Combinatorial Synthesis of RAFT Cationic Polymers for mRNA Delivery

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The success of COVID-19 vaccines has brought mRNA-based therapeutics into the spotlight. Compared to other nucleic acid therapeutics, mRNA has several inherent advantages, including low risk of mutagenesis, high transfection efficiency, and the possibility of mass production[1,2]. However, naked mRNA is unstable and readily degraded by various enzymes under complex biological conditions[3]. These characteristics of mRNA necessitate suitable delivery vectors to protect them from enzymatic degradation and facilitate their passage across cell membranes to exert function within the cytosols.

Cationic polymers have emerged as promising gene carriers owing to their high synthetic capability, structural versatility, and functionality[4]. However, their use for mRNA delivery has been relatively scarce. In this presentation, I will present our work on combinatorial synthesis of advanced RAFT cationic polymers and using them as delivery systems for mRNA application, focusing on comprehending the underlying relationship between the chemical and structural properties of cationic polymers and the delivery and translation of mRNA.

References:

[1]Islam, M. A.; et al. *Biomater Sci*, **2015**, *3*(12), 1519-1533
[2]Hajj, K. A.; Whitehead, K. A. *Nature Reviews Materials*, **2017**, *2*(10), 1-17
[3]A.J. Geall.; et al. *Seminars in Immunology* **2013**, *25*, 152– 159
[4]P. Huang.; et al. *Matter*, **2022**, *5*, 1670-1699