Single Cell Based Functional Analysis Technologies for Translational Research

Young Shik Shin, Ph.D.
Adjunct Assistant Professor
The Department of Molecular and Medical Pharmacology, UCLA

Heterogeneity in human disease, especially in cancer, is gaining interest to design more effective therapy strategies as well as to understand fundamental biology more in depth. The needs for capturing and analyzing the heterogeneous states of a biological specimen require the development of novel technologies for quantitative and sensitive measurements with high resolution. Over the fast few years, we have developed a microfluidic platform called the Single Cell Barcode Chip (SCBC) that permits cytoplasmic, membrane, and/or secreted functional proteins to be quantitatively assayed from individual cells in a multiparameter manner. I will discuss how we are applying this technology, in a clinical setting, towards suggesting effective single or combination therapies for individual glioblastoma (GBM) patients, based on our recent study on the mice and patient-derived GBM tissue analysis. I will also discuss our recent development of a microfluidics-based Positron Emission Tomography (PET) device with which we can measure metabolic activity of single cells under various drug treatment conditions with kinetic information. This platform can provide information on how individual cells react to specific treatment conditions within short time frame (from 30 min to several hours). Measuring heterogeneous metabolic response at single cell level has the potential to guide clinicians to effectively evaluate drug candidates at early time points for individual patients.