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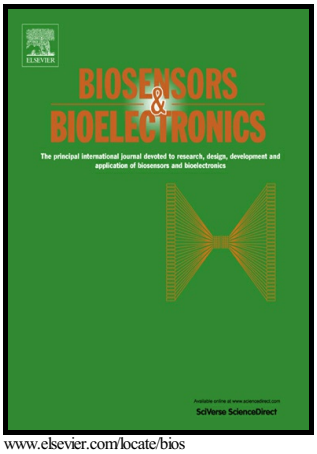

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Nano Optical Probe Samarium Tetracycline Complex for Early Diagnosis of Histidinemia in New Born Children

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Abstract

A new, precise, and very selective method for increasing the impact and assessment of histidine as a biomarker for early diagnosis of histidinemia disease in new born children was developed. The method depends on the formation of the ion pair associate between histidine and the nano optical samarium tetracycline $[Sm\text{-}(TC)_2]^+$ complex doped in sol-gel matrix in a borate buffer of pH 9.2. The $[Sm\text{-}(TC)_2]^+$ complex has +I net charge which is very selective and sensitive for $[histidine]^-$ at pH 9.2 in serum and urine samples of histidinemia disease. Histidine enhances the luminescence intensity of the nano optical $[Sm\text{-}(TC)_2]^+$ complex at 645 nm after excitation at 400 nm, in borate buffer, pH 9.2. The remarkable enhancement of the luminescence intensity at 645 nm of nano $[Sm\text{-}(TC)_2]^+$ complex doped in sol-gel matrix by various concentrations of the histidine was successfully used as an optical probe for the assessment of histidine in different serum and urine samples of new born children infected by histidinemia. The calibration plot was achieved over the concentration range 1.4×10^{-5} – 6.5×10^{-10} mol L^{-1} histidine with a correlation coefficient of (0.998) and a detection limit of (3.2×10^{-10} mol L^{-1}). The sensitivity (98.88 %) and specificity (97.41 %) of histidine as a biomarker were calculated.

Keywords: Histidine; Nano $[Sm\text{-}(TC)_2]^+$ Complex; Luminescence; Histidinemia.

1. Introduction

Histidinemia is a rare hereditary metabolic disorder characterized by a deficiency of the enzyme histidase, which is necessary for the metabolism of the amino acid histidine. A typical characteristic of histidinemia is an increase in the blood histidine levels from normal level (70-120 μM) to an elevated level (290-1420 μM) [Kawai et al. (2005)]. Histidinemia is considered benign with a patients of asymptomatic. The histidinemia is associated with multiple developmental symptoms including hyperactivity, speech impediment, developmental delay, learning difficulties, and sometimes mental retardation [Kawai et al. (2005)].