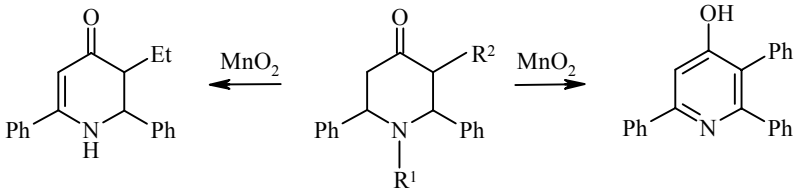
Chemistry of Heterocyclic Compounds, Vol. 38, No. 4, 2002

FIRST EXAMPLE OF THE AROMATIZATION OF γ-PIPERIDONES BY THE ACTION OF MANGANESE DIOXIDE

A. T. Soldatenkov, K. B. Polyanskii, and N. M. Kolyadina

Keywords: 4-hydroxypyridines, manganese dioxide, γ-piperidones, oxidation.

Manganese dioxide, which has been used for the aromatization of dihydro derivatives of five-membered heterocycles [1, 2], is also rather efficient for the transformation of dihydropyridines [3, 4] and tetrahydropyridines [5] into the corresponding pyridines. However, there has been no work on the oxidative dehydrogenation of γ-piperidones. In the present communication, results are given for a study of the oxidative transformations of three γ-piperidones **1a-1c** differing in the substituent at 3-C and/or the nitrogen atom in the heterocycle. In all cases, the oxidation of the substrates was carried out by heating in a toluene solution at reflux for 4 h with a 10-fold molar excess of active manganese dioxide. Under these conditions, the transformation of 3-ethyl-2,6-diphenylpiperidone (**1a**) was 34% and 3-ethyl-2,6-diphenyl-2,3-dihydro-4(1H)-pyridone (**2**) was isolated in 48% yield (relative to piperidone **1a** used).



2 **1a–c** **3**

1 a R^1 = H, R^2 = Et; **b** R^1 = H, R^2 = Ph; **c** R^1 = Me, R^2 = Ph

In the case of piperidone **1b**, a greater of extent of oxidative dehydrogenation was found since the major product is 4-hydroxy-2,3,6-triphenylpyridine (**3**), which was isolated in 55% yield relative to the amount of piperidone taken. Since the tautomeric γ-pyridone was not observed, we also studied the oxidation of N-methylpiperidone **1c**. However, also in this case, only 4-hydroxypyridine **3** was isolated in 44% yield relative to the amount of piperidone taken. This result indicates the facility not only for the dehydrogenation but also for the removal of the N-methyl group under the oxidation conditions studied.

Thus, we are the first to establish that not only dehydrogenation but also aromatization of 2,6-diphenylpiperidones may occur upon the action of manganese dioxide.

3-Ethyl-2,6-diphenyl-2,3-dihydro-4(1H)-pyridinone (2). A mixture of **1a** (1 g, 3.6 mmol) and manganese dioxide (3.1 g, 35.6 mmol) in toluene was heated at reflux for 4 h. Manganese dioxide was separated and washed on the filter with chloroform (50 ml). The combined filtrates were evaporated in vacuum and the

Russian People's Friendship University, 117923 Moscow, Russia, e-mail: asoldatenkov@sci.pfu.edu.ru.
Translated from Khimiya Geterotsiklicheskikh Soedinenii, No. 4, pp. 558-559, April, 2002. Original article submitted November 19, 2001.

 0009-3122/02/3804-0492$27.00

residue was subjected to chromatography on an alumina column using 1:1 ether–hexane as the eluent to give 0.66 g starting **1** (66% recovery) and 0.16 g **2** (16% yield relative to piperidone **1** taken or 48% yield relative to **1** consumed) as a thick light-yellow oil with R_f 0.4 (on Alufol with chloroform as the eluent). IR spectrum, ν, cm^{-1}: 3200 br (NH), 1650-1610 (C=C–C=O). ^{1}H NMR spectrum ($CDCl_3$), δ, ppm, J (Hz): 0.93 (3H, t, J = 5.0, Me–CH_2); 1.55 and 1.78 (1H each, both m, Me–CH_2); 2.62 (1H, m, 3-H); 4.70 (1H, dd, J = 6.4 and 1.0, 2-H); 5.30 (1H, br. s, NH); 5.47 (1H, s, 5-H) 7.35-7.60 (10H, m, Ph). Mass spectrum, *m/z*: 277 $[M]^+$. Found, %: C 82.05; H 7.11; N 4.93. $C_{19}H_{19}NO$. Calculated, %: C 82.31; H 6.86; N 5.05.

4-Hydroxy-2,3,6-triphenylpyridine (3) was obtained analogously from piperidone **1b** or **1c** (0.5 g, ~1.5 mmol) and manganese dioxide (1.3 g, 15 mmol). In the case of NH-piperidone **1b**, 60 mg starting compound was recovered (88% conversion) along with 0.27 g 4-hydroxypyridine **3** (55% relative to piperidone **1b** taken) as colorless crystals; mp 208-210°C, R_f 0.42 (Alufol with chloroform as the eluent). IR spectrum, ν, cm^{-1}: 3300 br (OH), 1615. ^{1}H NMR spectrum ($CDCl_3$), δ, ppm: 7.22 (10H, m, Ph); 7.43 (4H, m, Ph+5-H); 8.0 (2H, br. m, Ph). ^{1}H NMR spectrum (DMSO-d_6), δ, ppm: 7.25 (10H, m, Ph); 7.53 (4H, m, Ph+5-H); 8.03 (2H, br. m, Ph); 10.75 (1H, br. s, OH). Mass spectrum, *m/z* (I_{rel}, %): 323 (51) $[M]^+$, 322 (100), 189 (12), 161 (12), 152 (5), 83 (13), 77 (5). Found, %: C 85.31; H 5.46; N 4.05. $C_{23}H_{17}NO$. Calculated, %: C 85.45; H 5.26; N 4.34.

In the case of N-methylpiperidone **1c**, starting compound (0.2 g) was isolated along with **3** (0.22 g) (in 44% yield relative to piperidone **1c** taken or 74% yield relative to piperidone **1c** consumed). The product was identical in its melting point and R_f value to the sample obtained from piperidone **1b**.

This work was carried out with the financial support of the Russian Basic Research Fund (Grant No. 99-03-32940a).

REFERENCES

1. O. Meth-Cohn and H. Suschitzky, *Chem. Ind.*, **5**, 443 (1969).
2. A. J. Fatiadi, *Synthesis*, 65 (Pt I), 133 (Pt II) (1976).
3. A. Kuno, H. Sakai, Y. Sugiyama, and H. Takasugi, *Chem. Pharm. Bull.*, **41**, 156 (1993).
4. A. Sausin'sh and G. Dubur, *Khim. Geterotsikl. Soedin.*, 579 (1993).
5. A. T. Soldatenkov, K. B. Polyanskii, A. W. Temesgen, S. A. Soldatova, N. D. Sergeeva, N. M. Kolyadina, and N. N. Lobanov, *Mendeleev Commun.*, 27 (2001).