THE ANTIBACTERIAL ACTIVITY OF SILVER NANOPARTICLES

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In recent years, multidrug resistant (MDR) microorganisms have become a major challenge towards successful treatment of various infectious diseases. Unresponsiveness of MDR microbes to various antimicrobial drugs often leads to increased time and cost of treatment and higher rates of morbidity and mortality. These problems have led to the growth of interest in research of alternative antimicrobial treatments free of resistance and high cost.

One of the most promising methods for managing resistant microorganisms is treatment with silver nanoparticles (AgNPs). It has been proved that interaction with AgNPs has lethal effect on both Gram-positive and Gram-negative microorganisms including multidrug resistant microorganisms [1]. There are four main modes of silver nanoparticles action against various microorganisms which include AgNPs adhesion to microbial cells and penetration inside the cells, modulation of transmembrane transport and generation of reactive oxygen species (ROS). Moreover, it was demonstrated that bactericidal efficiency of AgNPs highly depends on their size making 5-10 nm nanoparticles the most lethal to different microorganisms [2].

In this work, we have tested the antimicrobial effects of 7 nm silver nanoparticles, manufactured by "Rho nano", UAB. To assess the ability of AgNPs to inhibit the growth of the bacteria, minimum inhibitory concentrations (MIC) of the particles were determined by microdilution method [3]. The experiments were performed with *E. coli* DH5α strain bacteria. AgNPs used in these experiments were suspended in ethanol, H_2O or polyvinylpyrrolidone (PVP) solution. We have observed that nanoparticles suspended in aqueous solutions tended to aggregate and this process decreased their ability to inhibit bacterial growth. In order to solve this problem AgNPs were suspended in PVP solution which reduces aggregation process. Results have shown that *E. coli* treatment with AgNPs was lethal to the bacteria. Furthermore, as expected AgNPs suspended in PVP solution demonstrated lower MIC values than AgNPs suspended in ethanol or aqueous solutions.

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