BDR SEMINAR via Zoom

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Centre for Genomic Regulation (CRG), Barcelona, Spain

Thursday, September 22, 2022

17:00-18:00

Meeting URL will be announced on the event day by e-mail.

※This seminar is open only to BDR members.

Oocytes maintain ROS-free mitochondrial metabolism by suppressing complex I

This seminar is a part of the QMIN project seminar series.

Summary

Oocytes, female germ cells that become eggs, form before birth and remain viable for several decades in the ovary before fertilization. We know little about the strategies and mechanisms through which oocytes keep a 'youthful' cytoplasm for many years, or why these strategies eventually fail with advanced maternal age. In my laboratory, we study the cellular biology of immature oocytes with a focus on homeostasis and use frog, mouse and human ovaries, which are complimentary for their ease of handling and relevance to physiology.

Reactive oxygen species (ROS) produced as by-products of mitochondrial activity are associated with lower rates of fertilization and embryo survival. Yet, how healthy oocytes balance essential mitochondrial activity with the production of ROS is unknown. In this talk, I will show that oocytes evade ROS by remodelling the mitochondrial electron transport chain through elimination of complex I. Combining live-cell imaging and proteomics in human and frog (Xenopus) oocytes, we find that early oocytes exhibit greatly reduced levels of complex I. This is accompanied by a highly active mitochondrial unfolded protein response, which is indicative of an imbalanced electron transport chain. Biochemical and functional assays confirm that complex I is neither assembled nor active in early oocytes. Thus, oocytes are the first known physiological cell type in animals without complex I. Our findings also clarify why patients with complex-I-related hereditary mitochondrial diseases do not experience subfertility. Complex I suppression represents an evolutionarily conserved strategy that allows longevity while maintaining biological activity in long-lived oocytes.

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