

Chapter 5

Systems Biology Tools to Understand the Role of Host MicroRNAs in Infection: a Closer Look at HIV

Jerolen Naidoo, Robyn Brackin, Rethabile Khutlang, Anca Savulescu and Musa M. Mhlanga

ABSTRACT

The discovery of mammalian microRNAs (miRNAs) has greatly enhanced our appreciation for the complexity associated with the regulation of the mammalian transcriptional landscape. Endogenous miRNA pathways mediate the targeted and subtle variations in gene expression required to drive complex biological processes that must be coordinated both spatially and temporally within cells and tissues. It is not surprising then that the dysregulation of miRNA function has been implicated in various models of disease and pathogenesis. Increasing interest in miRNA function has facilitated the transfer of many existing technologies to miRNA-based formats. Expression-based tools like RNAseq and qPCR microarray technologies, as well as the use of synthetic molecules to inhibit or enhance miRNA functions have been employed to identify and characterize distinct miRNA expression profiles in various models of infection. In this chapter we take a closer look at the application of some of the existing tools for miRNA-based analyses with a focus on host–pathogen interactions. Aspects pertinent to high-content miRNA-based screens are also discussed using an HIV screening workflow as a backdrop to address the important considerations associated with miRNA-based studies.