



Impromptu Seminar #1

Keio University School of Medicine

JKiC 1F seminar room
at the north end of the campus

Wed, December 6th, 2017

16:00-17:00

Takanari Inoue

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"Generating force in living cells at will"

Host: M. Yasui, Professor of Pharmacology (ex. 62625)

At all levels in biology, form and function are closely related; functions of a given biological entity ranging from molecules to tissues are often ruled by its form, and vice versa. One such example at a subcellular scale is the form-function interplay at intracellular organelles. Mitochondria have particularly attracted attention in this context, as altered morphology is often observed under pathophysiological conditions such as heart failure, Alzheimer's disease and Charcot-Marie-Tooth (CMT) disease. Despite the significance, it has long been out of reach to test a causal relationship between mitochondrial morphology and functions, primarily because existing experimental approaches are limited in manipulating the morphology of this submicron length-scale entity inside cells. We therefore developed a novel strategy based on genetically-encoded molecular tools which can rapidly generate constrictive force against target organelles in living cells with high precision in space and time. We then implemented the tools and revealed the causal relationship between form and function of mitochondria. The modular design and genetically encoded nature of the molecular tools will enable their application beyond isolated culture cells, or mitochondria. To our knowledge, there is no report of molecular probes that can generate force in living cells in a rapidly inducible manner, making our approach highly unique and powerful in deforming, and even moving, biological entities, thus addressing biological questions associated with physical characteristics *in situ*.

Phua SC, Chiba S, Suzuki M, Su E, Roberson EC, Pusapati GV, Setou M, Rohatgi R, Reiter JF, Ikegami K, **Inoue T***. "Dynamic Remodeling of Membrane Composition Drives Cell Cycle through Primary Cilia Excision." **Cell** 2017;168:264-279.

Nakamura H, Lee AA, Afshar AS, Lin YC, Tanigawa M, Suarez A, Razavi S, DeRose R, Bobb D, Hong W, Gabelli SB, Goutsias J, **Inoue T***. "Intracellular production of hydrogels and synthetic RNA granules by multivalent molecular interactions" **Nature Materials** (In press)