Ultrafast Rotary genetic analyzer for multiplex viral RNA detection

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In this study, we demonstrated a novel method of reverse transcriptase-polymerase chain reaction (RT-PCR) using a rotary system, called Rotary Genetic Analyzer, for detecting influenza A virus with high speed. The Rotary Genetic Analyzer consists of three parts including a disposable plastic PCR microchip, thermal blocks for temperature control, and a stepper motor for precise rotating of the chip. A disposable RT-PCR microchip was fabricated by glass-PDMS hybrid with 1 $\mu\ell$reaction volume. Three thermal blocks fitted on the rotary stage, and the temperature of each block was correspondent to the PCR thermal cycling, namely 95 ℃(denaturing), 58 ℃(annealing), 72 ℃(extension). A stepper motor was positioned at the center and could rotate the PCR chip at each heater block as designed angle and time by LabVIEWTM. The generated amplicons by the rotary system were analyzed on a capillary electrophoretic microdevice. Target amplification was performed with only 25 min time and limit of detection was 12 ag of influenza A H3N2 virus. In addition, multiplex detection was performed confirming three influenza A virus (H1N1, H3N2, and H5N1) simultaneously.