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New UCI Malaria Initiative aims to disrupt deadly disease transmission in Africa

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University of California, Irvine vector biologist Anthony James will lead a multimillion-dollar effort to cultivate new strains of mosquitoes to fight malaria in Africa.

A world leader and pioneer in creating genetically altered mosquitoes, James will direct the UCI Malaria Initiative, which will bring together experts in molecular biology, entomology, public health, community engagement and regulatory control to further develop and one day test these insects in the field.

To aid this endeavor, the Bill & Melinda Gates Foundation is providing \$2 million for the generation of sustainable, genetics-based approaches to controlling malaria parasite transmission by the vector mosquito *Anopheles gambiae*. Grants from the National Institutes of Health and other funding sources will also support the highly collaborative work involving scientists from other University of California campuses.

"Our goal is to see if prototype strains developed in partnership with UC San Diego geneticists Valentino Gantz and Ethan Bier can be refined into something appropriate for disrupting malaria transmission in Africa," James said.

UC Davis vector biologist Greg Lanzaro, UC Berkeley mathematical modeler John Marshall and remote sensing expert Ziad Haddad of UCLA and the Jet Propulsion Laboratory-California Institute of Technology will focus on identifying field sites for a trial. They're following guidelines established by the World Health Organization, the National Academies and others in which a phased protocol is used to test both safety and efficacy of the strains as the work progresses. These phases include strict adherence to national and international regulations and involve stakeholders from the disease-endemic countries.

"There must be a multifaceted approach to the eradication of malaria," said James, a Donald Bren Professor at UCI and a member of the prestigious National Academy of Sciences. "Working hand in hand with thought leaders,

scientists, public health personnel and government officials, we expect to lay the foundation for eliminating a disease that affects hundreds of millions of people globally."

In the most recent World Malaria Report, WHO estimates that there were 212 million cases of malaria and 429,000 malaria-related deaths in 2015, with more than 90 percent of the latter occurring in Africa. No effective transmission-blocking vaccine yet exists. Mosquito mitigation measures, such as insecticide-treated nets, have reduced malaria infections and mortality but aren't enough to achieve eradication. Among the more promising new tactics is genetic modification of mosquitoes in order to disrupt transmission of the disease.

In 1998, James was the first to create a genetically modified mosquito model, and his laboratory pioneered the development of synthetic antimalarial genes based on antibodies that prevent mosquitoes from transmitting the disease-causing parasites. Along with Bier and Gantz from UC San Diego, he employed a revolutionary genome editing method called CRISPR/Cas9 to insert these genes into mosquitoes and in late 2015 showed in laboratory studies that the antimalarial trait was successfully passed on to an astonishing 99 percent of the progeny. Previous techniques explored by James and others resulted in only half the progeny inheriting the anti-disease trait.

What this means is that the antimalarial DNA could spread through a large mosquito colony much more rapidly, making the use of these altered insects in wild populations potentially much more effective.

James plans to utilize this approach to create strains of *Anopheles gambiae*, which are the malaria-spreading mosquitoes in many parts of Africa.

He said that once the mosquitoes are released in the wild, it will require two to five seasons to measure their impact on malaria rates. He emphasized that the people living in affected regions will have the ultimate say in whether or not the strategy will be utilized.

Source:

<https://news.uci.edu/research/uci-establishes-malaria-initiative-to-fight-deadly-disease-in-africa/>
