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Single-cell microfluidic impedance chip for monitoring cancer cell response to drug treatment

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Electrical cell-substrate impedance sensing (ECIS) is a valuable method for investigating various cellular events such as attachment, adhesion, growth, and motility through the monitoring of electrical alternations at the interfaces between the cell and electrode in an real-time, label-free, and nondestructive manner. Recently, the cell-based sensor has gained a great deal of attention for studying cancer cells and monitoring drug-induced cellular events for drug discovery. However, because of the limited capability to control the cell adhesion process, conventional cell-based sensors usually used a large cell population for seeding cells randomly on top of the electrodes. In this work, a microfluidic device integrated with microelectrode array using ECIS method for monitoring the response of single cancer cells to drug treatment was proposed. Using microfluidic techniques without the requirement of physical connections to off-chip pneumatics, the proposed biosensor can efficiently capture single cells on microelectrode arrays for sequential measurement. Impedance spectra change induced by single cells behaviors on microelectrode arrays was successfully recorded. Single breast cancer MDA-MB-231 cell line respond to different concentrations of Doxycycline was monitored by changing of impedance spectra. The proposed biosensor could be employed as a new tool for cancer research and drug evaluation.

Biography

Tien Anh Nguyen received his BSc in Physics in 2003 at Vietnam National University, Hanoi (VNU). In 2008 he received his MSc in Electronics-Telecommunication Technology at VNU. From 2011 he received the MOET-DAAD scholarship to pursuing a PhD degree at IMTEK within the Embedded Microsystems program of the University of Freiburg, Germany. His research interests include accelerometer, gyroscope and cell-based sensors.

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