

Biomedical applications of double-stranded RNAs: Virus detection and beyond

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Long double-stranded RNAs (dsRNAs) are duplex RNAs that can induce immune response when present in mammalian cells. These RNAs are associated with viral replication as these RNAs are generated by positive-strand RNA viruses as well as by DNA viruses. In addition, recent evidences suggest that human cells naturally encode endogenous dsRNAs that can regulate antiviral machineries. In this talk, we present our strategies in using reactive polymer surface to capture and detect viral dsRNAs. As these RNAs are common signature of multiple types of viruses, our platform provides a primary diagnostic tool to determine the infection status for a wide range of viruses. In addition, we also utilized photochromic organic compound spiropyran to profile and quantitate dsRNA expression. By using spiropyran, we can quantitatively measure changes in the dsRNA expression levels which can be used to predict cellular response to the chemotherapy drug that kills cancer cells by inducing dsRNA expression. Collectively, our work establishes potential of dsRNA detection in biomedical applications ranging from viral infection to cancer.