Ukrainian Conference with International Participation

«CHEMISTRY, PHYSICS AND TECHNOLOGY OF SURFACE»

devoted to the 35th anniversary of the
Chuiko Institute of Surface Chemistry of NAS of Ukraine

and

Workshop

«NANOSTRUCTURES AND NANOMATERIALS IN MEDICINE: CHALLENGES, TASKS AND PERSPECTIVES»

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"Chemistry and Technology of Surface Modification"
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Book of abstracts

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Effects of silver nanoparticles *in vitro* on the structural and functional state of RBCs membranes in patients with stomach tumor

L.V. Batyuk[1], N.N. Kizilova[2], O.A. Muraveinik[3]

[1]Kharkiv National Medical University,
4 Nauki Ave., Kharkiv 61022, Ukraine, liliya-batyuk@ukr.net
[2]Warsaw University of Technology,
1 Pl. Politechniki, Warsaw 00661, Poland,
[3]Kharkiv City Clinical Hospital No 7, Kharkiv, Ukraine

Biomedical nano/microparticles must have special specific properties, based on the unique size-dependent, have electrochemical, physical and mechanical activity and be clinically useful. This is important for development methods of drug delivery technologies, interact of nanoparticles with the cell of blood, in particular red blood cells (RBCs) membranes. Nanoparticles must not induce severe adverse effects on RBCs at loadings of membrane cells the drugs of necessary for therapeutic applications. In the literature, there is conflicting information regarding the destructive effect of silver nanoparticles (AgNP) on cell morphology, membrane structure and protective effect [1]. In this work, the investigated of AgNP preparations (diameter d~100 nm and d~35 nm) on RBCs membranes 5 health donors and 10 oncologic patients with stomach cancer using a test protocol described in Standard Test Method for Analysis of Hemolytic Properties of Nanoparticles [2]. The dispersions were prepared by the method described in [3]. The significance of differences between the control and experimental results was assessed using the Student's t-test. Differences between the compared indicators were considered significant at $p \leq 0.05$. Hemolysis levels for all particle concentrations were significantly different from the control of donors. Based on the results obtained, it can be concluded that AgNP penetrate into the RBCs of blood of cancer patients 60 % (d~100 nm) and 38 % (d~35 nm) more actively, where they probably interact with hemoglobin molecules. Probably, the cytotoxic effect of silver on the erythrocyte membranes of cancer patients is associated with the processes of increased generation of reactive oxygen species and oxidative stress associated with violations of the structural state of the RBCs membranes in cancer patients.

1. N.C. Adragna, P.K. Alla, I.E. Pavel-Sizmore, A.S.L. Paluri, J. Yaklic, P.K. Lauf, Cell Physiol Biochem. **53** (2019) 532.
2. M.A. Dobrovolskaia, J.D. Clogston, B.W. Neun, J.B. Hall, A.K. Patri, S.E. McNeil, Nano Lett. **8** (2008) 2180.
3. J.Choi, V. Reipa, V.M. Hitchins, P.L. Goering, R.A. Malinauskas, Toxicological Sciences. **123** (1) (2011) 133.