

HONG KONG RNA CLUB



香港城市大學
City University of Hong Kong

Hybrid Seminar

17 Sep 2026 (Thur) / HKT 16:30-17:30

Venue: City University of Hong Kong
Yeung Kin Man Acad Building
(AC1), G5-314

Registration required: [click here](#)

Distinguished Speaker:

Prof. Hiroshi Abe

Professor

*Department of Chemistry
Graduate School of Science
Nagoya University*

**Chemistry-based mRNA design
enhancing translation toward
therapeutics**



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Chemistry-based mRNA design enhancing translation toward therapeutics

Prof. Hiroshi Abe

Professor

Department of Chemistry

Graduate School of Science

Nagoya University



Abstract

Messenger RNA has emerged as a powerful therapeutic modality, yet its key properties - translation efficiency, stability, and immunogenicity - remain difficult to control precisely. Our laboratory develops chemistry-based tools to design and synthesize mRNA bearing defined, position-specific modifications. In this talk, I will present our methods for the complete chemical synthesis of mRNA and for efficient chemical capping, together with the PureCap approach, which uses a hydrophobic photocleavable tag to isolate fully capped mRNA and thereby enables reliable evaluation of cap structures. Building on these tools, we have systematically examined how the cap structure, the 5'-UTR, the poly(A) tail, and position-specific nucleoside and backbone modifications govern translation and stability. I will also describe internal cap-initiated translation (ICIT), a molecular design that endows circular mRNA with cap-dependent, highly efficient, and potentially cell-type-selective protein production. Together, these chemical strategies expand the design space of linear and circular mRNA and offer a versatile platform for next-generation RNA therapeutics.

Biography

Hiroshi Abe is a Professor in the Department of Chemistry at the Graduate School of Science, Nagoya University, Japan. He is a leading researcher in the chemical biology of nucleic acids and RNA therapeutics. Professor Abe received his Ph.D. from the Graduate School of Pharmaceutical Sciences at Hokkaido University under the supervision of Professor Akira Matsuda. He also holds an M.S. and B.S. from Hokkaido University's School of Pharmaceutical Sciences.

Before joining Nagoya University in 2015, he served as an Associate Professor at Hokkaido University (2013-2015) and as a Researcher at RIKEN (2005-2013). His postdoctoral research was conducted under the guidance of Professor Eric Kool at Stanford University (2002-2005) and Professor Joanne Stubbe at the Massachusetts Institute of Technology (2001-2002).

Professor Abe's work has been recognized with numerous awards, including the Incentive Award of the Pharmaceutical Society of Japan (2010), the Japanese Society of Nucleic Acid Medicine Award for Chemistry-Based Nucleic Acid Drug Research (2020), and the Society of Synthetic Organic Chemistry Corporate Endowed Award, Kaneka Life Science Award (2024).

His research has led to significant advancements in RNA therapeutics and chemical biology. Some of his notable works include the discovery of internal cap-initiated translation (ICIT) and trans-acting cap-dependent translation (TACT), as well as the PureCap method for purifying fully capped mRNA, complete chemical synthesis of mRNA, and position-specific chemical modification of mRNA for more efficient protein synthesis. He founded Crafton Biotechnology. In addition, chemically modified nucleoside analogs are applied to siRNA and antisense oligonucleotides to enhance the knockdown efficiency and durability of the effect.