Acta Crystallographica Section E
Structure Reports Online
ISSN 1600-5368

5-Acetyl-4,6-dimethyl-1,2,3,4-tetrahydropyrimidin-2-one

Valery E. Zavodnik,[a] Anatoly D. Shutalev,[b] Galina V. Gurskaya,[c] Adam I. Stash[a]* and Vladimir G. Tsirelson[d]

[a]Karpov Institute of Physical Chemistry, 10 Vorontsovo Pole, 105064 Moscow, Russia, [b]Lomonosov State Academy of Fine Chemical Technology, 86 Vernadsky Prospect, 119571 Moscow, Russia, [c]Engelhardt Institute of Molecular Biology, Russian Academy of Sciences, 32 Vavilova Street, 119991 Moscow, Russia, and [d]Mendeleev University of Chemical Technology, 9 Miusskaya Square, 125047 Moscow, Russia

Correspondence e-mail: adam@cc.nifhi.ac.ru

Key indicators

Single-crystal X-ray study
T = 293 K
Mean σ(C–C) = 0.002 Å
R factor = 0.029
wR factor = 0.095
Data-to-parameter ratio = 10.5

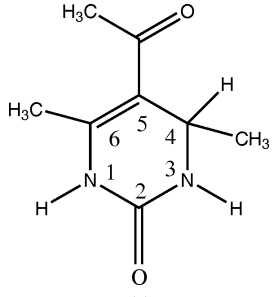
For details of how these key indicators were automatically derived from the article, see http://journals.iucr.org/e.

Received 22 November 2004
Accepted 5 January 2005
Online 22 January 2005

The title compound, $C_8H_{12}N_2O_2$, belongs to the class of 5-substituted 1,2,3,4-tetrahydropyrimidin-2-ones, which exhibit a wide spectrum of biological activities. The conformation of the tetrahydropyrimidine ring is that of a distorted boat. In the crystal structure, N—H···O hydrogen bonds form molecular dimers and also link these dimers into chains along the *c* axis of the unit cell.

Comment

The title compound, (I), belongs to the class of 5-substituted 1,2,3,4-tetrahydropyrimidin-2-ones, which are known as 'Biginelli compounds' (Kappe, 1993). Some representatives of this group have emerged as orally active antihypertensive agents (Atwal *et al.*, 1991; Grover *et al.*, 1995; Kappe, 2000; Kappe *et al.*, 1997; Rovnyak *et al.*, 1995), mitotic kinesin Eg5 inhibitors which can be considered as potential anticancer drugs (Haggarty *et al.*, 2000; Kappe, 2000), and α-1a adrenoceptor-selective antagonists, useful for the treatment of benign prostatic hyperplasia (Kappe, 2000; Nagarathnam *et al.*, 1999).



(I)

To establish a correlation between the biological activity and spatial structure of molecules in the series of 1,2,3,4-tetrahydropyrimidin-2-ones and their 2-thioxo analogues, the conformation of the pyrimidine ring is usually considered (Kappe *et al.*, 1997; Gurskaya *et al.*, 2003*a*,*b*). In (I) (Fig. 1), the pyrimidine ring has the conformation of a distorted boat. The deviations of atoms N1 and C4 from the C2/N3/C5/C6 plane are 0.146 and 0.412 Å, respectively.

Molecules of (I) are linked into dimers by pairs of intermolecular N—H···O hydrogen bonds (Table 1 and Fig. 2) across centres of symmetry. These dimers are linked by further N—H···O hydrogen bonds to form chains along the *c* axis.

Experimental

The title compound was prepared according to the general method of synthesis of 5-substituted 1,2,3,4-tetrahydropyrimidin-2-ones (or

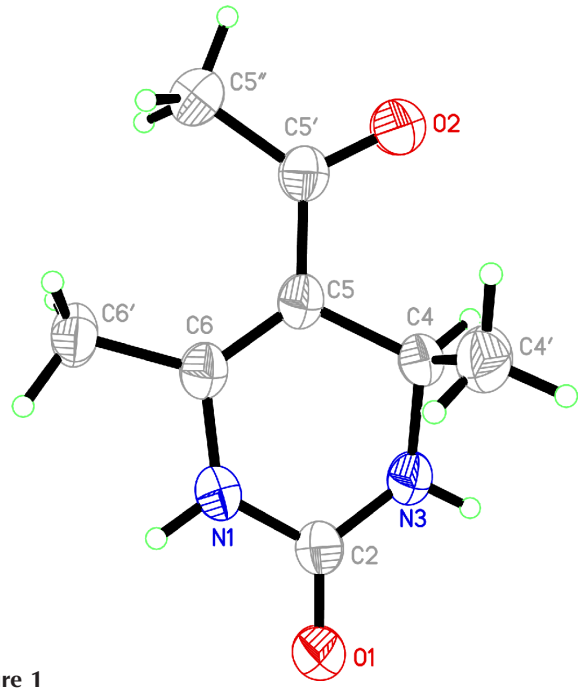


Figure 1
The molecular structure of (I), showing the atom-labelling scheme. Displacement ellipsoids are drawn at the 50% probability level.

thiones) (Shutalev *et al.*, 1997, 1998). The synthesis of (I) was performed by the reaction of *N*-(1-tosylethyl)urea with the sodium enolate of acetylacetone in dry acetonitrile, followed by a TsOH-catalyzed dehydration of the resulting 5-acetyl-4-hydroxy-4,6-dimethylhexahydropyrimidin-2-one, without isolation of the latter. Crystals of (I) suitable for X-ray structure analysis were prepared at room temperature by slow evaporation of the solvent from a saturated solution of (I) (19 mg) in ethanol (1 ml).

Crystal data

$C_8H_{12}N_2O_2$
M_r = 168.20
Monoclinic, *C*2/*c*
a = 14.473 (3) Å
b = 6.994 (1) Å
c = 17.200 (3) Å
β = 103.37 (3)°
V = 1693.9 (6) Å^3
Z = 8
D_x = 1.319 Mg m^{-3}
Mo *K*α radiation
Cell parameters from 24 reflections
θ = 11.7–12.4°
μ = 0.10 mm^{-1}
T = 293 (2) K
Prism, colourless
0.46 × 0.42 × 0.12 mm

Data collection

Enraf–Nonius CAD-4 diffractometer
θ–2θ scans
Absorption correction: none
1712 measured reflections
1660 independent reflections
1187 reflections with $I > 2\sigma(I)$
R_{int} = 0.019
θ_{max} = 26.0°
h = −17 → 15
k = 0 → 8
l = −21 → 15
3 standard reflections
frequency: 60 min
intensity decay: 0.5%

Refinement

Refinement on F^2
$R[F^2 > 2\sigma(F^2)]$ = 0.029
$wR(F^2)$ = 0.095
S = 1.07
1660 reflections
158 parameters
All H-atom parameters refined
$w = 1/[\sigma^2(F_o^2) + (0.0592P)^2 + 0.1584P]$ where $P = (F_o^2 + 2F_c^2)/3$
$(\Delta/\sigma)_{max} < 0.001$
$\Delta\rho_{max}$ = 0.19 e Å^{-3}
$\Delta\rho_{min}$ = −0.12 e Å^{-3}
Extinction correction: *SHELXL97* (Sheldrick, 1997)
Extinction coefficient: 0.0043 (12)

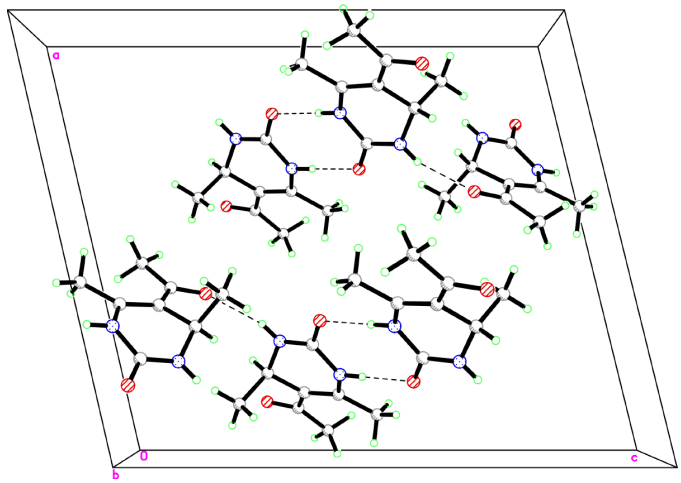


Figure 2
A view, down the *b* axis, of the packing and hydrogen bonding (dashed lines) occurring in the crystal structure of (I).

Table 1
Hydrogen-bond geometry (Å, °).

D—H···*A*	*D*—H	H···*A*	*D*···*A*	*D*—H···*A*
N1—H1···O1^{i}	0.858 (16)	1.991 (17)	2.8487 (15)	177.7 (14)
N3—H3···O2^{ii}	0.828 (17)	2.110 (17)	2.8891 (16)	156.8 (13)

Symmetry codes: (i) $-x+\frac{1}{2}, -y+\frac{3}{2}, -z+1$; (ii) $-x+\frac{1}{2}, y+\frac{1}{2}, -z+\frac{1}{2}$.

All H atoms were located in difference syntheses and refined isotropically. The C—H and N—H bond lengths are in the ranges 1.00 (2)–0.92 (2) Å and 0.86 (2)–0.83 (2) Å, respectively.

Data collection: *CAD-4-PC Software* (Enraf–Nonius, 1993); cell refinement: *CAD-4-PC Software*; data reduction: *CAD-4-PC Software*; program(s) used to solve structure: *SHELXS97* (Sheldrick, 1997); program(s) used to refine structure: *SHELXL97* (Sheldrick, 1997); molecular graphics: *XP* in *SHELXTL* (Sheldrick, 1991); software used to prepare material for publication: *SHELXL97* and *CIFTAB* (Sheldrick, 1997).

The authors are grateful to RFBR (grant No. 04–03-33053).

References

Atwal, K. S., Swanson, B. N., Unger, S. E., Floyd, D. M., Moreland, S., Hedberg, A. & O'Reilly, B. C. (1991). *J. Med. Chem.* **34**, 806–811.
Enraf–Nonius (1993). *CAD-4-PC Software*. Version 1.2. Enraf–Nonius, Delft, The Netherlands.
Grover, G. J., Dzwonczyk, S., McMullen, D. M., Normandin, D. E., Parham, C. S., Sleph, P. G. & Moreland, S. (1995). *J. Cardiovasc. Pharmacol.* **26**, 289–294.
Gurskaya, G. V., Zavodnik, V. E. & Shutalev, A. D. (2003*a*). *Crystallogr. Rep.* **48**, 92–97.
Gurskaya, G. V., Zavodnik, V. E. & Shutalev, A. D. (2003*b*). *Crystallogr. Rep.* **48**, 416–421.
Haggarty, S. J., Mayer, T. U., Miyamoto, D. T., Fathi, R., King, R. W., Mitchison, T. J. & Schreiber, S. L. (2000). *Chem. Biol.* **7**, 275–286.
Kappe, C. O. (1993). *Tetrahedron,* **49**, 6937–6963.
Kappe, C. O. (2000). *Acc. Chem. Res.* **33**, 879–888.
Kappe, C. O., Fabian, W. M. F. & Semones, M. A. (1997). *Tetrahedron,* **53**, 2803–2816.
Nagarathnam, D., Miao, S. W., Lagu, B., Chiu, G., Fang, J., Dhar, T. G. M., Zhang, J., Tyagarajan, S., Marzabadi, M. R., Zhang, F. Q., Wong, W. C., Sun, W. Y., Tian, D., Wetzel, J. M., Forray, C. *et al.* (1999). *J. Med. Chem.* **42**, 4764–4777.

Rovnyak, G. C., Kimball, S. D., Beyer, B., Cucinotta, G., DiMarco, J. D., Gougoutas, J., Hedberg, A., Malley, M., McCarthy, J. P., Zhang, R. A. & Moreland, S. (1995). *J. Med. Chem.* **38**, 119–129.
Sheldrick, G. M. (1991). *SHELXTL*. Siemens Analytical X-ray Instruments Inc., Madison, Wisconsin, USA.
Sheldrick, G. M. (1997). *SHELXS97*, *SHELXL97* and *CIFTAB*. Release 97-2. University of Göttingen, Germany.
Shutalev, A. D., Kishko, E. A., Sivova, N. V. & Kuznetsov, A. Yu. (1998). *Molecules*, 3, 100–106.
Shutalev, A. D. & Kuksa, V. A. (1997). *Khim. Geterotsikl. Soedin.* pp. 105–109.