

Microspot with integrated pillars (MSIP) for the detection of Dengue NS1 virus

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Dengue is the most common mosquito-borne viral disease among humans in the tropical and sub-tropical regions of the world¹⁻³. This is a major threat to human kind and requires a high sensitive detection system for early diagnosis of Dengue³. In the present work, a new innovative technique, microspot with integrated pillars (MSIP), is developed for detecting Dengue non-structural protein (NS1) virus. Immunoassay for Dengue NS1 detection is employed on MSIP and quantified the fluorescent intensity emitted by Dengue NS1 detection antibodies.

The method starts with fabrication of silicon MSIPs (pillars are in square arrangement); immobilizing the MSIPs with Dengue NS1 capture antibodies using two-step process: (3-aminopropyl)triethoxy silane (APTES) and Glutaraldehyde; Dispensing the Dengue NS1 antigen into MSIP; then FITC tagged Dengue NS1 detection antibodies are injected in to the MSIP. Both fluorescent images and SEM images are captured before and after the immunoassay (see Figure 1). In addition, fluorescence intensity is measured using the fluorescent readers to quantify the concentration of Dengue NS1 virus. Effect of concentration of Dengue NS1 virus antigen on fluorescence intensity is studied. It is confirmed from the experiments that MSIPs can able to detect 100 pg/ml concentrations of Dengue antigen.

References

- [1] J. Whitehorn and J. Farrar, *British Medical Bulletin*, 2010, 95, 161–173.
- [2] C. Simmons, J. Farrar, N. van Vinh Chau and B. Wills, *New England Journal of Medicine*, 2012, 366, 1423–1432.
- [3] S. Ranjit and N. Kissoon, *Pediatric Critical Care Medicine*, 2011, 12, 90.

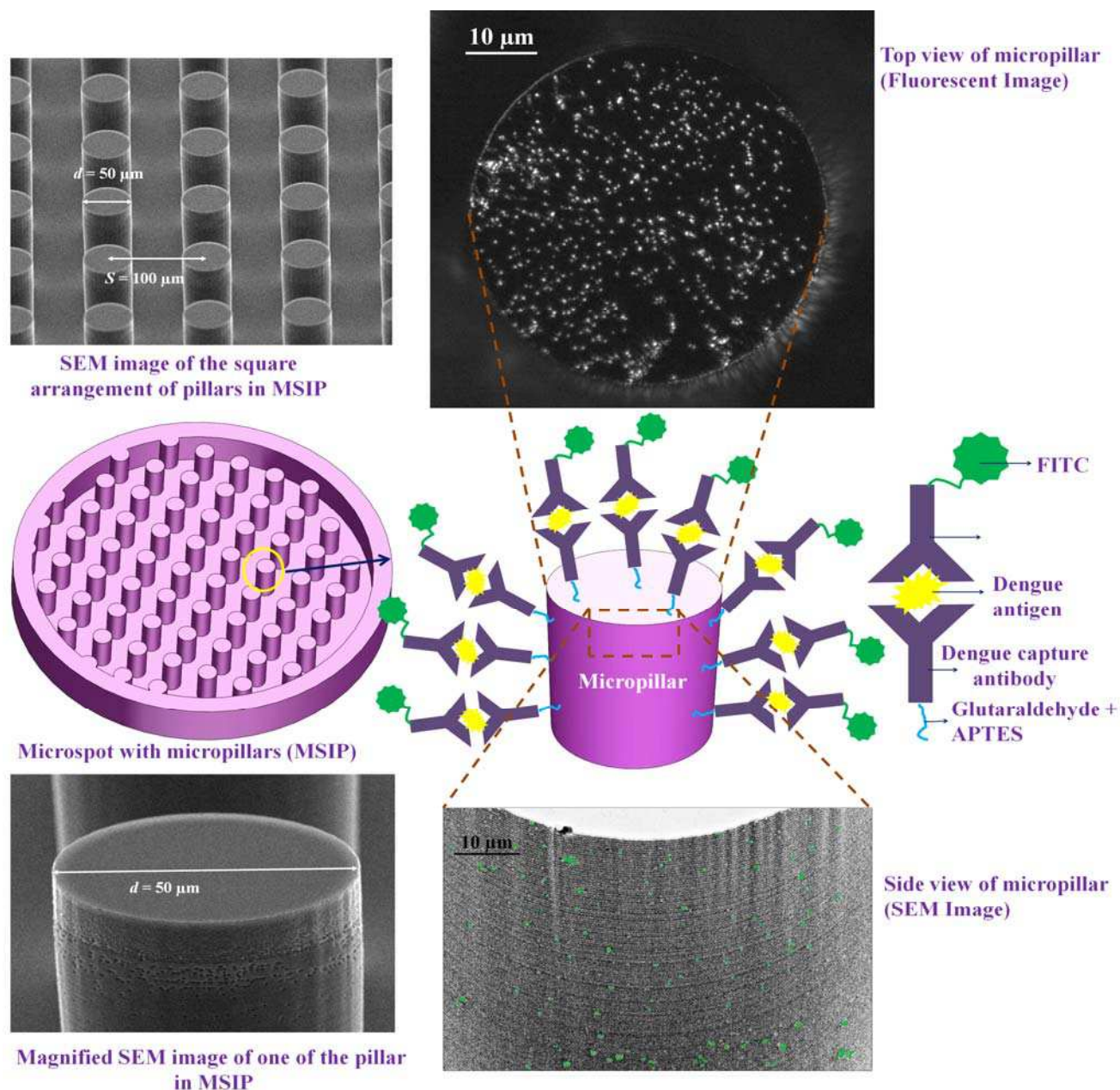


Figure 1: Schematic representation of immunoassay on MSIP (not to scale) with top view (fluorescent image) and side view (SEM image) of one of the micropillars after immunoassay. Also SEM images of the MSIPs before immunoassay is depicted.

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