Department of Biomedical Sciences
香港城市大學
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DECODING THE MECHANISTIC PRINCIPLES OF GENE REGULATION BY MITOCHONDRIAL 3D SPATIAL ORGANIZATION

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DATE: 25 March 2025 (Tuesday)
TIME: 10:00 - 11:50
VENUE: G4702, 4/F, Yeung Kin Man Acad Building, CityU HK

BIOGRAPHY

Dr. Tatsuhisa Tsuboi is a cell biologist at the Institute of Biopharmaceutical and Health Engineering, Tsinghua Shenzhen International Graduate School. He received his B.S. and M.S. degrees in Biology from Nagoya University, Japan, in 2009 and 2011, and his Ph.D. degree in Life Science from the Tohoku University, Japan, in 2014. He studied quality control mechanism of translational regulation under the supervision of Dr. Toshifumi Inada. From 2014, he started his postdoctoral training in cell biology at the University of California, Irvine, USA with Dr. Susanne Rafelski and from 2017, at the University of California, San Diego, USA with Dr. Brian Zid. He had a unique training opportunity in Robert Singer's lab at the Albert Einstein School of Medicine, USA as a visiting researcher. Since 2021 he has been a principal investigator at the Tsinghua Shenzhen International Graduate School. His main research interests are in quantitative cell biology and microscopic technologies. His current research focuses on analysis of translational regulation and developing computer vision techniques for analyzing and understanding biological microscopy images and on using these methods for understanding the molecular and systems mechanisms of basic cellular processes such as dynamic organization of intracellular organelle networks.

ABSTRACT

Mitochondria, a hub for biological reactions, regulate cellular activity such as cell aging and cancer. Mitochondria are also very dynamic structures with fluctuating morphologic transitions in response to cellular and environmental perturbations. While there have been studies investigating the pathways and conditions that alter mitochondrial morphology, the connections between these morphological changes and gene expression regulation are still poorly understood. We recently found that cells use translation elongation and mitochondrial spatial organization to fine-tune mitochondria specific gene expression. Our single molecule visualization techniques showed that changes in mitochondrial volume fraction and mitochondrial fragmentations affected the localization of certain nuclear-encoded mRNAs to the surface of the mitochondria (Tsuboi* et al., 2020, Khan et al., 2024). I will discuss general principles that underlie the control of gene expression through mitochondrial morphological change during cellular aging and fluctuating environmental conditions. I will further introduce recent progress in my laboratory.

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