

'Flying vaccinator': Can genetically engineered mosquitoes provide a new strategy against malaria?

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Mosquitoes transmit infectious diseases to millions of people every year, including malaria for which there is no effective vaccine. New research published in *Insect Molecular Biology* reveals that mosquito genetic engineering may turn the transmitter into a natural 'flying vaccinator', providing a new strategy for biological control over the disease.

The research, led by Associate Professor Shigeto Yoshida from the Jichi Medical University in Japan, targets the saliva gland of the *Anopheles stephensi* [mosquitoes](#), the main vectors of human malaria.

"Blood-sucking arthropods including mosquitoes, sand flies and ticks transmit numerous infectious agents during blood feeding," said Yoshida. "This includes malaria, which kills between 1-2 million people, mostly African children, a year. The lack of an effective vaccine means control of the carrier has become a crucial objective to combating the disease."

For the past decade it has been theorized that [genetic engineering](#) of the mosquito could create a 'flying vaccinator,' raising hopes for their use as a new strategy for [malaria](#) control. However so far research has been limited to a study of the insect's gut and the 'flying vaccinator' theory was not developed.

"Following bites, protective immune responses are induced, just like a

conventional vaccination but with no pain and no cost," said Yoshida. "What's more continuous exposure to bites will maintain high levels of protective immunity, through natural boosting, for a life time. So the insect shifts from being a pest to being beneficial."

In this study Dr. Yoshida's team successfully generated a transgenic mosquito expressing the Leishmania vaccine within its saliva. Bites from the insect succeeded in raising [antibodies](#), indicating successful immunization with the Leishmania vaccine through blood feeding.

While 'flying vaccinator' theory may now be scientifically possible the question of ethics hangs over the application of the research. A natural and uncontrolled method of delivering vaccines, without dealing with dosage and consent, alongside public acceptance to the release of 'vaccinating' mosquitoes, provide barriers to this method of disease control.

"For the past decade it has been postulated that the salivary gland could be the way to gain biological control over this important infectious disease," concluded Yoshida. "In this study we have shown, for the first time, the achievement of the original concept of the 'flying vaccinator.'"

More information: Yamamoto.D, Nagumo.H, Yoshida.S, "Flying vaccinator; a transgenic mosquito delivers a Leishmania vaccine via blood feeding," Insect Molecular Biology, March 2010, Wiley-Blackwell, [DOI:10.1111/j.1365-2583.2010.01000.x](https://doi.org/10.1111/j.1365-2583.2010.01000.x)

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