Measuring immune response could be key to differentiating malaria from other infections

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Analysing a patient's immune response could be key to quickly and

accurately diagnosing malaria, according to research presented on World Malaria Day at the 27th European Congress of Clinical Microbiology and Infectious Diseases (ECCMID).

Malaria affects around 200 million people around the world but its non-specific symptoms, coupled with a lack of access to testing facilities, mean it is difficult to distinguish from other infectious diseases.

Treating malaria promptly not only increases a patient's chances of survival, but also helps prevent the disease from spreading to more people. The new research, presented by Purvesh Khatri, Assistant Professor in the department of medicine at Stanford University, USA, could ultimately speed up malaria diagnosis and treatment.

Prof. Khatri and his team studied the way the immune system responds to infection by looking at gene expression—which genes are active and which are not—and whether there are differences in patients with malaria compared to other infectious diseases.

When it is active, each gene produces a unique molecule called a messenger ribonucleic acid, or mRNA. This means that gene expression can be measured by the amount of each unique type of mRNA found in a blood sample.

The team were able to combine the data already available from 40 previous studies, bringing together more than 3,000 blood samples from patients with various infectious diseases. This included some from patients who were known to have malaria, some from patients with other common tropical diseases such as dengue, typhoid, or leishmaniasis, and some from healthy volunteers.

Combining the data allowed the researchers to study the activity of more than 6,000 different genes. They used a computer to trawl through 2,100

of the samples and look for patterns of gene expression. They found that a group of seven genes showed a different pattern of expression in patients with malaria, compared with healthy people and patients with other infectious diseases.

Prof. Khatri told the congress: "We know that the immune system is able to deploy different tactics for fighting different infections such as bacteria, viruses and the malaria parasite. This research shows that we can detect signs of these differences by looking at which genes are being expressed, and we think it is possible to use this knowledge to speed up diagnosis and treatment."

Once the pattern of expression of these genes had been identified, Prof. Khatri and his colleagues tested it out on the remaining 900 samples from patients with different tropical diseases and from healthy people. They found that the pattern could distinguish malaria samples from the others with 96% accuracy.

Prof Khatri said: "The early signs of malaria include fever, headache and nausea, which can also be signs of common viruses such as the flu, or of other tropical diseases such as dengue. The gold-standard for diagnosing malaria involves examining blood under a microscope, but that option is not always available, for example in parts of Sub-Saharan Africa.

"This research suggests that it's possible to develop a fast and accurate blood test for malaria that could be used even in areas where medical facilities are very basic. And if that's the case, more patients can be given life-saving treatment straight away."

Prof. Khatri says the work still needs to be validated in a prospective trial, where the activity of these genes will be tested on samples from patients with suspected but undiagnosed malaria. At the same time, he is working with colleagues to develop a device for measuring the

expression of these genes that could be used in a low-resource setting. If both are successful, the test could be available in the next three to five years.

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