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Synthesis of *N*-mono- and *N,N*-dialkylated imidazole derivatives based on (adamantyl-1)bromomethylketone and study of their antibacterial activity

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Abstract

Different methods for the synthesis of *N*-mono- and *N,N*-dialkylated imidazole derivatives represent certain interest not only for organic chemistry, but also for medicine. *N*-alkylated imidazoles are the basis of drugs with antibacterial and antifungal activities. This allows us to consider them as efficient synthons for the synthesis of modern medicines. The quaternary imidazolium salts are applied as anticorrosive substances in petroleum industry due to their antibacterial activity against sulfur bacteria. The introduction of (adamantoyl-1)methyl group with high lipophilicity to the composition of imidazole derivatives contributes in some cases to increasing their bactericidal effect.

In this paper, *N*-mono- and *N,N*-dialkylation of imidazole derivatives was carried out by using (adamantyl-1)bromomethylketone. The newly obtained compounds were identified using ^1H NMR and IR spectroscopy, and its homogeneity by TLC. In addition, the counter synthesis was conducted with previously obtained *N*-adamantoylmethylimidazoles to define the structure of quaternary salts. The experimental results demonstrated identical of 1,3-bis[(adamantoyl-1)methyl]imidazolium bromides which were received in two various ways.

To determine antibacterial activity of received substances we were examined its influence on *E.Coli* cells. DMSO was used as a comparison control. The experiment was carried out in MPA medium. The disc-diffusion method was selected as a test of the antibiotic sensitivity of bacteria.

References

[1] M.D. Mashkovsky. Medicinal compounds. *Moscow: New wave.* **2012**. P.1216. (russian)
[2] L.S. Stratchounski, Y.B. Belousov, S.N. Kozlov. Practical guide to anti-infective chemotherapy. *Smolensk: IACMAC.* **2007**. P.462. (russian)
[3] L. Brunsveld, H. Zong, M. Glasbeek, E.W. Meijer. RNA Cleavage by a DNA Enzyme with Extended Chemical Functionality. *J. Am. Chem. Soc*. **2000**. Vol.122. P.6175-6182.
[4] D.I. Edwards. Nitroimidazole Drugs – action and resistance mechanisms. I. Mechanisms of Action. *J. Antimicrob. Chemother.* **1993**. Vol.31. P.9-20.
[5] O.E. Zhuravlev, L.I. Voronchikhina. *Modern problems of science and education.* **2008**. №10. P.66-67. (russian)
[6] S.V. Malhotra, V. Kumar. A profile of the in vitro anti-tumor activity of imidazolium-based ionic liquids. *Bioorg. Med. Chem. Lett*. **2010**. Vol.20. No.2. P.581-585.
[7] V.A. Shiryaev, E.V. Radchenko, V.A. Palyulin, N.S. Zefirov, N.I. Bormotov, O.A. Serova, V.A. Osyanin, I.M. Tkachenko, Y.N. Klimochkin. Molecular design, synthesis and biological evaluation of cage compound-based inhibitors of hepatitis C virus p7 ion channels. *Eur. J. Med. Chem*. **2018**. Vol.158. P.214-235.
[8] N.V. Makarova, E.I. Boreko, I.K. Moiseev, N.I. Pavlova, M.N. Zemtsova, S.N. Nikolaeva, G.V. Vladyko. Antiviral activity of compounds based on (1-adamantyl)bromomethylketone. *Pharm. Chem. Journal.* **2001**. Vol.35. No.6. P.308-311.
[9] A.F. Pozharskii, V.A. Anisimova, E.B. Tsupak. Practical studies on the chemistry of heterocycles. *Izd. Rost. Univ.* **1988**. P.98. (russian)

[10] D. Li, H. Bao, Q. Tan, D. Cai, T. You. *Synth. Commun.* **2005**. Vol.35. No.8. P.1017-1026.
[11] N.A. Klenova. Laboratory practice in microbiology. *Samara: Samara State University*. **2012**. P.102. (russian)
[12] Yu.P. Frolov. Mathematical methods in biology. Computer and programming: Theoretical foundations and practical training. *Samara: Samara State University*. **1997**. P.256. (russian)