



DISEASES DETECTED USING A TINY 'LAB ON A PHONE'

A smartphone-based diagnostic tool to detect diseases brings the lab to remote areas

Addressing a problem and fulfilling a market demand

The quest for on-the-spot sample analysis to detect pathogens

South Africans living in rural or remote areas must travel long distances to receive medical attention or treatment. Also, clinics and hospitals require expensive equipment and trained technicians to perform clinical laboratory tests and analyse the sample before a diagnosis can be issued. Sending samples to laboratories can delay the treatment of the patients while their condition deteriorates.

To address these challenges, there is a dire need for the development of point-of-care diagnostic devices that will take diagnoses from central laboratories or clinics to environments desperately in need of quick diagnostic services. In addition, the solution needs to be simple to use so that a trained technician is not required; inexpensive; independent of other instruments or equipment; and suitable for use in any location.

The technology on offer

Spectrometry that cuts through the hassles of testing for diseases

The CSIR has developed a smartphone technology that is used as a detection system for analysing biomolecular assays or chemical reactions. The smartphone is used to capture one or more images of the biomolecular assays, which are processed by way of bespoke hardware and software to provide analytical data, such as test results, associated with the biomolecular assays, in a cost-effective manner. Furthermore, since a

smartphone has internet connectivity, the analytical data test results can be stored in the cloud or transmitted to desired recipients.

The technology that will be embedded in the smartphone is economically advantageous because it uses low-cost materials.

Value proposition and competitive advantage

Bringing the lab to remote areas

Traditional technologies employed to analyse biomolecular assays are expensive, bulky and many can only be used in a laboratory environment by trained laboratory personnel. Using a standard smartphone as a means to analyse biomolecular assays addresses these hurdles.

The technology does not require any modification to the smartphone and is thus convenient, user-friendly and cost-effective. The smartphone device uses cheap components which cost less than R10, thus making the technology cost effective.

Market opportunity

Extending the reach of healthcare

End users are typically healthcare operators in outlying or low-income communities. Private and public medical laboratories can use the technology for performing routine diagnostic tests. The device can also be used outside the laboratory by patients to measure disease biomarkers in the comfort of their homes. Researchers, clinics and law enforcement agencies such as the Forensic Science Laboratory of the South African Police Services can also make use of the technology.

Business opportunity

Offering a technology partnership in a licensable product

The product is at level 7 of the internationally accepted technology readiness scale, a universal statement indicating that a prototype can be demonstrated in an operational environment. It has undergone in-practice testing at the CSIR Medical Centre.

The technology offers several pathways to commercialisation. Further investment and development of the technology is required for de-risking.

It can be licensed to an intermediary industry player in the diagnostics space to deploy and offer the technology and/or services to end users.

Another option is for sharing risk and partnering with service providers and intermediaries in a joint venture to offer the technology and services to end users.

It is also possible for the CSIR to first develop the technology fully and directly commercialise (an incubation model), offering technology and services directly to end users. Once at a mature level and established in the market, it can be spun out as an independent business with a commercial partner.



A smartphone camera, combined with novel in-built hardware and software, performing spectrometric analysis of bio-samples.

Investment and return on investment

Invest in a lab on a phone

A R25 million investment is required over two years. This will cover refinement of the HIV, tuberculosis and severe acute respiratory syndrome coronavirus 2 diagnostics capability; biosensor hardware design refinement, including miniaturisation; and ensuring South African Health Products Regulatory Authority conformance – all to be undertaken in the first six to nine months. The next phase will be the development of the mobile app, prototype integration and validation through field testing, and final design and implementation into the product prototype.

Combining expertise in physics, chemistry and biophotonics

The team behind the smartphone system includes CSIR senior researchers at post-PhD level in areas such as physics, chemistry, biophotonics, engineering and pharmaceuticals. The team is supported by the CSIR's proven capability in healthcare product development and certification, built over many years.

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