

A fully integrated Rotary RT-PCR system for Influenza virus detection

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In this study, we present a fully integrated and portable Rotary Genetic Analyzer for detecting the gene expression of influenza A virus with high speed and sensitivity. The Rotary Genetic Analyzer is made up of four parts including a disposable microchip, thermal blocks for temperature control, a stepper motor for precise spinning of the chip, and a miniaturized optical fluorescence detector. A disposable RT-PCR microchip ($50 \times 20 \times 2$ mm) consists of a solid-phase extraction based sample pretreatment unit and 1 μ L of the PCR chamber. A thermal block made from duralumin is integrated with a film heater at the bottom and a resistance temperature detector (RTD) in the middle. For the efficient performance of RT-PCR, three thermal blocks were placed on the Rotary stage and the temperature of each block was corresponded to the thermal cycling, namely 95 °C (denature), 58 °C (annealing), and 72 °C (extension). With an optimized microchannel dimension and surface treatment, we could dispense a RNA sample, a washing buffer, and an elution buffer subsequently by controlling the RPM into the 3D silica monolith enabling efficient RNA purification. Then, the extracted target RNA was moved into the PCR chamber and a Rotary RT-PCR reaction was performed with high speed. This novel Rotary Genetic Analyzer could analyze influenza A virus subtype H1N1, H5N1 and H3N2 simultaneously in 30 min.

Biography

Tae Seok Seo earned his Ph.D. at Columbia University, NY, USA in 2004 for the development of a novel DNA sequencing technology based on DNA sequencing by synthesis method, and started a postdoctoral research fellow in the Department of Chemistry at UC Berkeley from 2005 to develop the micro-total-analysis system. He is an associate professor in the Department of Chemical and Biomolecular Engineering at KAIST, Daejeon, Korea from 2007 and now serves as an editorial board member of Journal of Biosensors & Bioelectronics, and Biotechnology and Bioprocess Engineering.

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