

Mosquito hunters invent better, cheaper, DIY disease weapon

January 12 2010



Emory University researchers believe they have come up with the cheapest, most efficient way yet to monitor adult mosquitoes and the deadly diseases they carry, from malaria to dengue fever and West Nile Virus. Emory has filed a provisional patent on the Prokopack mosquito aspirator, but the inventors have provided simple instructions for how to make it in the Journal of Medical Entomology. "This device has broad potential, not only for getting more accurate counts of mosquito populations, but for better understanding mosquito ecology," says Gonzalo Vazquez-Prokopec, the invention's namesake. In both field and lab tests, the Prokopack outperformed the current gold standard for resting mosquito surveillance -- the Centers for Disease Control and Prevention Backpack Aspirator (CDC-BP). In addition to having a longer reach, enabling it to collect more mosquitoes than the CDC-BP, the Prokopack is significantly smaller, lighter, cheaper and easier to build. Credit: www.emory.edu/esciencecommons

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cheapest, most efficient way yet to monitor adult mosquitoes and the deadly diseases they carry, from malaria to West Nile Virus. Emory has filed a provisional patent on the Prokopack mosquito aspirator, but the inventors have provided simple instructions for how to make it in the *Journal of Medical Entomology*.

"This device has broad potential, not only for getting more accurate counts of mosquito populations, but for better understanding mosquito ecology," said Gonzalo Vazquez-Prokopec, the invention's namesake and a post-doctoral in environmental studies.

"There is a great need for effective and affordable mosquito sampling methods. Use of the Prokopack can increase the coverage area, and the quality of the data received, especially for blood-fed mosquitoes. Ultimately, it can help us develop better health intervention strategies."

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Anyone with access to a hardware store, and about \$45 to \$70, can make the Prokopack, which uses a battery-powered motor to suck up live mosquitoes for analysis. Mosquito-borne diseases rank among the world's top killers, and Vazquez-Prokopec hopes that more affordable and efficient surveillance methods will help save lives.

"I come from a developing country," says the Argentine native. "I understand what it feels like to know that there is a health technology available, and to not have the money to access it."



For decades, public health officials have struggled to conduct mosquito surveillance. One early method, with obvious drawbacks, was to expose a bit of skin and count the bites. Another low-tech method is to spray inside a home with insecticide, and gather the bugs that fall onto on a drop cloth.

Mosquito traps baited with a chemical that mimics human sweat are sometimes used to catch live adult insects. But these traps capture only females who are looking for a meal.

The CDC-BP can quickly vacuum up samples of live specimens, which can be analyzed in a lab to determine the source of blood they recently consumed. The drawbacks to the CDC-BP, however, include its heavy weight (26 pounds), its bulk and its price - about \$450 to \$750 in the United States.

Emory researchers used a CDC-BP in their study of <u>West Nile Virus</u> and urban mosquito ecology in Atlanta. They wanted to learn if mosquitoes that harbor the virus were overwintering in nooks near the ceilings of sewer tunnels. But the CDC-BP only reaches six feet, and the tunnels are 15-feet high.

With a bit of ingenuity and a few trips to the hardware store, the research team put together a solution: a plastic container, a wire screen, a plumbing pipe coupler, a battery-powered blower motor and painter extension poles. After some experimentation with these components, the Prokopack was born.

"It's not like we woke up one day and said, 'Let's invent a mosquito aspirator,'" Vazquez-Prokopec explains. "It grew out of our needs during field research."

Comparative tests with the Prokopack and the CDC-BP were conducted



outdoors and in sewer tunnels during the Emory lab's Atlanta research projects. Additional field tests were done during a dengue fever study in Iquitos, Peru, where public health technicians are trying to control mosquitoes in homes. The Prokopack, which weighs less than two pounds, collected more mosquitoes than the CDC-BP, and reached higher into ceilings and into foliage.

Collecting more mosquitoes in higher locations can give researchers more insights into their behaviors. Upper foliage, for instance, can yield more mosquitoes resting after feeding on birds. And upper walls and ceilings of homes may harbor more mosquitoes resting after a meal on humans.

Provided by Emory University

Citation: Mosquito hunters invent better, cheaper, DIY disease weapon (2010, January 12) retrieved 28 April 2024 from https://medicalxpress.com/news/2010-01-mosquito-hunters-cheaper-diy-disease.html

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