# Can a Proton of a Benzene Moiety Do Not Show-up During a Routine $^1$H NMR Experiment?

**Patrícia C. N. Nogueira[1] (PQ), Renata M. Araújo[2] (PQ), Raimundo Braz-Filho[3] (PQ) and Edilberto R. Silveira[1]* (PQ)**

*[1]Curso de Pós-graduação em Química, Departamento de Química Orgânica e Inorgânica, Centro de Ciências, Universidade Federal do Ceará. Caixa Postal 12.200 – Fortaleza, Ceará - 60021-940, Brazil.*
*[2]Curso de Pós-graduação em Química, Instituto de Química, Universidade Federal do Rio Grande do Norte. Caixa Postal 1524 – Natal, Rio Grande do Norte - 59072-970, Brazil.*
*[3]Laboratório de Ciências Químicas, Universidade Estadual do Norte Fluminense, Campos dos Goytacazes, 28013-602 Rio de Janeiro-RJ, Brazil.*

Keywords: *Aspidosperma pyrifolium*, Variable-temperature NMR, Plumeran Alkaloids.

## Introduction

*Aspidosperma pyrifolium* Mart., popularly known as "pereiro preto", is a shrub, sometimes a small tree, widely distributed in the northeastern Brazil flora.[1] Despite the report of 27 dihydroindole alkaloids with the plumeran skeleton already reported in the literature for *A. pyrifolium*, we decided to perform a phytochemical analysis of the ethanol extract from its seeds. This study led to isolation of seven alkaloids with the plumeran skeleton, four of which with no substituent on ring A of the dihydroindole moiety (see Figure 1). Only three of the four compounds showed the characteristic multiplicity pattern of the four contiguous protons consisting of a pair of doublets (protons 9 & 12) and a pair of triplets (protons 10 & 11) like the one of aspidofractinine (**1**, Fig. 1; spectrum G, Fig. 2). The fourth compound, to which we have assigned the structure of *N*-acetylaspidofractinine (**2**, Fig. 1) showed just a doublet and pair of triplets. In order to assign the unexpected behavior of this substance we decide to perform further NMR experiments to which this communication is related to.[2]

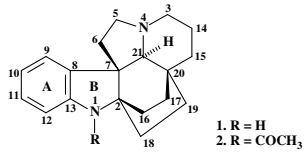


**Figure 1.** Structures of the alkaloids aspidofractinine (**1**) and *N*-acetylaspidofractinine (**2**).

## Result and Discussion

The first attempt was running the $^1$H NMR experiment in different deuterated solvents. Either for $CDCl_3$, $CD_3OD$ or DMSO-$d_6$, the same behavior was observed. In addition, no correlation with the supposed hydrogenated carbon-12 could be observed through the HSQC 2D $^1$H,$^{13}$C-NMR experiment. *N*-acetylaspidofractinine (**2**) has been previously obtained as a reactional derivative of aspidofractinine (**1**),[3,4] and no NMR data for the former is reported in the literature. One last attempt to solve this unexpected problem, a series of variable-temperature $^1$H NMR experiments in DMSO-$d_6$ was undertaken. As can be seen from Fig. 2, the expected splitting pattern starts to rise-up around 50 ºC to be completely observed at 80 ºC. Additionally, under 80 ºC both correlations of H-12 and H-11 and of H-12 with C-12 were now observed through the COSY and HMQC spectra, respectively.

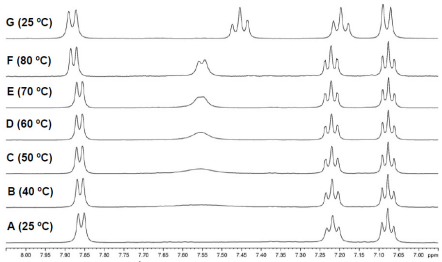


**Figure 2.** Partial $^1$H NMR spectra ($\delta$ 7.0-8.0), run under variable temperature (25-80 ºC) of *N*-acetylaspidofractinine (**A**-**F**, 500 MHz, DMSO-$d_6$) and of aspidofractinine (**G**, 500 MHz, $CD_3OD$) showing the splitting pattern of the benzene protons.

## Conclusion

*N*-acetylaspidofractinine is being reported for the first time as a natural product, as well its NMR data assignment.

Finally, we can now state that: "Yes, a proton can disappears on a routine $^1$H NMR experiment". Unfortunately, we do not have a plausible explanation for this behavior.

## Acknowledgements

CNPq, PRONEX, CAPES, FINEP and FUNCAP.

---

[1] Craveiro, A. A.; Matos, F. J. A. and Serur, L. M. *Phytochemistry* **1983**, *22*, 1526.
[2] Nogueira, P. C. N.; Araújo, R. M.; Viana, G. S. B.; Araújo, D. P.; Braz-Filho, R. and Silveira, E. R. *J. Braz. Chem Soc.* **2014**, *25*, 2108.
[3] Bycroft, B. W.; Schumann, D.; Patel, M. B. and Schmid, H. *Helv. Chim. Acta* **1964**, *47*, 1147.
[4] Guggisberg, A.; Gorman, A. A.; Bycroft, B. W. and Schmid, H. *Helv. Chim. Acta* **1969**, *52*, 76.