

SMALL FIXES

Low-cost innovations that can save thousands of lives

Brewing Up Double-Edged Delicacies for Mosquitoes

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On what food do mosquitoes live? Orgiastic gouts of human blood that distend their abdomens and render them almost unable to move — right?



Günter C. Müller and Yosef Schlein

MALARIA VECTOR

Anopheles sergenti sips the nectar of the Nile tamarisk.

Well, actually, no.

To lay eggs, females do need blood for its iron and protein. But usually mosquitoes subsist on modest sips of nectar from flowers or from ripe or rotting fruit.

And that, according to scientists from Hebrew University in Jerusalem, is an Achilles' heel — or Achilles' proboscis — through which the pests can also be poisoned.

“You can't move flowering trees around,” said Yosef Schlein, a parasitologist at the university's medical school. “So you have to use movable bait. That's how we came up with fruit juice.”

Supported by a grant from the Bill and Melinda Gates Foundation, Dr. Schlein and his research partner Günter C. Müller concocted an array of nectar poisons known as Attractive Toxic Sugar Baits that are easy to make, environmentally friendly and inexpensive.

In tests in Israel and in West Africa, the baits knocked down mosquito populations by 90 percent. Even better, they nearly eliminated older females, the most dangerous mosquitoes. (Only females bite humans, and only mosquitoes that have already picked up malaria, dengue or another disease from one human can inject it with their saliva into another human.)

Bruce W. Christensen, a mosquito expert at the University of Wisconsin Veterinary Medicine School who was not involved in the research, called the poisoned nectar “a very cool thing.”

“It's been talked about for a long time,” he said, “but they're the first who actually did it.”

Kathryn S. Aultman, who oversees the roughly \$1 million the Gates Foundation has put into the work thus far, said: “I’m very pleased and excited about the early results. It’s wonderful that we’re able to break free our imaginations to try some of these things.”

Dr. Müller and Dr. Schlein tested their idea five years ago at a desert oasis near the Red Sea. Putting out vases of flowering tree branches, they learned that acacias — the thorn trees common in Africa — attracted the most mosquitoes. They sprayed branches with a mixture of sugar water and Spinosad, a bacterial insecticide considered harmless to humans and most beneficial insects. The mosquitoes feeding on them died.

Their next test was in a Greek Orthodox monastery in the Judean hills where mosquitoes laid their eggs in underground rainwater storage cisterns.

They filled old soda bottles with a solution of brown sugar, the juice of rotting nectarines, Spinosad and a dye. They put each in a sock with a wick that helped keep the sock soaked with the colorful fatal elixir. They suspended a bait at the opening of each cistern.

Trapping later showed that up to 97 percent of all mosquitoes in the area were marked with the dye, meaning they had landed on a toxic sock at least once. Within a week, the female population had crashed to near zero; it stayed there for a month.

Their most recent study, published in *Malaria Journal*, was done in West Africa, where malaria is a major killer, especially of young children.

The scientists chose a rural road in Mali running past ponds where two aggressive mosquito species breed — *Anopheles gambiae* and *Anopheles arabiensis*. They sprayed weeds there with a solution of the fermented juice of local guavas and melons mixed with dye and boric acid.

Within a few days, they saw 90 percent die off.

Boric acid is much less expensive than Spinosad. It is also about as harmless to humans as table salt is. It is a chief ingredient in Silly Putty. Dr. Schlein said he had heard that some Malians sampled the alcoholic bait brew, with no ill effects.

But it kills insects that eat it. It is common in cockroach control; when a thin layer is spread on floors, cockroaches take it in when they preen their feet.

“You can buy it by the truckload,” Dr. Christensen said. “And it kills in so many ways that there’s never been resistance to it. Some authorities think there never will be.”

Two more concepts still need to be tested, experts said.

Although it clearly works in arid areas where there are few trees or flowers, will it work in jungles, forests or farms where there are many competing sources of nectar?

And how often does spraying have to take place? The inventors hope as seldom as once a month will do the job.

More than one scientist noted that the idea of toxic nectar seemed so simple that it was surprising it hadn't been thought of before.

“If you're a university person, you get credit for sophisticated publications,” Dr. Schlein said. “You don't get much credit for simple ideas.”

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