

SHORT
COMMUNICATIONS

Synthesis of Pyrazoleporphyrins and Pyrazolechlorins by Cyclization of Peripheral β -Diketone Groups of Porphyrins and Chlorins with Phenylhydrazines

G. V. Ponomarev¹, V. Yu. Pavlov¹, I. O. Konstantinov¹,
V. P. Timofeev¹, and B. G. Kimel'³

¹State Establishment Orekhovich Research Institute, Russian Academy of Medical Sciences, Moscow, 119121 Russia

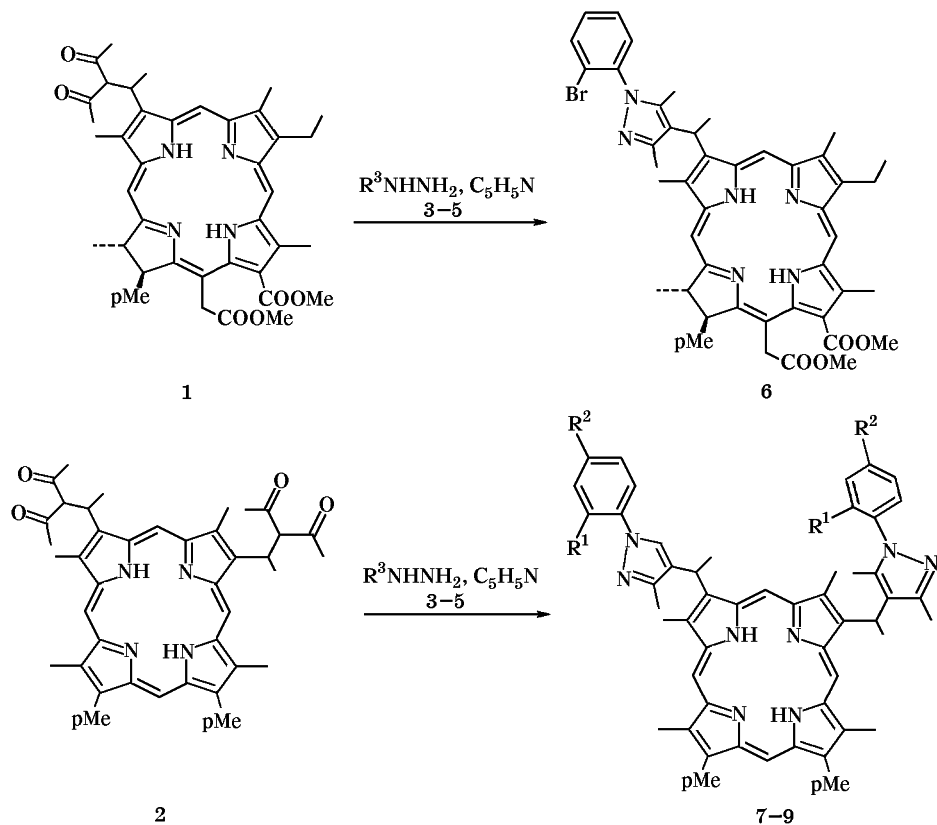
²Engelgardt Institute of Molecular Biology, Russian Academy of Sciences, Moscow, Russia

³Zelinsky Institute of Organic Chemistry, Russian Academy of Sciences, Moscow, Russia

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Porphyrins possessing *meso*-dimethylaminomethyl or alkoxyethyl groups and also peripheral (1-alkoxy)ethyl or alkoxyethyl groups which are capable to generate carbocations of benzyl type are known to readily react with β -diketones (acetylacetone, benzoylacetone etc.) to furnish derivatives containing β -diketone moieties [1-3].

Aiming at designing new promising photosensitizers for photodynamic cancer therapy and at further functionalization of tetrapyrrole structures possessing acetylacetonate substituents we carried out for the first time a synthesis of pyrazole system on these structures. As porphyrin components were selected compounds **1** [4] and **2** [2].



$R^1 = Br, R^2 = H$ (**7**); $R^1 = R^2 = H$ (**8**); $R^1 = H, R^2 = Me$ (**9**); $R^3 = o\text{-}BrC_6H_4$ (**3**), C_6H_5 (**4**), $p\text{-}MeC_6H_4$ (**5**);
 $pMe = CH_2CH_2COOMe$.

At heating at reflux in pyridine for 1 h compounds **1**, **2** with *o*-bromophenyldiazine **3** and porphyrin **2** with phenylhydrazines **4**, **5** we obtained the corresponding derivatives **6–9** in no less than 75% yield. Therewith we did not observe formation of the corresponding hydrazides at the ester groups.

All synthesized compounds **6–9** were characterized with mass spectra obtained by ionization in electro-spray. The most abundant peaks had values 877.3 $[MH]^+$, 1093.5 $[M]^+$, 935.7 $[M]^+$, and 963.7 $[M]^+$ respectively.

The formation of *exo*-pyrazole rings were revealed by the specific absorption in the electronic spectra in the region 220–300 nm characteristic of phenylpyrazole system and completely lacking in the spectra of initial compounds **1** and **2**.

The 1H NMR spectra (400 MHz, $CDCl_3$) unambiguously confirm the structure of compounds obtained. The presence of phenyl substituents in pyrazole moieties gave rise to multiplets of phenyl protons at 7.67–7.13 ppm and two singlets at 2.33 and 2.31 ppm [$CH_3C_6P_4$ in the spectrum of compound **9**].

The methylene protons attached to position 3' of chlorine **6** appear as a singlet at 5.01 ppm, and the protons of methyl groups of the pyrazole substituent are observed as two singlets at 2.34 and 1.95 ppm.

The chiral centers in positions 3' and 8 of compounds **7–9** are the cause of nonequivalence of methyl group pairs in the pyrazole fragments. In the spectra of compounds **8**, **9** they appear as two pairs of

singlets at 2.60–2.55 and 2.25–2.17 ppm, and in the spectrum of compound **7** they are observed as two multiplets at 2.80–2.55 and 1.96–1.89 ppm. The two broadened doublets in the spectra of compounds **7–9** at 2.46–2.43 and 2.44–2.38 ppm ($J \sim 7$ Hz) correspond to $CH(CH_3)$ groups. As characteristic signals in the 1H NMR spectra of compounds **8**, **9** may be regarded two classical overlapping quartets of protons belonging to groups $CH(CH_3)$ at 5.95–5.84 ppm ($J \sim 7$ Hz). The corresponding protons in the spectrum of compound **7** give rise to a multiplet at 6.03–5.77 ppm.

The high efficiency of building up the peripheral heterocyclic systems proceeding from acetylacetone derivatives of protoporphyrin **IX** and chlorophyll *a* opens totally new synthetic possibilities for purposeful preparation of compounds promising from the viewpoint of biological and pharmaceutical activity.

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