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Integration of microfluidic channel on electrochemical-based nanobiosensors for monoplex and multiplex analyses: An overview

Abstract

Background: Microfluidic devices have evolved into low-cost, simple, and powerful analytical tool platforms. Herein, an electrochemically-based microfluidic nanobiosensor array for monoplex and multiplex detection of physiologically relevant analytes is reviewed. Unlike other analyte detection methods, microfluidics-based embedded electrochemical nanobiosensors are portable, custom electrochemical readers for signal reading. Methods: Microfluidic devices and electrochemical sensors can be integrated into monoplex or multiplex systems. The integrated system is simple to use and sensitive, and so has great potential as a powerful tool for profiling immune-mediated treatment responses in real time. It may also be developed further as a point-of-care diagnostic device for conducting near-patient tests using biological samples. Therefore, using mutiplex analysis, a biosensor array may detect multiple analytes in a sample solution and provide different outputs for each analyte. A microfluidic electrochemical nanobiosensor, for example, can detect urine glucose, lactate, and uric acid. The microfluidic array of integrated nanobiosensors and electrochemical sensors enables fast and cost-effective selection of high-quality and statistically significant diagnostic data at the point of care. The multiplex analytical test is an important molecular tool for academic research as well as clinical diagnosis. Although key approaches for analysing numerous analytes have been developed, none of them are suitable for point-of-care diagnostics, especially in situations with limited resources. Significant findings: In this study, monoplex and multiplex microfluidic assays for rapid measurement of single and multiple analytes at the point of care are presented. Since this test can analyse both single and multiple analytes, it is exceptionally specific, easy to use, and inexpensive. The ability of integrated electrochemical-based microfluidic devices with single channel and multiple channels systems to perform monoplex and multiplex analysis simultaneously and independently is the novelty of this review.

Keywords

Biomarker; Diagnostics; Lab-on-a-chip; Nanobiosensor