McGill

Department of Anatomy and Cell Biology

Seminar Series

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Hosted by: Natalie Zeytuni, Ph.D.

Wednesday, November 2, 2022

11:30 am -12:30 pm

Room 1/12 - Strathcona Anatomy and Dentistry Building

"Increasing our understanding of intracellular transport for creating effective next-generation nuclear-targeting pharmaceuticals"

The nucleus is the organelle controlling the expression of gene products, with functions necessary for cellular survival. Nuclear targeting is a potential tool for improving the efficacy of traditional chemotherapy, vaccines, and gene therapy. Research on the implementation of nuclear localization signal (NLS)-therapeutics to 'actively' target the nucleus has been a topic of intense interest since the core principles governing signal-based intracellular transport were awarded the Nobel Prize in 1999. Understanding and implementing nuclear targeting strategies provides a path forward for controlling localization of drugs, polymers, nanoparticles to the nucleus, increasing their efficacy, reducing off-target effects, and applications beyond cancer. Despite these efforts, efficient nuclear localization and, hence, therapeutic efficacy has been difficult. The major obstacles are both intracellular and extracellular.

In this presentation, I will describe fundamental principles for nuclear transport and how this knowledge has helped therapeutic scientists to design and develop pharmaceuticals to 'actively' target the cell nucleus. I will describe the current complexities in nuclear transport and their challenges that must be overcome by drug targeting scientists to make an impact in the clinic. I will detail the advancements made in my research laboratory and their contributions to advance NLS-therapeutics.

The goal of my presentation will be to provide a much-needed integrated overview of basic nuclear transport important for targeting of therapeutics to the nucleus. Specifically, I will emphasize relevant fundamental principles in nuclear transport in the context of therapeutic design, including the impact structural biology has had on the field. Graduate students and structural biology scientists will appreciate how basic nuclear transport research can be converted into actionable design concepts and established therapeutic scientists will gain key insights to guide their research. The overall implication for the wider scientific community will be a presentation that provides a link between the principles of nuclear transport and its application to real-world medicine.