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NEW PAPER-BASED TEST KIT FOR MALARIA DETECTION

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Colour change: When the captured antigens interact with specific substrates inside the syringe, the blue dye turns into pink. | Photo Credit: Special Arrangement

With over one million reported cases in 2017, malaria still continues to be a burden for India and most countries of southeast Asia. Now, a group of researchers from IIT Guwahati has developed a simple detection method that uses an instrument when in the lab or a piece of chromatographic paper when in the field.

The kit can be used to detect *Plasmodium* parasite, which causes malaria and also specifically detect *Plasmodium falciparum,* a notorious species.

Using an ordinary syringe fitted with a small magnet, magnetic beads and few chemicals inside, the researchers were able to specifically capture the antigen released by the parasites in the blood of malaria patients.

“As the blood has many interfering agents, we used magnetic bead–tethered aptamers (two small DNA molecules), which capture only the specific antigens and separate these from the blood serum to perform the reaction. The magnetic bead helps in holding the aptamers,” explains Naveen Kumar Singh, Ph.D. scholar at the institute and first author of the paper published in *Analytical Chemistry.* “This kit also has high stability in hot and humid conditions. When mass produced, the kit can be cheaper than the existing rapid detection test kit available in the market.”

One of the aptamers selectively captures the antigen (*P. falciparum* glutamate dehydrogenase - PfGDH) from the *P. falciparum* strains, while the other captures another antigen (*Plasmodium* lactate dehydrogenase - PLDH) that is common to all the *Plasmodium* species.

The team used PfGDH instead of the currently used HRP-2 as there have been several reports of HRP-2 gene deletions in P. falciparum. This absence of gene allows the parasite to evade HRP-2-based detection tests, resulting in a false-negative test result.

When the captured antigens interact with specific substrates inside the syringe, the blue dye turns pink. The dye is then adsorbed over a modified chromatographic paper. The formation of pink colour on the paper is a direct indication of the presence of parasites in the blood serum. The intensity of the colour increases when the concentration of antigen is high.

“The paper-based method offers the result rapidly and the aptamer-tethered magnetic beads can be reused too.” adds Naveen.

In the instrument-based method the intensity of the colour change is measured using a spectrophotometer. This gives a quantitative measurement and can detect very low level of the antigen in blood.

The team has already filed patent applications for one of the aptamers as well as for the detection strategy used to develop the kit. “The next phase of the work involves validation of the kit through field trial for point of care applications,” says Prof. Pranab Goswami from the

Department of Biosciences and Bioengineering at IIT Guwahati and the corresponding author.

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From 1980-1987, seven blast endemics have occurred in India causing severe losses

END