

INTERNATIONAL MICROFLUIDICS CONGRESS

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International Conference on

ADDICTION RESEARCH AND THERAPY

August 13-14, 2018
San Diego, USA

Development of a glucose sensor integrated microfluidic device for cell based assay

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Online monitoring of cellular metabolism involved in cell growth and differentiation contributes to a better understanding cellular condition. However, conventional methods of cellular monitoring only measure discrete time-based data of cell condition, because they rely on intermittent sample extraction. Therefore, an online measurement method is highly desired to obtain a more detailed and dynamic information about cell activity. In this study, we developed a cell-based microfluidic device, which is integrated an electrochemical sensor, for online measurement of cellular glucose consumption under perfusion culture. The developed device consists of the cell culture chamber and sensor areas. Glucose sensor is

based on the immobilization of mixture of glucose oxidase and Nafion on the surface of electrodes. The electrodes are band Pt and Ag/AgCl band electrode. To validate a function of the device, we measured glucose consumption of HepG2 cells using the device. As result of our preliminary test, the online measurement of the difference of glucose concentration by cells succeeded using the device. The cell-based assay platform, which is integrated with a sensor and a perfusion system, was expected to improve measurement accuracy and efficiency, leading to the discovery of new tools in such wide-ranging fields as drug discovery, life sciences, and medical research.

Biography

Hiroshi Kimura graduated with a PhD in bioengineering from the University of Tokyo in Japan, and Postdoctoral degrees from Institute of Industrial Science (IIS), the University of Tokyo. Currently, he is an Associate Professor at Tokai University since 2012. His research interest is mainly in fundamental technologies of Microfluidic Devices and Systems, and their applications to biological sciences including a Body/Organ-on-a-chip.

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