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Commentary

RNA Extraction for Rapid Detection of COVID-19

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ABOUT THE STUDY

A rapid and large-scale diagnosis helped contain the recent 2019 coronavirus disease (COVID19) pandemic. The pandemic had a devastating effect on the world economy. Molecular detection systems have evolved over the last two decades and are rapidly replacing traditional confirmation techniques in diagnostic virology. However, the main limitation in implementing available molecular detection assays is the lack of availability of field-enabled nucleic acid separation platforms. Standard laboratory diagnosis relies on confirming the presence of severe acute respiratory syndrome coronavirus 2 (SARSCoV2) in airway specimens of suspicious patients. Preparation of viral nucleic acids is an important step, followed by a downstream molecular diagnostic platform. Many commercially available extraction kits are available for good quality viral RNA extraction.

These are being developed in a wave of pandemic scenarios, considering the great need for testing. Commercially available RNA extraction kits, either column-based or magnetic extraction, are limited and there is a rapid need for alternative non-commercial protocols. Here, we have standardized a magnetic bead internal RNA extraction method that uses simple internal reagents and a manual extraction method that does not require high-end equipment. The in-house assay was evaluated against the commercial available silica column and magnetic extraction kits using a panel of 100 throat /nasal swab samples. A high correlation in viral RNA detection with TaqMan RTqPCR was observed with excellent sensitivity and specificity. Interestingly, the developed method is very simple, cost effective, and rapid and can be quickly add up any downstream amplification platform for SARSCoV2 detection.

The protocol established in this study aimed at extracting SARSCoV2 RNA from respiratory patients swabs (oropharyngeal and nasopharyngeal) and is based on in-house synthesized magnetic bead and buffers based nucleic acid extraction protocol. Magnetic bead RNA extraction was performed manually with the use of magnetic stand. To minimize pipetting and handling errors, a manual pipetting system, which is cheaper than automated pipetting robots, was used. Here we show that the yield of our in-house magnet bead-based RNA extraction protocol is comparable to commercially available Qiagen and magnet bead-based viral RNA extraction kits, as determined by the commonly used amplification method RTqPCR.

The increasing scale of globalization has increased the potential for pandemics, placing a heavy burden on society and the medical system. The current and ongoing pandemic of COVID 19 increases the urgency of preparation and response. Despite the availability of treatments and vaccines, early detection and identification of patients continues to be the most effective way to prevent further human-to-human spread in palliative strategies. In the case of a respiratory viral disease, such as influenza/COVID19, nasopharyngeal swabs are used to extract viral RNA and further test by downstream molecular assays. To achieve high sensitivity and specificity in RNA isolation for downstream applications as well as detection this becomes a critical step. Therefore a simplified field compatible RNA purification protocols that can be easily coupled to downstream molecular diagnostic assays. However, the majority of commercial available RNA isolation kits are costly and based on multiple components in kits with add of buffers in vary compositions generally not provided owing to safeguard commercial interest. Therefore, these, commercial available kits do not offer flexibility and rapid availability when any large epidemic or pandemic scenario occurs.

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