Synthetic RNA Technologies to control gene expression and cell fate

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Abstract

We are investigating mRNA switches that can achieve target cell purification and specific regulation of expression. We have created a switch that turns off translation in response to microRNAs (miRNAs) that characterize cells (miRNA-responsive OFF switch). However, this OFF switch alone posed a challenge to the purification efficiency of some cell types. Recently, we developed a new switch that activates translation in response to miRNAs (miRNA-responsive ON switch). For the development of the ON switch, a unique RNA design approach was found, in which an artificial sequence was inserted downstream of the poly-A strand of the mRNA. A simple method of introducing mRNA switches into a cell population by combining ON and OFF switches successfully purifies target cells with high efficiency and kills unwanted cells without the use of cell sorters or other equipment. In addition to these RNA switch technologies, this presentation will also introduce the latest results of cellular reprogramming research, such as the use of AI to generate functional RNA and the use of RNA to create next-generation iPS cells.

Biography

Hirohide Saito is Professor at Institute for Quantitative Biosciences (IQB), The University of Tokyo, and Center for iPS Cell Research and Application (CiRA), Kyoto University. After completing predoctoral training at the University of Tokyo and SUNY Buffalo, he received his Ph.D. from the University of Tokyo in 2002. He is interested in the field of mammalian synthetic biology and RNA/RNP design biology. Using newly developed RNA and RNP technologies, he aims to understand design principles of living systems and contribute to future medicine.