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Authors: Enrico Tenaglia, Anna Ferretti, Laurent A. Decosterd, Dominique Werner, Thomas Mercier, Nicolas Widmer, Thierry Buclin, Carlotta Guiducci

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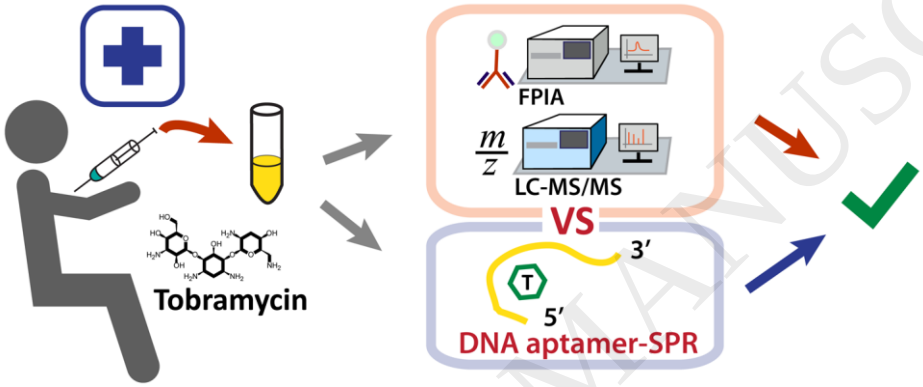
Comparison against current standards of a DNA aptamer for the label-free quantification of tobramycin in human sera employed for therapeutic drug monitoring.

Enrico Tenaglia[a], Anna Ferretti[a], Laurent A. Decosterd[b], Dominique Werner[c], Thomas Mercier[b], Nicolas Widmer[de], Thierry Buclin[d], Carlotta Guiducci[a*]

[a]. Ecole Polytechnique Fédérale de Lausanne, Institute of Bioengineering, Station 17 CH-1015 Lausanne, Switzerland.
[b]. Laboratory of Clinical Pharmacology, Service of Clinical Pharmacology, Lausanne University Hospital, Lausanne, Switzerland.
[c]. Clinical Chemistry Laboratory, Lausanne University Hospital, Lausanne, Switzerland.
[d]. Service of Clinical Pharmacology, Lausanne University Hospital, Lausanne, Switzerland.
[e]. Pharmacy of Eastern Vaud Hospitals. Vevey, Switzerland.

*: corresponding author

Graphical abstract



Abstract

The use of DNA aptamers in biosensors for the quantification of pharmaceuticals in the clinics would help to overcome the limitations of antibody-based detection for small molecules. The interest for such systems is proven by the ever-increasing number of aptamer-based solutions for analytics proposed in the literature as proof-of-concept demonstrators. Despite such diversity, these platforms often lack a comparative assessment of their performances against the current standard of practice in the clinics when using real samples. We employed an aptamer against tobramycin discovered in our laboratory to quantify through surface plasmon resonance the concentration of the antibiotic in clinical samples obtained from patients treated with tobramycin and undergoing therapeutic drug monitoring. We then compared the performances of our detection strategy against the current standard of practice. Our results show how, using adequate calibration and matrix complexity reduction, DNA aptamer-based direct assays can assess clinically relevant concentrations of small molecules in patient serum and with good correlation to current standards used in the clinics.

Keywords: Drug monitoring; SPR; DNA aptamers; tobramycin; drug dosage; label-free biosensors

Introduction

Bio-analytics have greatly profited from the technological advancements of the last three decades. The multidisciplinary merger of biotechnology, micro-engineering, physics, and chemistry has provoked a great diversification of the proof-of-concept solutions for the quantification of bio-analytes. These aim to respond to the ever-increasing need for simple, rapid, portable and miniaturized analytical systems for the detection of specific molecules. There are countless applications of these, in a diversity of