Towards the end of the 20th century, the World Health Organization (WHO) defined biomarkers as “almost any measurement reflecting an interaction between a biological system and a potential hazard, which may be chemical, physical, or biological” [1]. The biomarkers predict exposure effects of toxic materials. They are sensitive and informative indicators of adverse effects at doses and exposure times preceding toxicity, tissue injury and disease. The microRNAs (miRNAs) were discovered around the same time as the WHO definition of biomarkers when Lee, Feinbaum and Ambros (1993) published the results of their monumental study on two small lin-4 transcripts of Caenorhabditis elegans (C. elegans) of approximately 22 and 61 nucleotides [2]. Five years later, Fire et al. (1998) reported the potential and specific genetic interference by double-stranded RNA in C. elegans [3]. At the dawn of the 21st century, it was recognized that microRNAs are a family of small non-coding RNA molecules which are conserved by evolution. They control many developmental and cellular processes in eukaryotic organisms. They play important role in cancer development [4]. They regulate gene expressions [5] and show epigenetic activity in cancer development [6]. However, the physiologic functions of the majority of microRNAs are not known.

At the turn of the 21st Century, studies concerning the application of miRNAs as biomarkers for several diseases have started to take an international significance prompting researchers to investigate the role of these non-coding RNAs also as bio indicators of toxicity to chemicals and environmental pollutants [7–9].

Reports from independent laboratories published in last two decades have demonstrated that miRNAs can serve as sensitive diagnostic biomarkers of injury in specific tissues such as brain [10–13], heart [14–18], kidney [19–24], liver [13,25,26], muscle [13,27] and skin [28,29].

Beside organ-specific miRNAs, a growing body of evidences have identified disease-specific miRNAs. In this context, miRNAs as promising biomarkers were identified for several tumors [30–33], muscle skeletal and neurodegenerative pathologies [34,35], dysmetabolic diseases [36,37], cardiovascular disorders [38,39] and fertility defect [40].

These studies strongly suggest that miRNAs play important roles in several human diseases. Therefore, they have attracted great interests of research scientists in medicine and in toxicology. They have become a focal point of a developing new field of science in recent years. They show promise as possible new biomarkers of disease and injury. They demonstrate a tremendous potential for serving as biomarkers of toxicity and disease. Scientific interest in miRNAs has grown tremendously in last two decades. Our understanding of these non-coding RNA continues to evolve.

This special interest and attention of scientists all over the world on microRNAs has led the Toxicology Reports to publish this Special Issue, entitled “microRNAs: potential biomarkers of toxicity”, to provide up-to-date state-of-the-art information on these important bio-molecules for the benefit of our readers. It is my honor and privilege for serving as the guest editor of this Special Issue. Investigators of international recognition working in this developing scientific discipline have shared my enthusiasm and interest for this area of research and contributed generously to this Special Issue for which I deeply grateful to them. I sincerely hope that this Special Issue will be of great interest for the readers of Toxicology Reports providing authoritative and latest scientific data about the diagnostic and prognostic role of miRNAs in subject exposed to toxic agents. I encourage our readers to submit the exciting results of their studies to Toxicology Reports, which in return promises to provide quick publication following expert peer review process.

References


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