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LIFE

## Giving dengue the snip

Thai scientists aim to sterilise mosquitoes to reduce deadly diseases.

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# FIGHT AGAINST THE BITE

Thai researchers have launched a project to sterilise mosquitoes with the aim of reducing deadly diseases such as dengue

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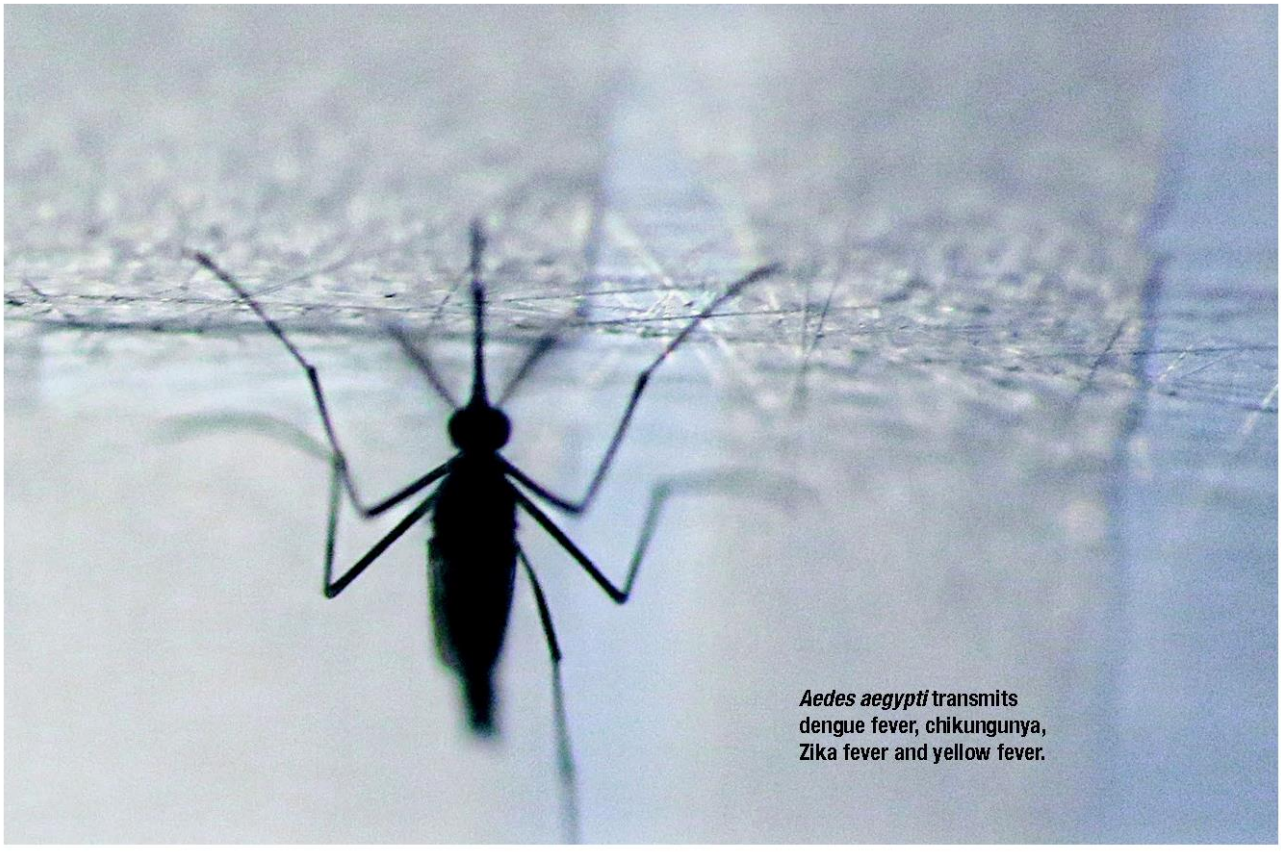

***Aedes aegypti*** transmits dengue fever, chikungunya, Zika fever and yellow fever.

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Mosquito containers.

Mosquitos are not just a nuisance. In the past few years, these tiny, buzzing creatures have posed more detrimental health risks as a carrier of several vector-borne diseases such as dengue fever, the Zika virus and others.

On an international scale, the World Health Organization declared in February the cluster of microcephaly cases (birth defects where a baby's head is smaller than expected) and other neurological disorders — potentially caused by the Zika virus — a health emergency. As of this month, 60 countries and territories report facing mosquito-borne transmission, of which 46 countries are experiencing a first outbreak of Zika since last year and 14 countries reported evidence of the disease's transmission from 2007-2014.

Thailand also bears the consequence of mosquito-borne illnesses, specifically dengue fever. Just six months into 2016, the number of patients suffering from dengue infection in Thailand has accumulated to over 18,000, revealed Dr Suwannachai Wattanayingcharoen, deputy permanent secretary of the Ministry of Public Health. The number saw a drastic decrease from last year where 140,000 people suffered from the disease. But while the outbreak has seemed to subside, the amount of deaths has now risen to 16 cases in just half-a-year. The death toll for the whole of 2015 was 14. Dengue still very much remains an epidemic in Thailand.

To combat this vector-borne disease, a research team at Mahidol University recently introduced its "Fighting Dengue with Super-Sterile Mosquitoes" project in the hope of lessening the number of dengue cases by suppressing the mosquito population. This project has received financial support from Mahidol University, the International Atomic Energy Agency of Austria and International Development Research Centre of Canada.

"We are getting rid of areas with stagnant water to minimise space for larvae to grow and such," said Dr Suwannachai. "That helps in controlling the population, to an extent. But, as effective as that is, as we now see a decrease in the number of our patients, we are also experiencing an increase in lives lost."

For the mosquito sterilisation project, *Thedes aegypti* mosquitoes — or the domestic *yoong lai* — were microinjected (injected at a microscopic level) with two strains of wolbachia bacteria isolated from forest mosquito (*A. albopictus)* collected from rubber plantations. The mosquitoes then became resistant to dengue infections and can sterilise the natural population upon mating.

They also undergo radiation treatment to make sure they can no longer breed. There is no tampering or modification to the mosquitoes' genes.

The technique of mosquito sterilisation is actually not new, but most countries that have jumped on this disease-prevention bandwagon either inject the bacteria or subject the mosquitoes to irradiation. The team at Mahidol University, however, claimed itself the first to utilise both sterilisation techniques.

Last Wednesday, marking the 6th Asean Dengue Day, the research team released these developed, super-sterile mosquitoes at Baan Nong Sathit of Plaeng Yao district in Chachoengsao province. About 10,000 mosquitoes were released, all of them male as they only feed on nectar, not blood like females, and thus don't carry vector-borne diseases.

"This population control scheme will result in a decline of vector-borne *A. aegypti* in nature. Hopefully, it will also prove successful in cutting down not only dengue, but also chikungunya [mosquito-borne virus infection resulting in fever and joint pain] and diseases like Zika fever and yellow fever," said project head Assoc Prof Pattamaporn Kittayapong from the Centre of Excellence of Vectors and Vector-Borne Disease at the university's Faculty of Science.

> This is an effective and safe method at controlling the population, with no effect on the environment and ecosystem

Baan Nong Sathit village sits in isolation from other neighbourhoods, which makes it a good choice to conduct this open-environment trial. Primary evaluation of the project's effectiveness will be easy to determine as the *A. aegypti* usually don't wander far. They mostly stay within a 100m radius from houses. The significance of the project has already been explained and discussed with villagers and local authorities.

"This is an effective and safe method at controlling the population, with no effect on the environment and ecosystem. Upon release, the mosquitoes will only live for a few weeks. They also won't be able to breed," explained the researcher.

For those who are concerned that downsizing the creature's population could pose unde-

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Releasing the developed mosquitoes in Baan Nong Sathit.

sirable effects to the ecosystem, Pattamaporn insisted there's nothing to worry about.

"The *A. aegypti* aren't the only mosquitoes out in nature. There are many other kinds that could still serve as food sources for organisms like lizards and spiders. And because the *A. aegypti* carry such harmful diseases for humans, the shrinkage in their population should be beneficial for us."

The effectiveness of the release will be evaluated after three months. And if it produces desirable results — meaning a statistically significant reduction in population — the research team plans to extend the project to cover the entire tambon.

Dr Suwannachai, already envisioning the project's future possibilities, said he can see it reaching to other regions of Thailand.

"Eventually, we hope this will lead to a body of knowledge and technology that can be broadened to the whole of Asean, all of Asia, and eventually the rest of the world as an alternative method of controlling the dengue epidemic," he said.

In the wake of recent epidemics, experiments on mosquitoes have been going on around the world with the aim to combat the spread of diseases. Last year, British biotechnology company Oxitec genetically modified *A. aegypti* with a self-limiting gene, calling them OX513A, which could make their offspring perish before reaching adulthood. These mosquitoes were released on field trials in Brazil and other countries.

"As the Oxitec mosquitoes have been genetically modified, we're unsure about the effects when they're released into nature. We think that our project — with no tampering with the mosquitoes' genes — should be friendlier towards the environment," said Pattamaporn.

Countries like Australia, Vietnam, Indonesia and Brazil are already leading the way in releasing modified mosquitoes, added the researcher.

"Other countries also tend to release both sexes of mosquitoes into the wild, aiming for them to replace the natural population. In the end, there'll be the same amount of mosquitoes biting people; they just don't spread diseases," she said, adding that her team only aims to reduce the population, which will in turn reduce prevalence of the diseases.

With the onset of this development, Pattamaporn hopes the super-sterile mosquitoes can be used in conjunction with vaccines to prevent vector-borne diseases. Also, preventive measures like cleaning out stagnant water sources around the house should still be continued.

"Whatever that has been done should be continued. Our project is only an additional means that should help in reducing the mosquito population faster."