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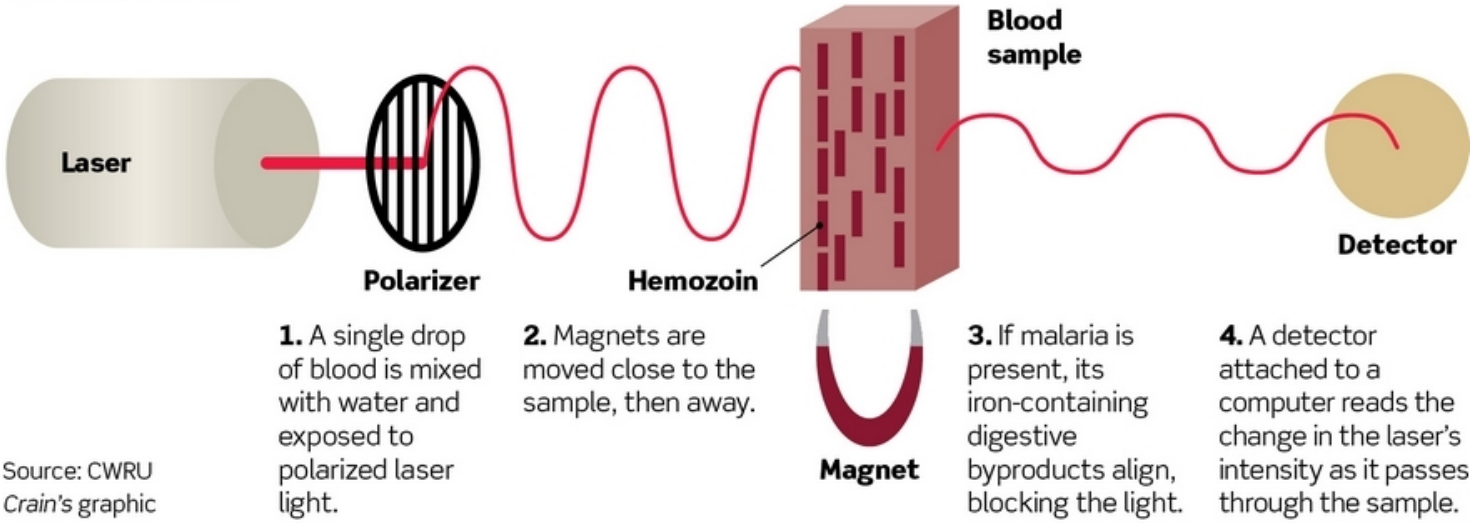
CWRU researchers could be key in malaria battle

By Lydia Coutré

How the CWRU malaria detector works

As malaria parasites consume red blood cells, they leave a byproduct called hemozoin. Because hemozoin contains iron particles, the malaria byproducts align when placed near a magnet, reducing the amount of laser light that can pass through a sample of blood. CWRU's Magneto-Optical Detector, or MOD, detects any change in light to determine whether a person is infected.



Source: CWRU
Crain's graphic

Photo by DAVID KORDALSKI

With a couple of magnets, a laser and a lot of ingenuity, researchers at Case Western Reserve University have developed a portable, battery-operated malaria detection device that can test for the disease more accurately and at a fraction of the time and cost — and it's getting a lot of attention.

Without technology like this, experts say, it would be very difficult to truly get rid of malaria — a disease for which almost half of the world's population is at risk, the World Health Organization estimates — because there's no other way to screen huge populations. Plus, there's not enough money or supply of anti-malaria drugs to administer them to everyone in a community.

CWRU's Brian Grimberg and Bob Brown led the group of researchers who developed the technology, dubbed the Magneto-Optical Detector, or MOD.

"We can finally go into villages and screen 500 people in a couple of days, whereas before if you had to do that with microscopy, there's no chance," said Grimberg, a malariologist and assistant professor of international health at CWRU. "That way, we can get the right people drugs to get rid of malaria in that area."

The MOD technology has recently been picked up for licensing and commercialization by Hemex Health, an Oregon-based startup focused on global health. Also, the work has earned a Patent for Humanity Award from the U.S. Commerce Departments' United States Patent and Trademark Office. The team, which has been working together since 2009, will also be honored at the White House this month.

Right now, two MOD machines are in the field in Peru and Kenya and have screened about 1,000 samples, but that should increase soon, Grimberg said. He plans to start screening whole villages in Kenya beginning in January.

How it works

As malaria parasites consume red blood cells, they leave behind a digestive byproduct called a hemozoin, which contains iron particles (effectively, Grimberg said, it's "malaria poop"). Magnets moved close to the sample cause the hemozoin to align, which reduces the amount of laser light that can pass through the sample. MOD can detect the change in the laser and quickly determine

whether a person is infected.
Right now, the prototype is roughly the size of a shoe box. It's attached to a couple of different batteries outside the box, as well as a laptop.
Inside, a motor rotates to move two magnets alongside and then away from the sample, which requires just a single drop of blood, as a laser beam is directed through it. An attached computer reads the change in the laser as the magnets flank the sample and then move away.
The final product, which Grimberg said industrial designers are working to perfect, will condense the power source, add solar power and remove the necessity for a separate laptop. With all the components, the machines cost about $500 to make.
"It's already light, it's already cheap, but we'd like to make it lighter and cheaper," said Brown, a CWRU distinguished university professor in physics.
Grimberg helped to develop the idea after working on malaria in Papua New Guinea. Scientists traditionally would spend up to an hour preparing and studying a slide to detect malaria. By the end of the day, there would still be people left over whose slides hadn't been read. His initial idea was to find a way to quickly triage patients.


Photo by CONTRIBUTED PHOTO Brian Grimberg has used the MOD technology in the field in Peru.

Instead, now there's a device that can provide results in 30 seconds. It's also 20 times more sensitive in detection and has a 96.5% accuracy rate, significantly more than the 85% rate seen with in-field tests with a microscopist studying slides.
And at less than $1 per test, Grimberg said, it's cheaper than the $1.57 average for a microscope test in the field or the $6 DNA test, which would be done in a lab.

To the market

Wayne Hawthorne, senior licensing manager at the Office of Technology Transfer at CWRU, helped the team file patents and connect them with internal and external funding. The university will get a "small royalty" off of this, he said, but the main focus is to get it out to the global health market.
"We're not looking for big return in terms of dollars, but we are looking for a big return in diagnosing malaria," Hawthorne said.
The return may come for anti-malaria organizations, which Grimberg estimated can save $1.2 billion annually on direct diagnostic costs.
Grimberg would like to see this in the hands of governments, villages' malaria clinics, anti-malaria organizations and even homes, though he said that's a ways off. But after several years, the technology is close to making it to market, Hawthorne hopes it will be ready for the market in a year.
Without Hemex picking up the license for the technology and the support of CWRU, Grimberg said the technology would be "the world's greatest science fair project."
"It's really interesting, it's great and maybe we'd help a few people, but really without the commercialization aspect, we don't go anywhere, and it doesn't really help anybody," he said.

Rapid Assessment of Malaria Detection Device