The RT-PCR test, the only gold-standard test for COVID-19 detection, is challenged by the needs of high-end equipment (RT-PCR machine), expensive consumables/reagents along with high standards of supporting lab infrastructure and skilled technicians to perform the testing. The alternative low-cost tests, or so-called rapid tests, commonly used for community level screening and surveillance, are premised on either antigen based tests or antibody based methods. The rapid antigen test kits are known to give false negative results due to low viral loads at early stage of infection, and such patients are commonly to be subjected to confirmatory RT-PCR test again. The rapid antibody tests (these are blood tests) can indicate the presence of antibodies, only after generation of specific antibodies in blood. This typically happens only after a significant time of inception of the infection by which the disease has silently spread from an asymptomatic patient to many others in the community, which is envisaged to be the greatest threat against arresting the pandemic.

Our research team has developed a new portable device for rapid detection of COVID19 infection from extracted viral RNA, as a low-cost alternative to the RT-PCR machine for similar purposes, without sacrificing the expected standards of accuracy. The machine caters the same essential scientific premises of reverse transcription and subsequent amplification of the RNA to DNA via a simplified pre-programmable thermal protocol, so that the Peltier based thermal cycling platform can be avoided. Additionally, we have replaced the optical detection system with a low-cost but highly accurate paper-strip based microfluidic detection unit, further simplifying the technology without compromising the overall accuracy. Finally, an augmented image analysis platform that utilizes a custom-made smartphone app has been integrated with the device to exclude manual interpretation of results. The resulting detection process, utilizing extracted RNA sample, can be completed in around 60 minutes. The method has been rigorously tested using patient samples and has been declared by a competent regulatory authority to produce RT-PCR test compatible quality outcomes, with a remarkably high level of specificity and sensitivity, the two common parameters used as indicators of efficacy of any diagnostic tests. Introduction of this new approach of confirmatory test for COVID 19 at the community level, thus, holds the potential of disruptively uplifting the affairs of pandemic management for the underserved community at unprecedented per-test cost.

This work has been done in collaboration with the research team of Dr. Arindam Mondal, School of Bioscience.