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Malaria, Dengue, TB play second fiddle to COVID-19

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Like the previous year, 2021 is expected to be dominated by the coronavirus pandemic. Apart from the difficulties it has imposed on the healthcare system, it has made India realise the importance of biomedical resources. It has pushed India to optimise the latent capabilities which the country possesses, across the public and private sector to promote indigenous development and manufacturing.

2020 saw many innovative solutions entering the market within the diagnostic space particularly for COVID-19 testing. A majority of them came from the academic sector, after receiving timely regulatory approvals and commercialis ation.

Although India worked relentlessly towards developing innovative testing solutions for COVID-19 throughout last year, the timely detection of a number of other infectious diseases got sidelined. A recent example is the rise of a rare fungal infection mucormycosis.

In India, the range and burden of infectious diseases are enormous such as tuberculosis, malaria, filariasis, leprosy, HIV infection, typhoid, hepatitis etc. In fact, inadequate containment of the vector has resulted in recurrent outbreaks of dengue fever and re-emergence of chikungunya virus disease and typhus fever.

For instance, India is home to approximately 2.8 million tuberculosis patients, making it the largest number in a single country. On the other hand, more than a decade after India eliminated leprosy, the disease continues to linger on. Adding on, India's malaria surveillance system ranks among the worst in the world according to the World Health Organization (WHO). According to a study published in The Lancet in 2020, diarrheal diseases, tuberculosis and lower respiratory infections were among the leading causes of deaths in India in 2019.

Thus, after witnessing a range of novel diagnostic tests stepping into the market for rapid detection of COVID-19, India should lay focus on developing and commercializing similar point-of-care tests for other infectious diseases too, for their

timely detection and subsequent elimination. If India can develop more than 20 different diagnostic tests or devices in a single year against COVID-19, many more such innovations can be brought out to effectively detect other infections looming in our country.

Translating ideas in lab

Amidst the ongoing pandemic, the need for devices that can rapidly detect and diagnose infectious bugs is evident within our scientific community. Resultantly, a number of researchers are finding out numerous ways to develop novel, inexpensive and easy-to-use devices to combat these diseases.

A recent example comes from the Indian Institute of Technology, Delhi (IIT-D) where a group of researchers has developed a handheld Surface Enhanced Raman Spectroscopy (SERS) based platform for early diagnosis of dengue virus. It gives dengue test results within one hour. The handheld device has been successfully tested on the clinical blood samples collected from hundreds of individuals in collaboration with the National Institute of Malaria Research (NIMR), New Delhi.

The detection and distinction of human immunodeficiency virus (HIV-1) was also carried out in collaboration with the National AIDS Research Institute (NARI), Pune through the handheld SERS based platform. It gives HIV-1 test results also within an hour. This research work has been funded by IMPRINT India program of the Ministry of Education with Gurugram-based New Age Instruments and Materials as the industry partner.

“Dengue is a serious global health concern with a large population around the world facing the risk of getting infected. Early diagnosis of dengue is the key to prevent deterioration of a patient’s health. However, conventional diagnostic tools like nucleic acid detection using Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) is a time taking process and it also requires expensive equipment and reagents for the diagnosis of dengue. Our ultrasensitive and handy device has a wide range of applications in the early-stage on-site detection of viral diseases and can produce the final report of investigation within an hour”, says Dr J P Singh, Professor, Department of Physics, Indian Institute of Technology, New Delhi.

Keeping a focus on rapid detection of tuberculosis (TB), engineers at the Indian Institute of Science (IISc) in Bengaluru have designed a low-cost paper-and-plastic device that can detect the presence of TB DNA in liquid samples. An untrained user can perform a TB test by simply adding liquid samples to the paper reaction zones and placing the device in an incubator for 60-80 minutes. The results of the test are read using a cell phone camera installed within a small plastic box. The material cost of fabricating the device is only Rs 61 and the cost of reagents per reaction zone is Rs 41.

“TB is the deadliest infectious disease today and India has the largest number of TB-related deaths among all countries in the world. Through our device, we have tried to address the challenges of affordability, accessibility and user-friendliness. The technology is called Fluorescent Isothermal Paper-and-Plastic Nucleic Acid Amplification Test (FLIPP-NAAT). A pilot clinical trial done in collaboration with Christian Medical College (CMC) Vellore has achieved 100 per cent sensitivity for the detection of TB. Besides its application for the diagnosis of TB, it could be modified to detect other diseases as well”, says Dr Bhushan Toley, Assistant Professor, Department of Chemical Engineering, Indian Institute of Science, Bengaluru.

Adding on, a recent collaborative study between Faridabad-based Translational Health Science and Technology Institute (THSTI) and University of Turku, Finland has led to the development of a highly sensitive and robust point-of-care test that can detect malaria infection. The test has been validated by running samples containing different strains of Plasmodium falciparum, the causal organism, from different geographical areas.

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