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Editorial

MicroRNAs and Microbial Pathogens

Rahul Tevatia*

Department of Chemical and Biomolecular Engineering, University of Nebraska-Lincoln, Lincoln, USA

***Corresponding Author**: Rahul Tevatia, Department of Chemical and Biomolecular Engineering, University of Nebraska-Lincoln, Lincoln, USA.

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Recent advancements in genomic, transcriptomic, and metabolomic approaches expedited our understanding of microbial pathogenic mechanisms; however, the prevention and treatment of these diseases are still demanding. In this urge of innovation, the understanding of microRNA (miRNA)-small non-coding RNA~18 - 24 nucleotides long)-presents compelling alternate. Within last decade, researchers identified strong correlations between the variation in miRNA expression and microbial pathogens.

After infection, the microbial pathogen manipulates host cellular machinery to replicate and survive. The pathogen secretes a variety of effector proteins into the host cells and changes the host's cellular pathways, including signal transduction, membrane trafficking, and pro-inflammatory responses. Microarray analysis confirmed that an infection can modulate the regulation of related miRNAs and vice versa; however, the exact mechanism is still unclear.

The miRNA regulates ~60% of the human transcriptome by downregulating the expression level of targeted genes. Bioinformatics analyses identified thousands of miRNA and respective mRNA targets in the human genome. However, as little as 6 or more base pairing can cause miRNA based silencing in mammalian cells, only the miRNA:mRNA interaction based experiments (cross-linking immunoprecipitation, western blotting, qRT-PCR and high-throughput genomic sequencing) can confirm the physiologically relevant targets [1,2].

Multiple miRNAs can target individual mRNA of a pathway. For instance, miRNA–21, 125a, b, 146, and 155 down-regulate immune related genes. This miRNA panel gets induced upon the infection of *Listeria monocytogenes* (gram-positive, intracellular), *Salmonella typhimurium* (gram-negative, intracellular), *Helicobacter pylori* (gram-negative, extracellular/intracellular), and *Mycobacterium* sp. (intracellular) [3,4]. Indeed, the increased levels of miRNA of such panels can act as a general marker for pathogenicity, but identification of signature miRNAs, which can distinguish individual disease, still require further investigation. The human blood has miRNAs as part of the circulating nucleotide pool. The modulation in target signature miRNAs can be used as a routine diagnostic technique for hard to detect pathogens.

The better understanding of the miRNA-infection mechanism and the identification of signature miRNAs may direct towards novel therapeutics. Designing new drugs targeting miRNA or entailing miRNA itself as a drug could develop a new era of the drug discovery to conquer the life threatening infections. Further, miRNA as a diagnostic marker may unravel the early detection of several pathologies.

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