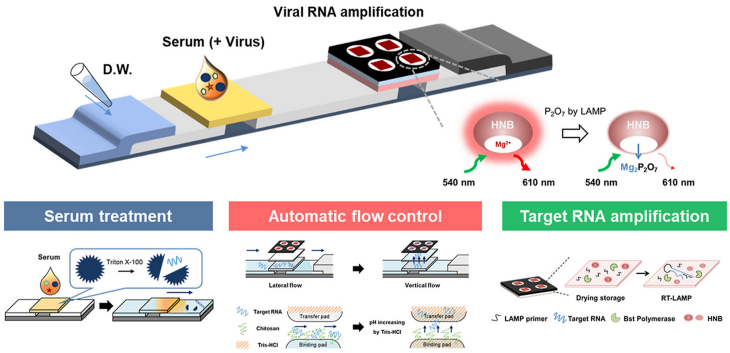
BioSpectrum
the business of Bio & Health Sciences
ASIA EDITION

Korea develops rapid diagnosis platform to detect tropical fevers

09 September 2020 | News

Scientists develop a pocket-sized tool for rapidly identifying various mosquito-borne diseases (Dengue, zika, and chikungunya)in resource-constrained clinical environments



Researchers from Gwangju Institute of Science and Technology in Korea have developed a simple and low-cost diagnostic platform—**a *lab-on-paper* strip**—that can readily detect the specific RNA of these viruses from a small blood sample.

Dengue, zika, and chikungunya viruses are transmitted by mosquitoes and cause tropical fevers with similar symptoms, making accurate early diagnosis particularly difficult without complex molecular diagnostic equipment.

In a recent effort to make the diagnosis of these mosquito-borne diseases faster and easier, a team of scientists, led by Professor Min-Gon Kim have developed a compact, fully automatic, and inexpensive tool that can identify the presence of these viruses from a blood serum sample. The device, named *LAMDA* (stands for *lab-on-paper for all-in-one molecular diagnostics*) by the scientists, is essentially a mini laboratory on a paper strip—vaguely reminiscent of over-the-counter pregnancy tests.

LAMDA performs all the steps of a standard nucleic acid test (a molecular diagnostic test), namely sampling, extraction, amplification, and detection of the target viral RNA, without external intervention at any intermediate step. To use LAMDA, one has to simply place a drop of blood serum and some drops of distilled water on two pads. The liquids naturally flow through the paper strip horizontally and reach the base of a small vertical stack of layers that extracts all the RNA from the sample and multiplies any existing viral RNA of the three diseases.

The top layer of the vertical stack comprises individual “reaction” patches, each designed to detect one of the three diseases. After the RNA is extracted, it flows up to the top layer, where “LAMP (Loop-mediated isothermal amplification)” reactions cause the fluorescent indicators on a patch to become dim if its target viral RNA is present in the sample.

In this way, LAMDA can correctly diagnose any of the three mosquito-borne diseases in less than an hour. Excited about the results, which are published in Elsevier’s *Biosensors and Bioelectronics*, Prof Kim remarks: “We believe that with minor modifications, such as a portable system to maintain reaction temperature at 65°C and a means to detect the fluorescence change with a smartphone, the proposed all-in-one paper chip can become a portable, low-cost, user-friendly, sensitive, and specific nucleic acid test platform with great potential in point-of-care diagnostics.”

LAMDA could be an excellent option for resource-limited clinics and hospitals, which are unfortunately common among countries most affected by mosquito-borne diseases. It could also bolster future research in the field of diagnostics for other

infectious diseases.