

Viscoelastic Separation and Concentration of Candida Using a Low Aspect Ratio Microchannel

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Abstract : Rapid diagnosis of fungal infections is critical for rapid antifungal therapy. However, it is difficult to detect extremely low concentration fungi in blood sample. To address the limitation, separation and concentration of fungi in blood sample are required to enhance the sensitivity of PCR analysis. In this study, we demonstrated a sheathless separation and concentration of fungi, candida cells using a viscoelastic fluid. To validate the performance of the device, microparticle mixture (2 and 13 μm) was used, and those particles were successfully separated based on the size difference at high flow rate of 100 $\mu\text{l}/\text{min}$. For the final application, successful separation of the Candida cells from the white blood cells (WBCs) was achieved. Based on the viscoelastic lateral migration toward the equilibrium position, Candida cells were separated and concentrated by center focusing, while WBCs were removed by patterning into two streams between the channel center and the sidewalls. By flow cytometric analysis, the separation efficiency and the purity were evaluated as $\sim 99\%$ and $\sim 97\%$, respectively. From the results, the device can be the powerful tool for detecting extremely rare disease-related cells.

Keywords : candida cells, concentration, separation, viscoelastic fluid

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