Department of Biomedical Sciences
香港城市大學
City University of Hong Kong

The accuracy and efficiency of primary microRNA processing by human Microprocessor

By
Dr. Tuan Anh NGUYEN, Ph.D.
Assistant Professor
Division of Life Science
Hong Kong University of Science and Technology

Date: 30 April 2021 (Friday)
Time: 11:00am – 12:00noon (Hong Kong Time)
Zoom link: https://cityu.zoom.us/j/94422685618
(Meeting ID: 944 2268 5618, Passcode: 322232)

Abstract

MicroRNAs (miRNAs), approximately 21-22 nucleotides, play vital roles in gene regulation. The functions of miRNAs are mainly dependent on their expression level that is primarily determined by their biogenesis. The dysregulation of miRNA biogenesis causes various defective cellular processes and human diseases such as cancer, virus infection, and neurodegenerative diseases. miRNAs are produced from primary miRNAs (pri-miRNAs), which are cleaved by the Microprocessor complex. Therefore, Microprocessor is crucial for determining the efficiency and precision of miRNA production, and thus miRNA functions. Here, we showed that Microprocessor has an unexpected single cleavage that creates a single cut on one of the pri-miRNA strands. This cleavage does not lead to miRNA production and thus downregulates miRNA expression. We found that the asymmetric internal loop (AIL) in the lower stem of pri-miRNAs facilitates the nicking activity. Therefore, by manipulating AILs, we could regulate the level of nicking activity, thereby controlling miRNA production both *in vitro* and *in vivo*. Besides, by performing high throughput enzymology assays, we discovered multiple BMWs (bulges, mismatches, and wobble base-pairs) that control the Microprocessor's efficiency and accuracy activity. These findings reveal different regulation levels of miRNA expression and offer an alternative approach to miRNA knockdown and foundation to explain miRNAs' abnormal expression in various cellular contexts.

Biography

Dr. Nguyen received his Ph.D. in Biochemistry from Korea Advanced Institute of Science and Technology (KAIST) where he studied DNA replication, recombination, and repair. He subsequently moved to Seoul National University as a postdoc and worked on microRNA biogenesis. During postdoc training, he extensively studied and made a contribution to understanding the molecular mechanism of human Microprocessor that is involved in microRNA biogenesis. In 2017, he joined the Division of Life Science at HKUST as an Assistant professor. His lab mainly focuses using biochemistry and bioinformatics approaches to address the molecular mechanism of RNA-interacting proteins.

Dr. Nguyen has received the Croucher Innovation Awards in 2018. (The Croucher Innovation Awards)

You can join by clicking the above link 10 minutes prior to the seminar. Please download ZOOM and complete the installation beforehand (https://zoom.us/download), and set up your camera and microphone if you wish to participate in the Q&A session after the presentation.

ALL ARE WELCOME

Enquiries: Ms Irene Wong (3442-4707, irene.wong@cityu.edu.hk)
Dr. Xin Wang (3442-2367, xin.wang@cityu.edu.hk)