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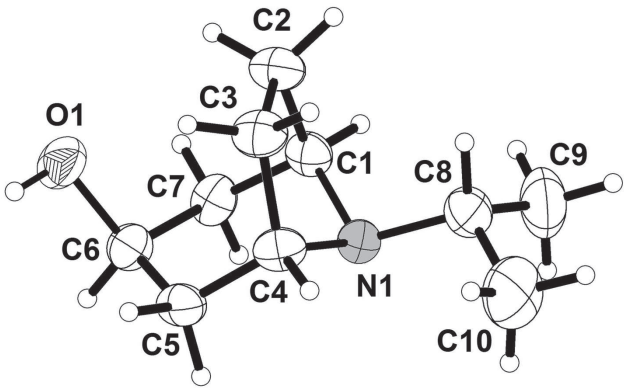
Crystal structure of 8-isopropyl-8-aza-bicyclo [3.2.1]octan-3-ol, $C_{10}H_{19}NO$



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Abstract

$C_{10}H_{19}NO$, monoclinic, $P2_1/c$ (no. 14), $a = 6.2427(16)$ Å, $b = 9.553(2)$ Å, $c = 16.932(4)$ Å, $\beta = 100.094(7)°$, $V = 994.1(4)$ Å^3, $Z = 4$, $R_{gt}(F) = 0.060$, $wR_{ref}(F^2) = 0.094$, $T = 296(2)$ K.

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The asymmetric unit of the title crystal structure is shown in the figure. Tables 1 and 2 contain details of the measurement method and a list of the atoms including atomic coordinates and displacement parameters.

Source of material

The compound we report is easily available by a literature known synthesis [1]. In a 500 mL three-neck flask, a mixture of 2,5-dimethoxy-tetrahydrofuran (50 g, 378.3 mmol) and HCl (33%, 170 mL) was stirred at reflux temperature for 3 h. Then isopropylamine hydrochloride (43.4 g, 453.96 mmol) and sodium acetate (31 g, 378.3 mmol) was added. Finally, 1,3-acetonedicarboxylic acid (55.27 g, 378.3 mmol) was added

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Table 1: Data collection and handling.

Crystal:	Colourless blocks
	Size 0.27 × 0.20 × 0.16 mm
Wavelength:	Mo $K\alpha$ radiation (0.71073 Å)
μ:	0.7 cm^{-1}
Diffractometer, scan mode:	Nonius CAD4, $\omega/2\theta$
$2\theta_{max}$, completeness:	50.8°, >98%
$N(hkl)_{measured}$, $N(hkl)_{unique}$, R_{int}:	5669, 1826, 0.108
Criterion for I_{obs}, $N(hkl)_{gt}$:	$I_{obs} > 2\ \sigma(I_{obs})$, 923
$N(param)_{refined}$:	114
Programs:	CAD4 programs [4, 5], SHELX [6]

Table 2: Fractional atomic coordinates and isotropic or equivalent isotropic displacement parameters (Å^2).

Atom	x	y	z	U_{iso}*/U_{eq}
C1	−0.0607(3)	0.6121(2)	0.30990(12)	0.0374(6)
H1	−0.1830	0.6708	0.3188	0.045*
C2	−0.0811(4)	0.4647(2)	0.34465(14)	0.0483(7)
H2A	−0.1626	0.4673	0.3884	0.058*
H2B	−0.1524	0.4011	0.3037	0.058*
C3	0.1556(3)	0.4204(2)	0.37460(14)	0.0465(7)
H3A	0.1901	0.3352	0.3483	0.056*
H3B	0.1824	0.4056	0.4322	0.056*
C4	0.2893(3)	0.5443(2)	0.35190(13)	0.0391(6)
H4	0.4242	0.5541	0.3910	0.047*
C5	0.3398(3)	0.5354(2)	0.26742(13)	0.0422(6)
H5A	0.4186	0.6190	0.2570	0.051*
H5B	0.4344	0.4558	0.2644	0.051*
C6	0.1397(4)	0.5210(2)	0.20244(13)	0.0420(6)
H6	0.1766	0.5524	0.1514	0.050*
C7	−0.0448(3)	0.6102(2)	0.22151(12)	0.0407(6)
H7A	−0.1807	0.5754	0.1913	0.049*
H7B	−0.0255	0.7053	0.2040	0.049*
C8	0.1260(4)	0.7108(2)	0.43824(14)	0.0502(7)
H8	0.0630	0.6323	0.4636	0.060*
C9	−0.0242(4)	0.8355(3)	0.43603(15)	0.0773(9)
H9A	0.0351	0.9131	0.4109	0.116*
H9B	−0.0384	0.8607	0.4898	0.116*
H9C	−0.1646	0.8120	0.4060	0.116*
C10	0.3445(4)	0.7468(3)	0.48856(14)	0.0825(10)
H10A	0.4336	0.6643	0.4964	0.124*
H10B	0.3232	0.7822	0.5397	0.124*
H10C	0.4152	0.8167	0.4615	0.124*
N1	0.1473(3)	0.66905(16)	0.35503(10)	0.0346(5)
O1	0.0651(3)	0.37937(16)	0.19364(10)	0.0536(5)
H1A	0.175(3)	0.330(2)	0.1836(13)	0.064*

and the reaction was stirred for another 3 h. After completion the mixture was cooled to room temperature, potassium carbonate was added, and saturated with sodium chloride. Then it was filtered at room temperature and extracted with chloroform (100 mL) for five times. Organic phases were combined and concentrated yielding *N*-isopropylnortropinone (57.53 g, 91%).

In a hydrogenation reactor *N*-isopropylnortropinone (57.53 g, 343.98 mmol), Raney-Ni (1 g) and ethanol (500 mL, 95%) were added, the air was exchanged with hydrogen for three times. Then hydrogen was added to a pressure of 2 MPa and the reaction was continued for 5 h. After completion of the reaction, it was cooled to room temperature, the reaction system was filtered and concentrated. The crude *N*-isopropylnortropine (57.06 g, 98%) was obtained as brown solid. Then 0.5 g of the title compound was dissolved in 5 mL ethanol solution. Evaporation at room temperature yielded colourless crystals.

Experimental details

The hydrogen atoms were placed on calculated positions with the help of the SHELX program [6].

Discussion

The title compound *N*-isopropylnortropine is a Noratropine derivative and is known as an important intermediate in the production of ipratropium bromide [2].

There is one molecule in the asymmetric unit of the title structure. All bond lengths and bond angles are in the normal ranges [3].

In the molecule the plane formed by C1, C2, C3 and C4 and C1, C4, C7 and C5 are nearly flat.

There is an intermolecular OH$\cdots$N hydrogen bond which connects adjacent molecules into an one-dimensional chain along the *b* direction.

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