Propositions

Accompanying the thesis:

mRNA and Drug Delivery with Lipid-based Nanoparticles

1. Nanomedicines have been customized to enter cells through different endocytosis pathways, delivering their cargo to the cell. *Chapter 3, this thesis.*

2. Lipid-based nanomedicines have a proven track record in the successful delivery of a wide range of therapeutics for various diseases. *Chapter 1, this thesis.*

3. Gene therapy potentially enables the treatment of disease at the genetic level by correcting or replacing malfunctioning genes. *Chapter 2, this thesis.*

4. Unlike typical endocytosis which needs to undergo endosome/lysosome degradation after internalization, membrane fusion has been recognized as able to overcome endosomal entrapment by driving direct fusion with the plasma membrane and subsequent delivery into the cytosol. *Chapter 1, this thesis.*

5. Using fusogenic coiled-coil peptides we managed to circumvent endosomal entrapment, resulting in direct cytosolic delivery of nucleic acids. *Chapter 2, this thesis.*

6. The dimerization of peptide K could increase membrane fusion and lipid affinity, which is pivotal for achieving enhanced liposomal drug delivery. *Chapter 3, this thesis.*

7. Coiled-coil induced membrane fusion independent of endocytosis could be beneficial to facilitate endo/lysosome escape and boost the transfection efficiency of mRNA in cells. *Chapter 4, this thesis.*

8. Proper LNP vaccine candidate screening is essential to identify superior LNP formulations that could boost robust T cell proliferation. *Chapter 5, this thesis.*

9. The success of new nanomedicine development requires multidisciplinary efforts between biologists, clinicians, engineers, and physical and chemical scientists.

10. Exploring science is like wandering in a forest, everything is so new and mind-blowing.