Abstract LOAC Dublin 2010

Subject: Microfluidics and Sport Science

Title: Microfluidics: New Tools in Sport Science

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Abstract:

Nowadays, Micro-Total-Analysis-Systems and Lab-on-a-Chip technology are widely used in analytical chemistry and biotechnology but they still are rarely used in other areas like sports science.[1] In this field, the development of wearable chemo-/bio-sensing that meet the operational requirements is extremely difficult to achieve. In particular, it requires that the desired sample of analysis, usually a body fluid (blood, sweat, urine, saliva, etc.), is delivered to an active surface on the sensor for a reaction to occur and a signal to be generated. Moreover the system must be low cost while also being robust, miniature, flexible, washable, reusable or/disposable. All these requirements point to microfluidic devices as the key tools for improving wearable chemo-/bio-sensing. Here, we will review the state of the art of microfluidics in sports science and we will present the latest results obtained with microfluidic devices in our laboratories to obtain real-time information about physical and physiological parameters in sweat during exercise.[2] Temperature, pH and sodium concentration are monitored in sweat during sport performance and training with a small, wearable microfluidic device that continuously samples and monitors these parameters. Moreover, these devices are light, inherently wearable and robust, and can be easily integrated into a wireless sensor network. The whole device can be incorporated into a simple adhesive plaster format which can be attached to the skin in a few seconds, and causes no discomfort during training.

References

[1] Bio-sensing Textile Based Patch with Integrated Optical Detection System for Sweat Monitoring. D. Morris, S. Coyle, Y. Wu, K. T. Lau, G. Wallance, D. Diamond. Sensors and actuators B, 139, 2009, 231-236.

[2] Pump Less Wearable Microfluidic Device for Real Time pH Sweat Monitoring. F. Benito-Lopez, S. Coyle, R. Byrne, A. Smeaton, N. E. O'Connor, D. Diamond, in Proceedings of the Eurosensors XXIII Conference, Procedia Chemistry, 1, 2009, 1103-1106.

Summary

We present the fabrication and the performance of a novel, wearable, robust, flexible and disposable microfluidic devices for monitoring in real time mode physical and physiological parameters during an exercising period.

Biography

Fernando Benito-López studied Chemistry at the Universidad Autonoma de Madrid and completed his master studies in the group of Dr. M.J. Macazaga and Dr. R.M. Medina. He graduated with a thesis entitled ‘‘Synthesis and electrochemical study of alkynyl cobalt and osmium complexes’’ in 2002. He obtained his Ph.D. at the University of Twente, Enschede, The Netherlands, under the supervision of Prof. David N. Reinhoudt and Dr. Willem Verboom, with a thesis entitled ‘‘High-pressure: a challenge for lab-on-a-chip technology’’ in 2007. Currently, he is a postdoctoral research fellow in the group of Prof. Dermot Diamond at Dublin City University, Dublin, Ireland.