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Sequence specific detection of RNA viral gene by chemically modified peptide nucleic acid

Molecular tools that can rapidly identify virus in clinical specimen are important for achieving therapeutic success and preventing the spread of infectious diseases. Peptide nucleic acid (PNA) is a DNA/RNA analogue that possesses a neutral amide backbone instead of phosphate backbone and thus efficiently binds to DNA without having electrostatic repulsion. Currently, we synthesized PNAs derivatized with different types of intercalators via an amide linkage at the N-terminus. Their intercalators increased PNA binding affinity to matched DNA; however, most of them also increased the binding efficiency to mismatched DNA. On the other hand, PNA derivatives with tolane selectively improve the binding affinity to the matched sequence, but not to the mismatched sequence. In this paper, we synthesized a series of PNA-tolane conjugates and measured UV melting temperature (Tm) with target ssDNA and ssRNA. Molecular dynamics simulations and thermodynamic studies were also performed to discuss the mode of actions of PNA-tolane derivatives against ssDNA and ssRNA. PNA-tolanes were also used to discriminate a neuraminidase inhibitor-resistant influenza A virus gene on our novel type of nucleic acid chromatography system.

Biography

Kunihiro Kaihatsu has received his PhD in Organic Chemistry and Nucleic Acid Chemistry from Kobe University, Japan. He has served as an Associate Professor in the Department of Organic Fine Chemistry in the Institute of Scientific and Industrial Research, Osaka University, Japan. He has received several awards from Chemical Society of Japan, International Society of Antiviral Research, Biobusiness Competition Japan Award in 2009 & 2010 and other research societies. He is currently focusing on developing diagnostic methods in virology using nucleic acid chemistry.

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