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Special Issue Reprint

## Crosstalk between MicroRNA and Oxidative Stress in Physiology and Pathology

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MicroRNAs (miRNAs) are small noncoding RNAs that are 19–24 nucleotides in length, following maturation. Recent evidence has demonstrated their key role as post-transcriptional regulators of gene expression through the binding of specific sequences within target messenger RNA (mRNA). miRNAs are involved in the synthesis of a very large number of proteins, and it is speculated that they could regulate up to 30% of the human genome. They control virtually every cellular process and are essential for animal development, cell differentiation, and homeostasis. Altered miRNA expression has been linked to such pathological events as inflammatory, degenerative, or autoimmune processes and have been associated with several diseases, including cancer, cardiovascular diseases, diabetes mellitus, and rheumatic and neurological disorders. Recently, miRNAs have been found in many different biological fluids, and this observation suggests the potential of miRNAs as new candidate biomarkers for diagnosis, classification, prognosis, and responsiveness in the treatment of different pathological conditions. Furthermore, the development of therapeutic strategies that involve either restoring or repressing miRNAs expression and activity has attracted much attention. Significant progress has been made in the systems for delivery of miRNAs, even if substantial improvements in this area are still necessary. Although they have been extensively studied, a number of interesting questions regarding the physiological and pathological role of miRNAs have been postulated, and their potential diagnostic and therapeutic role remain yet unanswered. Reactive oxygen species (ROS) are free radical-containing oxygen molecules derived from cellular oxidative metabolism, including enzyme activities at mitochondrial respiration, and play a pivotal role in many cellular functions. Whereas <https://doi.org/10.3390/ijms24102416> processes, their aberrant production, or failure of the capacity to scavenge excessive ROS, induces an altered redox status with excessive synthesis of free radicals, leading to an imbalance in the redox environment of the cell. The



loss of normal ROS levels causes lipid, protein, and DNA damage, which contribute to the development of various pathologies including neurological disorders, rheumatic and cardiovascular diseases, diabetes, and cancer. Increasing evidence highlights that there is crosstalk between miRNAs and components of redox signaling, even if this complex and the characteristics of mutual interaction need to be amply elucidated. Hence, both miRNAs and oxidative stress are involved in the multifactorial development and progression of acute and chronic diseases by influencing numerous signaling and metabolic pathways. The Special Issue entitled "Crosstalk between MicroRNA and Oxidative Stress in Physiology and Pathology" of the International Journal of Molecular Sciences includes original articles and reviews that provide new insights into the interaction between miRNAs and oxidative stress under normal and pathological conditions which can assist in the development of new therapeutic strategies. Finally, I would like to thank all the authors for their excellent contribution. I hope this Special Issue will provide readers with updated knowledge about the role of miRNAs and oxidative stress in physiology and pathology.