PKR, Double-stranded RNAs, and their Implication on Osteoarthritis

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Speaker

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Education

2006 - 2011 Ph.D., Chemical and Biological Engineering, Princeton University
2006 - 2008 M.A., Chemical and Biological Engineering, Princeton Unviersity
2002 - 2006 B.E., Chemical Engineering, Dartmouth College
2002 - 2006 A.B., Engineering Sciences modified with Chemistry, Dartmouth College

Biography

Prof. Kim's research is focused on identifying cellular double-stranded RNAs (dsRNAs) and investigating their function as a new class of signaling molecules. dsRNAs are originally believed as a signature of virus and induce immune response when introduced to human cells. His previous research, however, showed that human cells naturally express cellular dsRNAs that can provide signaling cues to govern cellular processes such as the cell cycle. His research lab combines experimental (molecular biology) and computational (bioinformatics) approaches to examine physiological function of cellular dsRNAs. Specifically, they are interested in establishing dsRNAs as a biomarker that detects early sign of degenerative disease and in developing novel therapeutics that targets these noncoding RNAs.

Abstract

When cells are infected with virus, innate immune response proteins quickly recognize features of viral RNAs such as their double-stranded secondary structure. One of the innate immune response proteins is protein kinase RNA-activated (PKR), which is phosphorylated upon binding to viral double-stranded RNAs (dsRNAs). In infected cells, phosphorylated PKR (pPKR) suppresses protein translation and eventually induces cell death. However, growing evidence suggests that PKR can be phosphorylated even in uninfected cells. Specifically, pPKR is commonly observed in patients with degenerative diseases such as Alzheimer's disease. Consistent with this, recent findings reveal that human cells naturally express cellular dsRNAs that can lead to PKR phosphorylation. In this presentation, we discuss our recent effort to identify cellular dsRNAs and investigate their function with respect to the onset of human degenerative disease. Specifically, we are interested in establishing PKR and cellular dsRNAs as new biomarkers for osteoarthritis that will allow early detection of the disease. Lastly, we also discuss how exercise may help to prevent accumulation of cellular dsRNAs and prevent cell degeneration via PKR phosphorylation..