LiMe
Institute for Life and Medical Sciences
Kyoto University

17th nanobiofluids seminar

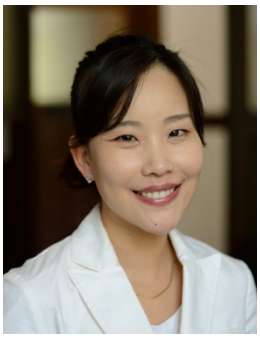
2025 Aug 11th, 14:00-15:00

Seminar Room (Room 104), 1st Floor, Bldg. No.2

https://www.infront.kyoto-u.ac.jp/en/access/

Zoom registration link

Microfluidic Strategies for Single-Cell Manipulation in Personalized Medicine



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Abstract

Variability in patient responses to treatment highlights the need for truly individualized therapeutic approaches. Gaining a clear, quantitative picture of single-cell behavior is key to understanding and addressing this heterogeneity. In the Hur laboratory, we apply fundamental principles of fluid mechanics to develop microfluidic platforms that gently probe and guide individual cells, shedding light on subtle functional differences. Our efforts focus on using hydrodynamic forces to sort and position cells based on measurable physical traits—such as size and deformability—through carefully designed inertial microfluidic channels. These channels allow us to isolate relatively uniform cell subsets under mild flow conditions, which improves consistency in downstream assays. We have also combined vortex-based inertial focusing with on-chip electroporation, creating a workflow that holds cells at specific locations for reliable molecular delivery before releasing them on demand. This approach enables efficient, repeatable transfection of primary cells with minimal mechanical stress. Our platforms aim to deliver accessible, scalable tools for applications in cancer research, immunology, gene therapy, and regenerative medicine. These systems support reliable target-cell separation, and sequential multimodal delivery—offering modest yet meaningful advances toward more personalized treatment strategies.

Biography

Soojung Claire Hur is an Assistant Professor in the Department of Mechanical Engineering and Department of Oncology at Johns Hopkins University. She received her B.S., M.S. and Ph.D. in Mechanical Engineering from UCLA. After her doctoral training, she joined the Rowland Institute at Harvard University as one of two Rowland Fellows in September 2011 with five years of research funding. Before joining the Johns Hopkins University, she managed the clinical studies funded by the Vortex Biosciences, Inc. as an assistant researcher at UCLA Department of Bioengineering. She has won numerous awards and scholarships, including Edward K. Rice Outstanding Doctoral Student award, the 2018 inaugural Johnson and Johnson WiSTEM2D scholar award, 2019 Hartwell Individual Biomedical Award, 2019 Susan G. Komen Career Catalyst Award and 2023 JHU Catalyst Award.

Host: Hirofumi Shintaku, shintaku@infront.kyoto-u.ac.jp