

# Small RNAs: Core Players in Health and Disease

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## Editorial

Considering the concept of The Complex Life of mRNA, a scientific meeting held every year in Heidelberg, Germany, this editorial aims to highlight the relevance of one of the types of small RNA that regulate messenger RNA; The microRNAs, that act as molecular markers, and can be used as diagnostic and therapeutic tools (*EMBL, 2014*).

Scientists have long been intrigued by the cellular processes orchestrated by the intricate network of molecular interactions. Recently, miRNAs have emerged as fundamental regulators. These small non-coding RNAs can significantly modulate gene expression, making them markers of biological processes in normal cellular development and pathological processes (*Mohr and Mott, 2015*).

## microRNAs and modulation of gene expression

microRNAs, 18 to 22 base pairs in length, are post-transcriptional regulators that bind to complementary regions (seed region) within the target mRNAs, leading to the translational repression or mRNA degradation. This mechanism allows microRNAs to adjust gene expression patterns, exerting control over various normal biological processes, including development and differentiation, but also in other pathologies, such as cancer (*Kunej et al., 2012*).

## microRNAs as biological markers

These small molecules also serve as promising molecular markers and offer information about normal physiological states. The stability of miRNAs in body fluids, along with their specific expression patterns in different tissues, have become attractive candidates for the discovery of noninvasive biomarkers.

As per the research conducted by Sun et al. (2016), circulating microRNA profiles have demonstrated a strong correlation with cardiovascular, immune, and metabolic conditions, thereby offering crucial diagnostic insights (*Sun et al., 2016*). These microRNA expression profiles can also be tracked longitudinally as a function of time to look for molecular signatures associated with aging, lifestyle, or exposure to environmental factors, thus seeking preventive strategies (*Sun et al., 2016*).

## microRNAs as biomarkers of disease

Aberrant miRNA expression profiles have been implicated in the pathogenesis and progression of various disorders including cancer and neurodegenerative diseases. Deregulated miRNAs can serve as diagnostic biomarkers, allowing early detection and disease stratification based on molecular subtypes (*Faruq and Vecchione, 2015*).

Furthermore, miRNAs are promising prognostic markers as they provide information on the aggressiveness of the disease, metastatic potential, and response to treatment. For example, specific miRNA profiles have been associated with resistance to chemotherapy in cancer patients, which guides therapeutic decision-making and improves treatment outcomes. Furthermore, dynamic changes in the expression of miRNAs during disease progression allow better monitoring.

## Challenges and future directions

Despite their promising advantages as molecular markers, several challenges have hindered their clinical implementation. The lack of standardization of collection protocols, sampling procedures, and sample analysis are factors that affect reproducibility and comparability between the studies. Collaboration between researchers, physicians, and industry is imperative to carry out work in a coordinated manner and take advantage of the potential of miRNAs in medicine precision.

## Conclusion

microRNAs emerge as central actors in different biological processes, offering knowledge about normal molecular mechanisms and disease pathogenesis. Their role as molecular markers is promising for improving diagnostics, prognosis, and therapeutic interventions across a spectrum of diseases. Through interdisciplinary efforts, it is possible to use the promising potential of microRNAs as tools for precision medicine and personalized medical care.

## References

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