

**Focusing for separation of human mesenchymal stem cells by microfluidic-chip based filtration**

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Human bone marrow-derived mesenchymal stem cells (i.e., hMSCs) are heterogeneous and have self-renewal capacity. Especially, they have multipotency so that they can differentiate into multiple cell types such as adipocytes, osteoblasts and chondroblasts. Thus, hMSCs have been proposed as a promising candidate for cell therapies. Lab-on-chips and microfluidics become to play an important role in many biomedical applications. In this view, we sought to develop the microfluidic-chips to have branch channels which can fractionate with different sizes of hMSCs for verifying and collecting each subpopulation group. It is observed that focusing the cells to use side channel in the lateral branch is a key stage to separating hMSCs, due to flow strength and inertia. We also investigated the quantitative effect of short- and long-term shear stress on disruption of hMSCs by using well-designed devices with channel and blocks.