

## DIMERIZATION OF NORISOACRONYCINE<sup>1</sup>

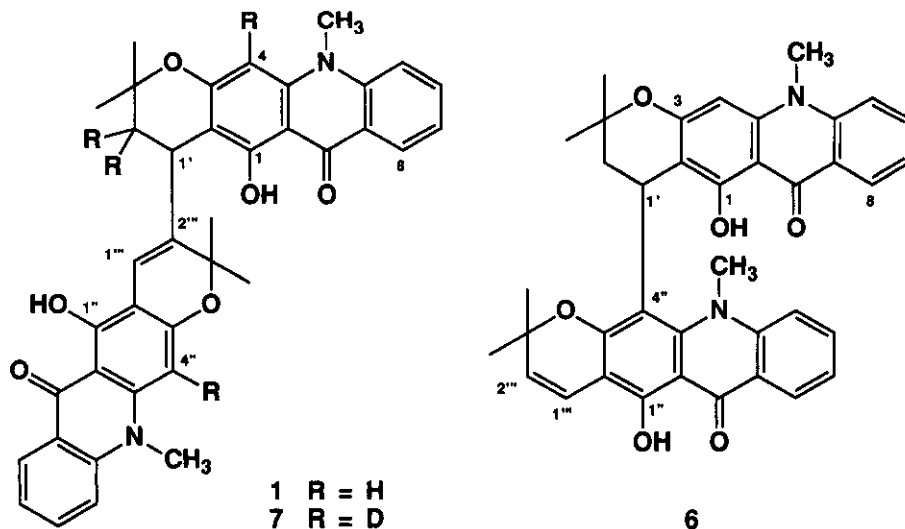
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**Abstract** - A new type of acridone dimer with a C-C junction between the prenyl moieties was obtained by treating norisoacronycine under acidic conditions. The chemical structure was deduced mainly by the comparison of its nmr spectral data with those of the acridone dimers which had been prepared previously.

A new type of acridone dimer (1) with a C-C junction between the prenyl moieties was synthesized by treating norisoacronycine (2) under acidic conditions. Its chemical structure was deduced mainly by comparison of its nmr spectra with those of AB-1 (3) and AB-2 (4) which had been prepared by treating noracronycine (5) in acidic conditions.<sup>2</sup>



Norisoacronycine (2)<sup>2</sup> (32.5 mg) was dissolved in a mixture of 12*N* HCl-CH<sub>3</sub>OH (1:2.5) and this yellow solution was refluxed for 8 hours. The orange reaction mixture was extracted with CHCl<sub>3</sub> (3 x 60 ml) and purified by p-tlc (benzene-EtOAc 9:1 (v/v), R<sub>f</sub> = 0.50) to afford a

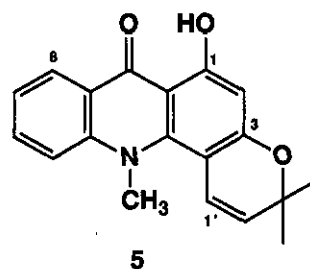
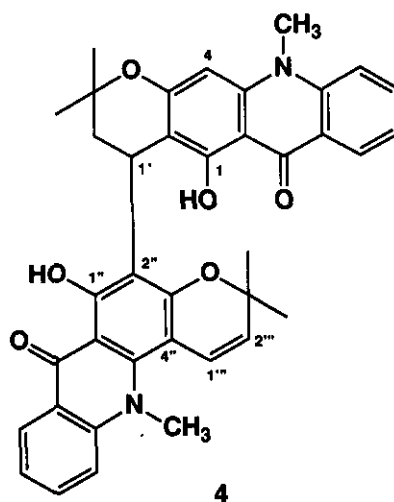
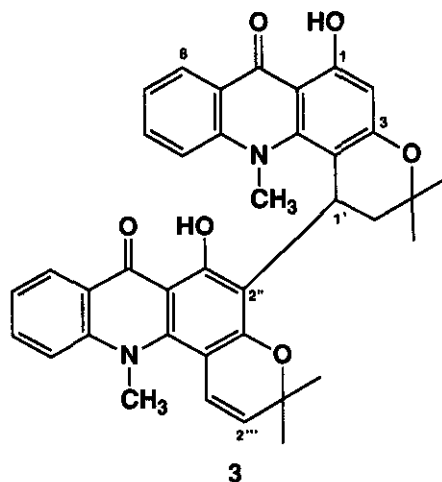
norisoacronycine-norisoacronycine dimer (1)<sup>3</sup> (5.0 mg; yield 15 %), as well as unreacted norisoacronycine (2) (2.1 mg). If the same type of reaction observed previously<sup>2</sup> would have occurred the chemical structure of the dimeric compound obtained should have the structure (6).

Prior to elucidating the structure of the norisoacronycine-norisoacronycine dimer as 1, <sup>13</sup>C nmr spectral assignments of AB-1 (3) and AB-2 (4) were accomplished by a combination of <sup>1</sup>H-<sup>1</sup>H COSY, <sup>13</sup>C-<sup>1</sup>H COSY and long range <sup>13</sup>C-<sup>1</sup>H COSY nmr experiments (Table 1).

**Table 1.** <sup>13</sup>C Nmr spectra of 1, AB-1 (3) and AB-2 (4).

	1	3	4
1	160.9 <sup>a</sup>	162.5	162.3
2	104.2	98.8	104.9
3	162.2 <sup>a</sup>	163.0	162.2
4	90.1 <sup>b</sup>	108.2	91.5 <sup>a</sup>
4a	141.0 <sup>c</sup>	148.1	142.3 <sup>a</sup>
5	113.2 <sup>d</sup>	116.7	114.2
6	132.7 <sup>e</sup>	133.3	133.7
7	120.0 <sup>f</sup>	121.3	120.8
8	125.7 <sup>g</sup>	125.7	127.0
8a	119.9	122.1	122.1
9	179.6 <sup>h</sup>	181.5	180.6 <sup>b</sup>
9a	103.5	103.7	106.6 <sup>c</sup>
10a	142.4 <sup>i</sup>	146.2	142.8 <sup>a</sup>
1'	28.7	28.3	24.2
2'	42.8	39.5	38.1
3'	75.8	75.2	76.8
4', 5'	23.3	22.6	23.6
	30.1	29.8	30.0
N <sub>10</sub> -CH <sub>3</sub>	32.8 <sup>j</sup>	43.4	33.9
1''	158.0	162.0	162.9
2''	113.2	111.0	112.1
3''	158.3 <sup>a</sup>	159.5	158.8
4''	90.9 <sup>b</sup>	100.8	100.8
4''a	141.3 <sup>c</sup>	143.1	142.9 <sup>a</sup>
5''	113.4 <sup>d</sup>	116.2	116.1
6''	132.8 <sup>e</sup>	134.2	133.7
7''	120.2 <sup>f</sup>	122.2	121.8
8''	125.8 <sup>g</sup>	126.4	126.5
8''a	119.9	121.9	121.0
9	179.8 <sup>h</sup>	181.2	181.3 <sup>b</sup>
9''a	103.5	106.1	106.7 <sup>c</sup>
10''a	142.7 <sup>i</sup>	144.8	145.0
1'''	110.2	120.9	121.7
2'''	141.0	122.4	122.5
3'''	80.5	76.3	75.5
4''', 5'''	26.0	25.2	24.7
	26.7	26.7	27.6
N <sub>10'''</sub> -CH <sub>3</sub>	33.0 <sup>j</sup>	43.5	43.8

<sup>a-j</sup>Assignments may be interchanged.



The chemical structure of **1** was deduced mainly by comparison of its nmr spectral data with those of **3** and **4**. The lower field shifts (ca. 10 ppm) of the N-CH<sub>3</sub> moieties of **3** ( $\delta_C$  43.4 and 43.5) compared with that of the linear type moiety of **4** (N<sub>10''</sub>-CH<sub>3</sub>,  $\delta_C$  33.9), indicated that since the two N<sub>10</sub>-CH<sub>3</sub> and N<sub>10''</sub>-CH<sub>3</sub> signals of **1** were observed at regular field ( $\delta_C$  32.8 and 33.0), no bulky substituent was attached peri- to either N-CH<sub>3</sub> group. Therefore, the possibility of structure (**6**) or any linear-angular structure dimer obtained through this reaction was denied.

In the <sup>1</sup>H nmr spectrum of **1**, a set of three signals were observed at  $\delta_H$  3.66 (1H, dd,  $J = 7, 10$  Hz, H-1'), 1.95 (1H, dd,  $J = 10, 14$  Hz, H-2') and 2.22 (1H, dd,  $J = 7, 14$  Hz, H-2'). Such signals had been also observed in the <sup>1</sup>H nmr spectra of **3** and **4**, albeit the chemical shift of the methine of **1** appeared higher than those of **3** ( $\delta_H$  5.165 (1H, dd,  $J = 7.3, 11.7$  Hz)) and **4** ( $\delta_H$  4.904 (1H, dd,  $J = 7.7, 11.5$  Hz)).<sup>2</sup> On the other hand, a set of doublets observed in the <sup>1</sup>H nmr of **3** ( $\delta_H$  5.116 and 6.171 ( $J = 9.6$  Hz)) and **4** ( $\delta_H$  5.309 and 6.463 ( $J = 9.6$  Hz))<sup>2</sup> disappeared in the <sup>1</sup>H nmr of **1**; instead a singlet at  $\delta_H$  6.30 ( $\delta_C$  110.2) was apparent. Two more singlet resonances ( $\delta_H$  6.28, 6.29) were observed in the <sup>1</sup>H nmr of **1**, and these signals were correlated to  $\delta_C$  90.1 and 90.9, respectively, and were similar to that of the C-4 chemical shift ( $\delta_C$  91.5) observed in the <sup>13</sup>C nmr spectrum of **4**. Correlations between  $\delta_C$  103.5 (2 x C) and  $\delta_H$  14.85 and 15.03 (each 1H, s) enabled the assignments of these <sup>13</sup>C signals as C-9a and C-9'a to be made. In addition, in the long range <sup>13</sup>C-<sup>1</sup>H COSY spectrum,  $\delta_H$  6.28 and 6.29 were found to be correlated to C-9a and C-9a'. These results indicated that **1** possessed two C<sub>4</sub>-H moieties. Because a singlet resonance at  $\delta_C$  141.0 was correlated to  $\delta_H$  3.66 (C-1') and was also correlated to the C-4''' and C-5''' signals ( $\delta_H$  1.59 and 1.77), the second unit was found to be attached to the C-2''' position. Thus, it was concluded that the C<sub>1'</sub> position of the first unit and the C<sub>2'''</sub> position of the second unit were joined. The reaction mechanism for the formation of **1** was considered to be shown in Figure 1.

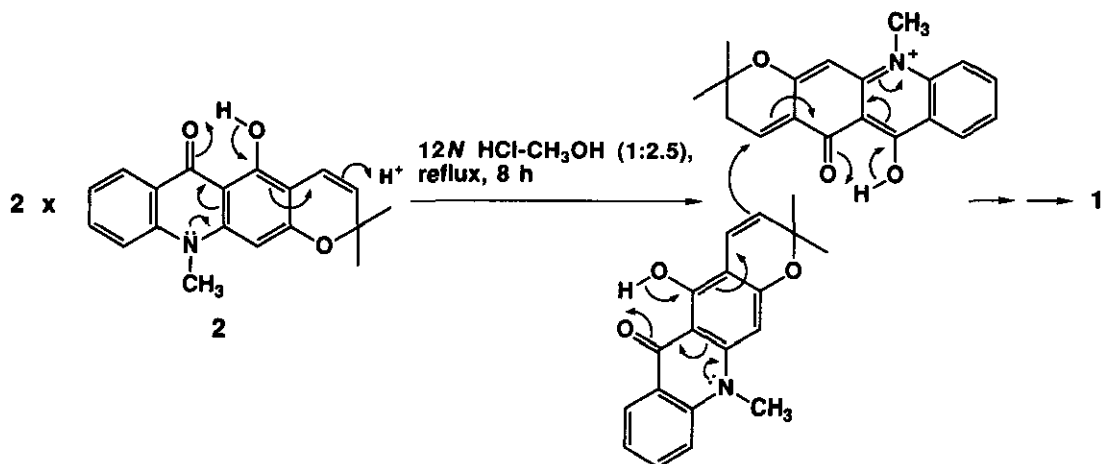


Figure 1. Dimerization of Norisoacronycine (**2**) in Acidic Conditions.

As acridone dimers, Diels-Alder adducts<sup>4</sup> have been reported to possess a C-C bond between the prenyl moieties of two acridone moieties, but the linkage points of compound (1) are different from those compounds reported previously.

As expected, compound (7) was obtained when the above reaction was performed using 12*N* DCl and CH<sub>3</sub>OD.<sup>5</sup> In the <sup>1</sup>H nmr of 7, the methylene resonance of 1 at H<sub>2</sub>-2' disappeared and a methine resonance at δ<sub>H</sub> 3.66 (dd, H-1') was changed into a singlet at δ<sub>H</sub> 3.72 (s, H-1').<sup>2</sup> In addition, two of the three singlet methine resonances disappeared<sup>2</sup> and only a singlet at δ<sub>H</sub> 6.36 (s, H-1'') was observed.

#### ACKNOWLEDGEMENTS

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#### REFERENCES AND NOTES

1. Part 14 in the series "Chemistry of Acronycine". For Part 13, see ref. 2.
2. S. Funayama and G. A. Cordell, *Heterocycles*, 1989, **29**, 815 and references cited therein.
3. Compound (1) was obtained as an orange-yellow powder. Uv λ<sub>max</sub> (MeOH) 227, 250, 264, 274, 300, 310, 333 (sh), 403 nm. Fabms *m/z* 614 (M<sup>+</sup>). Eims *m/z* 614 (M<sup>+</sup> 5%), 599 (3), 360 (2), 308 (20), 292 (23), 277 (4), 254 (4), 146 (4). Hreims obsd. 614.2396; calcd. for C<sub>38</sub>H<sub>34</sub>N<sub>2</sub>O<sub>6</sub> 614.2417. <sup>1</sup>H Nmr (CDCl<sub>3</sub>, δppm) 1.24 and 1.43 (each 3H, s, CH<sub>3</sub>-4' and 5'), 1.59 and 1.77 (each 3H, s, CH<sub>3</sub>-4'' and 5''), 1.95 (1H, dd, *J* = 10, 14 Hz, H-2'), 2.22 (1H, dd, *J* = 7, 14 Hz, H-2''), 3.66 (1H, dd, *J* = 7, 10 Hz, H-1'), 3.72 and 3.74 (each 3H, s, N<sub>10</sub> and N<sub>10</sub>''-CH<sub>3</sub>), 6.28 and 6.29 (each 1H, s, H-4 and 4''), 6.30 (1H, s, H-1'''), 7.17 and 7.18 (each 1H, dd, *J* = 8, 8 Hz, H-7 and 7''), 7.39 and 7.40 (each 1H, d, *J* = 8 Hz, H-5 and 5''), 7.61 and 7.63 (each 1H, ddd, *J* = 2, 8, 8 Hz, H-6 and 6''), 8.33 and 8.35 (each 1H, dd, *J* = 2, 8 Hz, H-8 and 8''), 14.85 and 15.03 (each 1H, s, C<sub>1</sub> and C<sub>1</sub>''-OH). <sup>13</sup>C Nmr, see Table 1.
4. A. Elomri, S. Michel, F. Tillequin, and M. Koch, *Heterocycles*, 1992, **34**, 79.
5. Compound 2 (12.7 mg) was dissolved in a mixture of 12*N* DCl-CH<sub>3</sub>OD (1:2.5, 6.0 ml), and the mixture refluxed on an oil bath for 4 h. The reaction mixture was diluted with D<sub>2</sub>O (10 ml). The product displayed <sup>1</sup>H nmr (CDCl<sub>3</sub>, δppm) 1.31 and 1.50 (each 3H, s, CH<sub>3</sub>-4' and 5'), 1.64 and 1.84 (each 3H, s, CH<sub>3</sub>-4'' and 5''), 3.72 (1H, s, H-1'), 3.79 and 3.81 (each 3H, s, N<sub>10</sub> and N<sub>10</sub>''-CH<sub>3</sub>), 6.36 (1H, s, H-1'''), 7.23 and 7.24 (each 1H, dd, *J* = 8, 8 Hz, H-7 and 7''), 7.46 and 7.48 (each 1H, d, *J* = 8 Hz, H-5 and 5''), 7.67 and 7.70 (each 1H, ddd, *J* = 2, 8, 8 Hz, H-6 and 6''), 8.40 and 8.42 (each 1H, dd, *J* = 2, 8 Hz, H-8 and 8''), 14.82 and 15.03 (each 1H, s, C<sub>1</sub> and C<sub>1</sub>''-OH).

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