



## Introduction

The use of salivary diagnostics within the sporting community has gathered momentum in recent years; identifying hormone levels to assist in the optimisation of workloads, or antibodies such as sIgA to assess individual recovery status and potential immune suppression. Immediate feedback for coaching and support staff via a Point of Care (POC) test would give a significant time advantage over standard laboratory techniques, which often reveal data to sporting squads only days later.

Salivary methods are preferred to blood, because they are non-invasive, quick and simple to collect with no requirement for skilled staff in the collection process.

As a catabolic stress hormone, salivary cortisol (sCort) has relevance to sports scientists attempting to characterise responses to different training loads and matches in football and other team sports. sCort is often measured in tandem with testosterone, an anabolic hormone, to create a ratio to examine the anabolic:catabolic endocrine profile (McLellan et al., 2010), which is a useful "readiness to train" index for strength, speed and power aspects of performance.

This paper assesses a new POC product for the rapid determination of (sCort) in comparison to standard laboratory ELISA determination.

## Methods

A total of 29 saliva samples were taken from a cohort of English Football League Championship Academy soccer Players (mean age: 16.6 ± 0.5 yrs) using IPRO Oral Fluid Collector (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). With this method, the samples are unaffected by recent food or drink taken.

The samples were taken as part of routine monitoring, in the morning, before all training sessions. Some of the players had participated in a match the evening before, whilst other were well rested, thus giving a reasonable range of values.

The samples were analysed immediately at the training venue using an IPRO POC Lateral Flow Device (LFD), specific for sCort, in an IPRO LFD Reader. This platform has previously been validated for measuring sIgA in a similar manner (Dunbar et al., 2011).

Two drops of saliva/buffer mix from the OFC were added to the sample window of the LFD. The liquid runs the length of the test strip via lateral flow, creating a control and test line visible in the test window. Ten minutes after the sample is added, the test line intensity is measured in an IPRO LFD Reader and converted to a quantitative value.

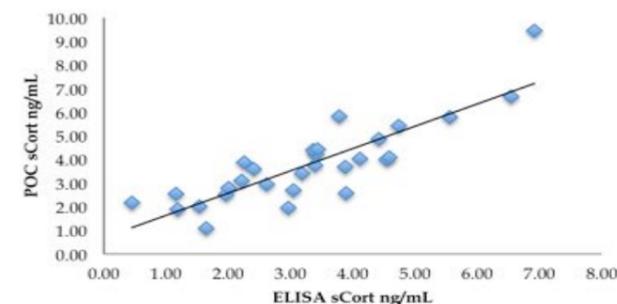
The same samples were then taken to the IPRO laboratory for subsequent analysis by ELISA, which was started within four hours of collection. The measurement range for ELISA was 0.4 – 28.0 ng/ml (1.10 – 77.26 nM) and POC test 0.75 – 15.0 ng/ml (2.0 – 40 nM).

## Results

All samples were within the measurement range on both platforms with concentrations measured via ELISA ranging between 0.50 - 6.26 ng/ml and with the LFD from 1.09 - 9.45 ng/ml.

The relationship between the sCort values obtained using ELISA and POC LFD test was represented by the formula:

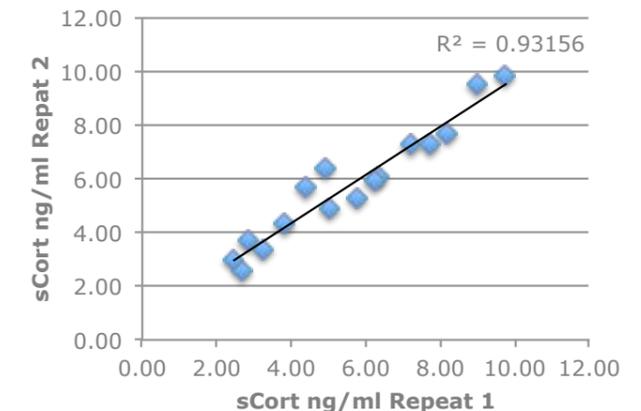
$$y = 0.7983x - 0.488, \text{ with } R^2 \text{ } 0.7936.$$



**Figure 1: Relationship between sCort values determined via laboratory ELISA and the POC LFD test (n=29).**

A key aspect of any monitoring tool is the repeatability of measurement, where emphasis is more on how an individual varies on a longitudinal basis, as opposed to how a POC result compares with ELISA. In this regard the POC test performed well when another batch of 16 samples

were measured on POC LFD test on two occasions, 30 minutes apart. There was good agreement with mean within cv between repeats of 6.88%.



**Figure 2: Repeatability sCort values using the POC LFD test (R<sup>2</sup> = 0.93, n=16).**

## Practical Implications

The sCORT POC LFD test shows good repeatability and agreement with laboratory ELISA. Given the rapid turnaround of analysis (within 12 minutes of sample collection), this represents a considerable paradigm shift in the way athletes can be monitored and appropriate interventions immediately applied.

## References

- Dunbar J, Jehanli A & Skelhorn S (2011) Investigating the use of a point of care sIgA test in English Premier League Soccer players. *Proceedings 10<sup>th</sup> Symposium Intl Soc. Ex. Immunol.*
- 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 Intl Soc. Ex. Immunol.*
- McLellan C, Lovell D & Gass G (2010) Creatine Kinase and Endocrine Responses of Elite Players Pre, During and Post Rugby League Match Play. *J Strength & Cond Res 24 (11): 2908-2019.*