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Aedes aegypti, Yellow Fever Mosquito

(Diptera: Culicidae)

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Description

Aedes aegypti, commonly known as the yellow fever mosquito, is a major vector of viruses that infect humans such as yellow fever, dengue, Zika and chikungunya. This common pest is found worldwide in various tropical, subtropical and temperate locations, especially in densely populated areas.

Adult *Aedes aegypti* mosquitoes are small to medium sized, 1/6 to 1/4 of an inch in body length (4 to 7 mm). They possess one pair of wings, as all members of the order Diptera. The body (thorax and abdomen) is boldly patterned with white scales or speckles. Each leg is also marked with thick, white stripes that are similar to those of the Asian tiger mosquito (*Aedes albopictus*). However, the thorax of *Aedes aegypti* has white stripes on its dorsal side that resemble the shape of a guitar or violin. This violin pattern distinguishes *Aedes aegypti* from the other physically similar species, *Aedes albopictus*. Overall body color of this species varies from a light to dark brown. Males can be distinguished from females due to their fluffy antennae and smaller size. The aquatic larvae range from 1/25 to 1/3 of an inch (1 to 8 mm) in length, depending on stage of development and are light tan to brown in color. They are cylindrical in shape, have a dark brown head capsule, and possess small setae (hairs or spines) along the exterior of the body that help with movement. The larvae are often called "wigglers" due to their erratic wiggling movement when disturbed in the water. Larvae sit vertically in the water with one end floating at the surface for oxygen. *Aedes aegypti* pupae (about 1/6 of an inch) are initially light tan in color (similar to larval color) and gradually darken (brown to black) until adult emergence. Eggs are usually less than 1/25 of an inch (1 mm) long and are white when first deposited but soon turn black. They are normally laid in groups on edges of stagnant bodies of water.

Aedes aegypti eggs laid on a wet substrate (Sarah E. McComic).

Early stage pupa of Aedes aegypti (Tom Murray, Bugguide.net, Creative Commons license).

This species has been given other common names that can lead to confusion with other species, including "tiger striped mosquito." The notable markings on its dorsal side (violin shape) and its light to dark brown color are important for distinguishing *Aedes aegypti* from its similar counterpart, *Aedes albopictus.*

Life Cycle

As with most mosquitoes, adult yellow fever mosquito females require a blood meal for egg development. She can lay anywhere from 100 to 200 eggs per blood feeding cycle. The female can take a large number of blood meals, and not all eggs are viable after the first blood meal. The eggs are laid on the inside surface of containers and edges of stagnant water puddles along the edge of the water. Dry eggs can survive up to eight months before losing viability. After 24 to 48 hours of water exposure, first stage (instar) larvae hatch and start feeding. Larvae feed on various aquatic microorganisms and algae until they reach the fifth larval stage (the last instar). Once they have completed their larval life cycles (five to seven days in warm conditions), they pupate at the water surface. Pupae do not feed, and duration of the pupal stage is 24 to 48 hours. Pupae remain at the water surface until emerging as adult mosquitoes. Total time from larval hatch to adult emergence is seven to ten days in warm, humid conditions. Male mosquitoes typically pupate and emerge before females. After emergence, both female and male mosquitoes feed on nectar from plants to obtain sugars for energy, but this only lasts a couple of days. Males continue to feed on nectar while females search for sources of blood meals. Only females bite to obtain nutrients necessary for egg production. After about 48 hours, females seek shallow water to lay eggs. Adult yellow fever mosquitos live for two weeks to one month depending on environmental conditions. Only the eggs of this species can undergo quiescence (inactivity or dormancy), which means they can survive dramatic changes in weather and cold months. This allows them to revive during ideal conditions of moisture and humidity to continue their life cycle.

Ecological Significance and Pest Status

Aedes aegypti is one of the most important vectors of the diverse group of viruses known as arboviruses due to the wide distribution of the mosquito. It is a major vector for yellow fever, dengue, Zika and chikungunya. These viruses are normally spread through blood transmission

Blood fed adult female Aedes aegypti (Mike Quinn, TexasEnto.net, Creative Commons license).

Late instar larva of Aedes aegypti (Mardon Erbland, Bugguide.net, Creative Commons license).

Distinguishing violin shape on thoracic dorsum of Aedes aegypti (Mike Quinn, TexasEnto.net, Creative Commons license).

(biting a human) of *Aedes* mosquitoes that have previously fed on an infected host. The species is a serious health issue in lower- to middle-income settlements in areas such as South America and the Caribbean, where over 70,000 cases of dengue virus were reported during a recent four-year span. This is largely due to the lack of resources available for monitoring and control programs. Additionally, this species obtained its common name, yellow fever mosquito, due to periodic epidemics reported in the United States beginning during the early 1700s. Yellow fever cases were common until the early 1900s. Modern control programs and eradication methods have caused a significant decline in the illness since then. The native range of the species is believed to be in Africa, but the yellow fever mosquito has been present in Louisiana for decades, with reports dating back to World War II. It is likely present in every parish in the state so the risk of dengue virus, and others, exists. Its counterpart, *Aedes albopictus,* is also a vector for dengue, so *Aedes aegypti* is not the sole carrier. *Aedes albopictus* has largely displaced Aedes aegypti as the dominant non-native mosquito species across most of the shared range of the two species in the United States, including Louisiana, but the latter species persists and can be common, especially in urban areas such as New Orleans. These species are found throughout the southern states, but the risk of arboviruses is low due to availability of modern pest management resources and access to medical treatment. Most of the reported dengue virus cases are in persons who previously traveled to tropical areas. The disease transmission risk of yellow fever mosquito in Louisiana is low. Fewer than 20,000 arbovirus cases per year in the United States are reported, but sporadic outbreaks are possible.

Control

Monitoring and surveillance. Identifying the presence of populations and environments that yellow fever mosquitos utilize for development are critical first steps. Adult females are normally monitored for dengue and other viruses by placing traps around potential breeding sites with appropriately high levels of humidity. Typical traps used by researchers and mosquito control agencies are dark-colored (ideal for egg deposition), sticky paper with an egg laying attractant and funneled lids to prevent escape. Traps must be kept free from rain and wind so the adult females can be collected in good condition on a weekly basis. Females are then tested in the laboratory for any virus infections using one or more molecular and bioassay techniques.

Virus detection in mosquitoes is usually higher in areas where dengue cases have been previously reported.

Environmental sanitation control. The least invasive method of control or prevention of yellow fever mosquitoes and other pest mosquitoes is to eliminate or drain outside containers that serve as potential larvae habitats. Removing items with shallow water sources such as used tires, plastic containers or bottles is an effective, simple step that reduces mosquito populations. Bird baths and pet water bowls should be cleaned and refilled every few days to stay ahead of adult emergence. Containers known to develop pools of water can also be covered during mosquito season to prevent oxygen from reaching larvae. Additionally, mowing grass and trimming vegetation adequately can reduce resting sites for adults and reduce populations near homes.

Biological control. Introduction of a variety of aquatic predators can help reduce or eliminate mosquito larval populations in pools and large containers. Various fish, particularly native mosquito fish and killifish (*Gambusia* and *Heterandria* species), carnivorous copepods, and a host of predatory aquatic insects can greatly reduce larval numbers. Biological control also includes the use of biological larvicides (products with Bacillus thuringiensis and insect growth regulators) that can be introduced to infested water to target mosquito larvae without harmful effects to the environment or other organisms.

Chemical control. Spraying chemical insecticides, both residual and quick knockdown of ultra-low volume (ULV) formulations, within a radius of 100 to 200 yards away from homes, can be effective in reducing populations. Liquid insecticides are usually applied as ULV sprays. These ULV sprays transform the insecticide into small droplets that float in the air to kill flying mosquitoes. Residual spraying is the application of insecticides on tall grasses or vegetation, and vertical surfaces such as brick walls in areas known to harbor mosquitoes. The insecticide dries and adult *Aedes aegypti* that land on those surfaces will be killed. Various insecticide types are used for these applications depending on purpose of use and location. Chemical spraying is the most effective method for control of yellow fever mosquito populations during active mosquito season. See the Louisiana Insect Pest Management Guide for currently approved insecticides for control of various mosquito species, and always follow label directions when applying insecticides.

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