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Microfluidics for cancer diagnosis: Detection of circulating micro-RNAs

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Abstract

Cancer is the second leading cause of death in Unites States. Most cancers are preventable and can be cured if diagnosed early. Current research is focused on seeking molecular targets that can be used in high risk population to identify cancer in early stages. Biological fluids such as blood, serum, urine, and saliva etc. have been evaluated to monitor various cancer-related molecular signatures in the hopes of developing non-invasive diagnostic methods. As a result, circulating micro-RNAs (not only floating freely but associated with circulating tumor cells and extracellular vesicles) have recently emerged as a new class of molecular tumor biomarkers for human cancers. Currently, there is no standard diagnostic platform which can detect circulatory miRNAs in cancer patients. A recent technological advancement in diagnostic cancer research, microfluidic devices, uses microfluidics to isolate and identify tumor-derived circulatory elements from the peripheral blood utilizing a non-invasive procedure. Identification of miRNAs in peripheral blood, in particular those carried by extracellular vesicles or exosomes that serve as a good source of stable miRNAs, is expected to play a prominent role in oncology, especially when studied in conjunction with circulating tumor cells and tumor itself. We have developed a microfluidics based device for easy isolation of extracellular vesicles for the detection and molecular characterization of miRNAs. We will present our recent findings on the role of miRNAs in cancers and the application of microfluidic nanotechnology for rapid isolation of exosomes and detection of miRNAs for cancer diagnosis and monitoring.

Biography

Dr Shailender Singh Kanwar is a translational scientist in the areas of bioassay development for cancer therapeutics and diagnosis. He completed his Ph.D in Cancer Biophysics from Punjab University, India and postdoctoral studies from Wayne State University School of Medicine. Currently, as a Research Fellow at Chemical Engineering department (University of Michigan), he is developing microfluidics based technologies for an early stage cancer diagnosis. He has published more than 35 research articles papers in reputed journals, authored a book and a book chapter in addition to review articles. He is also serving as an editorial board member of repute.