Non Invasive Detection of Biological Fluids: a new perspective in monitoring pH in saliva and sodium in sweat

Matzeu, G.*[1]; O'Quigley, C.[2]; McNamara, E.[2]; Fay, C.[2]; Zuliani, C.[1] and Diamond, D.[2]
[1]*CLARITY Centre for Sensor Web Technologies, National Centre for Sensor Research, Dublin City University, Dublin 9, Ireland*
[2]*Insight Centre for Data Analytics, Dublin City University, Dublin 9, Ireland*

Abstract:

The chemical composition of body fluids contains crucial information about the state of health of an individual. While many efforts have been already directed toward real time analysis of blood and urine, there is still a pressing need for new solutions to non-invasively monitor other fluids like saliva and sweat[1].
Towards this aim, the main technological challenge is the development of devices that are at the same time low-cost, minimally invasive and wearable, so that they could be used for in situ and real-time monitoring of physiological conditions[2]. For example, continuous recording of sodium levels in sweat could be an informative tool to assist clinicians in prescribing a more personalised treatment of diseases such as Cystic Fibrosis[3] and in assessing athletes' performances[4]. Similarly, the monitoring of pH levels in saliva provides valuable information for the treatment of pathologies where physiological mouth conditions are compromised, like in Gastroesophageal Reflux Disease (GERD)[5].
Ion Selective Electrodes (ISEs) are potentiometric sensors designed to detect specific ions in blood and saliva. Using dual-screen printed electrodes as substrates, we were able to reduce their production cost, improve reproducibility, and combine pH[5] and sodium ISEs with solid contact reference electrodes. In our design, the sensors will be interfaced to two miniaturized potentiometric platforms (WIXEL for pH and Tyndall Mote for sodium detection) that were wirelessly connected to a base station. For pH measurements, the device will be accommodated into a gum shield. For sodium detection instead, we will use a microfluidic channel to convey sweat to the electrodes. The mote communication platform was adapted so that it could be worn on the upper shoulder through a fiber strip.

References:

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Email: giusy.matzeu2@mail.dcu.ie