Interactions between oligonucleotide secondary structures and Porphyrins

Maria Grazia Nolli[1*], Andrea Patrizia Falanga[1], Maria Marzano[1], Alessandro D'Urso[2], Stefano D'Errico[1], Gennaro Piccialli[1], Giorgia Oliviero[3] and Nicola Borbone[1].

First author[1*]

1 - Department of Pharmacy, Università degli studi di Napoli Federico II, via D. Montesano 49 - 80131 Naples
2 - Department of Chemical sciences, Cittadella Universitaria, V.le A. Doria 6, 95125 Catania.
3 - Department of Molecular Medicines and Medical Biotechnologies, Università degli studi di Napoli Federico II, via D. Montesano 49 - 80131 Naples

Oligonucleotide analogues (ODNs) are biomolecules with great scientific potential due to their remarkable properties (higher bioavailability, target affinity, stability and resistance to nuclease degradation). They can therefore be used as nanoprobes and biosensors, but also for the development of new materials in the field of nanotechnology[1]. ODNs and their analogues can adopt several secondary structures that play an important role in biology, biotechnology and nanotechnology[2]. In particular, ODNs rich in guanine can adopt secondary structures called G-quadruplexes, which are also very interesting from a diagnostic and therapeutic point of view[3]. In the human genome, G-quadruplexes are found in regions of genes of high regulatory importance (such as enhancers, promoters and oncogenes). Stabilisation and destabilisation of these secondary structures have been shown to influence the onset of disease. There is a field of research investigating the interactions between small molecules and DNA secondary structures, including G-quadruplexes. In this paper we focus on the interactions between G-quadruplexes and modified porphyrins, a class of macrocyclic compounds that play a very important role in the metabolism of living organisms[4].

References

(1) © 2013 Landes Bioscience SpeciAL FocuS ReVieW SpeciAL FocuS ReVieW; 2013. www.landesbioscience.com.

(2) SantaLucia, J.; Hicks, D. The Thermodynamics of DNA Structural Motifs. Annual Review of Biophysics and Biomolecular Structure. 2004, pp 415–440. https://di.org/10.1146/annurev.biophys.32.110601.141800.

(3) Oliviero, G.; D'Errico, S.; Pinto, B.; Nici, F.; Dardano, P.; Rea, I.; De Stefano, L.; Mayol, L.; Piccialli, G.; Borbone, N. Self-Assembly of g-Rich Oligonucleotides Incorporating a 3'-3' Inversion of Polarity Site: A New Route towards G-Wire DNA Nanostructures. ChemistryOpen 2017, 6 (4), 599–605. https://doi.org/10.1002/open.201700024.

(4) Biesaga, M.; Pyrzyn´ska, K.; Pyrzyn´ska, P.; Trojanowicz, M. Porphyrins in Analytical Chemistry. A Review; 2000; Vol. 51. www.elsevier.com/locate/talanta.