‘SWEATCH’: A FULLY INTEGRATED WEARABLE WATCH-TYPE PLATFORM FOR REAL-TIME SWEAT ANALYSIS AND COLLECTION

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In traditional biomedical diagnostics blood samples have predominantly been used as the test specimen for detection of various conditions. Recent advances in sensor technology, combined with the need for non-invasive diagnostics, has led to the development of methods and devices which target more easily accessible biological specimens such as sweat, saliva and breath[1]. These advances and the success of wearable devices monitoring physiological and environmental parameters have led to interest from large companies such as Google and Apple in the production of wearable biochemical sensors. Advances in electrochemical sensing have led to breakthroughs in wearable sensing, including a wearable sensor for monitoring of multiple biomarkers in exercise induced sweat [2].

This work presents a fully integrated watch-type platform for harvesting and analysing the sodium content of sweat in real-time. This has been achieved through the combination of miniaturised all solid-state ion selective electrodes (ISE’s) and reference electrodes [3], custom built data logger (Shimmer, Dublin Ireland) with integrated Bluetooth wireless communications. Rapid prototyping, via 3D printing, has allowed the development of two platform designs: (1) a ‘watch’ type design in which the electronics and fluidics components are arranged vertically, and (2) a ‘pod’ like design in which the electronics and fluidics components are arranged horizontally in separate compartments. Both platforms are attached securely with elastic straps to suit various sampling sites on the body including the wrist and upper arm. Sweat enters into the device through a sampling pore in direct contact with the skin and passes over the solid-state ISE and reference electrode, through capillary action, and into a storage area containing a high capacity adsorbent material (i.e. no pump is required). Changes in voltage, reflecting sodium concentration, are detected by the high input impedence data logger and transmitted wirelessly to a remote base station (laptop, mobile phone, tablet) for data visualization and storage in standard formats. Results obtained during on body trials over a period of ca. 30 minutes of controlled exercise are consistent with previously published data [2], showing a gradual increase of the sodium concentration in the sweat over the exercise period.

References:

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