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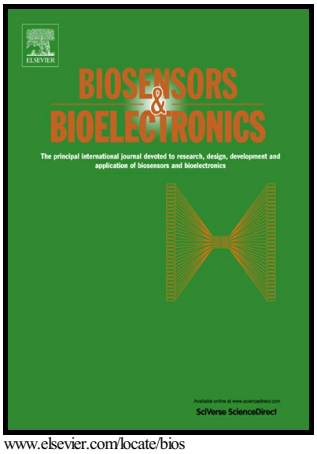

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Simultaneous Detection and Determination of Mercury (II) and Lead (II) Ions through the Achievement of Novel Functional Nucleic Acid-based Biosensors

Zahra Khoshbin[a], Mohammad Reza Housaindokht[a]*, Asma Verdian[b], Mohammad Reza Bozorgmehr[c]

[a]Department of Chemistry, Faculty of Science, Ferdowsi University of Mashhad, Mashhad, Iran

[b]Department of food safety and quality control, Department of Food Nanotechnology, Research Institute of Food Science and Technology (RIFST), Mashhad, Iran

[c]Department of Chemistry, Mashhad Branch, Islamic Azad University, Mashhad, Iran

*Corresponding author. housain@um.ac.ir

Abstract

The serious threats of mercury (Hg^{2+}) and lead (Pb^{2+}) ions for the public health makes it important to achieve the detection methods of the ions with high affinity and specificity. Metal ions usually coexist in some environment and foodstuff or clinical samples. Therefore, it is very necessary to develop a fast and simple method for simultaneous monitoring the amount of metal ions, especially when Hg^{2+} and Pb^{2+} coexist. DNAzyme-based biosensors and aptasensors have been highly regarded for this purpose as two main groups of the functional nucleic acid (FNA)-based biosensors. In this review, we summarize the recent achievements of functional nucleic acid-based biosensors for the simultaneous detection of Hg^{2+} and Pb^{2+} ions in two main optical and electrochemical groups. The tremendous interest in utilizing the various nanomaterials is also highlighted in the fabrication of the FNA-based biosensors. Finally, some results are presented based on the advantages and disadvantages of the studied FNA-based biosensors to compare their validation.

Keywords: Functional nucleic acid based biosensors; Simultaneous detection; Heavy metal ion; Aptasensor; DNAzyme; G-quadruplex

1. Introduction

As two of the most toxic metallic pollutants, Hg^{2+} and Pb^{2+} ions have received worldwide concern due to their deleterious biological and environmental effects (Lin et al. 2011b; Tchounwou et al. 2012). The repletion of Hg^{2+} in human body can cause ailments in vital organs, disorders in