

Department of Biomedical Engineering

Seminar Series

Integrative Drop-Screen for Rapid Tumor Profiling

Dr. Chia-Hung Chen

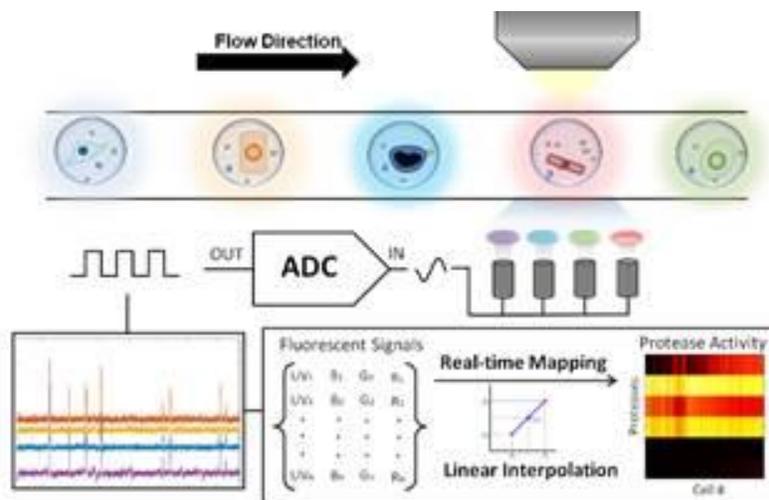
Department of Biomedical Engineering, National University of
Singapore, Singapore
Biomedical Institute for Global Health Research and Technology,
Singapore

Date:	April 17, 2019 (Wednesday)
Time:	2:30pm - 3:30pm
Venue:	Rm B6619 BME/MNE/SEEM Conference Room, 6/F, Yeung Kin Man Academic Building

Abstract

Precision medicine refers to giving the right therapeutics, to the right patient, at the right time. In the context of cancer, successful implementation of precision medicine, requires treatment individualization not only taking into account patient and tumor factors, but also tumor heterogeneity and tumor evolution over time. In this study, a continuous flow microfluidic device was developed as a functional flow cytometer (integrative Drop-Screen system) to detect secreted multiplexed protease activities at single cell resolution (Fig. 1). The individual cells from patient samples are encapsulated within water-in-oil droplets for single cell multiplexed protease assay. We modified

FRET (fluorescence resonance energy transfer)-based substrates to accommodate different fluorescent pairs with distinct excitation and emission wavelengths to obtain multiple signals from droplets containing single cells. Four substrate-protease reactions in a droplet were simultaneously monitored at three distinct pairs of fluorescent excitation (UV: 400nm, B: 470nm, G: 546nm, R: 635nm) and emission (B: 520nm, G: 580nm, R: 670nm) wavelengths. To infer a quantitative profile of multiple proteolytic activities from single cells, we applied the computational method Proteolytic Activity Matrix Analysis (PrAMA). The capability to determine multiple protease activities at single cell resolution has the potential to characterize tumor progress of individual patients for therapeutics.



Biography

Dr. Chia-Hung Chen is an Assistant Professor at National University of Singapore (NUS). Before joining NUS, he worked at Massachusetts Institute of Technology as a postdoctoral associate. Dr. Chen received his Ph.D. degree at the University of Cambridge (Biological and Soft Systems). He earned his M.S. degree at Harvard University (Division of Engineering and Applied Science) and earned his B.S. at National Taiwan University (Physics). Dr. Chen's research program is focused on

developing fluidic devices for single cell analysis and precision medicine. Compared with most current platforms, integrative fluidic device offers unique advantage in rapid measurement for on-time personalized therapeutics. For example, the system that integrated imaging technology, multiplexed chemical sensors and a computational data-analysis method was developed to analyze small amounts of physiological samples to determine the disease progression of individual patients with brain tumors. With this program, Dr. Chen has delivered promising research outcomes, including 50 papers in international journals including Nature Communications, PNAS, JACS, Lab on a Chip, Advanced Materials, Advanced Functional Materials and Analytical Chemistry. Dr. Chen has collaborated with clinicians at the National University Hospital of Singapore (NUHS) and Massachusetts General Hospital (MGH) to develop medical instrumentations using in the hospitals. One of his projects is now sponsored by an industrial partner, MediaTek and aims to develop a wearable wireless sensor for personal healthcare at home. Moreover, Dr. Chen has secured the external grants of amount more than 4M USD as Principle Investigator (PI) to support his research activities until end of 2022 and was nominated by Royal Society of Chemistry (RSC) committee, as an Emerging Investigator in Lab on a Chip.

Enquiry: 3442 8420

All are Welcome!

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