

## Nucleosides, Nucleotides and Nucleic Acids

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/lncn20>

### METHYL 5-O-BENZOYL-2,3-OXAZOLE-D-RIBOFURANOSIDE: A USEFUL INTERMEDIATE FOR THE SYNTHESIS OF CONFORMATIONALLY RESTRAINED NUCLEOSIDES

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Published online: 07 Feb 2007.

To cite this article: José Molina, Hannah L. Maslen & Claire Simons (2001) METHYL 5-O-BENZOYL-2,3-OXAZOLE-D-RIBOFURANOSIDE: A USEFUL INTERMEDIATE FOR THE SYNTHESIS OF CONFORMATIONALLY RESTRAINED NUCLEOSIDES, *Nucleosides, Nucleotides and Nucleic Acids*, 20:4-7, 981-983, DOI: [10.1081/NCN-100002473](https://doi.org/10.1081/NCN-100002473)

To link to this article: <http://dx.doi.org/10.1081/NCN-100002473>

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**METHYL 5-*O*-BENZOYL-2,3-OXAZOLE-D-RIBOFURANOSIDE: A USEFUL INTERMEDIATE FOR THE SYNTHESIS OF CONFORMATIONALLY RESTRAINED NUCLEOSIDES**

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**ABSTRACT**

The synthesis of methyl 5-*O*-benzoyl-2,3-oxazole-D-ribofuranoside, a tetrahydrofuro [3,4-*d*]oxazole is described. The key step involves the reaction of methyl 3-amino-3-deoxy-5-*O*-benzoyl-D-ribofuranoside with *N,N*-dimethylformamide dimethyl acetal with cyclisation to the 2,3-oxazole *via* a prototropic rearrangement-elimination reaction.

The conformation of nucleosides is important for optimal binding at a specified enzyme active site and can therefore have a profound impact on the biological activity. For example, conformational analysis of HIV-1 reverse transcriptase inhibitors has shown that the 3'-exo (and to a lesser extent 2'-endo) character of the sugar moiety with a *trans* (*ap*) C4'–C5' conformation is the most favourable conformation with regards to biological activity (1). The introduction of either fused rings, *e.g.* benzofuran (2), in place of the sugar moiety or the introduction of cyclic moieties, *e.g.* cyclopropyl (3), in the sugar component, can result in the nucleoside being 'locked' in a specific conformation. The objective was to develop methodology for the synthesis of novel tetrahydrofuro[3,4-*d*]oxazoles (2,3-oxazole-D-ribofuranosides), which could be used for the synthesis of conformationally restrained nucleosides.

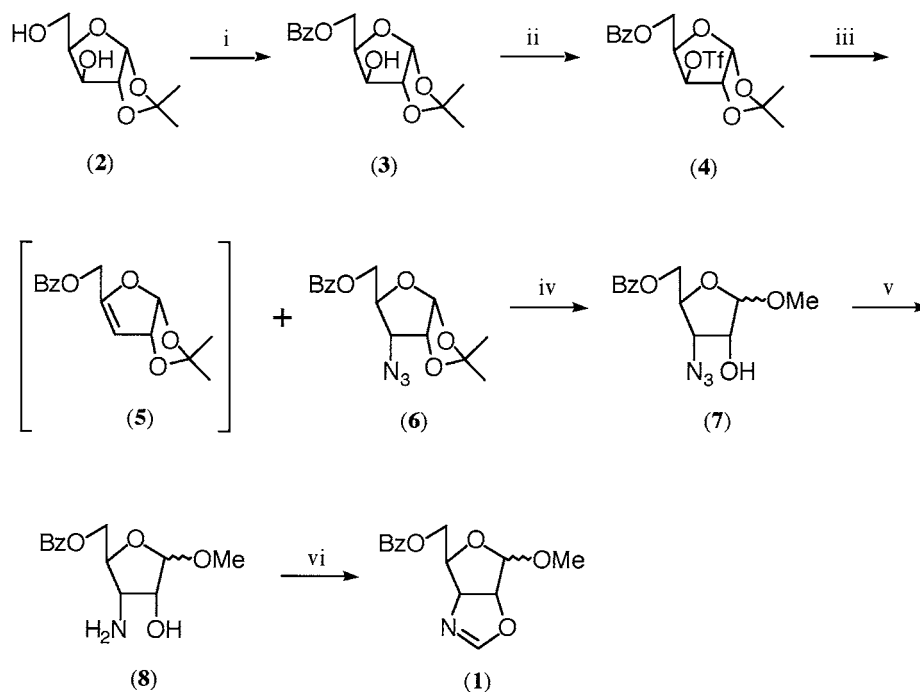
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Initial studies involved the synthesis of methyl 2,3-oxazole-D-glucufuranoside, which was achieved in five steps from diacetone-D-glucose (4). The methodology established in this synthesis was then applied to the preparation of the required methyl 5-*O*-benzoyl-2,3-oxazole-D-ribofuranoside **1**, using 1,2-*O*-isopropylidene-D-xylofuranose **2** as the starting material.

After selective 5-*O*-benzoylation to give **3**, the 3-hydroxy was then converted to the triflate **4** in quantitative yield on reaction with triflic anhydride. Displacement of the triflate with azide anion gave the 3-azido-sugar **6** in only 26% yield owing to a competing base-induced elimination of TfOH from **4**, resulting in the formation of the 3,4-ene-sugar **5** in 44% yield (Scheme 1).

Removal of the 1,2-*O*-isopropylidene group of **6** with concomittant methylation at C-1 was achieved in a 1-pot reaction to give the methyl furanoside **7**, using methodology previously described by us (5), and reduction of the azido function with  $\text{Ph}_3\text{P}/\text{H}_2\text{O}$  gave the precursor methyl 3-amino-3-deoxy-5-*O*-benzoyl-D-ribofuranoside **8**. The resulting amino-sugar **8** was reacted with *N,N*-dimethylformamide dimethylacetal to give the cyclised product, methyl 5-*O*-benzoyl-2,3-oxazole-D-ribofuranoside **1**, via a prototropic rearrangement followed by ring closure with consecutive elimination of dimethylamine (5).



**Scheme 1.** Reagents and conditions: (i) BzCl, pyridine,  $\text{CH}_2\text{Cl}_2$ ,  $-20$  to  $-30^\circ\text{C}$ , 10 min, 84% (ii)  $\text{Tf}_2\text{O}$ , pyridine,  $\text{CH}_2\text{Cl}_2$ ,  $-20^\circ\text{C}$ , 1.5 h, 97% (iii)  $\text{NaN}_3$ , DMF,  $50^\circ\text{C}$ , 2 h, 44% for **5** and 26% for **6** (iv) 0.5% wt/vol  $\text{I}_2$  in MeOH,  $80^\circ\text{C}$ , 7 h then r.t. o/n, 80% (v)  $\text{Ph}_3\text{P}$ , THF, r.t. 1 h then  $\text{H}_2\text{O}$ ,  $60^\circ\text{C}$ , 30 min, 86% (vi) *N,N*-dimethylformamide dimethylacetal, DMF, 20 h, 85%.



The methodology for the synthesis of novel tetrahydrofuro[3,4-*d*]oxazoles has been applied to the synthesis of a 2,3-oxazole-fused-ribose intermediate, which can be employed in the preparation of conformationally restrained nucleosides. Further work involving the preparation of conformationally restrained nucleosides using the tetrahydrofuro[3,4-*d*]oxazoles, as well as extension of the described methodology for the preparation of intermediates with modification in both the oxazole component and position of fusion, is currently underway.

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