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Seminar series – Drug Delivery and Translational Medicine

Optimized mRNA Tails Enhances Effectiveness of mRNA Vaccines

by



Prof. Yi Kuang

Associate Professor

Department of Chemical and Biological Engineering
The Hong Kong University of Science and Technology

Date: 26 September 2024 (Thursday)

Time: 10:00 a.m. – 11:00 a.m.

Venue: Seminar Room 4, G/F, Laboratory Block,
LKS Faculty of Medicine, 21 Sassoon Road,
Pokfulam

Abstract:

Over the last two decades, numerous efforts drove the development of synthetic mRNA vaccine against COVID-19. Nowadays, mRNA vaccines targeting other infectious diseases and various types of cancers are being developed. However, the applications of synthetic mRNA vaccines are still restricted by several factors. For example, the low cellular stability limits the protein production efficiency and the random truncation during template synthesis increases the cost and duration of production. We pioneered the research in optimization of poly(A) tail sequences by inserting non-A nucleotides at the rear part of the tail. This engineering of optimized tail sequences can not only substantially prolong mRNA half-life to boost protein production rate and maintain high protein levels in the cell, but also reduce random truncation rate during template synthesis. These effects of optimized tails were observed in all cell types, for all model mRNAs, and were independent of the transfection reagents used. We also confirmed on animal model that optimized tail can drastically boost the efficacy of mRNA cancer vaccines. As the use of the optimized tails does not alter production pipeline of mRNA and is compatible with other mRNA enhancement technologies, we believe they can be broadly used to promote the clinical applications of mRNA vaccines.

Bio:

Professor Yi Kuang received her B.S. in Biotechnology from Sun Yat-Sen University and her M.Phil in Bioengineering from The Hong Kong University of Science and Technology. She obtained her Ph.D. in Chemistry from Brandeis University under the supervision of Prof. Bing Xu, studying controlled supramolecular assembly. She worked at the Center for iPS Cell Research and Application at Kyoto University, first as an Interdisciplinary Human Frontier Science Program Postdoctoral Fellow and then as a JSPS Research Fellow. She was awarded with several General Research Fund from RGC of Hong Kong and received research support from HS Chau Foundation and Fei Chi En Education and Research Fund. She was elected as Early Career Advisory Board (ECAB) of ACS Synthetic Biology in 2023. Her research is focused on the engineering of high performance synthetic mRNA for mRNA vaccines and for mRNA-based logic gates.

Moderator: Prof. Weiping Wang, Associate Professor, Department of Pharmacology and Pharmacy & Dr. Li Dak-Sum Research Centre, The University of Hong Kong
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