Department of Biomedical Engineering
香港城市大學
City University of Hong Kong

BME Seminar Series 06

7 July 2023 (Friday), 2:30 p.m.
LT-7 Lily Chiang Lecture Theatre, 4/F, YEUNG

https://www.cityu.edu.hk/bme/

(organized by Prof. Peng SHI)

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Minimally Invasive Devices for Biomedical Applications

Abstract Biomedical sensing is the key to access biological information. In recent years. The development of biosensing has gradually evolved from detection from blood detection level to in situ detection on tissue or cellular level. The technology of detection has also evolved from single point detection, to in situ sensing for long time or even sensing with high resolution. Among the existing in situ biosensing technologies, non-invasive sensing does not reach the detection target in the tissue, making it difficult to accurately reflect the real situation. Invasive sensing through implanted devices, on the other hand, has safety concerns. Therefore, how to balance safety and accuracy has been challenging in the field of biosensing. Microneedle arrays, as a minimally invasive technology, can balance the accuracy of invasive sensing with the safety of non-invasive sensing. Our research of minimally invasive biosensing technology employs microneedle arrays as the core structure to penetrate skin layers or cell membranes minimally invasively to detect information in tissues or cells in vivo. The key technologies we have developed for minimally invasive devices consist of three aspects: first, the delicate preparation of microneedle arrays and the preparation of highly sensitive sensing modules on the surface of microneedles; second, the development of technologies for efficient and safe penetration of microneedle arrays through tissue mucosa and cell membranes. The third is the design and development of miniaturized multifunctional circuit systems to support the functions of minimally invasive devices. The minimally invasive biosensing technologies we have developed have been validated and applied in penetrating cell membranes to record intracellular physiological signals, penetrating organ mucosa layers to measure biochemical signals in tissues, and penetrating skin layers to measure in vivo physiological signals, respectively. These minimally invasive biosensing technologies are expected to provide new tools and solutions for the diagnosis and treatment of major diseases.

Biosketch Prof. Xi Xie is currently a full professor in the School of Electronics and Information Technology at Sun Yat-sen University, and was awarded by the National Science Fund for Distinguished Young Scholars (国家杰青). He is also an adjunct professor in the First Affiliated Hospital of Sun Yat-sen University. He graduated from Stanford University in USA with PhD degree on 2014, and then worked as a postdoc researcher in the Prof. Robert Langer's lab at Massachusetts Institute of Technology. On 2016, he started his own research lab at Sun Yat-sen University. Prof. Xi Xie has been focusing on the research on minimally invasive biosensing technologies. In specific, he has been working on microneedles or nanoneedles technologies for detection of biological information in vivo or even inside cells. He has published >100 manuscripts. As corresponding author or first authors, 60 manuscripts have been published on journals including Nature Biomedical Engineering, Nature Nanotechnology, Nature Protocols, Nature Communications, Science Advances and et al. He has applied for >80 patents. He was also awarded by "MIT Technology Reviews Innovators Under 35 China", the "Outstanding Scientific Award of Chinese Institute of Electronics", and the "Microsystems & Nanoengineering Summit 2019 Young Scientist Award". He serves as Associate editor in Microsystems & Nanoengineering (Nature Publishing Group, JCR Q1) and Bio-designs and Manufacturing (JCR Q1). He also served as the editorial board member in two core journals including Life Science Instruments, and served as the academic members in three academic associations in China.