

Compound IVb had mp 194–195°C (from butanol). PMR spectrum: 7.89 (d, 1H, 3-H), 8.14 (d,  $J_{34} = 8$  Hz, 4-H), 8.34 (s, 1H, 2'-H), 7.44 (m, 4'-, 5'-, 6'-, and 7'-H), and 6.26 ppm (m, furyl ring protons). Compound IVc had mp 218–219°C (from methanol). PMR spectrum: 8.17 (d, 1H, 3-H), 8.80 (d, 1H,  $J_{34} = 9$  Hz, 4-H), 3.70 (t, 2H,  $J_{67} = 5$  Hz, 6-H), 2.9 (t, 2H,  $J_{78} = 5$  Hz, 8-H), 2.4 (m, 2H, 7-H), 8.37 (d, 1H,  $J_{1'2'} = 4$  Hz, 2'-H), and 7.17–8.03 ppm (m, 4'-, 5'-, 6'-, and 7'-H). The results of elementary analysis were in agreement with the calculated values.

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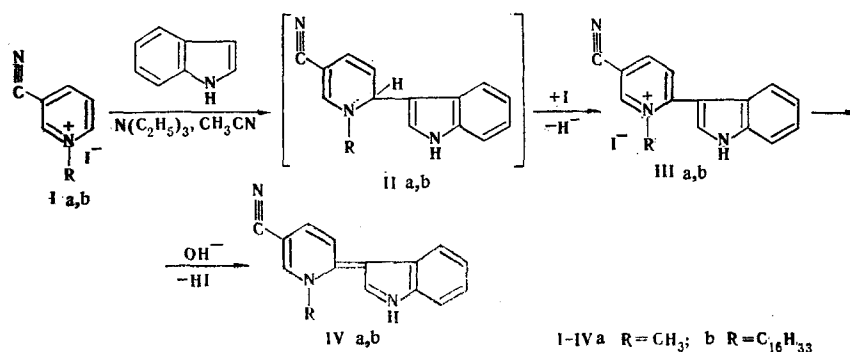
#### NEW SYNTHESIS OF PYRIDYLINDOLES

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Despite the large number of studies devoted to the synthesis of pyridylindoles, which display diverse physiological activity, these bisheterocycles with all possible modes of fusion of the pyridine and indole rings remain difficult to obtain. All of the methods for their synthesis reduce, as a rule, to Fischer cyclization of the arylhydrazones of a number of ketones of the pyridine series [1, 2], which are also difficult to obtain. However, cases involving the production of pyridylindoles by the direct reaction of pyridine and indole derivatives are extremely rare and are limited to only a few examples [3–5].

In a study of the reactions of quaternary 3-cyanopyridinium salts with nucleophiles we found a fundamentally new direct method for the synthesis of 3-(2-pyridyl)indole derivatives. We found that 1-alkyl-3-cyanopyridinium iodides I in acetonitrile in the presence of triethylamine readily react with indole to give 1-alkyl-3-cyano-6-(3-indolyl)pyridinium iodides (IIIa,b):



The reaction evidently proceeds through a step involving the intermediate formation of dihydro structure II, which then under the influence of excess salt I splits out a hydride ion to give final substance III. Salts III are readily deprotonated under the influence of alcoholic KOH solution to give stable anhydro bases IV. Intense absorption bands at 1650–1670 and 2190–2200  $\text{cm}^{-1}$ , which correspond to the stretching vibrations of the C=N and C≡N bonds in the molecules, are observed in the IR spectra of III and IV. An intense maximum at 3485–3490  $\text{cm}^{-1}$ , which is related to the absorption of the NH group of the indole fragment, is also present in the spectra of salts III. The following signals are observed in the PMR spectrum of one of the compounds (IVa): 3.70 (s, 3H, N-CH<sub>3</sub>), 7.73 (s, 2H, pyridine 4-H and 5-H), 7.90 (d, 1H, indole 2-H,  $J_{12} = 3.0$  Hz), and 6.5–7.4 ppm (indole aromatic protons).

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The results of elementary analysis of III and IV for their C, H, and N content were in agreement with the calculated values. The following 3-(2-pyridyl)indole derivatives were obtained (compound, melting point in degrees centigrade, and yield in percent given): IIIa, 270-271, 50; IIIb, 235-236, 55; IVa, 236-237, 95; IVb, 122-123, 98.

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