Engineers create new technique for malaria diagnosis

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Researchers from the Universities of Exeter and Coventry have developed the first new technique for diagnosing malaria able to challenge the rapid diagnostic tests (RDTs) currently used in the field.

Early results, now published in the *Biophysical Journal*, suggest that the technique could be as effective as RDTs but far faster and cheaper, making it a potentially viable alternative. The team is now working on a non-invasive version of the device, which with the assistance of a team from the Royal Tropical Institute (KIT), Department of Biomedical Research in Amsterdam, it is planning to trial in Kenya later this year.

Two years in the making and funded by the European Union, this technique uses magneto-optic technology (MOT) to detect haemozoin, a waste product of the malarial parasite, in the blood. Haemozoin crystals are weakly magnetic and have a distinct rectangular form. They also exhibit optical dichroism, which means that they absorb light more strongly along their length than across their width. When aligned by a magnetic field they behave like a weak Polaroid© sheet such as used in sunglasses. This new technology takes advantage of these properties to give a precise reading of the presence of haemozoin in a small blood sample. The team has created a device, which gives a positive or negative reading for malaria in less than a minute.

The new device has a totally different approach from RDTs, which use a chemical agent to detect antigens associated with the malarial parasite. One of the problems with RDTs is that they need to be kept within a

given temperature range, which is difficult in hot climates. These disposable kits cost between $1.50 and $4.50 each and take around 15 minutes to deliver a reading.

High-power microscopy is still the best method available for malaria diagnosis and has been used for more than a century. Unfortunately it is time-consuming and requires expensive equipment and specialist medical skills, which are rarely available in villages in rural areas in malaria endemic countries. Over the last decade RDTs have been developed, which allow for faster diagnosis in the field, but these are too costly to be viable for developing countries.

Furthermore, RDTs are often not stable at relatively high temperatures and sometimes remain positive even after successful treatment. In many communities where malaria is having a severe impact on health, there is no testing for malaria and young children who have a fever are given anti-malaria drugs as a matter of course. This has contributed to the malarial parasite becoming increasingly resistant to the common anti-malaria drugs. Malaria is a disease for which there is still no vaccine.

Professor Dave Newman of the University of Exeter's School of Engineering, Computing and Mathematics, said: "There is an urgent need for a new diagnostic technique for malaria, particularly in the light of global warming, which threatens to spread the disease into new parts of the world, including southern Europe. The early results from our device are very promising and hugely exciting. We expect to ultimately produce a sensitive non-invasive device that will be cost effective and easy to use, making it suitable for developing countries, where the need is greatest."

Source: University of Exeter