



Università degli Studi di Napoli Federico II

PhD in Biotechnology - 35th Cycle

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DNA and analogs in therapy, diagnostics and new materials development.

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The Ph.D. program will focus on the investigation of oligonucleotides and their analogues. G-quadruplex structures as secondary structures of DNA are oligonucleotide molecules studied for applications both in therapy and diagnostics. These structures have been found in significant regions of the genome [1] and are observed in many scaffolds of aptamers. G-quadruplexes can also be used to create supramolecular structures and have potential use in nanotechnology and the creation of new hybrid materials [2].

The most extensively investigated DNA analogue is Peptide Nucleic Acid (PNA). PNA has been investigated in pro-gene, antigene, antisense, and anti-miR processes. DNA/PNA hybrids can also be used as biosensors by immobilization of PNA strands on a transducer surface able to recognize binding events with DNA strands.

The Ph.D. proposal research will regard the study oligonucleotides and analogues in diagnostic, therapy and in the development of new DNA based supramolecular structures:

The major topics will regard:

1. new anti-HIV aptamers based on branched DNA structures;
2. synthesis of conjugated PNA with fluorescent probes or cell-penetrating molecules;
3. development of new G-quadruplex polymers and composite material
4. DNA/APTAMER/PNA biosensors for diagnostics and studies of binding.

References

1. Davis, J. T. (2004) G-quartets 40 years later: from 5'-GMP to molecular biology and supramolecular chemistry. *Angew. Chem., Int. Ed.* 43, 668– 698, DOI: 10.1002/anie.200300589
2. Oliviero, G., D'Errico, S., Pinto, B., Nici, F., Dardano, P., Rea, I., ... Borbone, N. (2017). Self-assembly of G-rich oligonucleotides incorporating a 3'-3' inversion of polarity site: A new route towards G-Wire DNA nanostructures. *ChemistryOpen*, 6(4), 599–605.