

Microfluidic hydrodynamic trapping for single cell analysis: mechanisms, methods and applications

Vigneswaran Narayanamurthy^a, Sairam Nagarajan^b, Al'aina Yuhainis Firus Khan^c, Fahmi Samsuri^a, and T. M. Sridhar^d

¹ Faculty of Electrical and Electronics Engineering, University Malaysia Pahang, Pekan 26600, Malaysia

E-mail: vigjes@gmail.com

^b Faculty of Mechanical Engineering, Concordia University, Montreal, Quebec, Canada H3G 1M8

^c Department of Biomedical Science, Faculty of Allied Health Sciences, International Islamic University Malaysia, 25200 Kuantan, Pahang, Malaysia

^d Department of Analytical Chemistry, University of Madras, Guindy Campus, Chennai 600 025, India

ABSTRACT

The development of hydrodynamic-based microfluidic biochips has been increasing over the years. In this technique, the cells or particles are trapped in a particular region for single cell analysis (SCA) usually without any application of external force fields such as optical, electrical, magnetic or acoustic. There is a need to explore the insights of SCA in the cell's natural state and development of these techniques is highly essential for that study. Researchers have highlighted the vast potential field that needs to be explored to develop biochip devices to suit market/researcher demands. Hydrodynamic microfluidics facilitates the development of passive lab-on-chip applications. This review gives an account of the recent advances in this field, along with their mechanisms, methods and applications.

KEYWORDS

External force field; Hydrodynamic trapping; Lab on chip; Micro fluidic biochips; Potential field; Singlecell analysis

REFERENCES

1. El-Ali, J., Sorger, P.K., Jensen, K.F.
Cells on chips
(2006) *Nature*, 442 (7101), pp. 403-411.
2. Dittrich, P.S., Tachikawa, K., Manz, A.
Micro total analysis systems. Latest advancements and trends
(2006) *Analytical Chemistry*, 78 (12), pp. 3887-3907.

3. Johann, R.M.
Cell trapping in microfluidic chips
(2006) *Analytical and Bioanalytical Chemistry*, 385 (3), pp. 408-412.
4. Wang, D., Bodovitz, S.
Single cell analysis: The new frontier in 'omics'
(2010) *Trends in Biotechnology*, 28 (6), pp. 281-290.
5. Dittrich, P., Jakubowski, N.
Current trends in single cell analysis (Open Access)
(2014) *Analytical and Bioanalytical Chemistry*, pp. 6957-6961.