

Cortisol and Luteinizing Hormone. A Tale of Two Aptamers

¹S.Ben-Aissa, Anthony Cass¹

¹Imperial College London, White City Campus, London UK,
t.cass@imperial.ac.uk

Summary:

This presentation draws together several threads of our recent research in the area of electrochemical aptamer based (EAB) sensors as applied to continuous hormone measurements (CHM). These threads range from the computational; modelling the structures of aptamer-target complexes through workflows for sensor interface engineering using statistical approaches, to surface chemistry and the control of the aptamer sensor surface interface.

Keywords: nanoporous gold, response surface methodology, molecular dynamics, G-quadruplexes, voltammetry

Background, Motivation and Objective

Continuous hormone measurements (CHM) are currently generating considerable interest amongst the medical and sensor communities. There are several reasons for this, including the success of continuous glucose measurement (CGM) technologies, both for clinical applications (diabetes management) and as a dietary and wellness aid. Within this space, there are often parallels drawn between CGM and CHM, parallels that can obscure the very real differences, both physiological and sensor-dependent, between the two. Some of these are summarised in Table 1.

Description of the New Method or System

The use of computational methods (structure prediction and DoE) combined with experimental feedback can help to optimize sensor performance at both the molecular and the device levels. Results

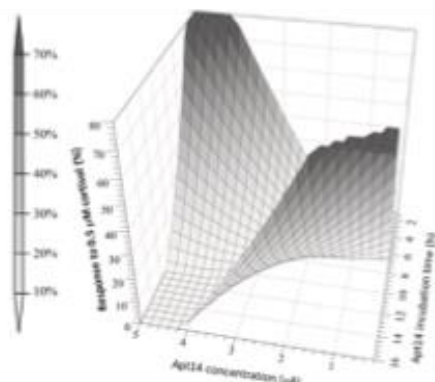


Figure 1 shows a typical response surface for the optimisation of aptamer loading and incubation time for a small (14nt) cortisol-binding aptamer.

Tab. 1: Comparison between CGM and CHM

Sensor	CGM	CHM
# of analytes for clinical decision	One	Several
Measurement Range	2-20mM	nM-pM
Analyte diversity	Low A single molecule	High Proteins, steroids
Sensing Modality	Catalytic	Affinity

References

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- [2] Liang, S. *et al.* Measuring luteinising hormone pulsatility with a robotic aptamer-enabled electrochemical reader. *Nature Communications* **10**, 852 (2019) [doi.10.1038/s41467-019-08799-6](https://doi.org/10.1038/s41467-019-08799-6)