Faster and economic detection of SARS-CoV-2 using isothermal amplification techniques

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Abstract

With the dimension of the SARS-CoV-2 pandemic all over the world, showing highly contagious rates and severe complications, an urgent need exists for faster detection methods to identify infected people, and slow down the contagion networks. RT-qPCR is the primary, and crucial, tool employed for the detection of different pathogens, and became the standard methodology for this particular virus [1]. Despite its high sensitivity to detect the presence of viral RNA in a sample, this technique is slow and needs complex equipment and specialized work force to perform the analysis. For this reason the number of tests accomplished is limited, and can lead to a decrease in subjects tested, and no measures can be implemented to control cross-contamination with others. Isothermal amplification have been extensively studied due to its advantages when compared to traditional PCR for the detection of pathogenic bacteria and virus in patients. As they perform at constant temperature the equipment needed is much simpler, and the reaction may be performed even in a water bath. This characteristic also allow an easier integration in miniaturized devices, and a complete automatization of the analysis can be reached, reducing the complexity and the cost of the analysis [2]. Our group works in the development of new methodologies for the detection of pathogens based in nucleic acid detection, thus directly applicable for the detection of viral RNA of SARS-CoV-2. We have applied several isothermal amplification techniques, including Loop-mediated isothermal AMPlification (LAMP) and Recombinase Polymerase Reaction (RPA) for pathogen detection. With the addition of a pre-step for reverse transcription of RNA into cDNA, both techniques can easily be applied for the detection of viral RNA. Another advantage of these techniques is the possibility to combine them with different naked eye detection strategies, what simplifies the interpretation of the results. Efforts have been made to validate LAMP to be used in different applications, and already some studies have shown as an alternative to RT-qPCR for the detection of SARS-CoV-2 [3,4] Despite RPA has not been yet tested for the detection of this virus, its advantages in terms of speed and simplicity of the reaction, can improve the analysis. This poster will compare and summarize different isothermal amplification techniques which present a real potential for a simple, economic and faster detection of SARS-CoV-2.

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