Wireless Perspiration-based Cortisol Monitoring Patch With Differential Pulse Voltammetry and Near Field Communication

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Abstract

Recently, wearable medical devices is becoming a hot commodity that could be integrated as medical apparatus and instruments due to its highly recognized advantages such as portability, flexibility, accessibility and other distinct features[1]. Among these devices, smartphone-based wearable medical devices are one of the most popular system, providing promising solutions for personalized medical service. This paper presents a wireless patch for the monitoring of cortisol in perspiration as shown in Figure.1A. The wireless patch is connected to an electrochemical immunosensor and controlled by a smartphone. User could easily attach the wireless patch onto any body parts due to the flexibility and stretchability of the patch as demonstrated in Figure. 1B. Sweat is a common kind of biofluids that contains numerous metabolites and are secreted onto the body surface. These metabolites provide extensive physiological information about human health [2, 3]. For instance, the cortisol in human sweat is a crucial metabolite as it is the final product of the HPA axis(the hypothalamic-pituitary-adrenal axis). Its existence could maintain normal stress response process such as immune response process, food digestion process, sexual behavior process and so on.Based on the physiological significance abovementioned, we have developed a near field communication-based system to detect sweat cortisol via differential pulse voltammetry using smartphone. The advantages of near field communication-enabled smartphone like wireless, battery-free, portability, combining with the high sensitivity and specificity of electrochemical immunosensors, together with the ease of stretchability of the flexible printed circuit board are fully exploited to build an integrated detection system for perspiration-based cortisol as shown in Figure. 1C. Consequently, we could provide a solution to detect sweat cortisol in the field of clinical rapid detection.

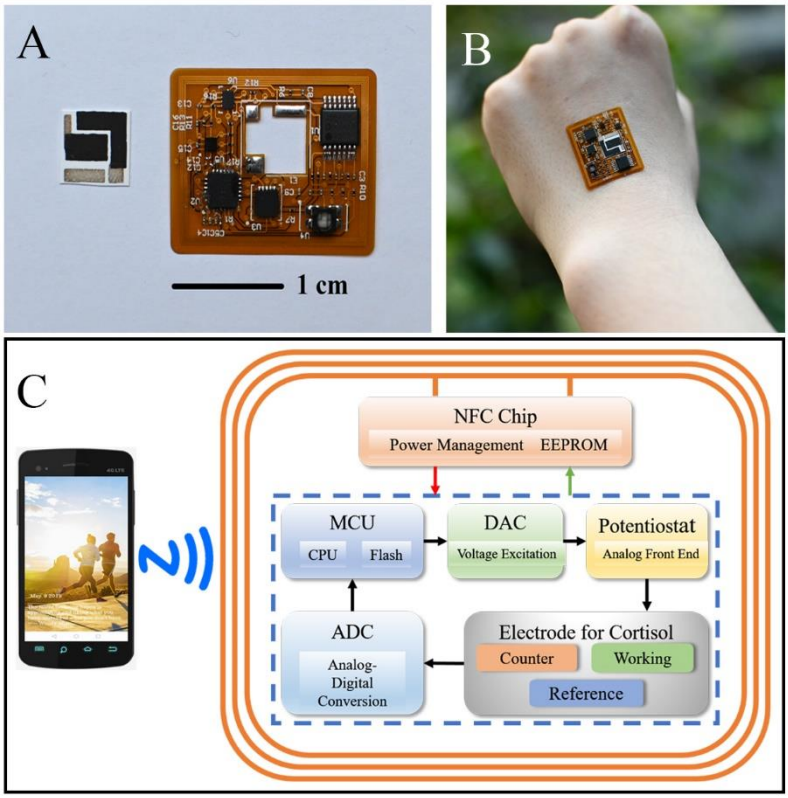

Fig.1. Detailed illustrations of the wireless patch for perspiration cortisol based on differential pulse voltammetry and near field communication. (A)The external view of the wireless and passive patch.(B)The wireless patch is being attached to the user's hand.(C)The functional block diagram of the wireless patch connected to a near field communication-enabled smartphone.

References

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