Lebed A.P.[1], Furtat I.M.[1], Tomina V.V.[2], Vaclavikova M.[3], Melnyk I.V.[2,3]

THE ROLE OF SILICA FUNCTIONALIZED MICROSPHERES IN THE FORMATION OF BIOFILM BY *STAPHYLOCOCCAL* CLINICAL ISOLATES

[1]National University of Kyiv-Mohyla Academy, Kyiv, Ukraine;
[2]Chuiko Institute of Surface Chemistry of NAS of Ukraine, Kyiv, Ukraine;
[3]Institute of Geotechnics SAS, Kosice, Slovak Republic
anastasia.lebed3@gmail.com

Biofilm is a complex consortium of microbial cells which is surrounded by the extracellular matrix. This form of existence is believed to be a specific kind of the mechanism of resistance against microbicidal compounds. It provides pathogens with the ability to cause chronic and acute forms of infection. In this regard, the study aimed to investigate the promising method of coping with pathogenic bacteria, which is inhibition of the biofilm formation by cutting-edge antimicrobials - nanoparticles. To investigate the ability to form biofilm in the presence of Cu^{2+}-containing silica nanoparticles and those without Cu^{2+}, the standardized suspensions of the cells of 18-hour cultures of two isolates, *Staphylococcus sp*. R1 and R2, have been used. It has been achieved with the help of the microtiter assay with a 1% solution of crystal violet. Optical density has been measured at 538 nm. The ability of intact cells to form biofilm has been taken as 100 percent and used as a positive control. Impact of nanocomposites in experimental groups was calculated, comparing to the control one. Isolate R2 has been characterized moderate ability to form biofilms when isolate R1 has performed weak biofilm forming activity. Previously, it has been found that Cu^{2+}-containing nanoparticles rather than without them would have more significant antibacterial activity. In this regard, two concentrations of microspheres which have partial bactericidal properties - 0.1 and 0.01% - have been used. After the 120-minute contact of bacterial cells with Cu^{2+}-containing nanoparticles, more sufficient inhibiting effect than with those without Cu^{2+} has been found. Thus, the level of inhibition in isolate R1 was 38,1 and 41,43 with the presence of 0.1 and 0.01% solutions of nanoparticles, and in isolate R2 – 42,2 and 22,1. It has been shown that such the essential process would be efficiently blocked in the presence of the silica nanoparticles without Cu^{2+}. Apparently, inhibition of biofilm formation, increased amount of nanocomposites and their bigger size would reduce the ability to block sites of adhesion of the bacterial cells.