

## Circulating tumor cell separation by vibrating filtration

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Circulating tumor cell (CTC) is the most important indicator of cancer. For the diagnosis and clinical treatment, accurate detection of cancer at an early stage is crucial. To detect CTC in human whole blood, mechanical filtration has been generally employed because CTC and blood cells have different physical properties such as size, density, and deformability. However, mechanical filtration can have a pore clogging problem. The whole blood contains millions of blood cells, which are considered as contaminant for CTC detection because it blocked the filter constrictions. Furthermore, this kind of physical separation requires the identification of separated cells. For the identification, DNA sequencing and polymerase chain reaction (PCR) have been adopted based on the simplest idea. Herein, we added a vibrating module to a typical filtration system for the clogging-free CTC separation and PCR for the confirmation of CTCs in human blood. The vibration module directly floats the cells from the membrane and clears the filter surface. This vibration anti-clogging strategy improved the CTC separation efficiency and separation capacity. We also demonstrated and confirmed the separated cells as cancer cells using PCR.