

CIRCULATING TUMOR CELLS ISOLATION USING ON-CHIP DIELECTROPHORETIC PLATFORMS

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Abstract. *Understanding the specific and intriguing properties of cellular subpopulations is one essential aspect of the future development of biomedical research. It relies however on the isolation of the cells to be analyzed. The existing downstream assays permitted step-by-step identification and separation of the cells under scrutiny via specific immunologic labeling. Dielectrophoresis (DEP), which developed as one alternative and complementary approach to the immune assays, employed differential electrical proprieties of the cellular subpopulations to be identified and characterized. DEP belongs to the family of label-free technologies besides the biomechanical-based procedures. DEP proved itself succcessfully in the detection and isolation of the cells and it showed real clinical potential when applied to the study of circulating tumor cells (CTC). The present work highlights the technological advances in the field of detection, isolation and characterization of the scarcely noticeable malignant cells in the blood of patients with various malignancies. Since the moment the body of research evidenced the role of CTC in the malignant progress towards metastasis, CTC transformed into a prognostic element of the deadly disease cancer is. However, the cells have to differentiate from the blood cells and this is possible if the various intrinsic physical proprieties are used by the label-free technologies like DEP. Such technologies are ideal in the process of isolation of CTCs which lost or transformed their antigenic expressions during the malignant transformation. The validity of the procedure is analysed in the current review to highlight the clinical applicability of DEP as label-free isolation technique in oncology.*

Keywords: dielectrophoresis, circulating tumor cells, microfluidic

1. Introduction

Microfabrication offers an excellent platform for chemical and biological applications due to cost-effectiveness, controllability, low volume, high resolution, and sensitivity. The efforts concentrate upon one of the deadly diseases which, according to statistics, remains a principal cause of death worldwide: if in 2008, 7.6 million lives were lost to cancer (~13% of all human deaths), more than 13 million are expected in 2030.^{1,2} However, the World Health Organization estimates that at least 30% of the deaths and 90% of cancer-related mortalities due to metastatic cancer are preventable with a development of new therapies to

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