Anti-tank missile detector joins the fight against malaria

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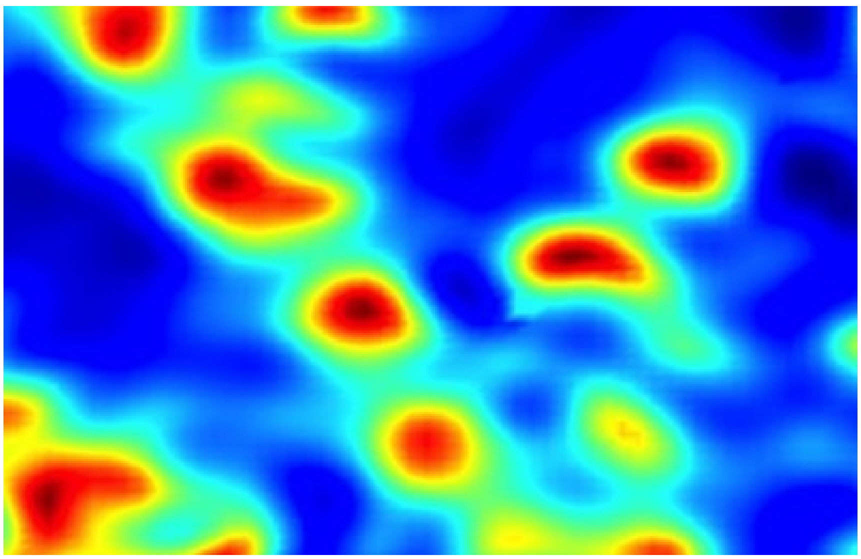

(Phys.org) —State-of-the-art military hardware could soon fight malaria, one of the most deadly diseases on the planet.

Researchers at Monash University and the University of Melbourne have used an anti-tank Javelin missile detector, more commonly used in warfare to detect the enemy, in a new test to rapidly identify malaria parasites in blood.

Scientists say the novel idea, published in the journal *Analyst*, could set a new gold standard for malaria testing.

The technique is based on Fourier Transform Infrared (FITR) spectroscopy, which provides information on how molecules vibrate.

Researchers used a special imaging detector known as a Focal Plane Array (FPA) to detect malaria parasite-infected red blood cells. Originally developed for Javelin anti-tank heat seeking missiles, the FPA gives highly detailed information on a sample area in minutes. The heat-seeking detector, which is coupled to an infrared imaging microscope, allowed the team to detect the earliest stages of the malaria parasite in a single red blood cell.

The infrared signature from the fatty acids of the parasites enabled the scientists to detect the parasite at an earlier stage, and crucially determine the number of parasites in a blood smear.

Lead researcher, Associate Professor Bayden Wood from Monash University said to reduce mortality and prevent the overuse of antimalarial drugs; a test that can catch malaria at its early stages is critical.

"Our test detects malaria at its very early stages, so that doctors can stop the disease in its tracks before it takes hold and kills. We believe this sets the gold standard for malaria testing," Associate Professor Wood said.

"There are some excellent tests that diagnose malaria. However, the sensitivity is limited and the best methods require hours of input from skilled microscopists, and that's a problem in developing countries where malaria is most prevalent," he said.

As well as being highly sensitive, the new test has a number of advantages – it gives an automatic diagnosis within four minutes, doesn't require a specialist technician and can detect the parasite in a single blood cell.

The disease, which is caused by the malaria parasite, kills 1.2 million people every year. Existing tests look for the parasite in a blood sample. However the parasites can be difficult to detect in the early stages of infection. As a result the disease is often spotted only when the parasites have developed and multiplied in the body.

Professor Leann Tilley from the University of Melbourne said the test could make an impact in large-scale screening of malaria parasite carriers who do not present the classic fever-type symptoms associated with the disease.

"In many countries only people who display signs of malaria are treated. But the problem with this approach is that some people don't have typical flu-like symptoms associated with malaria, and this means a reservoir of parasites persists that can reemerge and spread very quickly within a community," she said.

"Our test works because it can detect the malaria parasite at the very early stages and can reliably detect it in an automated manner in a single red blood cell. No other test can do that," Professor Tilley said.

FPA detectors were originally developed for portable Javelin anti-tank missiles in the 1990s. The heat seeking detector is used on shoulder fired missiles but can also be installed on tracked, wheeled or amphibious vehicles, providing spatial and spectral information in a matter of seconds and are currently used by the defence force.

The FPA detector used in this project was coupled to a synchrotron source located at InfraRed Environmental Imaging (IRENI) facility at the Synchrotron Radiation Center (SRC) in Wisconsin, developed by Professor Carol Hirschmugl. The continued development of brighter laboratory based infrared sources along with optical refinements will see this type of technology make an enormous impact in the clinical environment.

The next phase of research will see Associate Professor Wood's team work with Professor Patcharee Jearanaikoon from the Kohn Kaen University in Thailand to test the new technology in hospital clinics.

Provided by Monash University