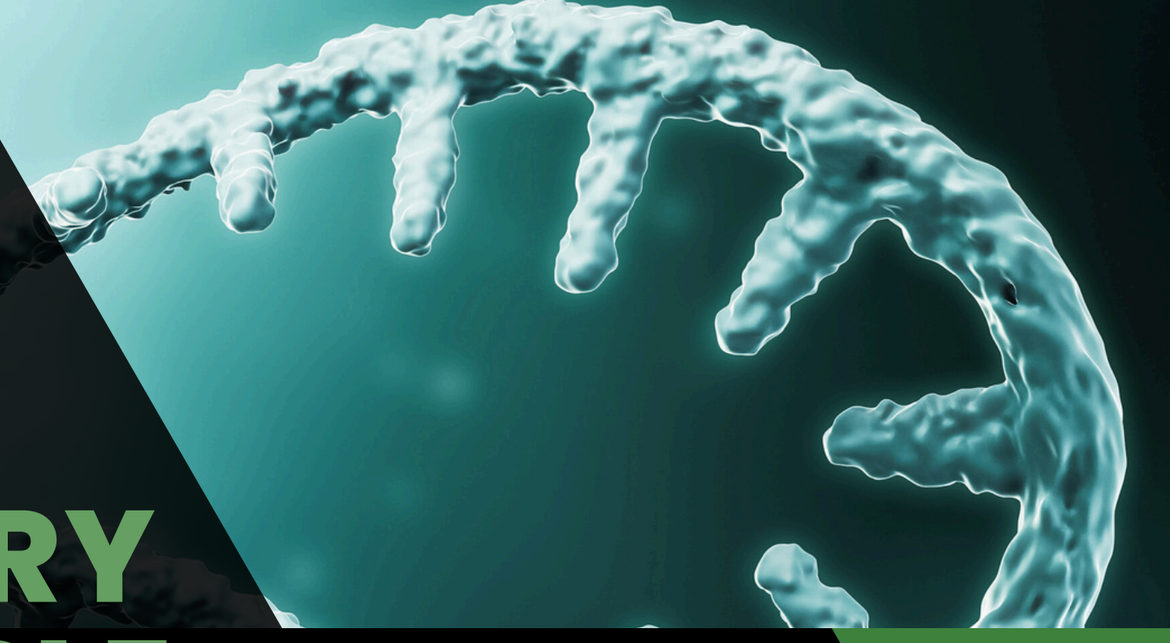
SINGAPORE RNA SEMINAR SERIES



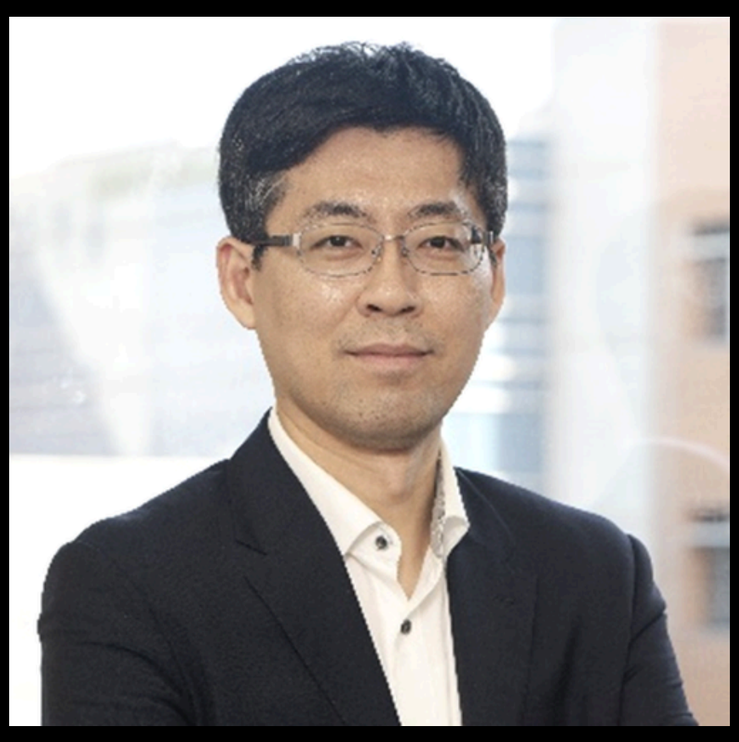
EXPLOITING THE IMMUNOREGULATORY POTENTIAL OF DOUBLE-STRANDED RNAS

Tuesday 9 September 2025
10.00am (SGT , GMT+8)

Via Zoom

About the speaker

Dr. Yoosik Kim is a chemical and biological engineering Ph.D. graduate from Princeton University, and studied signal transduction cascades in early Drosophila embryos. Post-Ph.D., he delved into RNA biology and studied the innate immune regulation by cellular double-stranded RNAs (dsRNAs) at Seoul National University. He became a professor in the Department of Chemical and Biomolecular Engineering at KAIST in 2016, studying the regulation and function of cellular dsRNAs. Originally identified in viruses, dsRNAs are recognized by innate immune sensors and trigger inflammatory responses in cells. Notably, the human genome encodes various repeat elements that can generate cellular dsRNAs. Dr. Kim's lab employs molecular biology, biochemistry, and bioinformatics to understand how cellular dsRNAs are regulated, their interaction with RNA-binding proteins, and their implications in various inflammatory diseases.



Dr. Yoosik Kim
Associate Professor
Korea Advanced Institute of Science and Technology (KAIST)

About the seminar

Long double-stranded RNAs (dsRNAs) are duplex RNAs that can induce an immune response when present in mammalian cells. These RNAs are associated with viral replication, but recent evidence suggests that human cells naturally encode endogenous dsRNAs that can activate innate immune response proteins such as Protein Kinase R (PKR). Our laboratory utilizes the immunoregulatory potential of cellular dsRNAs for therapeutic purposes. We find that the inhibition of the intron debranching process by depleting a debranching enzyme, DBR1, results in hyperactivation of PKR due to the accumulation of intron lariat-derived transposable elements (TEs) that can adopt double-stranded secondary structure. Interestingly, these TE-containing lariat RNAs are retained in the nucleus, but are released to the cytosol during mitosis, where they activate PKR, resulting in aberrant mitotic progression and apoptosis. We further exploit the lariat RNA-PKR interaction during mitosis and show that DBR1 depletion and anti-mitotic chemotherapy drugs can synergistically induce cancer cell death both in vitro and in vivo. In addition to cancer therapeutics, we investigate PKR-dsRNA interactions and develop PKR-inhibiting aptamers. We then apply such aptamers to modulate immunogenic response to exogenous mRNAs. In this presentation, we discuss our recent efforts in utilizing the immunoregulatory effect of cellular dsRNAs in RNA therapeutics.

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