

Micro/nano biosensing technologies towards point-of-care testing and in-vitro drug evaluation

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It is well recognized that various biomarkers - ranging from small molecules and proteins to nucleic acids and cells - are closely associated with human health status and can serve as reliable indicators for disease screening and precision medicine. Focusing on these multi-scale biomarkers, we will present the recent advancements of our group in the following areas: 1) Electrochemical biosensing with the construction of 3D nanostructured interface. 3D nanostructures were established on electrochemical sensing surface for robust and point-of-care biosensing of small molecules, proteins and miRNAs; 2) Optical biosensing based on biomimetic nanoenzymes. Specific nanoenzymes were synthesized and utilized for optical biosensing based on the unique characteristics of various biomarkers. Ultrafast and programmable DNA loading on AuNPs was also achieved by protein corona-assisted freezing for tunable biosensing and cell capture. 3) Multimodal 3D cell-based biosensing for cell viability, electrophysiology and ionic metabolism. 3D cell culturing and biosensing were achieved with the integration of different micro/nano sensors and sensing strategies. By integrating these micro/nano biosensing strategies, we aim to establish a comprehensive biosensing toolkit for highly sensitive and multi-dimensional health monitoring, ultimately advancing early disease screening and precision medicine.

Keywords: Micro/nano biosensor; Cell-based biosensor; Nanoprobe; Point-of-care testing; Drug evaluation

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