wise a slight excess of 50% potassium hydroxide. The evolution of nitrogen was quantitative. After warming to 60° the semicarbazone was prepared directly to yield 0.95 g. (56%) of semicarbazone, m. p. 172–173°, sintering at 166°.

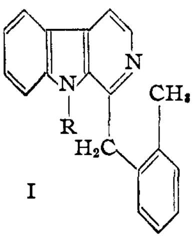
CHEMISTRY LABORATORY OF
THE OHIO STATE UNIVERSITY
COLUMBUS, OHIO MELVIN S. NEWMAN

RECEIVED DECEMBER 13, 1948

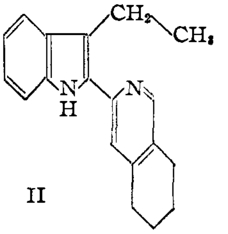
THE STRUCTURE OF SEMPERVIRINE

Sir:

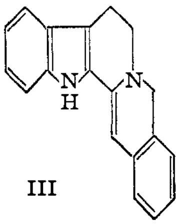
The alkaloid sempervirine, $C_{19}H_{16}N_2$, from *Gelsemium sempervirens*, Ait., is remarkable for its color and its high degree of unsaturation. In a recent elegant investigation, Prelog[1] has shown that the substance is transformed to the isomeric yobyrine (I, R = H) when heated with selenium, and to tetrahydroisoyobyrine (II) on treatment with Raney nickel. These results led to the proposal of structure (III) for sempervirine.



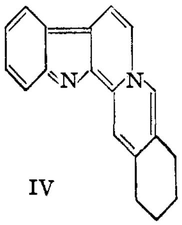
I



II

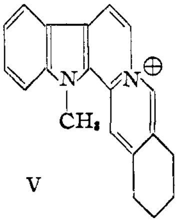


III

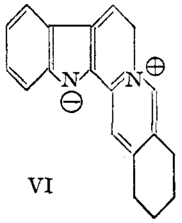


IV

We wish to propose a new structure (IV) for the alkaloid. In our view, the new formula is better in accord with the color of sempervirine, and with the formation from it of tetrahydroisoyobyrine. Beyond that we have been able to marshal new facts which provide further strong support for (IV). Thus, (i) the infrared spectrum of sempervirine *contains no band in the NH region*, while by contrast, all N-unsubstituted indole derivatives are characterized by an intense sharp band at 2.9 μ; (ii) when sempervirine methochloride is heated with selenium, a new base, m. p. 103° [hydrochloride, m. p. 229°, picrate, m. p. 235°, (calcd. for $C_{26}H_{21}O_7N_5$: C, 60.58; H, 4.11. Found: C, 60.38; H, 4.15)], is formed, which is clearly N-methylyobyrine (I, R = Me), since its ultraviolet spectrum is nearly identical with that of yobyrine, and its infrared spectrum possesses no NH band.[2] These observations support the view that the metho-salts of sempervirine contain the cation (V). The expression IV implies of course an important contribution of the fully aromatic ionic structure (VI). Consideration of this fact makes understandable the formation of metho-salts of the structure (V), as well as the color of the alkaloid, and its high basicity (*pK*, 10.6). The formation from sempervirine of a mole of methane in the Zerewitinow determination can be attributed to the presence in (IV ←→ VI) of a virtual (substituted) γ-picolinium system.



V



VI

We wish to thank M. Raymond-Hamet (Paris) and Professor M.-M. Janot for their gracious gifts of sempervirine.

CONVERSE MEMORIAL LABORATORY
HARVARD UNIVERSITY R. B. WOODWARD
CAMBRIDGE 38, MASS. BERNHARD WITKOP

RECEIVED MAY 17, 1948

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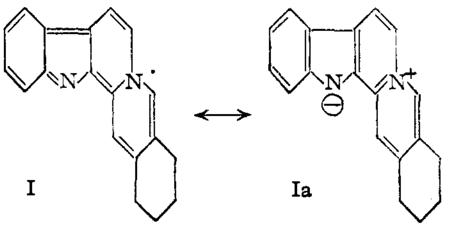
(1) Prelog, *Helv. Chim. Acta*, **31**, 588 (1948).

(2) More recently the nature of the base has been confirmed through direct comparison with a synthetic sample kindly supplied by Dr. Percy L. Julian.

THE SYNTHESIS OF SEMPERVIRINE METHOCHLORIDE

Sir:

It has been suggested on the basis of analytical and degradative evidence that the alkaloid sempervirine possesses the remarkable structure I ←→ Ia.[1] We have now been able to provide conclusive evidence for the proposed structure through the synthesis of sempervirine methosalts by an unambiguous route.



In model experiments, the lithium derivative of α-picoline was condensed with isopropoxymethylene cyclohexanone[2] (II) [b. p. 64–65° (0.2 mm.), $n^{26}D$ 1.4980, calcd. for $C_{10}H_{16}O_2$: C, 71.39; H, 9.59. Found: C, 71.18; H, 9.40]. From the acid-treated reaction-mixture, salts of the dehydroquinolizinium cation (III) were readily obtained (picrate, m. p. 237–238°, calcd. for $C_{19}H_{16}O_7N_4$: C, 55.34; H, 3.91; N, 13.59. Found: C, 55.41; H, 4.17; N, 13.36; per-

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(1) Woodward and Witkop, THIS JOURNAL, **71**, 379 (1949).

(2) Prepared from hydroxymethylene cyclohexanone by the method of Claisen, as reported by v. Auwers (*Ber.*, **71**, 2082 (1938)) and developed by Johnson and Posvic (THIS JOURNAL, **69**, 1361 (1947)).