



Anticoagulant and antiaggregatory activities of a series of substituted 1,3-dioxacycloalkanes and O-, S-containing macrocycles

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Abstract

Interest in the search and study of new anticoagulant and antiaggregatory compounds is explained by the possibility of preventing many diseases and critical conditions arising as a result of hemostasis disturbance with their help. The results of earlier studies aimed at finding potential antiplatelet agents in a series of newly synthesized cyclic compounds motivate further search for potential correctors of the hemostatic system among derivatives of this series. Therefore, the proximity of carbo- and heterocyclic compounds to natural biomolecules makes them attractive objects for research as antiplatelet agents.

Cyclic acetals of various structures were obtained by acetalization of polyols such as glycerol, diglycerol, etriol, dietriol, and dipentaerythritol. On the basis of the free hydroxyl group of which esters were isolated in quantitative yields by reaction with linear and aromatic acid chlorides of mono- and two basic carboxylic acids. The interaction of 1,3-oxoheterocycloalkanes with ethyl 2-diazo-3-oxobutanoate yielded previously unexplored polyfunctional oxygen- and sulfur-containing macroheterocycles.

This work presents the results of screening and studying the antiaggregatory and anticoagulant properties of new heterocyclic compounds, as well as O- and S-containing macrocycles in comparison with known drugs such as: 3,7-dimethyl-1-(5-oxohexyl)-xanthine, 1,3,7-trimethylxanthine salt with sodium benzoate, 1,3-dimethylxanthine salt with 1,2-ethylenediamine, 2-acetyloxybenzoic acid and sodium heparin.

It was found that all the provided compounds exhibit antiaggregatory activity. Also, the obtained substances showed varying degrees of severity of the effect on the plasma component of the hemostatic system.

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References

- [1] L.A. Yanovskaya, S.S. Yufit, V.F. Kuchеров. Chemistry of acetals. *Moscow: Nauka*. **1975**. (Russian)
- [2] T.W. Greene, P.G.N. Wuts. Protective Groups in Organic Synthesis. *N.-Y.: John Wiley & Sons*. **1991**. Vol.4. P.431-533.
- [3] G.A. Burdock. Fenaroli's Handbook of Flavor Ingredients. *N.-Y.: John Wiley & Sons*. 1995. Vol. 2. Ley S.V., Priepke H.W.M. Eintopfsynthese einer Trisaccharideinheit des gemeinen Polysaccharid-Antigens von Streptococci der Gruppe B unter Verwendung Cyclohexan-1,2-diacetal(CDA)-geschützter Rhamnoside. *Angew. Chem*. **1994**. Vol.106. P.2412.
- [4] Sh.Sh. Dzhumaev, G.Z. Raskil'dina, Yu.G. Borisova, L.V. Spirikhin, S.S. Zlotsky. Synthesis and some reactions of polyols formals. *Russian Journal of General Chemistry*. **2020**. Vol.90. No.1. P.1-6. (Russian)
- [5] Sh.Sh. Dzhumayev, Yu.G. Borisova, S.Yu. Shavshukova, G.Z. Raskil'dina. Sintez slozhnykh efirov na osnove atsetaley glitserina i formaley etriola. *Bashkir Chemical Journal*. **2019**. Vol.26. No.2. P.25-29. (Russian)
- [6] Eu.A. Yakovenko, G.Z. Raskil'dina, L.M. Mryasova, S.S. Zlotsky. Synthesis and herbicidal activity of some esters and amides that include saturated oxygen-containing heterocycles *Chemistry and Technology of Organic Substances*. **2019**. No.3(11). P.4-13. (Russian)
- [7] G.N. Shaikhullina, R.M. Sultanova, I.P. Baikova, G.Z. Raskil'dina, S.S. Zlotsky. Cyclic acetals in the synthesis of polyoxamacrocycles. *Russ Chem Bull*. **2017**. Vol.66. P.164-167.
- [8] L.I. Borodin, G.N. Shaykhullina, R.M. Sultanova. Synthesis of polyfunctional *O*- and *C*-heterocycles based on cyclic acetals and their heteroanalogues. *Bashkir Chemical Journal*. **2016**. Vol.23. P.3-7. (Russian)
- [9] G.N. Sakhabutdinova, I.P. Baikova, G.Z. Raskil'dina, S.S. Zlotsky. Catalytic Reaction of Ethyl 2-Diazo-3-oxobutanoate with alcohols. *Russ J Org Chem*. **2018**. Vol.54. P.373-376. (Russian)
- [10] D.A. Petrov, R.M. Sultanova, S.S. Zlotskii, A.A. Fatykhov. Interaction of asymmetric 1,3-dioxolanes with methyldiazoacetate. *Dokl. Chem*. **2002**. Vol.385. P.207. (Russian)
- [11] R.M. Sultanova, V.R. Katashova, D.A. Petrov, A.A. Fatykhov, S.S. Zlotskii, V.A. Dokichev. Catalyzed reaction of 1,3-dioxanes with methyldiazoacetate. *Russ. Chem. Bull., Int. Ed*. **2001**. No.50. P.865.
- [12] M.D. Khanova, R.M. Sultanova, S.L. Khursan, V.A. Dokichev, Yu.V. Tomilov. Rh₂(OAc)₄ catalyzed interaction of methyldiazoacetate with 1,3-oxazolidines and 1,3-oxathiolanes. *Russ. Chem. Bull., Int. Ed*. **2006**. Vol.55. No.8. P.1411. (Russian)
- [13] R.M. Sultanova, M.D. Khanova, V.A. Dokichev. Catalytic interaction of 1,3-diheteracycloalkanes with diazocompounds. *ARKIVOC*. **2009**. IX. P.236-247.
- [14] M. Liao, S. Dong, G. Deng, J. Wang. Synthesis of oxygen-containing heterocyclic compounds based on the intramolecular *O*-H insertion and Wolff rearrangement of α -diazocarbonyl compounds. *Tetrahedron Letters*. **2006**. Vol.47. P.4537.
- [15] N.D. Bunyatyan. Methodical instructions for conducting preclinical studies of medicinal products. Part one. *Moscow: GrifiK*. **2012**. P.944. (Russian)

- [16] G.G.V. Born. Aggregation of blood platelets by adenosine diphosphate and its reversal. *Nature*. **1962**. Vol.194. P.927-929.
- [17] Gulnara Z. Raskildina, Gulnur N. Sakhabutdinova, Peotr P. Purygin, Natalia A. Bondareva, Yulianna G. Borisova, Simon S. Zlotskii. Anticoagulant and antiaggregatory activities of a series of substituted 1,3-dioxacycloalkanes and *O*-, *S*-containing macrocycles. *Butlerov Communications*. **2021**. Vol.65. No.1. P.53-58. DOI: 10.37952/ROI-jbc-01/21-65-1-53 (Russian)