Microfluidic Chip as a Novel Separation Method of the Targeted Myeloid-Derived Suppressor Cells

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Abstract:

Myeloid-derived suppressor cells (MDSCs) are a heterogeneous population of immune cells playing a critical role in tumor-induced immune suppression, making them a key target in cancer immunotherapy. Conventional methods for isolating MDSCs, such as density gradient centrifugation and magnetic-activated cell sorting (MACS), are often limited by inefficiency, low purity, high costs, and scalability issues. In this study, we present a novel microfluidic chip-based platform utilizing antibody-mediated separation for the effective isolation of MDSCs from peripheral blood mononuclear cells. The microfluidic chip is functionalized with CD33 antibodies, which target surface markers commonly expressed on MDSCs, allowing for high-purity separation and high-throughput processing via immunocapture. This approach combines precision with efficiency, offering a non-invasive and cost-effective alternative to traditional techniques. The device was optimized for flow dynamics and antibody affinity, yielding high recovery rates and purity levels. Flow cytometry was used to confirm the successful isolation of MDSCs, helping us modify and enhance the system to develop a well-optimized microfluidic chip for future applications.

Keywords:

Myeloid-derived suppressor cells (MDSCs), Microfluidic chip, Antibody-mediated separation, Immunocapture.