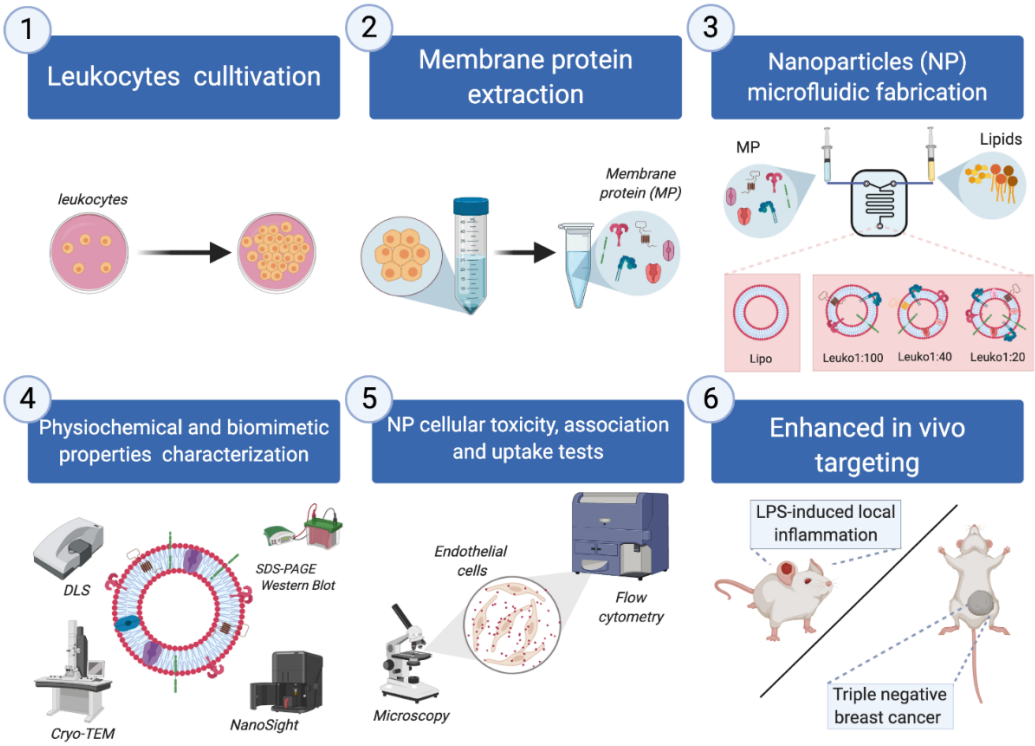

Unlocking the Cellular Blueprint: Precision Targeting of Diseased Tissues with Biomimetic Nanoparticles

Assaf Zinger[1,2]
assafzinger@technion.ac.il

[1] Laboratory for Bioinspired NanoEngineering and Translational Therapeutics, Department of Chemical Engineering, Technion−Israel Institute of Technology, Haifa, 3200003, Israel
[2] Cardiovascular Sciences and Neurosurgery Departments, Houston Methodist Academic Institute, Houston, 77030 TX, USA

Abstract

Biomimetic nanoparticles aim to emulate the behavior of either cells or exosomes effectively. For example, leukocyte-based biomimetic nanoparticles incorporate cell membrane proteins to transfer the natural tropism of leukocytes to the final delivery platform.

Here, I will demonstrate how tweaking the protein content improved the targeting of inflamed endothelium in three different preclinical models and describe the imaging challenges that arose in these projects[1,2,3].

I will also discuss the reproducible production of two types of neuron-targeting biomimetic nanoparticles, each with a distinct lipid formulation backbone suited to potential therapeutic cargo (e.g., mRNA, small molecules, and protein), by integrating membrane proteins unbiasedly sourced from human pluripotent stem-cell-derived neurons[4].

Our combined use of a microfluidic, bottom-up approach and tuning of key synthesis parameters enabled the synthesis of reproducible5, enhanced biomimetic nanoparticles that have the potential to improve the treatment of inflammatory-based conditions and genetic disorders through targeted nano delivery.

[1] **Zinger et al.**, Unleashing the potential of cell biomimetic nanoparticles: Strategies and challenges in their design and fabrication for therapeutic applications, *Journal of Controlled Release*, 2023. [2] **Zinger et al.**, Enhancing Inflammation Targeting Using Tunable Leukocyte-Based Biomimetic Nanoparticles, *ACS Nano*, 2021. [3] **Zinger et al.**, Biomimetic Nanoparticles as a Theranostic Tool for Traumatic Brain Injury. [4] **Zinger et al.**, Humanized Biomimetic Nanovesicles for Neuron Targeting, *Advanced Science*, 2021. [5] **Zinger et al.**, Reproducible and Characterized Method for Ponatinib Encapsulation into Biomimetic Lipid Nanoparticles as a Platform for Multi-Tyrosine Kinase-Targeted Therapy, *ACS Applied Biomaterlas*, 2020.