



Seminars at the
Melbourne Centre for
Nanofabrication



Unveiling Cellular Nanotherapeutic Dynamics: Molecular Insights and Mechanisms

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11:00am, 07/05/2024

Melbourne Centre for Nanofabrication

151 Wellington Road, Clayton, 3168

Zoom link: [click here](#)

Meeting ID: 836 7591 9281 and passcode: 381619



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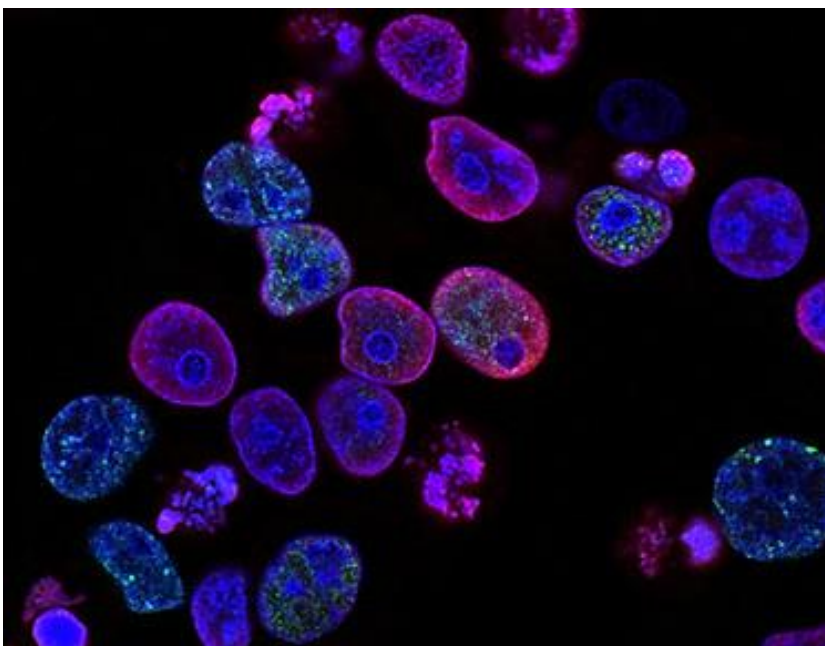
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Abstract:

Cellular nanotherapeutics represent a promising frontier in medical science, offering targeted approaches for disease treatment at the molecular level. Understanding the intricate dynamics of these therapeutic mechanisms is paramount for optimizing their efficacy and safety. At the forefront of cellular nanotherapeutics lie nanocarriers, finely tuned vehicles capable of transporting therapeutic cargo to specific cellular targets. By exploiting various nanomaterials and surface modifications, these carriers navigate through complex biological barriers to precisely deliver payloads. However, the journey from administration to cellular uptake involves a multitude of dynamic interactions influenced by both intrinsic and extrinsic factors. In my research talk, I will discuss the design of next-generation highly stable nanotherapeutic vehicles, including nanoarchaeosomes, nano protein origamis, self-propulsive nanomotors, and the fate of nanoparticles in real time, elucidating mechanisms of cellular uptake, intracellular trafficking, cargo release, and their application as tumor immune vaccines. In order to gain much deeper insights into cellular cancer protein mechanics and their interactions with nanoparticles, we have carried out single-molecule- imaging and force mechanics with optical tweezers and total internal reflection microscopy thus elucidating molecular intricacies of tumor biology and therapeutic interventions. We believe that by elucidating the molecular underpinnings of nanocarrier-cell interactions, we can harness the full potential of cellular nanotherapeutics for precision medicine applications, ushering in a new era of targeted and personalized therapies.



Dr. Swathi Sudhakar is an Assistant Professor in the Department of Applied Mechanics and Biomedical Engineering at the Indian Institute of Technology Madras. She completed her PhD in Biology from Eberhard Karls University in Tuebingen, Germany. She did her postdoc at Imperial College London. She was a gold medalist in her Bachelors and Masters studies. She got summa cum- Laude during her PhD. She also received the Reinhold und Maria Teufel-Stiftung Doctoral Award for an outstanding dissertation in Baden Wurttemberg state, Germany. One of her research works has also been published in Science. Her research focuses on the interface of nanotechnology and biology, particularly on cancer nanotherapeutics and single-molecule biophysics. She has received numerous awards and recognition for her contributions to the field and has published extensively in peer-reviewed journals (No of Journals: 23). Dr. Sudhakar is also actively involved in several funded research projects to address key challenges in healthcare and biotechnology at national and International levels. Dr. Swathi Sudhakar has also filled more than seven patents so far.