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강연제목: 단분자 물리력이 질병의 발생에 미치는 영향

The Impact of Single-Molecule Force in the Onset of Diseases.

Abstract:

The mechanical crosstalk between membrane proteins and their ligands is a key factor influencing the onset and progression of diseases, including cancer and neurodegenerative disorders. Despite its significance, accurately quantifying membrane protein tension dynamics at the single-molecule level remains challenging due to the lack of suitable measurement tools. To address this limitation, we have developed an innovative DNA-based single-molecule force probe, called the Tension Gauge Tether (TGT), along with its derivatives. By combining the TGT assay with advanced micro- and nanofabrication techniques, our study provides a detailed analysis of the spatiotemporal variations in membrane protein tension with single-molecule precision, focusing on its implications in cancer metastasis and amyloidosis. This presentation will discuss the fundamental principles of the TGT technique and share our latest findings, offering new insights into the molecular mechanisms of membrane protein-mediated signaling in disease contexts.

Brief Biosketch

Byoung Choul Kim completed his undergraduate studies in Biotechnology at Yonsei University in 2008 and went on to earn two Master's degrees from the University of Michigan in Biomedical Engineering and Macromolecular Science and Engineering, in 2010 and 2014 respectively. He received his Ph.D. in Biomedical Engineering at the same university in 2014, mentored by Prof. Shuichi Takayama. His Ph.D. research was centered on the development of fracture-based, size-controllable micro/nanofluidics for single molecule/cell capturing for epigenetics analysis. Post-Ph.D., he served as a postdoctoral fellow at the Howard Hughes Medical Institute (HHMI), working at the University of Illinois at Urbana-Champaign and Johns Hopkins School of Medicine between 2014 and 2017 in Prof. Taekjip Ha's lab. His research there focused on DNA based single molecule force probes for studying mechanobiology. In 2017, he joined Incheon National University (INU) in South Korea, where he now holds the position of Associate Professor. His current research interests lie in mechanobiology at the single molecule level, particularly in relation to diseases including amyloidosis and cancer metastasis.