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Article

1997

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How to cite

BERNARDINELLI, Gérald Hugues, TRONCHET, Jeannine, TRONCHET, Jean Marcel Julien. Methyl 2-Aza-2-deoxy-4,6-di-*O*-methyl-2-*N*-(*p*-nitrophenylamino)- β -D-*erythro*-hexopyranosid-3-ulose. In: Acta crystallographica. Section C, Crystal structure communications, 1997, vol. 53, n° 7, p. 950–951. doi: 10.1107/S0108270197002345

This publication URL: <https://archive-ouverte.unige.ch/unige:81162>

Publication DOI: [10.1107/S0108270197002345](https://doi.org/10.1107/S0108270197002345)

References

- Berkovitch-Yellin, Z. & Leiserowitz, L. (1977). *Acta Cryst.* B33, 3657–3669.
- Blessing, R. H., Coppens, P. & Becker, P. (1974). *J. Appl. Cryst.* 7, 488–492.
- Enraf–Nonius (1977). *CAD-4 Operations Manual*. Enraf–Nonius, Delft, The Netherlands.
- Fair, C. K. (1990). *MolEN. An Interactive Intelligent System for Crystal Structure Analysis*. Enraf–Nonius, Delft, The Netherlands.
- Johnson, C. K. (1976). *ORTEP II*. Report ORNL-5138. Oak Ridge National Laboratory, Tennessee, USA.
- Killeen, R. C. G. & Lawrence, J. L. (1969). *Acta Cryst.* B25, 1750–1752.
- Main, P., Fiske, S. J., Hull, S. E., Lessinger, L., Germain, G., Declercq, J.-P. & Woolfson, M. M. (1980). *MULTAN80. A System of Computer Programs for the Automatic Solution of Crystal Structures from X-ray Diffraction Data*. Universities of York, England, and Louvain, Belgium.
- Morken, P. A., Bachand, P. C., Swenson, D. C. & Burton, D. J. (1993). *J. Am. Chem. Soc.* 115, 5430–5439.
- Morken, P. A., Baenziger, N. C., Burton, D. J., Bachand, P. C., Davis, C. R., Pedersen, S. D. & Hansen, S. W. (1991). *J. Chem. Soc. Chem. Commun.* pp. 566–567.
- Tinant, B., Declercq, J., Bouvy, D., Janousek, Z. & Viehe, H. G. (1993). *J. Chem. Soc. Perkin Trans. 2*, pp. 911–915.
- Zachariasen, W. H. (1963). *Acta Cryst.* 16, 1139–1144.

Acta Cryst. (1997). C53, 950–951

Methyl 2-Aza-2-deoxy-4,6-di-*O*-methyl-2-*N*-(*p*-nitrophenylamino)- β -D-erythro-hexopyranosid-3-ulose

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(Received 12 December 1996; accepted 5 February 1997)

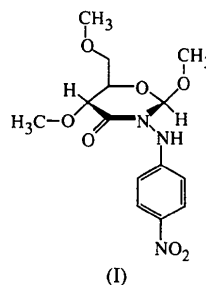
Abstract

All asymmetric C atoms of the title compound, C₁₄H₁₉N₃O₇, are in the *R* configuration. The azapyranose ring adopts a half-chair conformation with substituents in equatorial and quasi-equatorial positions. The molecular packing is fixed by hydrogen bonds involving the amino group and one of the methoxy substituents.

Comment

Six-membered sugar lactams can be obtained by oxidative ring enlargement of furanose *p*-nitrophenyl hydrazones (Tronchet, Tronchet, Rachidzadeh, Barbalat-

Rey & Bernardinelli, 1988). The reaction proceeds generally regioselectively and the configuration of the existing asymmetric C atoms is preserved. These compounds are potential glycosidase inhibitors (Look, Fotsh & Wong, 1993). The title compound has been prepared (Tronchet, Tronchet, Barbalat-Rey & Bernardinelli, 1997) from methyl 2-deoxy-3,5-di-*O*-methyl-2-(*p*-nitrophenylhydrazono)- β -D-erythro-pentofuranoside which was oxidized (lead tetraacetate) to an epimeric mixture of azoacetates, which upon saponification of their ester function underwent a base-catalyzed ring enlargement. X-ray analysis was deemed necessary to assess the geometrical features of this new type of sugar analogue which has an anomeric center of the unusual orthoester type, particularly its solid-state conformation, and to confirm the configuration established by ¹H NMR. Despite numerous attempts at crystallization only very fine needle crystals could be obtained.



Since the configuration at the C3 atom is known (*R*) and preserved during the regioselective synthesis, the absolute configuration of the molecule is well determined as 2*R*,3*R*,4*R*. The minimum value of the asymmetry parameters (Nardelli, 1983) shows that the azapyranose ring adopts a half-chair conformation with a pseudo-twofold axis passing through the O1—C3 bond [$\Delta C_2(O1—C3) = 0.012(5)$]. The substituents at C2 and C4 are located in quasi-equatorial positions whereas the methoxymethyl group at C3 is equatorial. In the crystal the molecules are associated in chains along the *b* axis by hydrogen-bond interactions involving the amino group and the anomeric methoxy group at C4 [$N2 \cdots O5(x, y - 1, z) = 2.89(1) \text{ \AA}$; $N2—H02 \cdots O5 = 138.2(4)^\circ$].

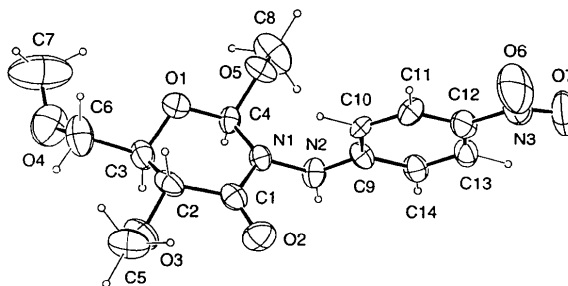


Fig. 1. View of the title compound with atomic labelling. Ellipsoids are represented at the 40% probability level.

Experimental

Crystals [m.p. 419.9–420.11 K, $[\alpha]_D^{21} + 11.7$ (c, 0.6, CHCl₃)] were grown at room temperature from ethyl ether/ethanol solution.

Crystal data

C ₁₄ H ₁₉ N ₃ O ₇	Cu K α radiation
$M_r = 341.3$	$\lambda = 1.5418 \text{ \AA}$
Monoclinic	Cell parameters from 23 reflections
C2	$\theta = 5.5\text{--}21.5^\circ$
$a = 21.574 (1) \text{ \AA}$	$\mu = 0.965 \text{ mm}^{-1}$
$b = 4.5576 (9) \text{ \AA}$	$T = 293 \text{ K}$
$c = 17.039 (2) \text{ \AA}$	Fine needle elongated along b
$\beta = 104.238 (5)^\circ$	$0.27 \times 0.07 \times 0.025 \text{ mm}$
$V = 1623.9 (4) \text{ \AA}^3$	Yellow
$Z = 4$	
$D_x = 1.396 \text{ Mg m}^{-3}$	
D_m not measured	

Data collection

Enraf–Nonius CAD-4 diffractometer	$R_{\text{int}} = 0.032$
$\omega/2\theta$ scans	$\theta_{\text{max}} = 54^\circ$
Absorption correction: analytical by integration	$h = -22 \rightarrow 22$
$T_{\text{min}} = 0.887$, $T_{\text{max}} = 0.972$	$k = 0 \rightarrow 4$
2491 measured reflections	$l = 0 \rightarrow 17$
2403 independent reflections	2 standard reflections
1371 reflections with $F > 4\sigma(F)$	frequency: 30 min
	intensity decay: none

Refinement

Refinement on F^2	$\Delta\rho_{\text{max}} = 0.326 \text{ e \AA}^{-3}$
$R(F) = 0.076$	$\Delta\rho_{\text{min}} = -0.333 \text{ e \AA}^{-3}$
$wR(F^2) = 0.074$	Extinction correction: none
$S = 2.342$	Scattering factors from <i>International Tables for X-ray Crystallography</i> (Vol. IV)
1804 reflections	Absolute configuration: Flack XABS refined
217 parameters	Flack parameter = 0.5 (1.0)
H atoms in calculated positions with $U_{\text{iso}} = 0.05$	
$w = 1/\sigma^2(F^2)$	
$(\Delta/\sigma)_{\text{max}} = 0.09$	

Table 1. Selected geometric parameters ($\text{\AA}$, $^\circ$)

O1—C3	1.427 (14)	N1—C1	1.408 (14)
O1—C4	1.394 (14)	N1—C4	1.471 (14)
O2—C1	1.197 (15)	N2—C9	1.366 (14)
O3—C2	1.391 (16)	C1—C2	1.541 (18)
O5—C4	1.376 (16)	C2—C3	1.502 (16)
N1—N2	1.384 (13)	C3—C6	1.518 (19)
C3—O1—C4	111.4 (8)	N1—C1—C2	113.0 (10)
N2—N1—C1	117.1 (10)	C1—C2—C3	111.7 (9)
N2—N1—C4	112.6 (7)	O1—C3—C2	108.3 (10)
C1—N1—C4	124.8 (9)	O1—C4—N1	110.4 (8)
N1—N2—C9	120.7 (10)		
C4—O1—C3—C2	70.9 (11)	C4—N1—C1—C2	−16.3 (17)
C3—O1—C4—N1	−55.1 (12)	C1—N1—C4—O1	28.7 (17)
C5—O3—C2—C1	100.2 (12)	N1—N2—C9—C10	5.0 (17)
C7—O4—C6—C3	−104.3 (18)	N1—C1—C2—C3	28.6 (16)
C8—O5—C4—N1	127.7 (10)	C1—C2—C3—O1	−55.0 (14)
C1—N1—N2—C9	−89.7 (14)	C2—C3—C6—O4	−162.2 (13)

The coordinates of the H atoms have been calculated.

Data collection: *CAD-4 Software* (Enraf–Nonius, 1989). Cell refinement: *Xtal LATCON* (Hall, Flack & Stewart, 1992). Data reduction: *Xtal REFCAL*, *LSABS* (Blanc, Schwarzenbach & Flack, 1991), *SORTRF*. Program(s) used to solve structure: *MULTAN87* (Main *et al.*, 1987). Program(s) used to refine structure: *Xtal CRYLSQ*. Molecular graphics: *Xtal ORTEP*. Software used to prepare material for publication: *Xtal BONDLA*, *CIFIO*.

Supplementary data for this paper are available from the IUCr electronic archives (Reference: HA1186). Services for accessing these data are described at the back of the journal.

References

- Blanc, E., Schwarzenbach, D. & Flack, H. D. (1991). *J. Appl. Cryst.* **24**, 1035–1041.
- Enraf–Nonius (1989). *CAD-4 Software*. Version 5.0. Enraf–Nonius, Delft, The Netherlands.
- Hall, S. R., Flack, H. D. & Stewart, J. M. (1992). Editors. *Xtal3.2 Reference Manual*. Universities of Western Australia, Australia, Geneva, Switzerland, and Maryland, USA.
- Look, G. C., Fotsh, C. H. & Wong, C. H. (1993). *Acc. Chem. Res.* **26**, 182–190.
- Main, P., Fiske, S. J., Hull, S. E., Lessinger, L., Germain, G., Declercq, J.-P. & Woolfson, M. M. (1987). *MULTAN87. A System of Computer Programs for the Automatic Solution of Crystal Structures from X-ray Diffraction Data*. Universities of York, England, and Louvain, Belgium.
- Nardelli, M. (1983). *Comput. Chem.* **7**, 95–98.
- Tronchet, J. M. J., Tronchet, J. F., Barbalat-Rey, F. & Bernardinelli, G. (1997). *Carbohydr. Res.* Submitted.
- Tronchet, J. M. J., Tronchet, J. F., Rachidzadeh, F., Barbalat-Rey, F. & Bernardinelli, G. (1988). *Carbohydr. Res.* **181**, 97–114.

Acta Cryst. (1997). **C53**, 951–954

Refinement of Ibuprofen at 100 K by Single-Crystal Pulsed Neutron Diffraction

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(Received 1 November 1996; accepted 24 February 1997)

Abstract

The structure of racemic ibuprofen [α -methyl-4-(2-methylpropyl)benzeneacetic acid], C₁₃H₁₈O₂, has been refined using single-crystal pulsed neutron diffraction data collected at 100 K. Accurate positional and