

Lab-on-a-disk as a potential Microfluidic platform for Dengue NS1-ELISA

Abstract

Detection of non-structural protein 1 (NS1) of dengue virus can give early diagnosis of dengue and show high sensitivity. Current techniques used for the dengue NS1 detection are enzyme-linked immunosorbent assay (ELISA) on 96 microwell plate. However, the assay requires long incubation time about 90 minutes (for antigen–antibody interaction) and total assay time takes almost 2 hours and 30 minutes to complete. Therefore, a lab-on-a-disk with applied centrifugal force is proposed as a potential microfluidic platform to reduce the assay time by effectively mixing and separating liquid in the ELISA assay. The advantages of the technique are having large specific volume, short diffusion length, minimum reagent consumption and simplified procedures. The lab-on-a-disk will exploit centrifugal and capillary forces to act as a passive valve to control the flow sequence of different solutions involved. Each step of the ELISA process is carried out automatically by controlling the rotation speed of the disk. This paper will describe the lab-on-a-disk platform on its microfluidic principles, fabrication process, detection systems, biosensor applications, and the proposed model for dengue NS1-ELISA assay.

Keywords — Lab-on-a-disk, dengue NS1-ELISA, centrifugal and capillary force.