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Scientists engineer mosquito immune system to fight malaria

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Researchers at the Johns Hopkins Malaria Research Institute have demonstrated that the Anopheles mosquito's innate immune system could be genetically engineered to block the transmission of malaria-causing parasites to humans. In addition, they showed that the genetic modification had limited impact on the mosquito's fitness under laboratory conditions. The researchers' findings are published December 22nd in the Open Access journal *PLoS Pathogens*.

In this study, Dimopoulos and his team genetically engineered *Anopheles* mosquitoes to produce higher than normal levels of an immune system protein Rel2 when they feed on blood. Rel2 acts against the malaria parasite in the mosquito by launching an immune attack involving a variety of anti-parasitic molecules. Through this approach, instead of introducing a new gene into the mosquito DNA, the researchers used one of the insect's own genes to strengthen its parasite-fighting capabilities.

According to the researchers, this type of genetically modified mosquito could be further developed and used to convert malaria-transmitting to Plasmodium-resistant mosquito populations. One possible obstacle for this approach is the fitness of the genetically modified malaria resistant mosquitoes, since they would have to compete with the natural malaria-transmitting mosquitoes. The researchers showed with their study that the Rel2 genetically modified mosquito strain lived as long, and laid as many eggs, as the non-modified wild type mosquitoes, thereby suggesting that their fitness had not become significantly impaired.

"Malaria is one of world's most serious public health problems. Mosquitoes and the malaria parasite are becoming more resistant to insecticides and drugs, and new control methods are urgently needed. We've taken a giant step towards the development of new mosquito strains that could be released to limit malaria transmission, but further studies are needed to render this approach safe and fail-proof," said Dimopoulos.

Provided by Public Library of Science

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