

Crystal structure of *N*-(3-hydroxyphenyl)succinimideP. A. Suchetan,<sup>a</sup> S. Naveen,<sup>b</sup> N. K. Lokanath<sup>c</sup> and S. Sreenivasa<sup>d\*</sup><sup>a</sup>Department of Studies and Research in Chemistry, U.C.S., Tumkur University, Tumkur, Karnataka 572 103, India, <sup>b</sup>Institution of Excellence, Vijnana Bhavan, University of Mysore, Manasagangotri, Mysore 570023, India, <sup>c</sup>Department of Studies in Physics, University of Mysore, Manasagangotri, Mysore, India, and <sup>d</sup>Department of Studies and Research in Chemistry, Tumkur University, Tumkur, Karnataka 572 103, India. \*Correspondence e-mail: drsreenivasa@yahoo.co.in

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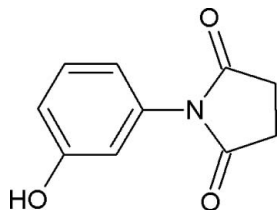
Edited by H. Stoeckli-Evans, University of Neuchâtel, Switzerland

In the title compound, C<sub>10</sub>H<sub>9</sub>NO<sub>3</sub>, the dihedral angle between the benzene and pyrrolidine rings is 53.9 (1)°. In the crystal, molecules are linked through strong O—H...O hydrogen bonds into zigzag *C*(8) chains running along [010]. The chains are linked by C—H... $\pi$  interactions forming sheets lying parallel to (100).

**Keywords:** crystal structure; succinimide; hydrogen bonding.**CCDC reference:** 1013858

## 1. Related literature

For the crystal structures of the 3-methyl and 3-chloro derivatives of *N*-phenylsuccinimide, see: Saraswathi *et al.* (2010, 2011).



## 2. Experimental

## 2.1. Crystal data

C<sub>10</sub>H<sub>9</sub>NO<sub>3</sub>  
*M<sub>r</sub>* = 191.18Monoclinic, *P*2<sub>1</sub>/*c*  
*a* = 11.432 (2) Å*b* = 7.6567 (14) Å  
*c* = 10.115 (2) Å  
 $\beta$  = 98.688 (7)°  
*V* = 875.2 (3) Å<sup>3</sup>  
*Z* = 4Cu *K* $\alpha$  radiation  
 $\mu$  = 0.91 mm<sup>-1</sup>  
*T* = 293 K  
0.42 × 0.31 × 0.19 mm

## 2.2. Data collection

Bruker APEXII diffractometer  
Absorption correction: multi-scan  
(*SADABS*; Bruker, 2009)  
*T*<sub>min</sub> = 0.749, *T*<sub>max</sub> = 0.841  
3786 measured reflections1234 independent reflections  
1207 reflections with *I* > 2 $\sigma$ (*I*)  
*R*<sub>int</sub> = 0.028  
 $\theta$ <sub>max</sub> = 60.0°

## 2.3. Refinement

*R*[*F*<sup>2</sup> > 2 $\sigma$ (*F*<sup>2</sup>)] = 0.044  
*wR*(*F*<sup>2</sup>) = 0.140  
*S* = 1.20  
1234 reflections  
131 parametersH atoms treated by a mixture of independent and constrained refinement  
 $\Delta\rho$ <sub>max</sub> = 0.16 e Å<sup>-3</sup>  
 $\Delta\rho$ <sub>min</sub> = -0.23 e Å<sup>-3</sup>

Table 1

Hydrogen-bond geometry (Å, °).

*C*<sub>g</sub> is the centroid of the C1–C6 benzene ring.

<i>D</i> —H... <i>A</i>	<i>D</i> —H	H... <i>A</i>	<i>D</i> ... <i>A</i>	<i>D</i> —H... <i>A</i>
O3—H3...O1 <sup>i</sup>	0.94 (4)	1.82 (4)	2.758 (2)	175 (4)
C8—H8A... <i>C</i> <sub>g</sub> <sup>ii</sup>	0.97	2.83	3.613 (3)	138
C9—H9A... <i>C</i> <sub>g</sub> <sup>ii</sup>	0.97	2.79	3.579 (3)	139

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

Data collection: *APEX2* (Bruker, 2009); cell refinement: *APEX2* and *SAINT-Plus* (Bruker, 2009); data reduction: *SAINT-Plus* and *XPREP* (Bruker, 2009); program(s) used to solve structure: *SHELXS97* (Sheldrick, 2008); program(s) used to refine structure: *SHELXL97* (Sheldrick, 2008); molecular graphics: *Mercury* (Macrae *et al.*, 2008); software used to prepare material for publication: *SHELXL97*.

## Acknowledgements

The authors acknowledge the IOE X-ray diffractometer facility, University of Mysore, India, for the data collection.

Supporting information for this paper is available from the IUCr electronic archives (Reference: SU2752).

## References

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## supporting information

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## Crystal structure of *N*-(3-hydroxyphenyl)succinimide

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### S1. Introduction

As a part of a study on the effect of ring and side-chain substitutions on *N*-(Aryl)-succinimides (Saraswathi *et al.*, 2010,2011), the title compound has been synthesized and we report herein on its crystal structure.

### S2. Experimental

#### S2.1. Synthesis and crystallization

The title compound was prepared according to the reported procedure (Saraswathi *et al.*, 2010,2011). Colourless prisms of the title compound were obtained by slow evaporation of an aqueous methanolic solution at room temperature.

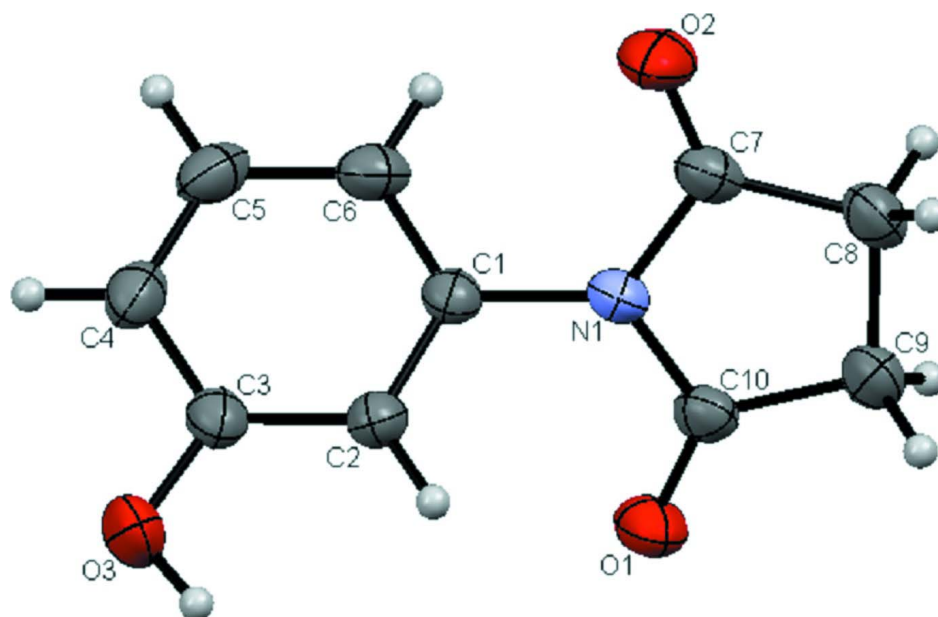
#### S2.2. Refinement

Crystal data, data collection and structure refinement details are summarized in Table 2. The hydroxyl H atom was located in a difference Fourier map and freely refined. The C-bound H atoms were positioned with idealized geometry and treated as riding atoms: C—H = 0.93-0.97 Å with  $U_{\text{iso}}(\text{H}) = 1.2U_{\text{eq}}(\text{C})$ .

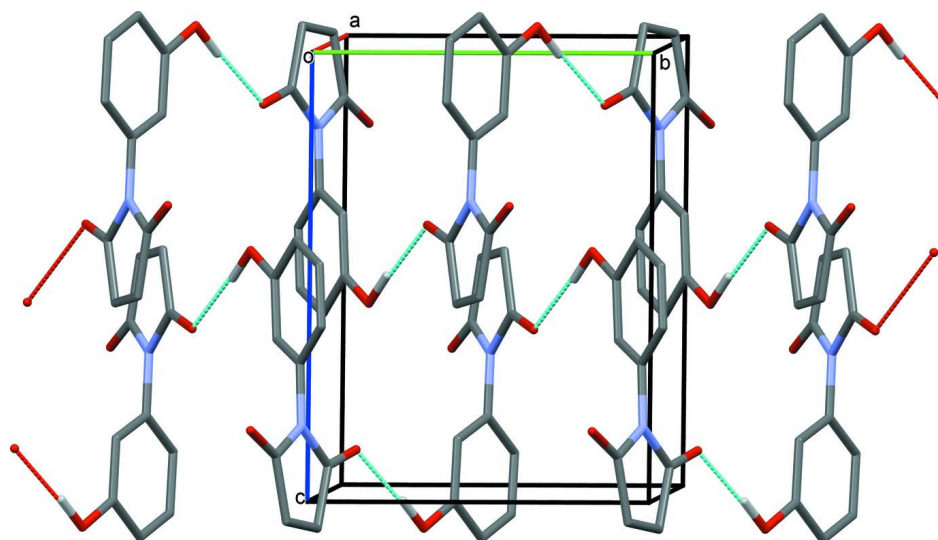
### S3. Results and discussion

The title molecule, Fig. 1, is non-planar with the benzene and pyrrolidine [r.m.s. deviation = 0.039 Å] rings tilted at 53.9 (1)°. This is close to the values of 52.5 (1) and 59.5 (1)° observed in *N*-(3-methylphenyl)-succinimide (Saraswathi *et al.* 2010) and *N*-(3-chlorophenyl)-succinimide (Saraswathi *et al.* 2011).

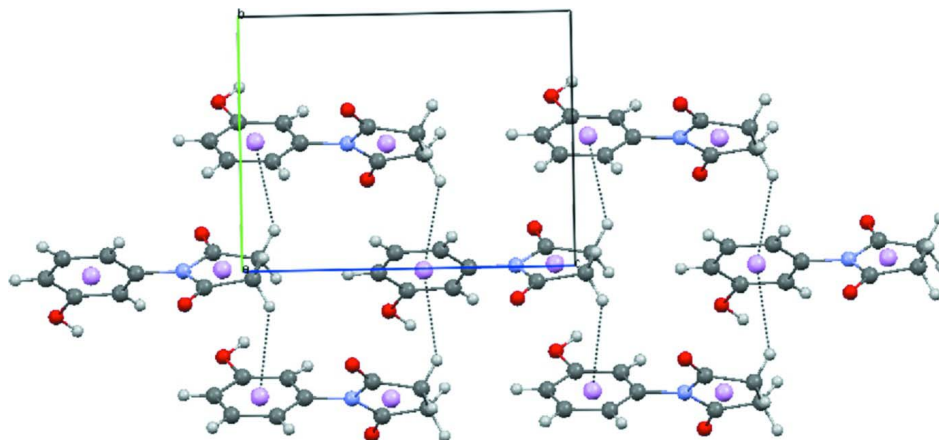
In the crystal, molecules are linked through strong O—H···O hydrogen bonds into zigzag C(8) chains running along [010] (Table 1 and Fig. 2). The chains are linked by C—H··· $\pi$  interactions (Table 1 Fig. 3) forming sheets lying parallel to (100).

**Figure 1**

Molecular structure of the title molecule, with atom labeling. Displacement ellipsoids are drawn at the 50% probability level.

**Figure 2**

A view along the a axis of the crystal packing of the title compound, showing the formation of the zigzag C(8) chains through O—H...O hydrogen bonds (dashed lines; see Table 1 for details).

**Figure 3**

A partial view along the *a* axis of the crystal packing of the title compound, showing the C—H... $\pi$  interactions (dashed lines; see Table 1 for details).

### 1-(3-Hydroxyphenyl)pyrrolidine-2,5-dione

#### Crystal data

$C_{10}H_9NO_3$   
 $M_r = 191.18$   
 Monoclinic,  $P2_1/c$   
 Hall symbol: -P 2ybc  
 $a = 11.432$  (2) Å  
 $b = 7.6567$  (14) Å  
 $c = 10.115$  (2) Å  
 $\beta = 98.688$  (7)°  
 $V = 875.2$  (3) Å<sup>3</sup>  
 $Z = 4$   
 $F(000) = 400$

#### Data collection

Bruker APEXII  
 diffractometer  
 Radiation source: fine-focus sealed tube  
 Graphite monochromator  
 phi and  $\varphi$  scans  
 Absorption correction: multi-scan  
 (SADABS; Bruker, 2009)  
 $T_{\min} = 0.749$ ,  $T_{\max} = 0.841$

#### Refinement

Refinement on  $F^2$   
 Least-squares matrix: full  
 $R[F^2 > 2\sigma(F^2)] = 0.044$   
 $wR(F^2) = 0.140$   
 $S = 1.20$   
 1234 reflections  
 131 parameters  
 0 restraints

Prism  
 $D_x = 1.451$  Mg m<sup>-3</sup>  
 Melting point: 393 K  
 Cu  $K\alpha$  radiation,  $\lambda = 1.54178$  Å  
 Cell parameters from 25 reflections  
 $\theta = 3.9$ – $60.0$ °  
 $\mu = 0.91$  mm<sup>-1</sup>  
 $T = 293$  K  
 Prism, colourless  
 $0.42 \times 0.31 \times 0.19$  mm

3786 measured reflections  
 1234 independent reflections  
 1207 reflections with  $I > 2\sigma(I)$   
 $R_{\text{int}} = 0.028$   
 $\theta_{\text{max}} = 60.0$ °,  $\theta_{\text{min}} = 3.9$ °  
 $h = -12 \rightarrow 12$   
 $k = -7 \rightarrow 8$   
 $l = -5 \rightarrow 11$

Primary atom site location: structure-invariant  
 direct methods  
 Secondary atom site location: difference Fourier  
 map  
 Hydrogen site location: inferred from  
 neighbouring sites  
 H atoms treated by a mixture of independent  
 and constrained refinement

$$w = 1/[\sigma^2(F_o^2) + (0.0766P)^2 + 0.2946P]$$

where  $P = (F_o^2 + 2F_c^2)/3$   
 $(\Delta/\sigma)_{\max} < 0.001$

$$\Delta\rho_{\max} = 0.16 \text{ e } \text{\AA}^{-3}$$

$$\Delta\rho_{\min} = -0.23 \text{ e } \text{\AA}^{-3}$$

*Special details*

**Geometry.** Bond distances, angles etc. have been calculated using the rounded fractional coordinates. All su's are estimated from the variances of the (full) variance-covariance matrix. The cell esds are taken into account in the estimation of distances, angles and torsion angles

**Refinement.** Refinement of  $F^2$  against ALL reflections. The weighted  $R$ -factor  $wR$  and goodness of fit  $S$  are based on  $F^2$ , conventional  $R$ -factors  $R$  are based on  $F$ , with  $F$  set to zero for negative  $F^2$ . The threshold expression of  $F^2 > 2\sigma(F^2)$  is used only for calculating  $R$ -factors(gt) etc. and is not relevant to the choice of reflections for refinement.  $R$ -factors based on  $F^2$  are statistically about twice as large as those based on  $F$ , and  $R$ -factors based on ALL data will be even larger.

*Fractional atomic coordinates and isotropic or equivalent isotropic displacement parameters ( $\text{\AA}^2$ )*

	<i>x</i>	<i>y</i>	<i>z</i>	$U_{\text{iso}}^*/U_{\text{eq}}$
O1	0.91904 (12)	0.1492 (2)	0.88087 (15)	0.0436 (5)
O2	0.56202 (12)	-0.1251 (2)	0.82562 (16)	0.0482 (5)
O3	0.92280 (13)	-0.1661 (2)	0.43867 (15)	0.0454 (5)
N1	0.74293 (13)	0.0058 (2)	0.82293 (16)	0.0293 (5)
C1	0.74308 (15)	-0.0001 (2)	0.68070 (19)	0.0281 (6)
C2	0.83725 (16)	-0.0782 (2)	0.63281 (18)	0.0300 (6)
C3	0.83605 (17)	-0.0861 (3)	0.49542 (19)	0.0326 (6)
C4	0.74209 (18)	-0.0147 (3)	0.4099 (2)	0.0391 (7)
C5	0.64917 (18)	0.0627 (3)	0.4603 (2)	0.0407 (7)
C6	0.64839 (17)	0.0704 (3)	0.5970 (2)	0.0361 (6)
C7	0.65000 (16)	-0.0592 (2)	0.8850 (2)	0.0327 (6)
C8	0.68144 (17)	-0.0292 (3)	1.0320 (2)	0.0374 (7)
C9	0.80476 (18)	0.0493 (3)	1.0518 (2)	0.0367 (6)
C10	0.83298 (16)	0.0764 (2)	0.91334 (19)	0.0313 (6)
H2	0.90020	-0.12450	0.69140	0.0360*
H3	0.978 (3)	-0.223 (5)	0.502 (4)	0.088 (10)*
H4	0.74170	-0.01900	0.31800	0.0470*
H5	0.58650	0.11000	0.40200	0.0490*
H6	0.58570	0.12170	0.63140	0.0430*
H8A	0.68090	-0.13840	1.08050	0.0450*
H8B	0.62560	0.05040	1.06340	0.0450*
H9A	0.80610	0.15940	1.09940	0.0440*
H9B	0.86130	-0.02960	1.10190	0.0440*

*Atomic displacement parameters ( $\text{\AA}^2$ )*

	$U^{11}$	$U^{22}$	$U^{33}$	$U^{12}$	$U^{13}$	$U^{23}$
O1	0.0306 (8)	0.0573 (10)	0.0443 (9)	-0.0123 (7)	0.0103 (7)	-0.0083 (7)
O2	0.0306 (8)	0.0641 (10)	0.0501 (9)	-0.0141 (7)	0.0066 (7)	0.0068 (8)
O3	0.0417 (9)	0.0634 (10)	0.0328 (9)	0.0051 (7)	0.0110 (7)	-0.0054 (7)
N1	0.0224 (8)	0.0360 (9)	0.0305 (9)	-0.0012 (6)	0.0071 (6)	0.0000 (6)
C1	0.0248 (10)	0.0305 (10)	0.0290 (10)	-0.0052 (7)	0.0045 (8)	0.0009 (7)
C2	0.0248 (10)	0.0362 (11)	0.0283 (10)	-0.0014 (8)	0.0021 (8)	0.0010 (8)

C3	0.0302 (10)	0.0375 (11)	0.0304 (10)	-0.0074 (8)	0.0060 (8)	-0.0009 (8)
C4	0.0377 (12)	0.0478 (13)	0.0299 (10)	-0.0099 (9)	-0.0010 (9)	0.0044 (9)
C5	0.0308 (11)	0.0470 (13)	0.0406 (12)	-0.0039 (9)	-0.0067 (9)	0.0116 (9)
C6	0.0241 (10)	0.0386 (11)	0.0452 (12)	-0.0010 (8)	0.0043 (8)	0.0051 (9)
C7	0.0250 (10)	0.0340 (10)	0.0405 (11)	0.0024 (8)	0.0100 (9)	0.0054 (8)
C8	0.0349 (11)	0.0431 (12)	0.0371 (11)	0.0054 (8)	0.0151 (9)	0.0020 (8)
C9	0.0333 (11)	0.0447 (11)	0.0333 (11)	0.0060 (9)	0.0085 (8)	-0.0043 (9)
C10	0.0250 (10)	0.0345 (11)	0.0353 (11)	0.0028 (8)	0.0072 (8)	-0.0048 (8)

*Geometric parameters (Å, °)*

O1—C10	1.218 (2)	C5—C6	1.385 (3)
O2—C7	1.202 (2)	C7—C8	1.494 (3)
O3—C3	1.364 (3)	C8—C9	1.518 (3)
O3—H3	0.94 (4)	C9—C10	1.498 (3)
N1—C1	1.440 (2)	C2—H2	0.9300
N1—C7	1.404 (2)	C4—H4	0.9300
N1—C10	1.380 (2)	C5—H5	0.9300
C1—C2	1.382 (2)	C6—H6	0.9300
C1—C6	1.380 (3)	C8—H8A	0.9700
C2—C3	1.389 (3)	C8—H8B	0.9700
C3—C4	1.386 (3)	C9—H9A	0.9700
C4—C5	1.380 (3)	C9—H9B	0.9700
C3—O3—H3	112 (2)	N1—C10—C9	108.71 (16)
C1—N1—C10	124.14 (15)	O1—C10—N1	123.55 (18)
C7—N1—C10	112.43 (16)	C1—C2—H2	121.00
C1—N1—C7	123.43 (15)	C3—C2—H2	121.00
N1—C1—C6	118.80 (16)	C3—C4—H4	120.00
C2—C1—C6	122.34 (18)	C5—C4—H4	120.00
N1—C1—C2	118.85 (16)	C4—C5—H5	120.00
C1—C2—C3	118.63 (17)	C6—C5—H5	120.00
O3—C3—C4	117.31 (17)	C1—C6—H6	121.00
C2—C3—C4	119.80 (18)	C5—C6—H6	121.00
O3—C3—C2	122.87 (18)	C7—C8—H8A	111.00
C3—C4—C5	120.42 (19)	C7—C8—H8B	111.00
C4—C5—C6	120.57 (19)	C9—C8—H8A	111.00
C1—C6—C5	118.24 (19)	C9—C8—H8B	111.00
O2—C7—N1	123.91 (18)	H8A—C8—H8B	109.00
N1—C7—C8	107.82 (16)	C8—C9—H9A	111.00
O2—C7—C8	128.27 (18)	C8—C9—H9B	111.00
C7—C8—C9	105.74 (16)	C10—C9—H9A	111.00
C8—C9—C10	104.97 (16)	C10—C9—H9B	111.00
O1—C10—C9	127.74 (18)	H9A—C9—H9B	109.00
C7—N1—C1—C2	-125.04 (18)	N1—C1—C2—C3	178.96 (16)
C10—N1—C1—C2	55.4 (2)	C2—C1—C6—C5	-0.4 (3)
C7—N1—C1—C6	54.1 (2)	C1—C2—C3—C4	0.7 (3)

C10—N1—C1—C6	-125.46 (19)	C1—C2—C3—O3	-177.55 (17)
C7—N1—C10—C9	3.7 (2)	C2—C3—C4—C5	-0.6 (3)
C1—N1—C10—O1	4.0 (3)	O3—C3—C4—C5	177.7 (2)
C7—N1—C10—O1	-175.62 (16)	C3—C4—C5—C6	0.1 (3)
C1—N1—C7—O2	-0.3 (3)	C4—C5—C6—C1	0.4 (3)
C10—N1—C7—C8	-0.1 (2)	O2—C7—C8—C9	177.14 (19)
C10—N1—C7—O2	179.37 (17)	N1—C7—C8—C9	-3.4 (2)
C1—N1—C10—C9	-176.69 (16)	C7—C8—C9—C10	5.3 (2)
C1—N1—C7—C8	-179.75 (16)	C8—C9—C10—O1	173.70 (18)
C6—C1—C2—C3	-0.2 (3)	C8—C9—C10—N1	-5.6 (2)
N1—C1—C6—C5	-179.51 (18)		

*Hydrogen-bond geometry (Å, °)*

Cg is the centroid of the C1–C6 benzene ring.

<i>D</i> —H $\cdots$ <i>A</i>	<i>D</i> —H	H $\cdots$ <i>A</i>	<i>D</i> $\cdots$ <i>A</i>	<i>D</i> —H $\cdots$ <i>A</i>
O3—H3 $\cdots$ O1 <sup>i</sup>	0.94 (4)	1.82 (4)	2.758 (2)	175 (4)
C8—H8 <i>A</i> $\cdots$ Cg <sup>ii</sup>	0.97	2.83	3.613 (3)	138
C9—H9 <i>A</i> $\cdots$ Cg <sup>ii</sup>	0.97	2.79	3.579 (3)	139

Symmetry codes: (i)  $-x+2, y-1/2, -z+3/2$ ; (ii)  $x, -y+3/2, z+1/2$ .