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ISOLATION AND STRUCTURE OF SUNGUCINE: A NEW TYPE OF BISINDOLINE ALKALOID

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Abstract: From the roots of Strychnos icaja Baill. an unsymmetrical dimeric alkaloid has been isolated and called sungucine. Its original structure has been established by X-Ray diffraction; UV, IR, MS and NMR data are also given.

Strychnos icaja roots are used in Central Africa for the preparation of arrow and ordeal poisons[1]. Early investigations have shown that these roots contained the well-known strychnine and its 12 hydroxy-derivative amongst many other bases[2]. We now record the isolation, characterization and structure determination of another major alkaloid: sungucine[3].

The dried root barks were extracted with EtOH, the extract concentrated and the resulting solution made acetic. This acidic solution was then extracted with $CHCl_3$ and has furnished tertiary crude bases (yield: 6 %). After purification by column chromatography over Al_2O_3 (activity II-III) and elution with Et_2O-C_6H_6, this main alkaloid was isolated by crystallization in Me_2CO-$CHCl_3$ as prisms (yield: 2 %); m.p. $>$ 350°C.

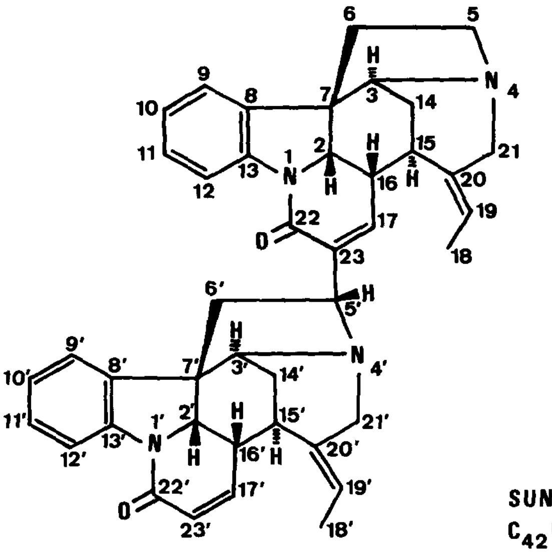
High resolution mass measurement of the new alkaloid suggested its molecular formula as $C_{42}H_{42}N_4O_2$ [found: 634,3249; required: 634,3306].

X-Ray crystallography established the relative configuration of sungucine. Crystals of $C_{42}H_{42}N_4O_2$ - C_3H_6O were orthorhombic, space group $P2_12_12_1$, with 4 molecules in a unit cell of dimensions a = 13.779(5), b = 24.516(6), c = 10.640(4) Å. The structure was refined to a final R value of 0.05 for 3.394 reflexions.

The absolute stereochemistry is based on the assumption that the 15 α configuration for $C_{15}H$ and $C_{15'}H$ agrees with the biosynthetic hypothesis[5]. From the X-Ray diffraction data[6] (about cis or trans relationship between asymmetrical carbons), the complete absolute stereochemistry of sungucine could be depicted as that shown overleaf.

Sungucine represents a new type of unsymmetrical bis-indoline alkaloid that is very different from other dimeric Strychnos alkaloids, e.g. toxiferines[7] and strychnobilines[8,9] which are mainly derived from Wieland-Gumlich-like aldehydic alkaloids. Indeed, sungucine has an original C_{23}-$C_{5'}$ bond between the two parts of the molecule.

The identification of sungucine can now be performed by spectroscopic methods. The MS with peaks at m/e (relative abundance in % of base peak): 634(95),527(17),512(16),437(37),384(10), 360(11),345(47),317(80),290(54),275(61),251(42),220(38),210(22),196(29),180(18),167(18),144(53),



SUNGUCINE
$C_{42}H_{42}N_4O_2$

143(13),135(91),122(98),121(base peak),108(75), supports the structure determination. The UV spectrum$\left[\lambda_{nm}^{EtOH}\right.$ (log ε) 218(4,87),265(3,84),292(4,02) and 305(4,01)$\left.\right]$ indicates a new chromophoric system. The IR spectrum$\left[\nu_{max}^{*KBr}\right.$ 3040,2950,2850,1710 (Me_2CO of crystallization),1670, 1600,1480,1460,1420,755 $cm^{-1}\left.\right]$ shows bands which can be assigned to the N_a-acyldihydroindole (1670) and ortho-disubstituted benzene ring (755). The NMR spectrum (in $CDCl_3$) shows characteristic signals at δ 8.28 and 8.03 (d;J=8Hz;H_{12}-$H_{12'}$),6.02(d;J=10Hz;$H_{23'}$),5.47 and 5.24(q;J_1=14Hz, J_2=7Hz;H_{19}-$H_{19'}$),4.38 and 4.35 (d;J=7.5Hz;H_2-$H_{2'}$),1.79 and 1.65(d;J=7Hz;Me_{18}-$Me_{18'}$).

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References and complementary notes

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