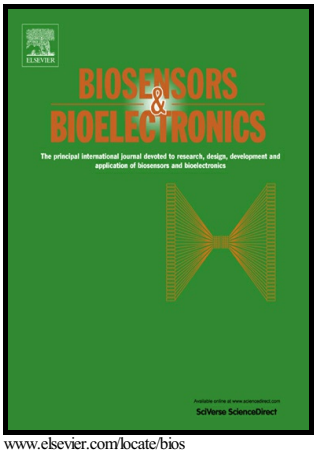

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PII: S0956-5663(18)30457-3
DOI: https://doi.org/10.1016/j.bios.2018.06.025
Reference: BIOS10545

To appear in: *Biosensors and Bioelectronic*

Received date: 24 April 2018
Revised date: 4 June 2018
Accepted date: 10 June 2018

Cite this article as: Behrouz Golichenari, Rahim Nosrati, Aref Farokhi-Fard, Khalil Abnous, Farzam Vaziri and Javad Behravan, Nano-biosensing approaches on tuberculosis: defy of aptamers, *Biosensors and Bioelectronic,* https://doi.org/10.1016/j.bios.2018.06.025

Nano-biosensing approaches on tuberculosis: defy of aptamers

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Abstract

Tuberculosis is a major global health problem caused by the bacterium *Mycobacterium tuberculosis* (*Mtb*) complex. According to WHO reports, 53 million TB patients died from 2000 to 2016. Therefore, early diagnosis of the disease is of great importance for global health care programs. The restrictions of traditional methods have encouraged the development of innovative methods for rapid, reliable, and cost-effective diagnosis of tuberculosis. In recent years, aptamer-based biosensors or aptasensors have drawn great attention to sensitive and accessible detection of tuberculosis. Aptamers are small short single-stranded molecules of DNA or RNA that fold to a unique form and bind to targets. Once combined with nanomaterials, nano-scale aptasensors provide powerful analytical platforms for diagnosing of tuberculosis. Various groups designed and studied aptamers specific for the whole cells of *M. tuberculosis*, mycobacterial proteins and IFN-γ for early diagnosis of TB. Advantages such as high specificity and strong affinity, potential for binding to a larger variety of targets, increased stability, lower costs of synthesis and storage requirements, and lower probability of contamination make aptasensors pivotal alternatives for future TB diagnostics. In recent years, the concept of SOMAmer has opened new horizons in high precision detection of tuberculosis biomarkers. This review article provides a description of the research progresses of aptamer-based and SOMAmer-based biosensors and nanobiosensors for the detection of tuberculosis.

Keywords: Aptamer, Aptasensor, Biosensor, SOMAmer, SOMAscan, *Mycobacterium tuberculosis*

1. Introduction

Tuberculosis (TB) is one of the most catastrophic diseases that human history ever witnessed. It is a bacterial disease caused by transmission of a member of the *Mycobacterium tuberculosis* complex (MTBC) bacteria (Comas et al. 2013; Faddoul 2015). The latent TB infection (LTBI) is the dormant