NUS National University of Singapore | Department of Biological Sciences Faculty of Science

Map to Block S3

SEMINARS

Thurs, 10 Dec 2026 | 10am-12pm| DBS Conference Room 1

Hosted by Assist Profs Lin Zhewang & Xue Shifeng

Maintaining a balanced proteome in health and disease



Ramanujan Hegde

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Gene expression is tightly controlled at numerous steps to dynamically regulate the proteome. The constituents of the proteome vary widely in abundance across several orders of magnitude, with the appropriate ratios among these constituents being crucial for cellular homeostasis. The importance of a balanced proteome is readily evident when one considers the subunits of a protein complex: the individual subunits must be produced in the correct stoichiometry to build functional complexes with minimal excess of any subunits. Imbalances in the production of subunits that form complexes, as occurs during aneuploidy and other disturbances, result in reduced cellular fitness due to impaired proteostasis. How cells mitigate the adverse consequences of an imbalanced proteome is incompletely understood. We have used a biochemical strategy to discover the quality control pathways that recognise and eliminate orphaned proteins, unassembled subunits of protein complexes. Our work has revealed that different types of orphans are engaged by different ubiquitin ligases that tag them provisionally with mono-ubiquitin marks. These mono-ubiquitinated orphans are then recognised by a ubiquitin-dependent ubiquitin ligase that builds K48-linked chains for proteasome degradation. These quality control systems are crucial for cellular and organismal homeostasis, leading to various diseases when they are impaired.

About the Speaker

Beyond the Genetic Code: Uncovering the Hidden Regulatory Landscape of the Ribosome



Maria Barna

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The ribosome is one of life's most ancient and essential molecular machines, yet its remarkable regulatory potential is only beginning to be understood. Traditionally viewed as a largely uniform machine that translates genetic information into proteins, emerging discoveries are challenging this paradigm, revealing that ribosomes are heterogeneous, dynamic, and intricately regulated within cells. A major frontier in biology is understanding how this diversity contributes to the spatial and temporal control of protein synthesis and ultimately influences cell identity, development, and disease. In this talk, I will discuss how our laboratory is uncovering previously unrecognized dimensions of ribosome biology through the development of transformative technologies, including RAPIDASH, RiboExM, Alibi, and RiboTweezer. These complementary approaches are providing unprecedented insights into the molecular composition, spatial organization, and dynamic behavior of ribosomes, revealing new layers of complexity in how the translational machinery is organized and regulated within cells. Together, our findings challenge the longstanding view of the ribosome as a passive executor of gene expression and instead point toward a much richer regulatory landscape in which ribosome diversity, molecular interactions, and cellular context may play fundamental roles in determining when, where, and how proteins are synthesized.

About the Speaker