Quantum Mechanical Studies of DNA and LNA

Quantum mechanical (QM) methodology has been employed to study the structure activity relations of DNA and locked nucleic acid (LNA). The QM calculations provide the basis for construction of molecular structure and electrostatic surface potentials from molecular orbitals. The topologies of the electrostatic potentials were compared among model oligonucleotides, and it was observed that small structural modifications induce global changes in the molecular structure and surface potentials. Since ligand structure and electrostatic potential complementarity with a receptor is a determinant for the bonding pattern between molecules, minor chemical modifications may have profound changes in the interaction profiles of oligonucleotides, possibly leading to changes in pharmacological properties. The QM modeling data can be used to understand earlier observations of antisense oligonucleotide properties, that is, the observation that small structural changes in oligonucleotide composition may lead to dramatic shifts in phenotypes. These observations should be taken into account in future oligonucleotide drug discovery, and by focusing more on non RNA target interactions it should be possible to utilize the exhibited property diversity of oligonucleotides to produce improved antisense drugs.

General information
State: Published
Organisations: Department of Chemistry, Physical and Biophysical Chemistry, Department of Physics, Biophysics and Fluids, Santaris Pharma A/S
Authors: Koch, T. (Ekstern), Shim, I. (Intern), Lindow, M. (Ekstern), Orum, H. (Ekstern), Bohr, H. G. (Intern)
Number of pages: 10
Pages: 139-148
Publication date: 2014
Main Research Area: Technical/natural sciences

Publication information
Journal: Nucleic Acid Therapeutics
Volume: 24
Issue number: 2
ISSN (Print): 1545-4576
Ratings:
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.38 SJR 1.203 SNIP 0.53
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 3.29 SJR 1.597 SNIP 0.907
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.56 SJR 1.244 SNIP 0.782
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 2.94 SJR 1.051 SNIP 0.803
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 1.97 SJR 0.909 SNIP 0.605
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.064 SNIP 0.712
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.271 SNIP 0.592
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.038 SNIP 0.562
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.701 SNIP 0.483
Scopus rating (2007): SJR 0.95 SNIP 0.589
Scopus rating (2006): SNIP 0.533 SJR 1.072
Scopus rating (2005): SNIP 0.842 SJR 1.482