

To access these and more than 165 other titles, visit UC IPM's Pest Notes Web page, ipm.ucanr.edu/PMG/PESTNOTES.

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Coyotes in California's Urban Areas

In many cities across California, urban coyote conflicts appear to be rising. Recent analysis of coyote reports from several entities in southern California has shown that coyote conflicts are generally much higher during the pup-rearing (May–August) and dispersal seasons (September–December), compared with the breeding season (January–April). It is unclear whether this is due to territoriality issues, increased human conflict due to increased coyote activity, increases in energy demands on coyotes when they are raising pups, or some other reason.

It is important to be proactive rather than reactive when it comes to addressing any human-wildlife conflicts. Help your customers or clients be prepared to protect themselves, families, and other animals from contact with coyotes by adhering to the following tips:

Never feed coyotes.

- Access to human food has been suggested as a contributor to aggressive behavior by coyotes toward people.
- Cover your trash so coyotes do not have access to leftover food. Unintentionally providing food to wildlife is known as indirect feeding. Although you are not directly providing food for the coyote, uncovered trash provides an unnatural food source for the coyote to consume.
- Harvest ripe and fallen fruit, as this is another source of indirect feeding for coyotes.
- Restrict access to compost. This is also a food source for coyotes.
- Feed pets inside, or leave food outside for limited periods of time only.
- Don't feed feral cats. Food provided for feral cats can also act as another food source for coyotes, as well as the cats themselves falling prey to coyote attacks.

Be vigilant with small children in areas where coyotes are often seen and heard.

- Be aware near dense vegetation where ambush attacks have been known to occur.



Adult coyote.

- Modify vegetation where coyotes may rest. This includes the reduction of dense shrubs that may provide shade and cover for coyotes to rest.

Keep dogs and cats indoors.

- Dusk to dawn is the period when coyotes are most active. However, it is important to be aware that coyotes are not always nocturnal. They can also be active during the day.
- Supervise pets in yards, particularly in areas where previous pet attacks are known to occur.
- NEVER walk your dog off leash or on a retractable leash. There is no leash law in California state law; however, most municipalities have leash laws that state that dogs must be attached to a leash held by a competent person.
- Be particularly vigilant during pup-rearing season when conflicts are at their highest and pets are in the most danger.

Build a coyote-proof fence where possible.

- Coyotes are excellent jumpers and can easily navigate 6-foot walls. Eight-foot fences are recommended where possible to try to exclude coyotes

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from yards. A roller bar may also be attached to the top of the fence to further deter coyote efforts to gain access to yards.

Enclose backyard poultry, livestock, or other small animals that live outside with secure fencing and a roof.

- These act as another food source for coyotes and need to be protected from predation attempts. Remember, coyotes can jump as well as dig, so ensure that desired animals are secured from all angles.

NEVER approach an aggressive, sick or injured coyote.

- Coyotes are often unpredictable and defensive. If you feel that there is an immediate threat to your safety, dial 911.

For more information about coyotes, their habitat, appropriate fencing, and other issues, see the UC IPM Pest Notes: *Coyote* at ipm.ucanr.edu/PMG/PESTNOTES/pn74135.html.

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Coyote pup at entrance to urban den.

N. M. QUINN, UCCE

Downy Mildew on Ice Plants

A downy mildew caused by the fungus *Peronospora mesembryanthemi* has recently been confirmed by the USDA-APHIS from a red apple ice plant (*Aptenia cordifolia*) sample collected in San Diego. Since this first finding in San Diego County in summer 2015, the disease has spread to Orange, San Bernardino, and Ventura counties and is now found in the Goleta area in Santa Barbara County.

Peronospora mesembryanthemi was first reported from South Africa and later in the United Kingdom and New Zealand, but has never before been reported in North America. The host range of *P. mesembryanthemi* is thought to be limited to ice plants, and in California it is currently found infecting the red apple ice plant, trailing ice plant or pink carpet (*Delosperma* [= *Mesembryanthemum cooperi*]), and *Lampranthus* spp. These ice plant species are all native to southern Africa.

Because of their environmental hardiness, ease of growing, and bright, colorful flowers, ice plants are grown as ornamental plants or as ground covers. However, the red apple ice plant, which is sometimes considered a weed, is also listed as an invasive plant by the California Exotic Pest Plant Council.

Pathogen

Downy mildew appears as a mat of gray, blue, or brown fungal growth on the undersides or sometimes on both sides of leaves and other infected plant parts. Fungal growth consists of the asexual

fruiting structures known as sporangia that are produced on sporangioophores, which are specialized hyphae.

Downy mildew fungi cause systemic infection and grow internally in all plant parts. Infection rapidly spreads under cool and wet conditions. Windblown rain or sprinkler splashing help disperse sporangia and aid in the disease spread. Downy mildew fungi are obligate parasites of plants and most of them have a narrow range of one or just a few hosts.

Damage

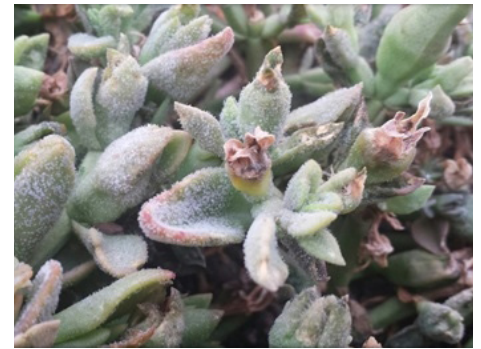
The rapid spread of *P. mesembryanthemi* through southern California could be from accidental movement of infected nursery stock. Severe damage with heavy or total loss of plantings is becoming common in southern California counties where the disease is currently found.

Management

There are relatively few fungicides effective against oomycetous fungi, and control can be very difficult. Since most of the fungicides available inhibit rather than kill the fungal growth, treatments against *P. mesembryanthemi* only suppress the fungus; systemic infections cannot be cured.

Downy mildew fungi evolve very quickly to form new races and can rapidly develop fungicide resistance.

Good cultural practices and sanitation can prevent or minimize downy mildew of ice plants. Some management options include:



Grayish sporulation of *Peronospora mesembryanthemi* on an ice plant.



Downy mildew-infected red apple ice plant.

- Prune plants regularly and remove weeds to improve air circulation and reduce fungal growth.
- Avoid overhead irrigation during cool weather.
- Consider watering in the morning hours so that plants dry during the day.
- Do not over- or under-fertilize as it may increase the chances of infection.
- Monitor highly susceptible species like the red apple ice plant; remove and destroy plants with disease symptoms.
- Consider other non-host plants as ground covers when replacing diseased ice plants.

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For more information about managing pests, contact your University of California Cooperative Extension office listed under the county government pages of your phone book, or visit the UC IPM Web site at ipm.ucanr.edu.

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WHAT IS IPM? Integrated Pest Management (IPM) programs focus on long-term prevention of pests or their damage through a combination of techniques including resistant plant varieties, biological control, physical or mechanical control, and modification of gardening and home maintenance practices to reduce conditions favorable for pests. Pesticides are part of IPM programs but are used only when needed. Products are selected and applied in a manner that minimizes risks to human health, beneficial and nontarget organisms, and the environment.