THE DEVELOPMENT OF A PORTABLE NON-INVASIVE SPORT PHYSIOLOGY MEASUREMENT DEVICE

Sesay Adama Marie\textsuperscript{1}, Katainen Janne\textsuperscript{2}, Lahtinen Mari\textsuperscript{2}, Virtanen Vesa\textsuperscript{1}

(Laboratory of Biotechnology, Oulu University\textsuperscript{1}, Measurement and Sensor Laboratory, Oulu University\textsuperscript{2}, Finland)

In sports an athlete must train hard in order to improve. Training is designed in a cyclic way allowing time for recovery with increasing load. During this period of hard training and progressive loading, temporary symptoms and physiological changes in the bodies’ biological chemistry will occur. These physiological changes (e.g. changes in cortisol, lactate, glucose, alpha-amylase and antibodies) can be measured and their concentration present in blood and/or in saliva can give a good indication of the fitness and performance level of an athlete whilst training and resting. The aim of the research is to develop a generic portable biosensor device for non–invasive in–vitro measurement of physiological bio–markers in saliva. Saliva samples can be collected non–invasively, making the sampling less stressful and easier than invasive methods, such as drawing blood. Saliva is progressively being used in physiological measurements, as it contains many compounds of biological interest, reflecting the health and fitness of a person. The research is being performed in collaboration between Measurement and Sensor Laboratory and the Biotechnology Laboratory of University of Oulu. The Measurement and Sensor Laboratory is developing the instrumentation and optical platform of the novel measuring device which is based on Surface Plasmon Resonance (SPR) imaging technique and the Biotechnology Laboratory is developing the analytical sensing layers and biosensor assays for SPR and electrochemical measurements.

The objective of the collaborative project is to measure several bio–marker indicators simultaneously in saliva. Selected relevant analyte receptors will be immobilised on the disposable biosensors chip arrays and detected by the joint optical and electrochemical biosensor platform. The combination of the versatile platform and micro–fluidics will enable the development of the novel diagnostic point–of–care diagnostic device that would significantly help improve the health and wellbeing of athletes and the general public. The preliminary results presented will describe the development of the joint imaging SPR and electrochemical device prototype and bio–sensing analysis assay methods for human physiology measurements for cortisol, C–reactive protein (CRP), alpha–amylase and lactate in model saliva samples.

Keywords: Sport Physiology, Biochemistry of Exercise, Exercise Biochemistry