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KISHNER REDUCTION OF 3,3-DIMETHYL-6-TRIFLUOROMETHYL-1,2,3,4-TETRAHYDRO-INDOLO[2,3-*c*]QUINOLIN-1-ONE

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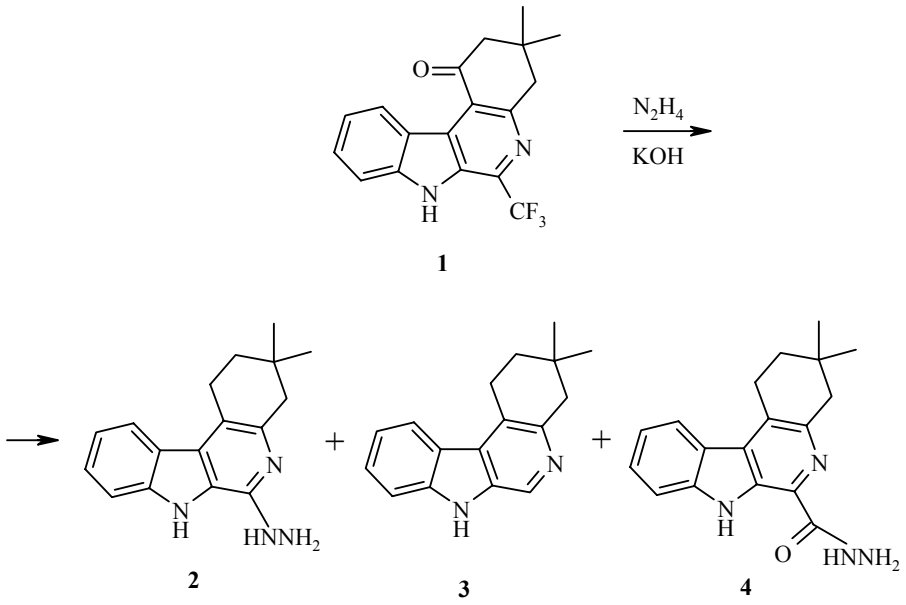
In connection with a study of the biological activity of tetracyclic derivatives of β-carboline, we have carried out reduction of the carbonyl group for several tetracyclic ketones of this series that we obtained in [1, 2], which led to synthesis of compounds with pronounced nootropic properties [2, 3]. We isolated the Kishner reduction products in close to quantitative yield. Reduction of 3,3-dimethyl-6-trifluoromethyl-1,2,3,4-tetrahydroindolo[2,3-*c*]quinolin-1-one (**1**) under these conditions unexpectedly led to a mixture of indoloquinoline derivatives not containing a trifluoromethyl group. Based on spectral characteristics (IR spectroscopy, mass spectroscopy, and ^{1}H NMR spectroscopy) and analytical characteristics of the three identified products, we established that along with reduction of the carbonyl group, hydrazinolysis of the trifluoromethyl group occurs with formation of substituted hydrazine **2**, 6-unsubstituted indoloquinoline **3**, and the hydrazide of the corresponding carboxylic acid **4**.



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There are not many examples of reactions of the trifluoromethyl group in heterocycles [4]. Usually stable relative to treatment with various reagents, the trifluoromethyl group is probably activated in a heterocyclic system with π-rich and π-deficient properties, which determines its ambiguous behavior in the reaction with hydrazine. We have observed such a transformation for the first time in a series of tetracyclic derivatives of β-carboline.

6-Hydrazino-3,3-dimethyl-1,2,3,4-tetrahydroindolo[2,3-*c*]quinoline (2). Yield 35%; mp 208-210°C (benzene). R_f 0.25 (Silufol UV-254, chloroform–pyridine, 10:1). IR spectrum (KBr), ν, cm^{-1}: 3425-3230, 1620, 1565. ^{1}H NMR spectrum (Bruker AM-300 (300 MHz), DMSO-d_6, TMS), δ, ppm (*J*, Hz): 1.03 (6H, s, 3,3-$(CH_3)_2$); 1.78 (2H, t, *J* ~ 6, 2-CH_2); 2.75 (2H, s, 4-CH_2); 3.32 (2H, t, *J* ~ 6, 1-CH_2); 4.91 (2H, s, 6-N–NH_2); 5.21 (1H, br. s, 6-NH); 7.16 (1H, t, *J* ~ 8, H-10); 7.44 (1H, t, *J* ~ 8, H-9; 7.61 (1H, d, *J* ~ 8, H-8); 8.12 (1H, d, *J* ~ 8, H-11); 11.0 (1H, s, H-7). Mass spectrum (Finnigan MAT.INCOS 50, 70 eV), *m*/*z* (*I*, %): 280 (100), 262 (30), 251 (19), 233 (4), 224 (22), 206 (33), 195 (17), 179 (9), 166 (13), 154 (7), 140 (12), 124 (32), 116 (14), 89 (9), 78 (31), 63 (8), 51 (12), 41 (25). Calculated: M = 280.38. Found, %: C 72.6; H 7.4; N 20.1. $C_{17}H_{20}N_4$. Calculated, %: C 72.83; H 7.19; N 19.98.

3,3-Dimethyl-1,2,3,4-tetrahydroindolo[2,3-*c*]quinoline (3). Yield 34%, mp 212-213°C (toluene). R_f 0.45 (Silufol UV-254, chloroform–pyridine, 10:1). IR spectrum (KBr), ν, cm^{-1}: 3230, 1625, 1610, 1565. ^{1}H NMR spectrum, δ, ppm (*J*, Hz): 1.02 (6H, s, 3,3-$(CH_3)_2$); 1.73 (2H, t, *J* ~ 6, 2-CH_2); 2.67 (2H, s, 4-CH_2); 3.42 (2H, t, *J* ~ 6, 1-CH_2); 7.31 (1H, t, *J* ~ 8, H-10); 7.65 (1H, t, *J* ~ 8, H-9); 7.82 (1H, d, *J* ~ 8, H-8); 8.17 (1H, d, *J* ~ 8, H-11); 8.98 (1H, s, H-6); 12.2 (1H, s, H-7). Found, %: C 81.3; H 7.3; N 11.3. $C_{17}H_{18}N_2$. Calculated, %: C 81.56; H 7.25; N 11.19.

6-Hydrazinocarbonyl-3,3-dimethyl-1,2,3,4-tetrahydroindolo[2,3-*c*]quinoline (4). Yield 6%; mp 265-267°C (chloroform), R_f 0.15 (Silufol UV-254, chloroform–pyridine, 10:1). IR spectrum (KBr), ν, cm^{-1}: 3380-3200, 1655, 1630, 1600, 1575, 1555, 1525. ^{1}H NMR spectrum, δ, ppm (*J*, Hz): 1.07 (6H, s, 3,3-$(CH_3)_2$); 1.62 (2H, t, *J* ~ 6, 2-CH_2); 2.78 (2H, s, 4-CH_2); 3.22 (2H, t, *J* ~ 6, 1-CH_2); 6.97 (2H, br. s, 6-NH_2); 7.18 (1H, t, *J* ~ 8, H-10); 7.24 (1H, t, *J* ~ 8, H-9); 7.41 (1H, d, *J* ~ 8, H-8); 8.06 (1H, d, *J* ~ 8, H-11); 8.39 (2H, br. s, 6-NH); 11.8 (1H, s, H-7). Found, %: C 69.9; H 6.6; N 18.4. $C_{18}H_{20}N_4O$. Calculated, %: C 70.11; H 6.54; N 18.17.

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