Editorial

G-Quadruplex Nucleic Acids

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G-quadruplexes are a family of four-stranded structures stabilized by guanine quartets, in which four planar guanines establish a cyclic array of hydrogen bonds. They are of special interest due to the increasing evidence for their formation *in vivo* and their possible implication in biology, especially at telomeres and as contributors to gene regulation. Moreover, G-quadruplexes are also formed as a result of self-assembling processes of guanosine derivatives, yielding several interesting motifs such as G-ribbons and G-wires which have peculiar electrical conductivity properties that are being explored as molecular wires.

This special issue is initiated with two articles discussing the self-assembling properties of guanosine derivatives which describe the basic principles of G-quadruplex formation. The first article by Neviani et al. analyzes the presence of several levels of organization of guanosine derivatives carrying one or two lipophilic units as observed by light scattering techniques and transmission electron microscopy (TEM) experiments. The second article by Mariani et al. describes a study on quadruplex formation of 2'-deoxyguanosine monophosphate by small-angle X-ray scattering techniques.

The determination of the structural properties of short G-rich oligonucleotides is the aim of the following three articles. First the formation and dimensions of G-wires formed by the assembly of short G-rich sequences have been investigated by dynamic light scattering and electrophoresis. Spindler et al. show that macromolecular aggregates formed by self-assembly of quadruplex (G-wires) up to 11 nm can be observed. Next, the structure of a G-quadruplex formed

between two cyclic oligonucleotides determined by nuclear magnetic resonance (NMR) and circular dichroism (CD) is described by Casals et al. Due to steric constraints, the global topology and the stability of the antiparallel G-quadruplex are different from the linear oligonucleotides. The adsorption and the redox behaviour of two intramolecular G-quadruplexes related with the thrombin binding aptamer are studied by atomic force microscopy (AFM) and voltammetry. Quadruplexes have distinct adsorption properties and redox behaviour that are characterized by Diculescu et al. in this article.

The natural occurrence and properties of G-quadruplex sequences including telomeres are the aim of the next three articles. Wong et al. provide useful information on a computational tool currently available at <http://www.quadruplex.org/> for predicting the formation of G-quadruplex from sequence data. Next, a comparative study of the impact of G-spot probes on affymetrix GeneChips of mammalia is described by Memon et al. The thermodynamic properties of human telomeric repeats are the aim of the next article by Viglaski et al. demonstrating the importance of the overhanging sequences as a determining factor for the thermal stability and topology of G-quadruplexes.

The last section of this special issue is devoted to the study of the binding of small molecules to G-quadruplexes. An extensive up-to-date review on macrocyclic ligands for G-quadruplex DNA recognition by Monchaud et al. is heading this section. A second manuscript by Granzhan et al. describes the search of cyclophan-type macrocycles with

enhanced selective binding to quadruplex over duplex DNA sequences. The characterization of the binding of distamycin A derivatives to the tetrameric parallel TGGGGT quadruplex by isothermal titration calorimetry (ITC) is the aim of the work of Pagano et al. In a successive study, the binding mode of telomestatin to G-quadruplex DNA has been analyzed by mass spectrometry. The requirement of an extra monovalent cation between telomestatin and G-quadruplex DNA is analyzed by molecular modelling by Gabelica et al. The synthesis and properties of novel ligands for G-quadruplex structures are addressed in the next two articles. Iida et al. describe the synthesis of a dimeric macrocyclic hexaoxazole with enhanced affinity to telomeric DNA. Ferreira et al. describe the synthesis of dimeric and trimeric acridines with affinity to G-quadruplex structures found in promoter regions of oncogenes. Finally the interactions of porphyrin-Zinc (II) complexes with an intramolecular G-quadruplex have been analyzed by spectroscopic and docking methods by Ishikawa et al.

The editors of the issue would like to thank all the authors and referees involved in the production and evaluation of the manuscripts for their efforts in the preparation of this first special issue of the Journal of Nucleic Acids. This special issue shows the large interdisciplinarity and international scope of the research on G-quadruplex. Special thanks are given to the COST Action MP0802 entitled "Self-assembled guanosine structures for molecular electronic devices" (G4net, <http://www.g4net.org/>) for providing the "natural" forum of discussion and elaboration of ideas, as well as an excellent technical assistance, absolutely precious for the development of this special issue.

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