EDITORIAL

Genetic and Epigenetic Biomarkers for Diagnosis, Prognosis, and Treatment of Global Diseases

Non-communicable diseases cause the most deaths and disorders worldwide. DNA mutations and epigenetic changes (DNA methylation, histone modification, and non-coding RNA-associated gene silencing) frequently cause these pathological states [1, 2]. It is very important to find reliable and accurate markers of diseases. They may help to develop diagnosis and treatment methods for these kinds of pathological conditions.

Novel molecular biological approaches allow finding of novel biomarkers for different stages of disease progression. Genetic biomarkers are characteristic biological molecules that can be detected and measured in biological samples like blood or tissue biopsy. DNA sequences, which cause diseases or associate with disease susceptibility may be a relevant genetic marker. In addition, recently, non-coding RNA, DNA methylation and acetylation states began to gain popularity in the diagnosis and prognosis of different types of cancer [3] and cardiovascular diseases [4], which are the most severe among global diseases. Moreover, advances in genomics have given techniques for the transition to personalized medicine. In addition, genetic engineering methods are also applicable for the development of molecular biomarkers. For example, CRISPR-Cas9-based screening accelerates the identification of novel biomarkers, which will promote the discovery and development of specific disease treatments [5].

Biomarker development must be precise and as easy to carry out as possible [6]. The results of different tests may not differ significantly from each other, and the marker must have proven its effectiveness for the diagnosis, prognosis, risk assessment and treatment of the affected diseases in independent studies. Not all biomarkers should be used to assess clinical outcomes, require different levels of validation depending on their intended use, and reflect a direct effect of the medicine [6]. Despite abundance of biomarkers for health state assessment, there is the consistent requirement for elaborating novel biomarkers, which may be applied for the diagnosis and treatment of global diseases.

This Thematic Issue summarized the current progress in developing novel molecular biomarkers based on advances in genetics and epigenetics. Specifically, DNA methylation as biomarkers was discussed in the context of metabolic disorders [7], hypertension [8], inflammatory bowel disease [9], and regenerative medicine [10]. Other biomarkers that are used in clinical studies of metabolic disorders are lncRNAs [11]. The most promising biomarkers for prognosis, diagnosis, and treatment of breast cancer were summarized in a very meticulous review [12]. An application of extracellular vesicles as epigenetic biomarkers was highlighted regarding cardiovascular diseases [13].

We would like to thank the authors of this issue for their contribution. We hope that the review of different genetic and epigenetic biomarkers will be valuable for the research of our readers.

REFERENCES


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