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NUCLEAR MAGNETIC RESONANCE STUDY OF APORPHINE ALKALOIDS - III

THE QUATERNARY ALKALOID OF FAGARA TINGUASSOIBA

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A recent investigation of the anion shifts, observed in the N.M.R. spectra of phenolic aporphine alkaloids (1), showed the value of this method in structure elucidations. We wish to report some further studies of this kind, which may increase its general applicability.

From an investigation of corydine [I] and its methiodide, it became clear that the method is equally well applicable to either free alkaloids or quaternary salts. Table 1 contains the τ-values of the aromatic proton resonances of these compounds and their anions in dimethylsulphoxide solution. Only small changes in the spectra were noticed in going from corydine to its methiodide. Relatively large meta shifts have been observed for the proton at C-3 for both these compounds, indicating that the limits for ortho, meta, and para anion shifts as given previously (1) should be regarded with some caution.

It has been noted before (1) that protons on the aromatic ring not bearing a hydroxyl group experience larger anion shifts if subject to mesomeric effects. This observation has been utilised in the assignment of the protons on C-8 and C-9 in corydine methiodide. For corydine itself, however, some doubt still exists as to the correctness of these assignments.

Recently Tschesche _et al_. (2) have proposed revised structures for several phenolic 1,2,9,10-tetrasubstituted aporphine alkaloids, including the quaternary base isolated from _Fagara tinguassoiba_ (3).

Our studies on this alkaloid support the proposed structure [II]. While this work was in progress, the synthesis of [II] and its identity with the Fagara alkaloid were reported (4). Figure 1 illustrates the anion shifts of the aromatic proton resonances as a function of the relative amount of NaOD added to the dimethylsulphoxide solution of the Fagara base (as its iodide). Table 1 also gives the τ-values of the alkaloid and its anion.

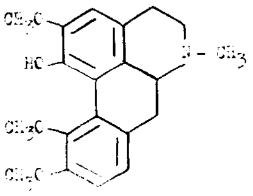
TABLE 1

Substance	τ-Values of Protons at Carbon Atoms[a)			
	3	8	9	11
Corydine	3.26	2.89[b)	2.99[b)	-
Corydine anion	3.68	3.10	3.28	-
Corydine methiodide	3.07	2.86	2.86	-
Corydine methiodide anion	3.56	3.00	3.18	-
Fagara alkaloid	3.12	2.99	-	1.96
Fagara alkaloid anion	3.69	3.21	-	0.92

a) Experimental conditions were the same as reported in Ref. 1

b) These values may be interchanged

In the spectra of the Fagara base and its anion the large low-field shift of the proton at C-11 is striking. Low-field shifts of this magnitude have been observed (1) for protons at C-1 or C-11 only if these protons were opposite to a hydroxyl group (on C-11 or C-1, respectively). Thus the hydroxyl group of the Fagara alkaloid must be placed at C-1. The C-3 proton undergoes a meta shift as large as those observed for corydine and its methiodide and the shift of the proton at C-8 is also within the expected limits. As there are still some unsolved problems in this series [viz. glaucentrine and thalicmidine (5)] the use of the method illustrated above may avoid time-consuming synthetic work.



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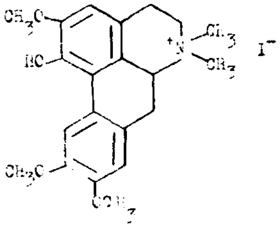

II

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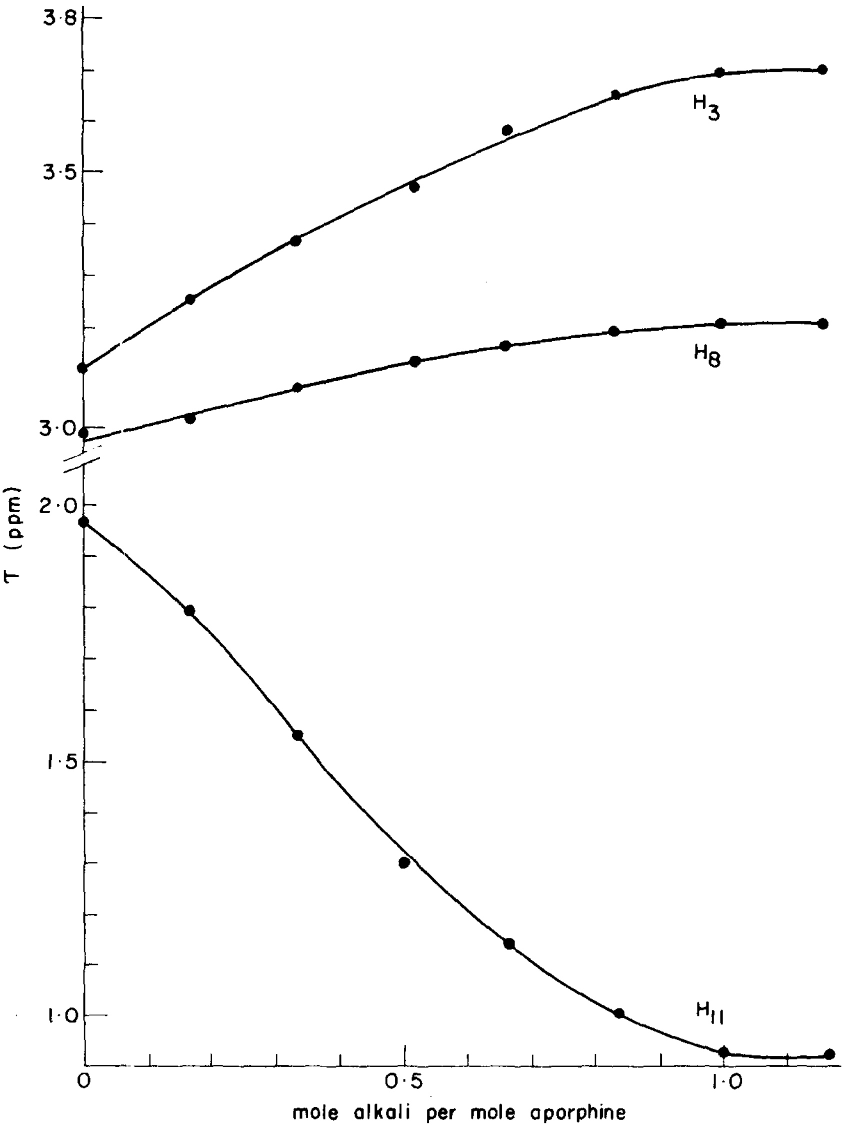
3·8
3·5
3·0
2·0
1·5
1·0
τ (ppm)
H_3
H_8
H_{11}
0
0·5
1·0
mole alkali per mole aporphine

FIGURE 1

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(3) N.V. Riggs, L. Antonaccio, and L. Marion, *Canad. J. Chem.* *39*, 1330 (1961).

(4) M. Shamma and W.A. Slusarchyk, *Tetrahedron Letters*, No. 20, 1509 (1965).

(5) The suggestion (Ref. 2) that thalicmidine is the l-form of the Fagara base also needs chemical proof. The latter can be methylated with diazomethane (Ref. 3), while the former was specifically reported to be unreactive under those conditions [see S. Yunusof *et al.* *J. Gen. Chem.* U.S.S.R. 1095 (1952)].