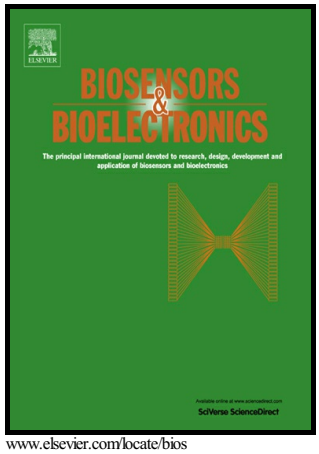

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Shifting paradigm of cancer diagnoses in clinically relevant samples based on miniaturized electrochemical nanobiosensors and microfluidic devices

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Abstract

Cancer is one of leading causes of death in the world and occurs in more than two hundred types according to the National Cancer Institute. Its early diagnosis has been remained a prime focus amongst scientists and clinicians since long, not only to understand the complications but also to mitigate its chance of further proliferation. Nowadays, tremendous advances in nanotechnology-empowered diagnostics are serving a substantial input to identify biomarkers associated with various cancers. These biomarkers are found in different forms including overexpressed proteins/surface antigens, metabolites, miRNA, and the entire cell as well. Several approaches have been adopted to detect such cancer biomarkers, where electrochemical sensors have widely been appreciated due to its high sensitivity, selectivity, robustness, and miniaturized point-of-care cancer diagnostics. Due to its immense importance, the present review has been formulated describing classicle concepts of cancer biomarker discovery followed by the recent status of electrochemical biosensors for cancer diagnoses. Particularly, we have summarized the state-of-the-art technologies based on potentiometric, impedimetric, amperometric, voltammetric biosensors for the detection of different biomarkers viz. protein, miRNA, and whole cell and biomarkers generated by metabolic shift in response to carcinoma population. Apart from these, we have also highlighted different deliverable microfluidics-based approaches and recent prototypes for cancer detection. To put various perceptive insights on the recent advancements in cancer diagnostics, an extended table is incorporated, which includes sensor fabrication strategies, type of biomarkers, detection strategies, and analytical performance of the cancer biosensor since last five years (2013-2017).