



ZIKA VIRUS AND CONTAINER-BREEDING MOSQUITO CONTROL

Introduction

Throughout history, mosquitoes have transmitted some of the most important and deadly diseases to humans. Their role in vectoring diseases such as malaria, West Nile, dengue, and chikungunya make mosquitoes arguably the most dangerous animals in the world. Worldwide, malaria alone accounts for more than 600,000 deaths each year, most of them are children under the age of five. Recently, the outbreak of another mosquito-borne illness, Zika virus, has dominated national headlines. With the number of confirmed cases in the Americas on the rise, the public demand for wide-spread mosquito management has never been greater.

Figure 1. Adult yellow fever mosquito, *Aedes aegypti*. Photo credit: James Gathany, CDC.



Zika Virus Disease

Zika virus disease (Zika) is caused by an emerging mosquito-borne virus that has no specific medical treatment or vaccine. The virus is spread to people primarily through the bite of an infected mosquito in the *Aedes* genus, the same mosquito responsible for transmitting yellow fever, dengue fever and chikungunya viruses. The symptoms of the illness are generally mild, but Zika virus infection during pregnancy can cause serious birth defects including microcephaly. In addition, infection may also be linked to neurological disorders such as Guillain-Barré syndrome.

Zika virus was first isolated in 1947 from a rhesus monkey in Uganda's Zika forest, but the first human cases of Zika were not detected until 1952. In 2007, a large epidemic of Zika virus was reported in Yap Island and Guam, Micronesia. In 2013 and 2014 multiple epidemics were reported in several Pacific Islands. By May 2015, the Zika virus was reported in Brazil as well as several countries of South and Central America and the Caribbean. Only eight months later, Brazil totaled nearly 30,000 reported cases of infection. The virus is now widespread in Brazil, and is continuing to spread throughout the Americas as well as the Oceania and Pacific Islands. In the United States, the Centers for Disease Control and Prevention reported that Zika virus disease has been confirmed in 42 states, but there have been no locally acquired mosquito-borne cases reported as of April 2016.

Zika Virus Vectors

The yellow fever mosquito, *Aedes aegypti*, is a small to medium-sized mosquito, approximately 4 to 7

Estimated range of *Aedes aegypti* in the United States, 2016



Estimated range of *Aedes albopictus* in the United States, 2016



Figure 2. Estimated range of the yellow fever mosquito *Aedes aegypti*, and the Asian tiger mosquito *Aedes albopictus* in the United States. Figure credit: CDC.

millimeters in length (**Fig. 1**). It can be identified by the pattern of white scales on the dorsal surface of the thorax that form the shape of a violin or lyre. Additionally, the hind legs have bands of white scales that appear to be stripes. The yellow fever mosquito is the principal mosquito vector of Zika and it is present in the United States. It prefers to feed on humans over other animals. As the common name suggests, this mosquito is also the primary vector of yellow fever as well as a vector of dengue and chikungunya. The yellow fever mosquito is a tropical mosquito species that thrives in warmer, humid conditions typical to the southern United States (**Fig. 2**).

The Asian tiger mosquito, *Aedes albopictus*, is medium-sized (2 to 10 mm in length) and closely resembles the yellow fever mosquito (**Figure 3**). These species can be distinguished by differences in scale patterns on the thorax of adults. The Asian tiger mosquito has a prominent single stripe of white scales down the middle of the dorsal surface of thorax that differs from the violin shape of white scales seen on the yellow fever mosquito. The Asian tiger mosquito has been implicated as a competent vector of Zika in other countries and could pose a similar risk in the United States. It is also capable of vectoring other viruses including dengue fever and Eastern equine encephalitis virus. The Asian tiger mosquito has adapted to survive in a broader temperature range and at cooler temperatures than the yellow fever mosquito. As a

The virus is spread to people primarily through the bite of an infected mosquito in the *Aedes* genus, the same mosquito responsible for transmitting yellow fever, dengue fever and chikungunya viruses.

result, the Asian tiger mosquito can tolerate more temperate climates and has a broader distribution in the United States than the yellow fever mosquito (**Figure 2**).

The yellow fever and Asian tiger mosquito live in close association with humans, largely due to their preferences in breeding sites. Both species seek out natural and artificial water-holding containers such as tree holes, bird baths, or plastic containers to lay their eggs. They can complete their lifecycle in as little as one half inch of water, making nearly any sized container a potential breeding site. After taking a blood meal, the female lays 100–200 black eggs (0.5 mm in length) in small batches, across multiple sites. Each egg is glued to the inner wall of a container, just above the waterline. Following a rain event, the water level rises, submerging the eggs, triggering them to hatch. If the container dries out, the eggs can survive desiccation for eight months or more. Larval development is temperature dependent, but both species can reach adulthood in as little as seven days under ideal conditions.

While the risk of Zika virus and other viruses transmitted by these mosquitoes is low, to prevent mosquito bites in general, the U.S. Centers for Disease Control recommends applying EPA registered insect repellents containing the active ingredients DEET, picardin, oil of lemon eucalyptus (OLE), or IR3535 to exposed skin according to label instructions.



Figure 3. Adult Asian tiger mosquito, *Aedes albopictus*. Photo credit: James Gathany, CDC.

Management

The basic approach to controlling container-breeding mosquitoes involves a three-step process: inspection and surveillance, source reduction, and chemical control. When executed properly, this integrated strategy can provide effective and continuous management of mosquitoes in a given area by eliminating breeding sites and reducing adult populations. The following information will provide direction on conducting this three-step process when managing yellow fever and Asian tiger mosquitoes. These two mosquito species are particularly well suited for local control on properties serviced by pest management professionals because of the mosquitoes' propensity to breed in areas associated with humans and their limited dispersal range, rarely flying further than 100 meters from their larval development site.

The best indication that a site is producing mosquitoes is to confirm the presence of mosquito larvae. Begin by identifying water-holding containers that could serve as potential breeding sites such as empty pots, children's toys, bird baths, pets' water bowls and tree holes. Once found, containers can be visually inspected for larvae. If containers are hard to reach or too dark to inspect, a clear turkey baster can be used to siphon out water samples. Ovitrap are another effective surveillance tool that can be used to confirm the presence of mosquitoes in an area. Ovitrap are small water-holding containers designed to mimic the mosquito's preferred breeding sites in order to attract egg-laying females. This type of trap can easily be constructed by placing a wooden tongue depressor in a small plastic jar or cup that is partially filled with water. A hole should be punched or drilled in the container to prevent the water level from rising too high. The tongue depressor should be inspected every few days for the presence of eggs. It is important to note that if ovttrap are left unattended they can become ideal breeding sites for mosquitoes, and therefore their locations should be mapped and they should be removed if not inspected every few days.

Source reduction focuses on eliminating mosquito breeding sites. For these container breeding mosquitoes, primary breeding sites can include many items that are commonly found in residential backyards. If water is present in a container for more than seven days in a row, mosquitoes can complete development and the container has the potential to breed mosquitoes. Inspect the property frequently for items such as bottles, barrels, old tires, or other vessels that may hold water and remove them if possible. Tipping over any water containing items regularly that cannot be removed will prevent larvae from making it to adulthood.

Chemical control of container-breeding mosquitoes plays an important role in reducing both larval and adult populations in an area. Products intended to control the immature stages of mosquitoes are known as larvicides, while products used to control adults are known as adulticides. Larvicides such as methoprene or *Bacillus thuringiensis israelensis* (Bti) can be applied directly into water-holding containers. Methoprene, an insect

growth regulator, does not kill mosquito larvae, but prevents them from developing into adults. Bti is bacterium that produces a toxin that is lethal to larvae upon ingestion. Adulticides can be applied using a gas-powered backpack mist blower to treat adult mosquito resting places such as shrubbery and other vegetation with an appropriately labeled residual insecticide. Mist blower applications allow for the deposition of insecticide onto the underside of leaves and interior architecture of shrubs more effectively than compressed air sprayers. Use caution to avoid treating plants that are in bloom and attractive to pollinators. Foundation walls and the undersides of decks may also be treated, as adult yellow fever and Asian tiger mosquitoes (as well as others), may rest there as well. Always read and follow all label instructions.

Personal Protection

Managing mosquitoes requires pest management professionals to spend time in areas where mosquitoes are active, which can increase the risk of mosquito bites. While the risk of Zika virus and other viruses transmitted by these mosquitoes is low, to prevent mosquito bites in general, the U.S. Centers for Disease Control recommends applying EPA registered insect repellents containing the active ingredients DEET, picardin, oil of lemon eucalyptus (OLE), or IR3535 to exposed skin according to label instructions. When also using sunscreen, apply it before the repellent.

Additional Information

- For the latest information on the distribution of the yellow fever and Asian tiger mosquitoes in the United States, visit: <http://www.cdc.gov/chikungunya/resources/vector-control.html>
- For more information on the history of Zika virus, visit: <http://www.who.int/emergencies/zika-virus/timeline/en/>
- For more information on the health effects of Zika virus, visit: <http://www.cdc.gov/zika/symptoms/index.html>
- For the latest information on the global spread of Zika virus, visit: <http://www.cdc.gov/zika/geo/index.html>
- For more information on insect repellents, visit: <http://www.cdc.gov/westnile/faq/repellent.html> <<

We are Celebrating our

**70th
Anniversary!**



After 70 years, we like to think we've learned a thing or two about building and managing a pest control company.

Whether you're an experienced entrepreneur, a savvy pest control technician, or an aspiring entrepreneur thinking about making the leap into business ownership for the first time, HYDREX would like to hear from you.

Contact us today to see if you are eligible.

Kris Simonich at info@hydrex.com
1323 Newbury Road, Suite #100
Newbury Park, CA 91320



www.hydrex.com

THESE FRANCHISES HAVE BEEN REGISTERED UNDER THE FRANCHISE INVESTMENT LAW OF THE STATE OF CALIFORNIA. SUCH REGISTRATION DOES NOT CONSTITUTE APPROVAL, RECOMMENDATION, OR ENDORSEMENT BY THE COMMISSIONER OF BUSINESS OVERSIGHT NOR A FINDING THAT THE INFORMATION PROVIDED HEREIN IS TRUE, COMPLETE, AND NOT MISLEADING.