Analytical and Bioanalytical Chemistry 2011 vol.401 N8, pages 2591-2597

Electrochemical sensor for blood deoxyribonucleases: Design and application to the diagnosis of autoimmune thyroiditis

Shakhmaeva I., Saifullina D., Sattarova L., Abdullin T.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

We designed an electrochemical sensor based on a carbon nanotube modified electrode (ME) to analyze DNA-cleaving activity. The cleavage of high molecular weight DNA resulted in an increase in the oxidation current from DNA guanine nucleotides due to a change in DNA adsorptive behavior on the surface of the ME. DNA digestion with DNAse I was accompanied by a linear increase in the DNA signal in proportion to the enzyme activity. We then proposed an assay based on the sensor for the direct assessment of the total deoxyribonuclease activity of blood serum as well as the separate detection of DNAse I and DNA abzymes. The assay was applied to analyze deoxyribonucleases in sera from 21 healthy donors and 17 patients with autoimmune thyroiditis. Our results show that the response of the sensor to DNA cleavage by blood deoxyribonucleases is a promising diagnostic criterion for autoimmune thyroiditis. This sensor can be implemented in a disposable screen-printed electrode format for application in clinical laboratories. © 2011 Springer-Verlag.

http://dx.doi.org/10.1007/s00216-011-5335-2

Keywords

Autoimmune thyroiditis, Biomarkers, DNA abzymes, DNAse I, Electrochemical assays, Myocardial ischemia