

Viscoelastic Cell Concentration in a High Aspect Ratio Microchannel Using a Non-Powered Air Compressor

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Abstract : Quantification and analysis of rare cells are challenging in clinical applications and cell biology due to its extremely small number in blood. In this work, we propose a viscoelastic microfluidic device for continuous cell concentration without sheath flows. Due to the viscoelastic effect on suspending cells, cells with the blockage ratio higher than 0.1 could be tightly focused at the center of the microchannel. The blockage ratio was defined as the particle diameter divided by the channel width. Finally, cells were concentrated through the center outlet and the additional suspending medium was removed to the side outlets. Since viscoelastic focusing is insensitive to the flow rate higher than 10 $\mu\text{l}/\text{min}$, the non-powered hand pump sprayer could be used with no accurate control of the flow rate, which is suitable for clinical settings in resource-limited developing countries. Using multiple concentration processes, high-throughput concentration of white blood cells in lysed blood sample was achieved by ~ 300 -fold.

Keywords : cell concentration, high-throughput, non-powered, viscoelastic fluid

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