Editorial

Biological Function of G-Quadruplex Nucleic Acids and Potential Application in Medicinal Chemistry

G-Quadruplexes are special secondary structures adopted in some guanine-rich DNA sequences. The highly prevalent putative existence of G-quadruplex and the influence on genomic stability, telomere maintenance and gene expression indicate that G-quadruplexes may play important roles in biological processes [1]. Many research findings have provided substantive evidence for potential applications of G-quadruplex nucleic acids as promising anticancer targets [2-5]. In this volume of Current Topics in Medicinal Chemistry (CTMC), we summarized recent research articles with special focus on the research progress for the biological function of G-quadruplex nucleic acids and potential application in medicinal chemistry, which covers several aspects of content including telomere G-quadruplex as target, RNA G-quadruplex as target, G-quadruplex small molecular probes for cellular imaging, G-quadruplex interactive proteins, and G-quadruplex as tool for biological target detection and drug delivery. In particular, this issue highlights the research fields that are rapidly growing on G-quadruplex in recent years, where six review articles were selected dealing with many different themes and illustrations that contribute to understanding the research status of the biological function of G-quadruplex nucleic acids and potential application in Medicinal Chemistry and Pharmaceutical Sciences.

Below, we present six selected articles with a brief account of the contribution of each:

- Telomere G-quadruplex as a potential target to accelerate telomere shortening by expanding the incomplete end-replication of telomere DNA by Tan et al. – In this article, based on a mathematical modeling and experimental results, a hypothesis is proposed that the formation of G-quadruplex in telomere may contribute to the incomplete end-replication of telomere DNA during telomere replication. According to this, stabilization of telomere G-quadruplex by chemical ligand may promise to accelerate telomere shortening in proliferating cells.

- RNA G-quadruplex: the new potential targets for therapy by Ou et al. – In this article, the structures, the biological roles, and the potential to be as drug targets of RNA G-quadruplexes were addressed. The G-quadruplexes formed in RNA are involved in many biological process including telomere elongation, transcription regulate, pre-mRNA splicing and translation.

- Recent development of G-quadruplex probes for cellular imaging by Ma et al. – In this article, the significance for the development of specific probes for detecting and distinguishing G-quadruplex structures was addressed. It summarizes recent advances in the development of G-quadruplex probes over the past three years, with a particular emphasis on the detection and imaging of G-quadruplex structures within living cells.

- A fluorescent anti-cancer agent, 3,6-bis(1-methyl-4-vinylpyridinium) carbazole diiodide (BMVC), stains G-quadruplexes in cells and inhibits tumor growth by Chang et al. – In this article, the potential of the molecule BMVC, not only as a G-quadruplex fluorescent probe but also as an anticancer agent, was addressed. BMVC may become a useful tool to investigate several aspects of G-quadruplex nucleic acids.

- Biological function and medicinal research significance of G-quadruplex interactive proteins by Li et al. – In this article, the authors present a general summary of reported G-quadruplex binding proteins and their biological functions, with focus on those of medicinal research significance. It is pointed out the possibility for some of these G-quadruplex binding proteins and their complexes with G-quadruplexes as potential drug targets.

- G-quadruplexes’ applications in biological target detection and drug delivery by Zhou et al. – In this article, the application of G-quadruplex for biological target detection and drug delivery was addressed. The authors summarized some typical systems for various target detection by utilizing G-quadruplex as signal readout unit and also its use in drug delivery.

In the context of this special issue, we would like to thank all authors of the chapters listed above and for their important contribution to this issue of Current Topics in Medicinal Chemistry. We believe that this volume will contribute to the literature beneficial to scientists of different research fields related to G-quadruplexes in Medicinal Chemistry and Pharmaceutical Sciences.

CONFLICT OF INTEREST

The authors confirm that this editorial content has no conflicts of interest

REFERENCES