Faculty of Engineering  
Summer Research Program 2021-2022

Project Title: Design and engineer stable mRNA as new therapeutics suitable for in vivo production

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Objective
1. Design mRNA molecule that is stable and suitable for production in *E. Coli*
2. Produce and purify mRNA and evaluate their function

Project Details
mRNA has emerged as a new kind of new therapeutics that changes the way how biologic drug can be applied for human kind. The recent breakthrough of mRNA vaccine against COVID-19 highlighted the breakthrough in this field. mRNA has attracted significant interests in biotechnology sector as it offers increased applications not only as vaccine but also RNA therapeutics. One factor that prevent broad application of mRNA is low efficiency of current production methods which is currently dominated by in vitro transcription and chemical synthesis.

This project aims to design mRNA that is stable in bacteria strain *E. coli* and could thus be manufactured using low cost microbial cell factory. The student will first design mRNA and then explore microbial production of mRNA using purposely engineered *E. coli*. The student will optimize culture conditions to improve production yield of mRNA, followed by studying its biological functions (e.g., translation into therapeutic proteins).

The students working on this project will gain hands on experience in molecular design, cell culture and purification of RNA and also the opportunity to acquire skills to use analytical tools for determining quality and functionality of RNA.

Prerequisites
Experience in biotechnology/bioprocessing/biochemistry is beneficial, but not essential.

Additional Information
Applicants may be required to attend an interview.