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## Asian tiger mosquitoes breed indoors

More mosquitoes living longer inside homes may boost capacity to spread dengue



Image credit:  
CDC/James Gathany

Asian tiger mosquitoes that spread chikungunya and dengue fever normally breed in outdoor containers kept around the home. But they can also adapt to indoor environments, a change set to improve their capacity to spread disease, according to research from northern Malaysia's Penang province published this week in *PLoS ONE*.

The study suggests that *Aedes albopictus* mosquitoes are capable of changing their behaviour to reproduce efficiently inside the home — in flower vases, sinks, paint cans and other containers that hold stagnant water.

"Adaption to the indoor/domestic environment may produce more competent vectors, since it favors long life and increased lifetime reproductive output," write Hamady Dieng, of Universiti Sains Malaysia in Penang, and colleagues.

Their experiments show that adapted mosquitoes live longer and get through more reproductive (gonotrophic) cycles, which are completed when the female lays eggs. With more mosquitoes finding more opportunities to bite people in or around the home comes a higher chance of transmitting pathogenic viruses, according to the authors.

The female Asian tiger mosquito is the second-best vector for dengue viruses, which are responsible for 50 million cases of infection and at least 20,000 deaths each year. It **can also transmit chikungunya**, yellow fever, and viruses that cause encephalitis.

Although the mosquito is native to Asia its territory now extends to the Western hemisphere. It took hold in Europe in the 1970s, allowing the chikungunya virus to **enter and threaten to spread** farther into the continent. *Ae. albopictus* mosquitoes were first seen in the Americas in the mid-1980s and are suspected to be playing a **role in the spread of dengue fever** in Latin American countries — and in parts of the USA, where a rare outbreak of the disease was **reported last May**.

Measures to control the spread of these diseases depend on how well vector-management programmes can **target the areas** where mosquitoes breed and develop. Female Asian tiger mosquitoes usually lay their eggs near stagnant pools of water kept in open containers outside the home. But when Dieng and colleagues conducted an entomological survey in parts of Penang Island in 2009, they noticed that mosquitoes were also developing in containers kept indoors.

Similar behaviour was seen recently in Thailand, they say, but no previous studies have examined what it could mean for the transmission of dengue fever or other vector-borne diseases.

Their research began with a survey of female *Ae. albopictus* collected from household containers in nine residential areas of Penang Island between February and June 2009. They found mosquitoes at various developmental stages in the samples collected during the five months of the survey. "The persistence of its larval and pupal stages in indoor containers over a long period suggests that *Ae. albopictus* is being adapted to the indoor environment," they write.

"The presence of larvae strongly suggests that at least a GC [gonotrophic cycle] has been achieved," add the authors. "Thus, infection would occur if the virus was present." They did not test the mosquitoes to find out whether they carried the dengue virus.

From these 'wild' *Ae. albopictus* they obtained five generations of females in the laboratory. Using data from three experiments they analysed differences between wild and fifth-generation mosquitoes in survival, body size, number of reproductive cycles, and capacity to produce offspring (fecundity).

Fifth-generation females completed a much higher number of reproductive cycles compared with the wild mosquitoes. The difference was statistically significant.

"With an extended period of GA [gonotrophic activity], females have a higher probability of picking up and transmitting a disease agent," explain the authors. "The increased period of reproduction... will also lead to a higher mosquito population density, which is also likely to be associated with increased occurrence of disease."

Longer reproductive periods can also increase the lifespan of these Asian tiger mosquitoes, according to Dieng and colleagues, because blood meals are a source of energy for them. In turn, a longer lifespan translates to more blood intake, which helps eggs mature and leads to higher fecundity. They explain that this leads to more mosquitoes biting people around the home, which is one of the factors that could increase the spread of disease.

Because the research was done in a dengue-endemic area, the experiments were conducted with mice as a source of blood for the mosquitoes. The authors caution that this is a drawback of the study, but add that under some conditions people would have similar responses to mosquito bites and infection with the dengue virus.

#### Reference and link

1. Dieng H, Saifur RGM, Hassan AA, Salmah MRC, Boots M, Satho T, *et al.* Indoor-breeding of *Aedes albopictus* in Northern Peninsular Malaysia and its potential epidemiological implications. *PLoS ONE* 2010, **5**:e11790. doi: [10.1371/journal.pone.0011790](https://doi.org/10.1371/journal.pone.0011790)

[US Centers for Disease Control and Prevention information on \*Aedes albopictus\*](#)

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