**Fascinating structures of DNA beyond double helix explored by NMR**

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**ABSTRACT**

Structure of DNA is best known for its double helix that comprises GC and AT complementary base pairs whose stacking contributes to stability. Guanine-rich nucleic acids can form G-quadruplexes in the presence of cations such as K+ or Na+ ions. These non-canonical four-stranded structures are composed of stacked layers of G-quartets, which are formed by four guanine residues connected by Hoogsteen-type hydrogen bonds. The distribution of G-rich sequences in the human genome is not random and their overrepresentation in the telomeric and promoter regions of human genes suggests that G-quadruplex formation may influence gene expression.

G-quadruplexes are very structurally diverse. Numerous G-quadruplex structural characteristics indicate that even for relatively simple G-rich DNA or RNA sequences possible structural motifs are still not known entirely. It is impossible to unequivocally predict folding topology from oligonucleotide sequence and assess its thermodynamic stability at the current state of knowledge. Both are however crucial for understanding biological functions of G-quadruplexes as well as for the use of these noncanonical structures as targets in development of new anticancer and antiviral drugs and in nanotechnological applications. NMR studies have contributed important insight to the field over the years.

In this talk our results will be presented based on selected recent references.

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