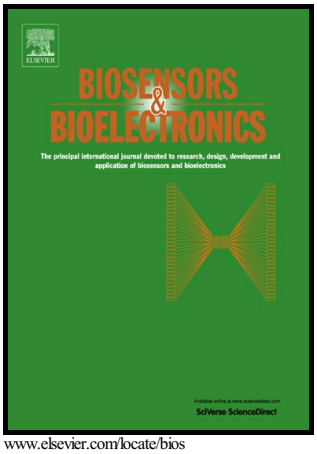

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Siderophore-based biosensors and nanosensors; new approach on the development of diagnostic systems

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Abstract

Siderophores are small organic compounds secreted by microorganisms under iron-depleted conditions which enhance the uptake of iron. Siderophores can play vital roles in ecology, agriculture, bioremediation, biosensor, and medicine. In recent years, the concept of siderophore-based biosensing devices has opened new horizons in high precision detection of various metal ions especially the iron, microorganisms, phosphopeptides, antibiotics as well pesticides. Once combined with nanomaterials, nano-scale siderophore systems provide powerful analytical platforms for detection of low concentration of metal ions and numerous pathogens. In this article, a brief overview of general aspects of siderophore is firstly discussed. In addition, a clear and concise review of recent advances of siderophore-based biosensors (siderosensor) and nanosensors are mainly discussed herein. Subsequently, future perspectives and challenges of siderophore-based sensors are discussed briefly.

Keywords: Siderophore, Biosensors, Nanosensors, Bacteria, Iron, Metal ion

1. Introduction

Siderophores are low-molecular-weight organic compounds secreted by microorganisms further down iron-depleted conditions which promote the process of iron uptake (Saha et al. 2015; Sandy and Butler 2009). Siderophores strongly bind the insoluble ferric form of iron ion (Fe^{3+}) outside the cell. Fe(III)-siderophore complexes are subsequently recognized by outer membrane siderophore receptors or siderophore binding proteins. The complexes cross the membrane to cytosol through siderophore-mediated Fe transport systems. Inside the cell, Fe(III) gets reduced into soluble ferrous iron (Fe^{2+}) which is accessible to microorganism followed by the siderophore release (Ahmed and Holmström 2014; Hider and Kong 2010; Saha et al. 2015).