

Advances in biosensors: Principle, architecture and applications

Abstract

The ability to detect pathogenic and physiologically relevant molecules in the body with high sensitivity and specificity offers a powerful opportunity in the early diagnosis and treatment of diseases. Early detection and diagnosis can be used to greatly reduce the cost of patient care associated with the advanced stages of many diseases. However, despite their widespread clinical use, these techniques have a number of potential limitations. For example, a number of diagnostic devices have slow response times and are burdensome to patients. Furthermore, these assays are expensive and cost the health care industry billions of dollars every year. Therefore, there is a need to develop more efficient and reliable sensing and detection technologies. A biosensor is commonly defined as an analytical device that uses a biological recognition system to target molecules or macromolecules. Biosensors can be coupled to a physiochemical transducer that converts this recognition into a detectable output signal. Typically biosensors are comprised of three components: (1) the detector, which identifies the stimulus; (2) the transducer, which converts this stimulus to a useful output; and (3) the signal processing system, which involves amplification and display of the output in an appropriate format. The goal of this combination is to utilize the high sensitivity and selectivity of biological sensing for analytical purposes in various fields of research and technology. We review here some of the main advances in this field over the past few years, explore the application prospects, and discuss the issues, approaches, and challenges, with the aim of stimulating a broader interest in developing biosensors and improving their applications in medical diagnosis.

Keywords; Transducer; Bioreceptor; Enzyme; Antibody; DNA; Pathology; Diagnosis