Acta Crystallographica Section E
Structure Reports
Online

ISSN 1600-5368

(*S*)-3-[4-(Benzyloxy)phenyl]-2-hydroxypropanoic acid

He-Qing Wang,[a] Qing-Le Zeng,[a] Hua Fang,[a] Rong-Bin Huang[b] and Yu-Fen Zhao[a]*

[a]The Key Laboratory for Chemical Biology of Fujian Province, Department of Chemistry, Xiamen University, Xiamen 361005, People's Republic of China, and [b]State Key Laboratory of Physical Chemistry and Solid Surfaces, Department of Chemistry, Xiamen University, Xiamen 361005, People's Republic of China

Correspondence e-mail: yfzhao@xmu.edu.cn

Key indicators

Single-crystal X-ray study
T = 293 K
Mean σ(C–C) = 0.008 Å
R factor = 0.070
wR factor = 0.204
Data-to-parameter ratio = 7.4

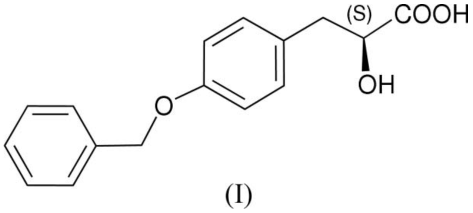
For details of how these key indicators were automatically derived from the article, see http://journals.iucr.org/e.

Received 31 March 2005
Accepted 15 June 2005
Online 30 June 2005

The title compound, $C_{16}H_{16}O_4$, has been obtained by the reaction of *O*-benzylated L-tyrosine with sodium nitrite as colorless blocks. The packing of the title compound exhibits two independent hydrogen bonds involving the hydroxy and carboxylic groups, giving rise to an infinite ladder parallel to the *b* axis.

Comment

The title compound, (I), is a key intermediate and widely used in the synthesis of PPARa/g dual agonists (Haigh *et al.*, 1999) and heteropeptides (Valls *et al.*, 2002). Much research has been carried out, but there are still some drawbacks in the existing synthetic processes. During our continuing study on asymmetric synthesis (Zeng, Liu, Cui *et al.* 2002; Zeng, Liu, Mi *et al.* 2002), we found a practical route for synthesis of the title compound, (I).



(I)

The two benzene ring of (I) are essentially coplanar. The packing exhibits wo independent hydrogen bonds involving the hydroxy and carboxylic acid groups (Fig. 2), forming an infinite ladder parallel to the *b* axis.

Experimental

To a solution of 1*M* sulfuric acid (39 ml) and DMF (19 ml), *O*-benzylated L-tyrosine (3.207 g) was added. The suspension was stirred until it dissolved and was then cooled with iced water. A solution of sodium nitrite (4.067 g) in water (10 ml) was added dropwise to the resulting solution. After one hour, 3.2 *M* sulfuric acid (9.8 ml) was added slowly, and the resulting solution was stirred overnight. The reaction mixture was extracted with ethyl acetate, and the organic layer was washed with water and saturated salt solution. It was then dried over anhydrous magnesium sulfate and filtered. The solvent was removed under reduced pressure, and a yellow liquid (3.090 g) was obtained in 96.4% crude yield. The crude product was recrystallized to give crystals (1.417 g) in 43.3% yield. ^{1}H NMR (600 MHz, $CDCl_3$): δ 2.60 (*br*, 2H), 2.96 (*dd*, 1H, J_1 = 14.4 Hz, J_2 = 7.8 Hz), 3.17 (*dd*, 1H, J_1 = 14.4 Hz, J_2 = 4.2 Hz), 4.49 (*dd*, 1H, J_1 = 7.2 Hz, J_2 = 4.2 Hz), 5.05 (*s*, 2H), 6.94 (*d*, 2H, J = 8.4 Hz), 7.18 (*d*, 2H, J = 8.4 Hz), 7.33 (*t*, 1H, J = 7.2 Hz), 7.39 (*t*, 2H, J = 7.2 Hz), 7.43 (*d*, 2H, J = 7.2 Hz) ^{13}C NMR (150 MHz, CD_3COCD_3): δ 39.6, 69.7, 71.4, 114.6, 127.6, 127.8, 128.5, 130.1, 130.7, 137.9, 157.8, 174.5.

doi:10.1107/S1600536805019100

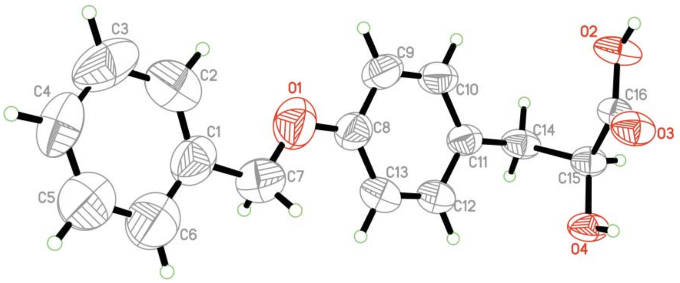


Figure 1
ORTEP3 (Farrugia, 1997) plot of (I), with displacement ellipsoids drawn at the 50% probability level. H atoms are drawn as spheres of arbitrary radii.

Crystal data

$C_{16}H_{16}O_4$
$M_r = 272.29$
Monoclinic, $P2_1$
$a = 8.532$ (4) Å
$b = 5.782$ (2) Å
$c = 14.050$ (6) Å
$\beta = 102.784$ (7)°
$V = 676.0$ (5) Å^3
$Z = 2$

$D_x = 1.338$ Mg m^{-3}
Mo $K\alpha$ radiation
Cell parameters from 2099 reflections
$\theta = 2.5$–27.7°
$\mu = 0.10$ mm^{-1}
$T = 293$ (2) K
Chunk, colorless
0.50 × 0.40 × 0.20 mm

Data collection

Bruker SMART APEX area-detector diffractometer
φ and ω scans
Absorption correction: multi-scan (*SADABS*; Bruker, 2001)
$T_{\min} = 0.954$, $T_{\max} = 0.981$
3287 measured reflections

1335 independent reflections
1231 reflections with $I > 2\sigma(I)$
$R_{\rm int} = 0.024$
$\theta_{\max} = 25.5°$
$h = -9 \rightarrow 10$
$k = -6 \rightarrow 6$
$l = -16 \rightarrow 17$

Refinement

Refinement on F^2
$R[F^2 > 2\sigma(F^2)] = 0.070$
$wR(F^2) = 0.204$
$S = 0.86$
1335 reflections
181 parameters
H-atom parameters constrained

$w = 1/[\sigma^2(F_o^2) + (0.1596P)^2 + 0.4615P]$
where $P = (F_o^2 + 2F_c^2)/3$
$(\Delta/\sigma)_{\max} < 0.001$
$\Delta\rho_{\max} = 0.55$ e Å^{-3}
$\Delta\rho_{\min} = -0.29$ e Å^{-3}

Table 1
Selected geometric parameters (Å, °).

O1—C7	1.320 (7)	O3—C16	1.177 (5)
O1—C8	1.346 (7)	O4—C15	1.388 (6)
O2—C16	1.297 (6)		
C7—O1—C8	121.4 (6)	C16—C15—C14	113.2 (4)
O1—C7—C1	113.1 (6)	O3—C16—O2	125.3 (4)
C11—C14—C15	114.5 (3)	O3—C16—C15	122.8 (4)
O4—C15—C16	110.5 (3)	O2—C16—C15	111.8 (3)
O4—C15—C14	109.6 (4)		

Table 2
Hydrogen-bond geometry (Å, °).

D—H···A	D—H	H···A	D···A	D—H···A
O2—H17···O4$^{\rm i}$	0.82	1.78	2.581 (5)	165
O4—H4A···O3$^{\rm ii}$	0.82	2.09	2.769 (5)	141

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

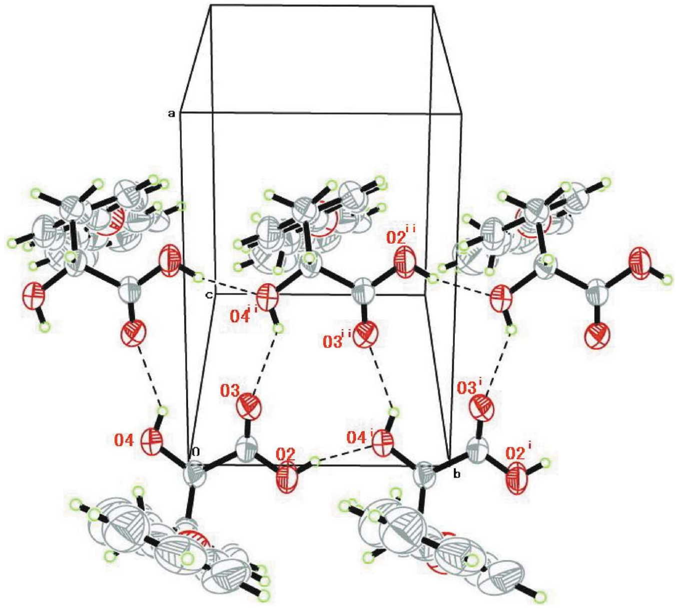


Figure 2
View of the intermolecular hydrogen bonds (dashed lines) in (I).

The H atoms were positioned geometrically (C—H = 0.93, 0.98 and 0.97 Å for phenyl, tertiary and methylene H atoms, respectively; O—H = 0.82 Å) and refined as riding, with $U_{\rm iso}({\rm H}) = 1.2U_{\rm eq}$(parent atom). Owing to the absence of any significant anomalous scatterers, Friedel pairs were merged before the final refinement. The absolute configuration has been determined from the chiral starting material.

Data collection: *SMART* (Bruker, 2001); cell refinement: *SAINT* (Bruker, 2001); data reduction: *SAINT*; program(s) used to solve structure: *SHELXS97* (Sheldrick, 1990); program(s) used to refine structure: *SHELXL97* (Sheldrick, 1997); molecular graphics: *ORTEP3* (Farrugia, 1997); software used to prepare material for publication: *SHELXL97*.

The authors thank the Fujian Foundation of Science and Technology (Nos. 2001 F008 and 2002 H011) for supporting this work and thank Mr Z. B. Wei for technical assistance.

References

Farrugia, L. J. (1997). *J. Appl. Cryst.* **30**, 565.

Bruker (2001). *SAINT* (Version 6.22), *SMART* (Version 5.625) and *SADABS* (Version 2.03). Bruker AXS Inc., Madison, Wisconsin, USA.

Haigh, D., Allen, G., Birrell, H. C., Buckle, D. R., Cantello, B. C. C., Eggleston, D. S., Haltiwanger, R. C., Holder, J. C., Lister,C. A., Pinto, I. L., Rami, H. K., Sime, J. T., Smith, S. A. & Sweeney, J. D. (1999). *Bioorg. Med. Chem.* **7**, 821–830.

Sheldrick, G. M. (1997). *SHELXS97* and *SHELXL97*. University of Göttingen, Germany.

Valls, N., Vallribera, M., Lopez-Canet, M. & Bonjoch, M. J. (2002). *J. Org. Chem.* **67**, 4945–4950.

Zeng, Q., Liu, H., Cui, X., Mi, A. Q., Jiang, Y. Z., Li, X. S., Choi, M. C. K. & Chan, A. S. C. (2002). *Tetrahedron Asymmetry*, **13**, 115–117.

Zeng, Q., Liu, H., Mi, A. Q., Jiang, Y. Z., Li, X. S., Choi, M. C. & Chan, A. S. C. (2002). *Tetrahedron*, **58**, 8799–8803.