**Salivary Lactate:**

At low oxygen levels cells are forced to metabolise glucose anaerobically leading to the production of lactic acid as a primary by-product. During elevated levels of lactic acid (hyperlactatemia) in blood a significant drop in the blood pH occurs. This physiological condition is known as **lactic acidosis**. Hence, it is important to monitor **capillary blood lactate (CBL)** concentration, especially among patients in intensive care units and operating rooms as lactic acidosis can lead to muscle damage that may result in heart attack [[36](http://www.hindawi.com/journals/bmri/2014/962903/#B36)].

It is also essential to measure CBL levels among diabetics due to the close metabolic relationship between glucose and lactate [[36](http://www.hindawi.com/journals/bmri/2014/962903/#B36), [37](http://www.hindawi.com/journals/bmri/2014/962903/#B37)]. **Besides that, analysis of CBL concentration is of high interest in sports medicine for athletes to tailor their training in order to optimise their performance** [[38](http://www.hindawi.com/journals/bmri/2014/962903/#B38), [39](http://www.hindawi.com/journals/bmri/2014/962903/#B39)]. For instance, it is important to determine the **anaerobic threshold (AT) or maximum lactate steady state (MLSS)** from the lactate load curves during exercise, which is the maximum load when **lactate production is in equilibrium with lactate elimination**. Based on the AT, suitable exercise intensity can be precisely given to the athletes for different types of sports in order to produce optimal results [[38](http://www.hindawi.com/journals/bmri/2014/962903/#B38)].

Lactate can also be detected in saliva due to the passive diffusion of lactate from blood and secretion from salivary glands [[40](http://www.hindawi.com/journals/bmri/2014/962903/#B40)]. **The typical lactate concentration in saliva ranges from 0.1 to 2.5 mM** [[38](http://www.hindawi.com/journals/bmri/2014/962903/#B38)]. Since SL has a high correlation to CBL concentration, typically a 1 : 4 saliva/blood ratio, SL is suitable for noninvasive CBL analysis [[41](http://www.hindawi.com/journals/bmri/2014/962903/#B41)], especially for critical-care patients, diabetics, and athletes.

**Devices used to analyse salivary lactate:**

More recently, a **mouthguard sensor** based on printable Prussian-blue (PB) transducer and poly-orthophenylenediamine (PPD)/LOx reagent layer was reported for continuous SL monitoring [[44](http://www.hindawi.com/journals/bmri/2014/962903/#B44)]. The extremely low detection potential for H2O2 (0.042 V versus Ag/AgCl) provided by the PB layer and the permselective behaviour of the PPD layer minimised the effect of possible interferences that are commonly present in saliva matrix. The sensor displayed dynamic range for lactate determination from 0.1 to 1 mM with sensitivity of 0.553 μA mM−1 and DL of 50 μM. It also exhibited good stability for continuous SL measurement (2 h duration with repeated measurement every 10 min) due to the PPD layer that protected the sensor surface against coexisting fouling constituents. The device was proposed as a practical wearable sensor that could always be in contact with saliva for continuous noninvasive monitoring of lactate in real time.

Since the material and fabrication process employed in constructing the aforementioned SL sensors were relatively expensive, complicated, and inappropriate for applications in the developing world, our group [[45](http://www.hindawi.com/journals/bmri/2014/962903/#B45)] developed a cotton fabric-based electrochemical device (FED) based on carbon modified with PB (C-PB) electrodes and LOx enzyme for SL measurement. The device was fabricated using a simple template method for patterning the three-electrode configuration and wax patterning technique to create the sample placement/reaction area on the cotton fabric substrate. The FED exhibited a linear working range for lactate detection from 0.1 to 5 mM with sensitivity of 0.3169 μA mM−1 and DL of 0.3 mM. Since the fluid flow in the cotton fabric platform occurred via capillary forces, it was envisioned that the use of pipettes could be eliminated by incorporating a hydrophilic cotton thread or an extension of the cotton fabric to enable both sampling and analysis within a single device.

Since continuous assessment of lactate is essential for clinical applications and sports monitoring, two of such wearable sensor concepts [[38](http://www.hindawi.com/journals/bmri/2014/962903/#B38), [44](http://www.hindawi.com/journals/bmri/2014/962903/#B44)] based on saliva samples have been reported in the literature.

However, **critical assessment of all potential toxicity and biocompatibility concerns should be addressed in order to allow it to be adapted as a safe and practical wearable sensor to be placed inside the mouth** [[44](http://www.hindawi.com/journals/bmri/2014/962903/#B44)]. In addition, **the sensors should also be easily removable and washable to maintain good oral hygiene. In order to make it feasible for long-term continuous SL monitoring, it is also crucial for the sensors to exhibit high operational stability.** Finally, **the sensors should be integrated with amperometric circuits and electronics for data acquisition, signal processing, and wireless transmission to provide real-time information of the wearer’s health status**