

lein (IIa) by 1,4-addition of hydrogen. This structure, which still represents a vinylogous amide, accounts for the non-basic properties of the reduced substance. Support for the correctness of this formulation is provided by the similarity of the infrared spectrum of dihydroedulein in the carbonyl region with that of the similarly constituted 1-methyl-4-keto-7,8-methylenedioxy-1,2,3,4-tetrahydroquinoline (IV) (λ_{\max} 5.99, 6.17, and 6.34 μ), the lithium aluminum hydride reduction product of casimiroin.²

EXPERIMENTAL⁶

Demethyledeulein (γ -hydroxy-1-methyl-2-phenyl-4-quinolone) (IIb). A mixture of 90 mg. of edulein, 1 g. of potassium hydroxide, and 10 cc. of ethylene glycol was boiled under reflux for 24 hr. Water was added, the solution was filtered, the filtrate was acidified with dilute hydrochloric acid, and the precipitate was collected. Crystallization from ethanol gave 74 mg. of demethyledeulein as needles, m.p. 322–324° (dec.). The substance gave a red color with alcoholic ferric chloride.

Anal. Calcd. for $C_{16}H_{13}NO_2$: C, 76.47; H, 5.22. Found: C, 76.25; H, 5.36.

The same substance was obtained by boiling edulein (90 mg.) with hydriodic acid (3 cc.; d 1.7) for 1 hr.

Treatment of demethyledeulein in ether suspension with ethereal diazomethane at 5° for 24 hr. regenerated edulein in almost quantitative yield.

Dihydroedulein (γ -methoxy-1-methyl-2-phenyl-4-keto-1,2,3,4-tetrahydroquinoline) (III). Edulein (150 mg.) dissolved in 25 cc. of dry tetrahydrofuran was added dropwise to a solution of 500 mg. of lithium aluminum hydride in 15 cc. of tetrahydrofuran and the mixture was boiled under reflux for 7 hr. It was then cooled, poured into ice cold dilute sulfuric acid, and extracted with ether. The ethereal extract was washed with water, dried, and evaporated. Chromatography of the residue on 3.5 g. of alumina and crystallization of the fractions eluted with pentane-benzene (1:1) from ether-pentane gave 105 mg. of dihydroedulein, m.p. 129–130°, λ_{\max} 238, 255, 283, and 375 $m\mu$ ($\log \epsilon$ 4.21, 4.37, 3.96, and 3.70, respectively), λ_{\max} 6.01, 6.20 and 6.37 μ , no hydroxyl band.

Anal. Calcd. for $C_{17}H_{17}NO_2$: C, 76.38; H, 6.41; N, 5.24. Found: C, 76.18; H, 6.19; N, 5.25.

Identification of edulein with γ -methoxy-1-methyl-2-phenyl-4-quinoline (IIa). A sample of edulein, m.p. 200–201°, gave no melting point depression on admixture with a sample of IIa (m.p. 199–200°) obtained by Dr. J. R. Price from the bark of *Lunasia amara*. The infrared spectrum of edulein was re-determined (λ_{\max} 6.15, 6.19, 6.24, 6.33, and 6.39 μ) and was found to be completely identical with the spectrum of IIa.

Edulein picrate was prepared again and after crystallization from methanol formed yellow needles, m.p. 220–221°. There was no depression on admixture with a sample of the picrate of IIa, m.p. 220–221°, kindly supplied by Dr. Price.

Acknowledgment. We are indebted to Drs. F. A. Kincl and G. Rosenkranz (Syntex S. A., Mexico City) for the edulein used in this investigation, to Dr. Sidney Goodwin for interesting discussions and

(6) Melting points are uncorrected. The ultraviolet spectrum was measured in 95% ethanol solution on a Unicam Model S.P. 500 spectrophotometer and the infrared spectra in chloroform solution on a Baird double-beam recording spectrophotometer. The analyses were carried out in our microanalytical department under the direction of Mr. Erich Meier.

correspondence, and to Dr. J. R. Price for samples of the alkaloid IIa and its picrate.

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Spiroisindolinium Salts

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Received November 27, 1957

During an investigation of various types of quaternary ammonium salts, seven new spiroisindolinium compounds were prepared for pharmacological evaluation (Table I). These derivatives resulted from the reaction of cyclic secondary amines and various *o*-xylylene halides in the manner generally described by other investigators.^{2–5} While most of the intermediates used have been previously described, improved preparations of some of them are reported in the experimental part.

The isindolinium salts were pressor agents in dogs. No other marked pharmacological activity was noted.

EXPERIMENTAL⁶

General procedure. The isindolinium salts were prepared by heating under reflux a mixture of 0.1 mole of an *o*-xylylene halide and 0.1 mole of a cyclic secondary amine in 600 ml. of isopropyl alcohol containing 0.1 mole of sodium hydroxide and 10 ml. of water. After 6 to 18 hr. the solution was filtered, then concentrated to a volume of 50 to 150 ml. and filtered again to remove inorganic material. The product was obtained by diluting the filtrate with anhydrous ether and refrigerating the mixture.

Crude yields of 60 to 90% were obtained. The products were recrystallized and dried *in vacuo* before analysis.

Secondary amines. Hexamethyleneimine was obtained from a commercial source; 2- and 4-methyl hexamethyleneimine were prepared by the method of Blicke and Doorenbos.⁷

Intermediates. 1,2-Bis(α -bromoethyl)benzene. A mixture of 5.0 g. (0.03 mole) of 1,2-bis(α -hydroxyethyl)benzene⁸ and 100 ml. of 65% aqueous hydrobromic acid was stirred for 48 hr. at room temperature, then poured into a mixture of 250 g. of ice and 250 ml. of water. The solid was separated by filtration, washed well with water and air-dried to give 8.4 g. (96%) of pure product, m.p. 88–91°.⁹

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