Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

GeneXpert for the diagnosis of COVID-19 in LMICs

Since the emergence of the COVID-19 pandemic, caused by infection with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), most countries were struggling with early detection of SARS-CoV-2 and subsequent rapid case management and contact tracing. Inadequate access to diagnostic testing and health-care facilities, which is particularly pronounced in resource-poor settings such as Madagascar, is substantially impeding COVID-19 control efforts. In this low-income country, approximately 12 million people (over half of the population) live in rural areas with poor access to primary health services and even less access to specific diagnostic services, such as SARS-CoV-2 testing. Only 60–70% of people living in Madagascar have access to any health facilities.[1] There are 1·6 physicians per 10 000 individuals and diagnostic laboratories are scarce and under-equipped; therefore, many patients have inaccurate diagnoses and, in some cases, inappropriate treatment.

In 2012, the GeneXpert MTB/RIF molecular platform (Xpert; Cepheid, Sunnyvale, CA, USA) was used in Madagascar to upscale the capacity for tuberculosis diagnostic testing.[2] In response to the COVID-19 pandemic, multiple RT-PCR assays, including the Cepheid Xpert Xpress SARS-CoV-2, have received authorisation for emergency use from the US Food and Drug Administration.[3] This 50 min RT-PCR-based assay detects the pan-sarbecovirus *E* gene and the N2 region of the *N* gene as its SARS-CoV-2-specific target.[4]

Before implementing the Xpert Xpress SARS-CoV-2 assay in Madagascar at national level, we evaluated its diagnostic accuracy by comparing it with the Detection Kit for 2019 Novel Coronavirus (2019-nCoV) RNA (Da An Gene; Sun Yat-sen University, Ghangzhou, China), a product of the WHO Emergency Use Listing for in vitro diagnostics that detect SARS-CoV-2 nucleic acid.[5] We tested 40 nasopharyngeal specimens that were previously confirmed as positive (n=20) or negative (n=20) using the Da An Gene assay, on the GeneXpert platform using the Xpert Xpress SARS-CoV-2 assay. We found that the sensitivity of the Xpert Xpress SARS-CoV-2 assay was 100% (20 of 20) and the specificity was 80% (16 of 20). When looking at the cycle threshold (Ct) values from the GeneXpert assay we observed that specimens with no amplification of the *E* gene (ie, Ct=0) and Ct values for the *N2* gene greater than 40 cycles were considered as positives, whereas they were negative using the other RT-PCR system (Da An Gene). These differences could be due to different limits-of-detection of the two assays but we found that positive specimens showed similar Ct values individually, which is in favour of similar analytical sensitivity.

With the tools available it is difficult to address the question on whether these specimens are true negative samples or low-positive samples with residual viral particles. Nevertheless, this automatic interpretation of the results by the GeneXpert software might lead to high numbers of false positives with a lower positive predictive value. These false positive results will unnecessarily overload health systems. To minimise these potential false positives, we have developed and are proposing a new user-guide to interpret the results (appendix). On the basis of this guide, we observed that the sensitivity and specificity of the GeneXpert assay for SARS-CoV-2 compared with the Da An Gene assay were each 100%. It is to be noted that the arbitrary cut-off established at 40 cycles does not affect the sensitivity of the test or increase the risk of getting a false negative result.

The use of already deployed technologies, such as the GeneXpert MTB/RIF platform, requires a minimum number of trained staff and less infrastructure and equipment when compared with classic real-time PCR. Following the need to provide COVID-19 diagnoses in different peripheral locations and the testing accuracy results found in our laboratory, the Ministry of Public Health of Madagascar has decided to use the existing GeneXpert system. Preliminary field data showed that between July 5 and July 28, 2020, a total of 2733 specimens from 15 different regions have been tested, of which 877 (32·1%) were found positive for SARS-CoV-2. The use of the GeneXpert MTB/RIF platform for the early detection of the SARS-CoV-2 is of great public health interest because it gives a prompt response and can inform allocation of resources for where they are most urgently needed. The example of Madagascar shows that optimising the use of the GeneXpert MTB/RIF platform for the surveillance of SARS-CoV-2 in low-income and middle-income countries is relevant and achievable and should be considered in settings with difficult access to laboratories and an already existing GeneXpert MTB/RIF network.

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For **statistics on health care in Madagascar** see https://www.cia.gov/library/publications/the-world-factbook/geos/ma.html

See **Online** for appendix

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