The ADAR and CRISPR-Cas families of RNA-binding proteins: Functions and Biotechnological Applications

Prof. Meng How Tan

School of Chemical and Biomedical Engineering,

Nanyang Technological University

Abstract

RNA-binding proteins (RBPs) are increasingly recognized as important regulators of gene expression. Over the years, my lab has focused on studying the ADAR and CRISPR-Cas families of RBPs. The ADAR enzymes bind to double-stranded RNAs (dsRNAs) and convert adenosines (A) to inosines (I) via a deamination reaction, but they can also perform functions independent of A-to-I RNA editing. Here, I will discuss some of our work on (1) mapping the spatiotemporal landscape of editing over normal vertebrate development, (2) understanding the regulation of editing, (3) dissecting the functions of ADAR in stem cell differentiation and cancer, and (4) developing new technologies to gain insights into the epitranscriptome. CRISPR-Cas systems function naturally to protect bacteria from phage infection, but they are best known today as programmable tools for genome and transcriptome engineering. Here, I will discuss some of our work on (5) evaluating different CRISPR-Cas systems for human genome engineering, (6) developing new Cas9 enzymes to address some of the inherent shortcomings of SpCas9, (7) developing new Cas13-based enzymes for programmable modulation of RNA metabolism, and (8) developing a new CRISPR-based diagnostic assay for COVID-19.

Biography

Meng How Tan is a faculty in the School of Chemical and Biomedical Engineering at Nanyang Technological University (NTU) and a principal investigator in the Genome Institute of Singapore at A*STAR. His laboratory is interested in studying RNA-binding proteins and has focused primarily on the ADAR and CRISPR-Cas families of enzymes. He has published corresponding-author papers in top-tier journals, including Nature, Nature Chemical Biology, and Nature Communications, and has received several awards for his research, including the Outstanding Young Principal Investigator award from AIChE (Singapore Local Section) and the EMBO Global Investigator award. He received a B.S. in mechanical engineering and a B.A. in economics from the University of California Berkeley, a M.S. in aeronautics from the California Institute of Technology (Caltech), a M.S. in biomedical engineering from NTU, and a Ph.D. in developmental biology from Stanford University under Harley McAdams and Lucy Shapiro. He also pursued postdoctoral research at Stanford University under Jin Billy Li, Mylene Yao, and Wing Hung Wong. His undergraduate and graduate studies were funded by an Overseas Merit Scholarship (Open) (Singapore Government), a Donald Wills Douglas Fellowship (Caltech), and a National Science Scholarship (Ph.D.) (A*STAR).