

Evaluation of Nanosilver Solution Stability against *Streptococcus mutans*, *Staphylococcus aureus* and *Pseudomonas aeruginosa*

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Background: Nanosilver compounds are admired in different fields of medicine and industry, due to their unique antibacterial properties. Maximum contact of silver particles in nanosilver suspension causes increasing antibacterial effect of this compound. **Objectives:** The aim of this study was to evaluate the stability of antibacterial properties of nanosilver solution during a period of 9 months against *Streptococcus mutans*, *Staphylococcus aureus* and *Pseudomonas aeruginosa*. **Materials and methods:** In this *in vitro* study, the antibacterial effect of serial concentrations of nanosilver solution and amoxicillin antibiotic as control group on the standard bacteria *S. mutans*, *S. aureus* and *P. aeruginosa* were measured in 0-3-6-9 month period by Disc diffusion methods. **Results:** The antibacterial activity and stability of nanosilver solution in comparison with amoxicillin antibiotic were measured and the results were examined by t-test statistical analysis. During 9 months, no significant changes were seen in antibacterial activity of nanosilver solution (4000 µg.mL⁻¹), except for *S. mutans*. In other concentrations of nanosilver solution and amoxicillin, reduction of antibacterial activity was observed. **Conclusions:** Antibacterial activity of 4000 µg.mL⁻¹ nanosilver was stable in a 9 month duration but reduction of antibacterial activity in lower nanosilver concentrations and amoxicillin were significant in the same time period.

Keywords: Nanosilver Solution; Antibacterial Effects; *Streptococcus mutans*, *Staphylococcus aureus*; *Pseudomonas aeruginosa*

1. Background

Antimicrobial properties of silver compounds had been identified for a long time (1-3). In recent decades nanosilver has been welcomed because of its unique antimicrobial properties (4). Silver particles have naturally antimicrobial properties and also increase the power of healing inflammatory effects and also increase the power of healing on enzyme systems, cell wall and bacterial DNA (7). The silver particles change phosphotyrosine peptide in bacteria and subsequently change signals between the cells and ultimately prevent the proliferation of bacteria (8). However, most antimicrobial mechanisms of this material are still quite unknown (9). Maximum exposure of silver particles in the nanosilver suspension causes increased antibacterial activity of this compound. No toxic effects on human's tissues were re-

ported by low concentration of nanosilver solutions (10, 11). Nanosilver particles are effective on the bacteria *Streptococcus mutans* which is one of the important pathogens in dental caries, and therefore it has anti-decay effects (12-14). *Staphylococcus aureus* is also a cause of nosocomial and Methicillin-resistant infections which has been discussed to be important in different studies (15). *Pseudomonas aeruginosa* bacterium is also a problematic drug resistance bacterium which has been tested in this study to evaluate the effect of nanosilver solution against Gram-negative bacteria. There is an important question about use of new antimicrobial agents and that is about stability of these materials. It is necessary to keep the suspension stable during the product lifetime. Despite the proven antibacterial properties of nanosilver solution, information about the stability of the antimicrobial properties is negligible (6, 16, 17).

Implication for health policy/practice/research/medical education

There is an important question about new antimicrobial agents use and that is about stability of the agents. It is necessary to keep the suspension stable for the product lifetime. Despite the proven antibacterial properties of Nanosilver solution, information about the stability of the antimicrobial properties is negligible. Copyright © 2013, Ahvaz Jundishapur University of Medical Sciences; Licensee Kowsar Ltd. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/3.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.