

# Digitalizing biosensor: Next generation of bionano-electrochemical based sensing

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## Abstract

The integration of bionano-electrochemical biosensors and mobile technology is more in demand as efficient and affordable analytical tools for various analytes detection in many fields. Such platforms are very useful for point-of-care applications that facilitate personalized health care management since patients can monitor their health at home and data can be easily transmitted to the cloud for collecting and sharing with clinicians and caregivers. Additionally, low cost and portable biosensors integrated with smartphones could become a real-time monitoring device in resource-limited settings for food safety and control, environmental monitoring and clinical diagnostics. Therefore, our research group, in collaboration with Silicon Craft Technology Public Company Limited, is developing the electrochemical-based device containing a microchip for electrical analysis and a near-field communication (NFC) antenna for mobile phone connection. The NFC air-interface is selected to be a connection between the microchip on the test strip and smartphone to simplify measuring units and make the test strip become a passive operated device, running without battery. The miniaturized devices were designed to detect aging and stress biomarkers reported in biological age and stress index. We also integrate health sensors such as vital signs, periodic blood, urine test, physical fitness and motion test to monitor the health status of the community members. With all these health data, the local healthcare facility will know in advance the health status and design plans along an appropriate lifestyle for each member. Furthermore, we are developing the biosensor based on the urease enzyme extracted from soybean for heavy metal detection. The developed biosensors provide high sensitivity and selectivity, low cost and easy to use which could be an alternative device to detect the heavy metal contamination in water, food and cosmetics.

*Keyword: electrochemical biosensor; near-field communication; biomarkers; heavy metals*