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

Vienna, Austria: 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) [1].

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 [2]. 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.

On Sunday 23 April, in the run up to World Malaria Day, Professor Sir Nicholas White will deliver a keynote speech at ECCMID on malaria elimination. He will discuss how a marked increase in financial support has resulted in effective preventive measures and a subsequent decline in the global burden of malaria.

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[1] The European Congress of Clinical Microbiology and Infectious Diseases (ECCMID) is the annual meeting of the European Society of Clinical Microbiology and Infectious Diseases (ESCMID). This year it will take place from 22 – 25 April 2017 in Vienna, Austria. At the world’s largest congress combining the fields of infectious diseases and clinical microbiology, researchers will present more than 3,000 regular and late-breaking abstracts with the latest findings and recommendations, which are set to help improve diagnosis, prevention and treatment of infection-related diseases. The congress offers almost 200 session, including keynote lectures, symposia, oral sessions, educational workshops and meet-the-expert session. ECCMID expects almost 12,000 participants from more than 100 countries.
[2] These figures have been updated since the submission of abstract because the researchers have since added more data to their analysis.

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