

Scientists develop COVID-19 testing lab in a backpack

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\$51 “Lab-in-a-backpack”. Credit: Lin et al., 2022, *PLOS ONE*, CC-BY 4.0 (creativecommons.org/licenses/by/4.0/)

In a new study, published in *PLOS ONE*, scientists from Queen Mary University of London show that their lab-in-a-backpack approach is as effective as commercially available COVID-19 tests at detecting SARS-CoV-2.

The compact kit is relatively inexpensive to make, costing \$51 in total. It could offer an alternative testing solution for resource-poor countries or [remote areas](#) with little access to well-equipped testing labs or trained personnel to process samples.

The testing kit is based on a simple, non-invasive COVID-19 LAMP [test](#) and uses low-cost hardware, including a centrifuge made from recycled computer hard drives to process samples.

The LAMP test is a widely accepted alternative to the commonly used PCR test, has a similar sensitivity but unlike the PCR test does not require temperature cycling, only a single high temperature to amplify any potential virus RNA. This allows the test to be performed with only minimal equipment and reagents. Because the LAMP test uses saliva samples, it also avoids the need for invasive, uncomfortable nasal swabs. However, the [high costs](#) of commercially available LAMP tests, as well as the expensive lab equipment required to run them, means that current commercial approaches aren't suitable for remote locations, or in-home testing.

Regular testing is a key part of global efforts to manage the COVID-19 pandemic, and it is hoped low-cost testing solutions like this could help improve access to fast and effective COVID-19 testing worldwide.

According to the researchers, next steps will include making the kit instructions even more understandable so that people can use them

regardless of their experience or language, as well as validating the kit with real patient samples. So, whilst this approach holds promise, further work is needed before the system can be implemented in real-world environments, Professor Smoukov said.

Professor Stoyan Smoukov, Professor of Chemical Engineering at Queen Mary University of London, said: "We are excited for the potential of this mobile lab to do COVID-19 tests and the possibility to democratise access to inexpensive testing technology. It is made possible by our philosophy of creating low-cost instruments whenever possible from advances in electronics, or existing instruments.

"Reuse is a high value option for energy and materials sustainability, and we are glad that rather than exporting electronics waste to developing countries, we can export ways to empower people and turn waste computer hard drives into a centrifuge. The COVID-19 test is a timely application, but we also believe with this CentriDrive kit people could perform a large array of routine blood and urine tests, providing a centrifuge away from central hospital facilities."

Emily Lin, lead author of the study, said: "In this study, using the LAMP test method in combination with a low-cost centrifuge, we provided an inexpensive, rapid and accurate method for the detection of COVID-19. It will not only provide a viable and inexpensive test kit for regions such as Africa, where innovative solutions are particularly important during the COVID-19 pandemic. It can also be used in resource-rich areas, for example, in high school classrooms to demonstrate how to test for COVID-19."

Professor Smoukov added: "Combining open access science with open-source hardware lets everyone in the world to test this for themselves with minimal resources. We are also providing this technology to the innovators and entrepreneurs in the Pan-African Innovation Competition

Queen Mary is running to inspire inventors in Africa. Perhaps this royalty-free invention will let people tinker and educate themselves and others on how different blood or virus tests work. Or the simplicity and cost advantage may inspire people to base a company around it."

More information: End-to-end system for rapid and sensitive early-detection of SARS-CoV-2 for resource-poor and field-test environments using a \$51 lab-in-a-backpack, *PLOS ONE* (2022).

[journals.plos.org/plosone/arti ... journal.pone.0259886](https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0259886)

Provided by Queen Mary, University of London

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