

Faculty of Engineering

Summer Research Program 2022-2023

Project Title: Delivery of mRNA for kidney disease treatment

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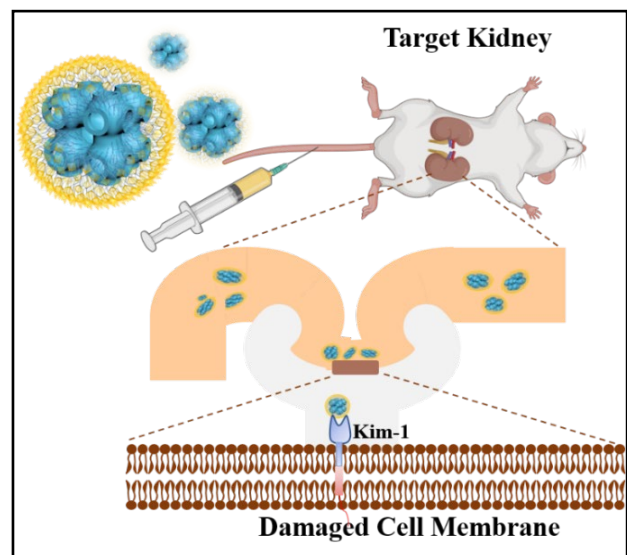
Objective

The objective of this project is to use lipid-based nanoparticles to deliver mRNA into the injured sites of kidney

Project Details

mRNA based therapeutics. The mRNA therapeutics have emerged as a high potent new class of drug, revolutionizing disease treatments, such as therapeutic vaccines, monoclonal antibodies, immunomodulatory drugs and cell therapies. The successful application of mRNA-based COVID-19 vaccine in 2021 has proved the feasibility and effectiveness of mRNA drugs. Therefore, utilizing mRNA to prompt the cells to create therapeutic proteins is an excellent avenue to pursue in the effort to restore people to health.

Nanotechnology-based solutions for mRNA delivery. One of the hurdles in mRNA therapy is to find an efficient delivery method for disease treatments. mRNA can be rapidly and easily degraded inside and outside the cells. Besides that, for many disease treatments, mRNA has to be delivered to a specific organ for the best treatment effects. Thus, the **overall aim** of this project is to fully exert mRNA's therapeutic power by enhancing cellular uptake using lipid-based nanoparticles and delivering mRNA into the injured kidney.



mRNA-nanoparticles complex can specifically target kidney injury molecule -1 (Kim-1) in renal tubules for mRNA delivery. Blue: mRNA-nanoparticles. Yellow: L-serine chitosan on the cornea of nanoparticles.