It should be pointed out that since all flasks contained deoxycytidine growth was the same regardless of the B_{12} concentration. Samples of DNA from cells grown with 2 mμg. of B_{12} per ml. and with ribose-1-C^{14} were degraded with sulfuric acid and the deoxyribose converted to levulinic acid which was isolated as the 2,4-dinitrophenylhydrazone.[5] All the C^{14} activity of the original DNA was recovered in this derivative.

The results of these experiments demonstrate that in *L. leichmannii* vitamin B_{12} is required for the conversion of ribose to deoxyribose.

Acknowledgment.—This investigation was supported by research grant A-721, National Institutes of Health, Public Health Service.

(5) M. C. Lanning and S. S. Cohen, *J. Biol. Chem.*, **216**, 413 (1955).

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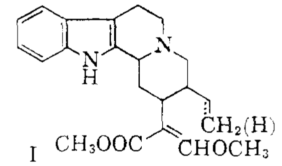
RECEIVED MAY 25, 1959

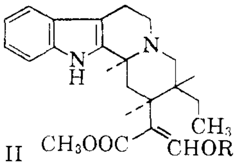
THE TOTAL SYNTHESIS OF *dl*-DIHYDROCORYNANTHEINE

Sir:

Structural[1] and stereochemical[2] investigations have revealed the characteristic alkaloids (I) of *Pseudocinchona africana* A. Chev. as "missing links" in the biogenetic sequences which involve among other substances, the venerable cinchona and yohimbine bases. We wish to record the first total synthesis of the racemic form of a naturally occurring representative of the corynantheine group, dihydrocorynantheine (II, R = CH_3).

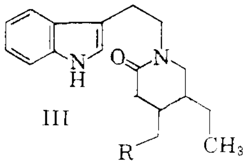
I



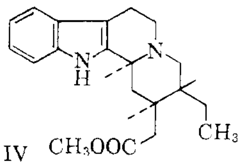


II

Nickel-catalyzed reduction of diethyl β-(1-cyano-1-propyl)-glutarate[3] in the presence of excess tryptamine afforded *cis* and *trans* ethyl *dl*-N-(β-3′-indolyl)-5-ethylpiperidone-4-acetates (III, R = $C_2H_5OOC^-$), which were separated as the acids (III, R = COOH) by chromatography on silicic acid (*cis* acid, m.p. 221–223°, C = 69.35; H = 7.54; *trans* acid, m.p. 203–205°, C = 69.78; H = 7.63). These isomers were distinguished stereochemically by correlation of the lower-melting substance with *trans*-N-(β-3′-indolyl)-4,5-diethylpiperidone (III, R = CH_3),[4] achieved by means of this series of transformations: selective reduction with lithium borohydride to the piperidone alcohol (m.p. 145–146°; C, 72.55; H, 8.28); without deliberate purification of intermediates, formation of the O-tosylate, then conversion to the isothiouronium salt, and reductive desulfurization of the latter by means of Raney nickel. Bischler–Napieralski cyclization of *trans* piperidone (III, R = CH_3OOC^-), and catalytic reduction over platinum of the resulting imine salt, resulted in formation of the *dl*-tetracyclic ester IV, m.p. 143.5–145.5° (HCl salt, m.p. 274.5–275°; C, 66.29; H 7.47). Treatment of IV with sodium triphenylmethyl then with methyl formate provided the α-hydroxymethylene ester (II, R = H), m.p. 185–186° (dec.) (infrared bands at 2.84 and 6.04μ) (C, 70.68; H, 7.47). Dimethyl sulfate and alkali, or, better, diazomethane in ethanol–ether, effected O-methylation, giving rise to *dl*-dihydrocorynantheine, which was characterized as the crystalline hydrochloride, m.p. 242–243° (C, 64.90; H, 7.17). The infrared spectrum (infrared bands at 2.85, 5.94 and 6.11μ) of the corresponding free base in chloroform solution was identical with the spectrum of *d*-dihydrocorynantheine in the same solvent.



III



IV

Acknowledgment.—This work was supported by a grant from the Research Committee of the University of Wisconsin, with funds supplied by the Wisconsin Alumni Research Foundation.

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(1) R. H. F. Manske and H. L. Holmes, "The Alkaloids," Vol. II, Academic Press, Inc., New York, N. Y., 1952, p. 420.

(2) (a) E. E. van Tamelen, P. E. Aldrich and T. J. Katz, *Chemistry and Industry*, 793 (1956); THIS JOURNAL, **79**, 6426 (1957); (b) M.-M. Janot, R. Goutarel, A. Le Hir, G. Tsatsas and V. Prelog, *Helv. Chim. Acta*, **38**, 1073 (1955).

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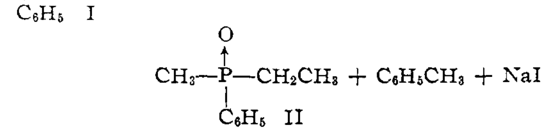
STEREOSPECIFIC CONVERSION OF METHYLETHYLPHENYLBENZYLPHOSPHONIUM IODIDE TO METHYLETHYLPHENYLPHOSPHINE OXIDE

Sir:

In the following communication[1] data were provided to show that the conversion by the action of sodium hydroxide solution of methylethylphenylbenzylphosphonium iodide (I) to methylethylphenylphosphine oxide (II), with elimination of toluene, is a third order reaction. We also wish to report that the reaction is completely stereospecific.



$$CH_3\text{—}\overset{\overset{CH_2CH_3}{|}\;+}{\underset{\underset{C_6H_5}{|}}{P}}\text{—}CH_2C_6H_5,I^- + NaOH \longrightarrow \quad \text{I}$$

$$CH_3\text{—}\overset{\overset{O}{\uparrow}}{\underset{\underset{C_6H_5}{|}}{P}}\text{—}CH_2CH_3 + C_6H_5CH_3 + NaI \quad \text{II}$$

Treatment of optically pure levorotatory I[2]

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(1) M. Zanger, C. A. VanderWerf and W. E. McEwen, THIS JOURNAL, **81**, 3806 (1959).

(2) K. F. Kumli, W. E. McEwen and C. A. VanderWerf, *ibid.*, **81**, 248 (1959).