



Canadian Association
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Single-molecule microscopy of RNA-lipid-nanoparticles: applying nanoscale physics to advance nanomedicines

Tuesday 20 June 2023 08:30 (45 minutes)

I will present a unique quantitative single-molecule imaging platform called CLiC (Convex Lens-induced Confinement) which enables simultaneous measurements of the size, mRNA-payload, and dynamic properties of mRNA-based therapies and vaccines in controlled, cell-like conditions (Kamanzi et al, ACS Nano 2021). Here, we apply single-molecule biophysics to help characterize and understand the mechanisms of action of emerging classes of therapeutics and vaccines. By isolating and imaging freely diffusing particles in solution as well as during reagent-exchange, such as in response to a change in solution pH, we can emulate and explore dynamics in a controlled setting which are relevant to understanding complex dynamics inside cells and as well as inside manufacturing devices. Over the long term and in collaboration with health scientists, we are working towards correlating detailed multi-scale data sets, including single-particle measurements made in vitro as well as in cells and tissues, with genomic and proteomic analyses of the same samples, as well as clinical results, to create a through-line of understanding of drug/vaccine effectiveness from the microscopic to clinical scale. Our inspiration is to innovate and use nanoscale tools to obtain new biophysical insights into how and why medicines/vaccines work to enable and optimize their rational design and engineering. This talk builds off our recent publication in ACS Nano (Kamanzi et al, 2021) which established our measurement platform, and describes our ongoing collaboration with health scientists and unpublished data sets on single-particle dynamics and mRNA-LNP properties acquired at our new labs in MSL-UBC during the pandemic.

Keyword-1

Keyword-2

Keyword-3

Presenter: LESLIE, Sabrina (UBC Physics and Astronomy and Michael Smith Labs)

Session Classification: (DPMB/DCMMP) T1-1 Soft Matter and Biological Physics Symposium | Symposium sur la matière molle et la physique biologique (DPMB/DPMCM)

Track Classification: Technical Sessions / Sessions techniques: Physics in Medicine and Biology / Physique en médecine et en biologie (DPMB-DPMB)