

Conjugation of contact lens care solutions with silver nanoparticles as new way to enhance their efficacy against *Acanthamoeba* strain

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Different species of amphizoic amoebae are widely distributed in many parts of the world and known as free-living organisms; they are found in the environmental samples and studied also in Department of Medical Biology, the Medical University in Warsaw. Some strains of the protists as facultative parasites may cause severe, potentially sight-threatening corneal disease known as *Acanthamoeba keratitis* (AK). The wearing contact lenses, especially poor hygiene while cleaning and using the lenses and their cases, corneal damages, eye exposure to moist soil or water in which *Acanthamoeba* forms exist, are among the main reported risk factors for AK. It is known, that the most popular multipurpose contact lens disinfection systems, commonly based on anti-microbial and anti-fungal agents, are not fully effective against *Acanthamoeba*. Therefore, there is an urgent need to broaden research in order to develop contact lens solutions with improved anti-amoebic activity. Nanoparticles activity against different protozoans has been already investigated and confirmed. Previous studies in our laboratory revealed that silver and gold nanoparticles were well absorbed and showed activity against *Acanthamoeba* strains of the T4 genotype. In this study. the activity of selected multipurpose contact lens solutions conjugated with silver and gold nanoparticles against the trophozoite stage of *Acanthamoeba* was investigated. The type *A. castellanii* Neff T4 strain identified as ATCC 30010 cultured axenically and monitored in our Department was included in this study. Most common types of solutions used in Poland for contact lens care: Solo Care Aqua, (SCA) and ReNuMultiPlus, (ReNu) were examined. Nanoparticles used in this study: the hydrocolloids of silver nanoparticles (AgNPs) and gold nanoparticles (AuNPs) were kindly provided by the Department of Animal Nutrition and Food Science, Warsaw University of Life Sciences. The pure contact lens solutions and contact lens care solutions conjugated with nanoparticles at different concentrations were examined *in vitro* and assessed for their anti-amoebic activity. To determine the anti-amoebic efficacy on trophozoites, the colorimetric 96-well microtitre plate assay, based on the oxido-reduction of AlamarBlue, was used. The clear anti-amoebic effect was observed after incubation with pure SCA; enhanced, dose dependent anti-amoebic effect showed SCA conjugated with AgNPs.

Detailed results obtained in assays with particular contact lens solutions conjugated with nanoparticles are presented and discussed; they show that the silver nanoparticles have better

anti-amoebic potential than gold nanoparticles. Further study are necessary to elucidate the mechanism of action and activity of this conjugation against *Acanthamoeba* cysts. It should be taken into consideration that the conjugation of selected contact lens solutions with silver nanoparticles might be a promising approach to prevent AK among contact lens users.