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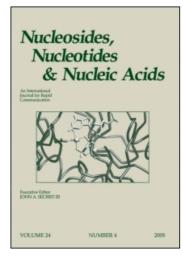
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## Nucleosides, Nucleotides and Nucleic Acids

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

# Oligonucleotides Containing Disaccharide Nucleosides: Synthesis, Physicochemical, and Substrate Properties

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Online publication date: 09 August 2003

**To cite this Article** Mikhailov, S. N. , Efimtseva, E. V. , Ermolinsky, B. S. , Bobkov, G. V. , Andreeva, O. I. , Golubeva, A. S. , Kochetkov, S. N. , Van Aerschot, A. , Schepers, G. and Herdewijn, P.(2003) 'Oligonucleotides Containing Disaccharide Nucleosides: Synthesis, Physicochemical, and Substrate Properties', Nucleosides, Nucleotides and Nucleic Acids, 22: 5, 1117-1118

To link to this Article: DOI: 10.1081/NCN-120022750 URL: http://dx.doi.org/10.1081/NCN-120022750

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### NUCLEOSIDES, NUCLEOTIDES & NUCLEIC ACIDS Vol. 22, Nos. 5–8, pp. 1117–1118, 2003

# Oligonucleotides Containing Disaccharide Nucleosides: Synthesis, Physicochemical, and Substrate Properties

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### **ABSTRACT**

The efficient synthesis of oligonucleotides containing 2'-O- $\beta$ -D-ribofuranosyl (and  $\beta$ -D-ribopyranosyl)nucleosides, 2'-O- $\alpha$ -D-arabinofuranosyl (and  $\alpha$ -L-arabinofuranosyl)nucleosides, 2'-O- $\beta$ -D-erythrofuranosylnucleosides, and 2'-O-(5'-amino-5-deoxy- $\beta$ -D-ribofuranosyl)nucleosides have been developed.

Key Words: Oligonucleotides; Disaccharide nucleosides; Chemical synthesis; Substrate properties.

Recently we have developed a simple route for the preparation of disaccharide nucleosides, an important group of natural compounds. Disaccharide nucleosides with a  $2'-O-\beta-D-ribofuranose$ ,  $2'-O-\beta-D-ribofuranose$ ,  $2'-O-\alpha-D-a-rabinofuranose$ ,

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1525-7770 (Print); 1532-2335 (Online)



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2'-O-α-L-arabinofuranose, 2'-O-β-D-erythrofuranose, and 2'-O-(5-amino-5-deoxy-β-D-ribofuranose) substituents were synthesized. These modified nucleosides were incorporated into oligonucleotides. Single substitution results in a ΔTm of +0.5°C to -0.4°C for DNA/RNA and a ΔTm of -0.8°C to -4.7°C for DNA/DNA duplexes. These disaccharide nucleosides can be accommodated well in RNA/DNA duplexes and the presence of a 5"-amino group has a beneficial effect on duplex stability. Previously the conformation of the self-complementary decaribonucleotide containing 2'-O-β-D-ribofuranosyladenosine was studied using high-resolution NMR spectroscopy and restrained molecular dynamics. It was found that the duplex RNA maintains an A-type helical geometry with extra 2'-O-ribose moiety located in the minor groove.

Several oligodeoxyribonucleotides containing 2'-O-β-D-ribofuranosyladenosine were used as modified primers in RNA-templated DNA synthesis catalyzed by HIV reverse transcriptase. It was shown that the additional 2'-ribofuranose residue in specific position (-4) of primer prevents its elongation due to the steric hindrances. <sup>[4]</sup> This finding might be of general value and such primers with bulky groups might be used for specific inhibition of different polymerases.

#### **ACKNOWLEDGMENT**

This work was supported by the Russian Foundation for Basic Research, Russian federal program "National priorities in medicine and public health/AIDS," and the KUL Research Council.

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