Researchers develop tool to determine function of MicroRNAs

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As microRNA biology has been implicated in everything from the development of cancer to virus infections, a new tool developed by scientists at the Icahn School of Medicine at Mount Sinai holds tremendous potential to develop new therapies that involve these small regulatory fragments of RNA. The scientists' findings are detailed in a study, titled "MicroRNA Function is Limited to Cytokine Control in the Acute Response to Virus Infection," published in the December issue of *Cell Host & Microbe*. While the article focuses on microRNA function as it pertains to virus infection, the development and characterization of this new tool has implications that far exceed the field of microbiology.

"Apart from their roles in causing medical maladies, viruses have long been used as tools to reveal unappreciated aspects of biology, providing us with insights into the many unknowns of how our cells function," said Benjamin tenOever, PhD, Fishberg Professor of Microbiology at the Icahn School of Medicine at Mount Sinai and corresponding author of the study. "We developed a tool based on a poxvirus gene that allows us to manipulate microRNA populations in any tissue or cell type we desire".

With the capacity to fine-tune protein expression, microRNAs, also called miRNAs, help regulate cell maintenance and differentiation. This regulatory pathway is known to often malfunction in the development of cancer and its role in the response to virus infection has remained largely unknown and difficult to study. To determine the global role of miRNAs in both cell biology and the response to virus infection, the team at

Mount Sinai, led by Dr. tenOever and PhD candidate Lauren C. Aguado, designed and generated a synthetic vector that rapidly eliminates total cellular miRNA populations in any cell or tissue to which it was administered.

While loss of miRNAs had a negligible impact on the cell's immediate reaction to virus or the short term biology of the cell, sustained depletion was found to have dramatic results on gene expression that was coupled to a burst of cytokines - protein messengers that alert the immune system of a problem. In all, this work concludes that miRNA function is limited to modulating the biology of the cell over long periods of time. Having a tool that can now manipulate these responses provides us with an unprecedented platform to reprogram healthy cells or treat diseases such as cancer where these pathways have malfunctioned.

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