

# Evaluation of a new Point of Care quantitative Cube reader for salivary analysis in Premier League soccer clubs

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## Introduction

The use of salivary biomarker responses has gathered momentum in recent years in sports, exercise and behavioural sciences. A Point of Care (POC) platform using Lateral Flow Device (LFD) technology, which takes just over 10 minutes to measure salivary IgA, has previously been validated (Coad et al., 2015).

Technological advancement has seen the introduction of a new reader device, the Ipro Cube Reader, that is smaller (2 inch cube), quicker (4 seconds scan time as opposed to 22 seconds) and considerably cheaper than the previous model. The ability to multiplex sampling with such a small and quick reader would save processing time and speed up delivery of data in the applied setting when the assessment of more than one biomarker is often required and such a POC test would certainly give a significant time advantage over standard laboratory techniques, which often reveal data to sporting squads only days later. This paper assesses a new Cube LFD reader in comparison to the previously validated LFD Reader.

## Methods

A total of 48 saliva samples were taken during routine monitoring of a cohort English Premier League soccer players on two occasions in the same week, using IPRO Oral Fluid Collection (OFC) kits. The OFC kits collect 0.5mL of oral fluid and contain a colour changing volume adequacy indicator within the swab, giving collection times typically in the range of 20-50 seconds (Jehanli et al., 2011).

The samples were analysed for cortisol concentration using Ipro Cortisol LFDs on both the standard LFD reader and the new Cube Reader.

Similarly, the next week 50 samples were taken and assessed for IgA concentration using Ipro IgA LFDs and the two types of LFD Reader.

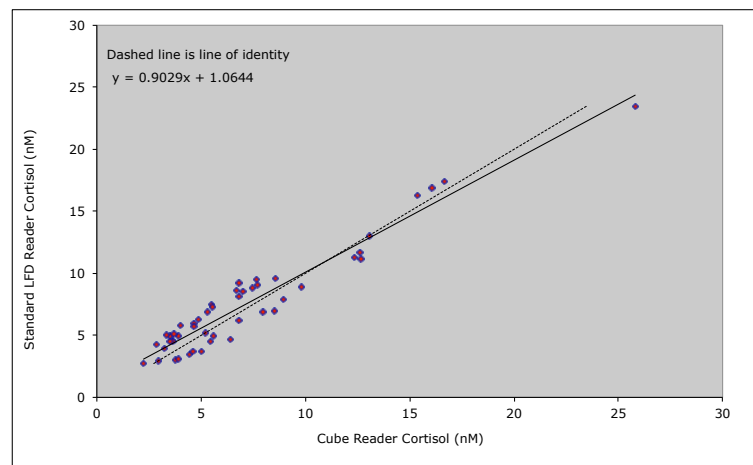
After sample collection and mixing (2 minutes), two drops of saliva/buffer mix from the OFC were added to the sample window of the cortisol or IgA LFFD. The liquid runs the length of the test strip via lateral flow, creating control and test lines visible in the test window. The test line intensity is inversely proportional to the cortisol or sIgA concentration in the sample giving a quantitative value on the reader.

Measurement range for cortisol is 1.5 - 40 nM on both readers and 18.5-900 µg/ml for sIgA, thus similar to typical ranges seen in laboratory ELISA analysis.

## Results

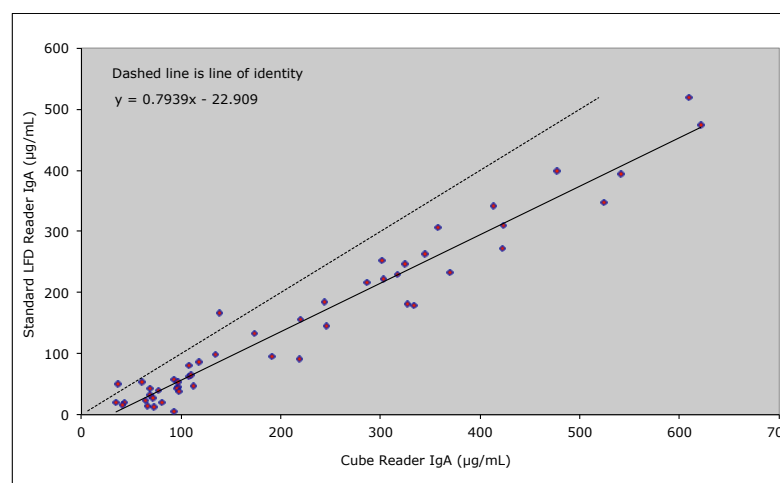
The cortisol values ranged from 2.24 - 25.8 nM on the Cube reader and 2.73 - 23.5 nM on the standard LFD Reader. Agreement between the two readers was good with Pearson correlation  $r = 0.96$  (95% CI 0.93 - 0.98) with typical error of estimate 1.18nM (95% CI 0.98-1.148) and no significant difference between the two readers (Cube mean  $7.1 \pm 4.6$  nM and LFD Reader  $7.5 \pm 4.3$  nM).

**Figure 1: Cortisol values on both LFD readers**



The IgA values ranged from 34.7 - 621.1 µg/ml on the Cube reader and 20.0- 518.8 µg/ml on the standard LFD Reader. The agreement between both readers was good, with the Pearson correlation  $r = 0.98$  (95% CI, 0.96 - 0.999) and with typical error of estimate 29.91 (95% CI 24.94 - 37.36) µg/ml, with slightly higher values on the Cube (mean  $215.6 \pm 163.8$ ) than the LFD Reader ( $148.3 \pm 142.1$ ).

**Figure 2: IgA values on both LFD**



## Conclusion / Practical Implications

The new Cube LFD Reader Point of Care device show suitable validity for use in the sporting environment. Given the quick data turnaround and efficiency in terms of cost, it represents a suitable alternative method for use in sports teams.

Given the fact that both IgA and cortisol concentrations can now be performed on site, in the training environment, alongside other markers such as alpha-amylase on the same device; this test represents a true paradigm shift in the way athletes can be monitored, in that results are gained within twelve minutes from sample collection and subsequent intervention strategies can be applied immediately where appropriate.

## References

Coad S, Mclellan C, Whitehouse T & Gray B (2015) Validity and reliability of a novel salivary immunoassay for Individual Profiling in Applied Sports Science. *Research in Sports Medicine* 23 (2): 140-150.

Jehanli A, Dunbar J & Skelhorn S (2011) Development and validation of an oral fluid collection device and its use in the immunoassay of salivary steroids and immunoglobulins in sports persons. *Proceedings 10<sup>th</sup> Symposium of the International Society of Exercise Immunology*.

## The whole IPRO POC system in use



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