MONDAY

COLLOQUIUM

Powering Pluripotency: Mitochondrial Regulation of the Cell Cycle in Stem Cells

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21 Jul 2024 (Monday) | 16:00 Hrs (Tea / Coffee 15:45 Hrs) | Venue: TIFRH Auditorium

Cell cycle regulation is a critical determinant of stem cell function. Emerging evidence suggests that the duration of the cell cycle—particularly the G1 phase—acts as an active regulatory node in stem cell renewal and fate specification. However, the mechanisms that govern the timing and progression of specific cell cycle phases remain poorly understood.

Using the planarian *Schmidtea mediterranea*, a highly tractable model for studying stem cell biology and regeneration, we investigated both intrinsic and extrinsic regulators of cell cycle dynamics. In this talk, I will highlight our recent findings that identify mitochondria as key modulators of stem cell function. Our study reveals a novel mechanism wherein RNA–protein (RNP) granules, enriched with Tudor domain-containing proteins, localise to the outer mitochondrial membrane and orchestrate mitochondrial states crucial for cell cycle progression.

These RNP granules serve a dual function: they tether mitochondria to the nuclear envelope and regulate the translation of mitochondrial transcripts essential for maintaining mitochondrial fusion–fission dynamics—processes intimately linked to proper cell cycle control. I will conclude by proposing a model that underscores the role of mitochondrial cristae architecture in regulating cellular energetics, ultimately influencing stem cell fate decisions.

Together, this work uncovers a previously unappreciated regulatory axis between mitochondrial state and cell cycle control, with broad implications for understanding how stem cell maintenance and differentiation are coordinated at the metabolic level.

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