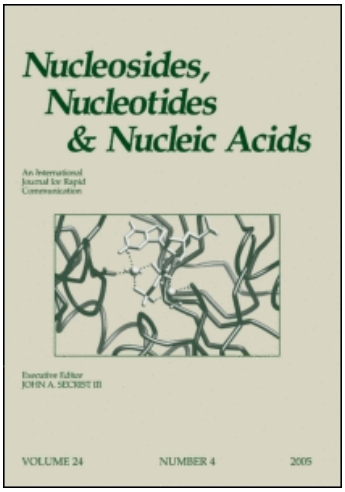

Nucleosides, Nucleotides and Nucleic Acids
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713597286

Oligodeoxyxylonucleotides Form Stable Triplexes with Single-Stranded DNA

M. B. Gottikh[a]; Y. I. Alekseev[ab]; A. V. Perminov[a]; M. D. Pinskaya[a]; Z. A. Shabarova[a]
[a] Belozersky Institute of Physico-Chemical Biology, Moscow State University, Moscow, RUSSIA [b] Syntol Co., MOSCOW, RUSSIA

To cite this Article Gottikh, M. B. , Alekseev, Y. I. , Perminov, A. V. , Pinskaya, M. D. and Shabarova, Z. A.(1999) 'Oligodeoxyxylonucleotides Form Stable Triplexes with Single-Stranded DNA', Nucleosides, Nucleotides and Nucleic Acids, 18: 6, 1625 — 1627
To link to this Article: DOI: 10.1080/07328319908044803
URL: http://dx.doi.org/10.1080/07328319908044803

NUCLEOSIDES & NUCLEOTIDES, 18(6&7), 1625–1627 (1999)

OLIGODEOXYXYLONUCLEOTIDES FORM STABLE TRIPLEXES WITH SINGLE-STRANDED DNA

Gottikh M.B.[1], Alekseev Y.I. *[1,2], Perminov A.V.[1], Pinskaya M.D.[1], Shabarova Z.A.[1]

1-Belozersky Institute of Physico-Chemical Biology, Moscow State University, Vorob'evy Hills, 119899, Moscow, RUSSIA; 2-Syntol Co., Timiryazevskaya ul. 42, 127550, Moscow, RUSSIA

ABSTRACT: The ability of oligodeoxyxylopyrimidilates to form triplexes with complementary single-stranded DNA at the neutral pH was found. The complex composition, relative strand orientation and base-pairing scheme were determined using electromobility shift assay and thermal denaturation experiments.

Inversion of the 3'-hydroxyl group over furanose ring of a deoxyribonucleoside results in a new isomer, deoxyxylonucleoside, having the changed sugar conformation. The fact of complex formation between oligodeoxyxylothymidilates and oligodeoxyriboadenylates was established for the first time by F.Seela and collaborators using thermal denaturation experiments [1]. The authors assumed that dodecadeoxyriboadenylate forms a duplex with dodecadeoxyxylothymidilate with unusual, Z-like, probably, left-handed helix form. We have investigated a complex formation between C,T-containing oligodeoxyxylopyrimidilates and their complementary oligodeoxyribonucleotides. Original methods have been elaborated to synthesize fully-protected deoxyxylo-C, T and 5-methylC phosphoramidites. To determine mutual strand orientation and possible base-pairing scheme in the modified complexes the following set of oligonucleotides was synthesized. An oligodeoxyribonucleotide 5'-GAAGGGGGAAAG-3' [D-Pu] was prepared as a template for the complex formation. Complementary oligodeoxyribonucleotides 5'-CTTTCCCCCTTC-3' [Py-apar],

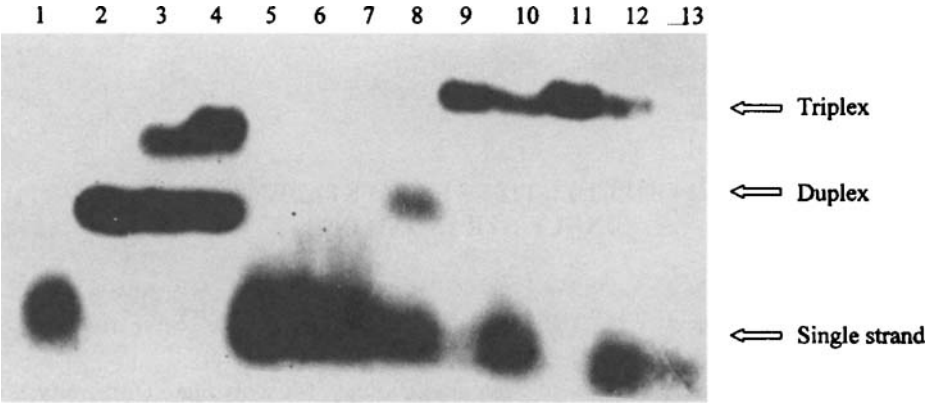

FIG. Analysis of the complex electromobility at pH 7 in 20% non-denaturating PAAG (0.02 M Tris-acetate, 0.1 M Na-acetate, 0.01 M Mg-acetate). Lanes: 1-[^{32}P]-labeled D-Pu (*pD-Pu); 2- Py-apar/*pD-Pu; 3-apar/*pD-Pu/Py-par; 4: Py-apar/*pD-Pu/5MePy-par; 5-5MePy-par/*pD-Pu; 6- Py-par/*pD-Pu; 7- xPy-apar/*pD-Pu; 8- xPy-par/*pD-Pu; 9- xPy-apar/*pD-Pu/xPy-par (strand ratio 1:1:1); 10- xPy-apar/*pD-Pu/xPy-par (strand ratio 1:2:1); 11- xPy-apar/*pD-Pu/5MexPy-par (strand ratio 1:1:1); 12- xPy-apar/*pD-Pu/5Mexy-par (strand ratio 1:2:1); 13- 5MexPy-par/*pD-Pu.

5'-CTTCCCCCTTTC'-3' [Py-par], 5'-^{me}CTT^{me}C^{me}C^{me}C^{me}C^{me}CTTT^{me}C-3' [5MePy-par] and oligodeoxyxylonucleotides 5'-x(CTTTCCCCCTTC)dG-3' [xPy-apar] 5'-(CTTCCCCCTTTC)dA-3' [xPy-par], 5'-x(^{me}CTT^{me}C^{me}C^{me}C^{me}C^{me}CTTT^{me}C)dA-3' [5MexPy-par] were designed as parallel and antiparallel complementary strands. The Figure represents that oligonucleotides xPy-par and xPy-apar form a complex with D-Pu at pH 7 (lanes 9-10). Taking into account its electrophoretical mobility and partial excluding of the D-Pu strand from the complex when a strand ratio is 1:2:1, we can conclude that this complex is a triplex. The strand orientation in this triplex is the same as in its natural analog Py-apar/D-Pu/Py-par (lane 3). Deoxyxylocytidine methylation increases the efficiency of the triplex formation (compare lanes 9 and 11), the same result was found for the natural triplex (lanes 3 and 4). Suprisingly, no complex formation was detected between xPy-apar and D-Pu (lane 7), whereas xPy-par partially forms a complex with D-Pu (lane 8). Using thermal denaturation study we have found that the melting curve for the modified triplex shows one transition with T_m equal to 51°C at pH 7, which is near the same as for the corresponding native duplex D-Pu/Py-apar, T_m=52°C. The

protonation of deoxyxylocytidine additionally increases the modified triplex thermostability up to 62°C at pH 5. This may indicate that a base-pairing scheme in the modified triplex is the same as in its natural analog.

REFERENCE

1. Rosemeyer, H.; Seela, F. *Helvetica Chimia Acta*, **1991**, 74, 748-760.