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Author: Laszlo Hajba, Andras Guttman

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# Circulating tumor-cell detection and capture using microfluidic devices

Laszlo Hajba<sup>a</sup>, Andras Guttman<sup>a, b</sup>

<sup>a</sup>MTA-PE Translational Glycomics, MUKKI, University of Pannonia, Veszprem, Hungary

<sup>b</sup>Horvath Laboratory of Bioseparation Sciences, University of Debrecen, Debrecen, Hungary

## HIGHLIGHTS

- Hydrodynamic-based circulating tumor cell (CTC)-capture devices are promising
- We review dielectrophoretic and magnetic force-based CTC-capture devices
- CTC-detection devices hold great promise in personalized cancer therapy

## ABSTRACT

Circulating tumor cells (CTCs) in the bloodstream are considered good indicators of the presence of a primary tumor or even metastases. CTC capture has great importance in early detection of cancer, especially in identifying novel therapeutic routes for cancer patients by finding personalized druggable targets for the pharmaceutical industry. Recent developments in microfluidics and nanotechnology improved the capabilities of CTC detection and capture, including purity, selectivity and throughput. This article covers the recent technological improvements in microfluidics-based CTC-capture methods utilizing the physical and biochemical properties of CTCs. We critically review the most promising hydrodynamic, dielectrophoretic and magnetic force-based microfluidic CTC-capture devices.

### Keywords:

Cancer-therapy management  
Circulating tumor cell (CTC)  
CTC capture  
CTC detection  
Dielectrophoresis  
Early detection  
Hydrodynamics  
Metastases  
Microfluidics  
Nanotechnology

*Abbreviations:* BM, Bone marrow; CTC, Circulating tumor cell; DEP, Dielectrophoresis; EGFR, Epithelial growth factor receptor; EpCAM, Epithelial cell adhesion molecule; HeLa, Cervical cancer cell line; HER, Human epidermal growth factor receptor; LNCaP, Androgen-sensitive human-prostate adenocarcinoma cell; mAb, Monoclonal antibody; MCF-7, Michigan Cancer Foundation-7 breast-cancer cell line; MDA-MB-231, Breast-cancer cell line; NSCLC, Non-small cell lung cancer; OEC-M1, Human oral squamous cancer cell line; PBS, Phosphate buffered saline; PC-3, Human prostate-cancer cell line; SCLC, Small-cell lung cancer; SKOV-3, Ovarian cancer cell line; SW-620, Colon adenocarcinoma cell line

\* Corresponding author.

E-mail address: a.guttman@neu.edu (A. Guttman)

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