

An *in vitro* study on antimicrobial effect of metallic silver colloidal against multispecies oral biofilm

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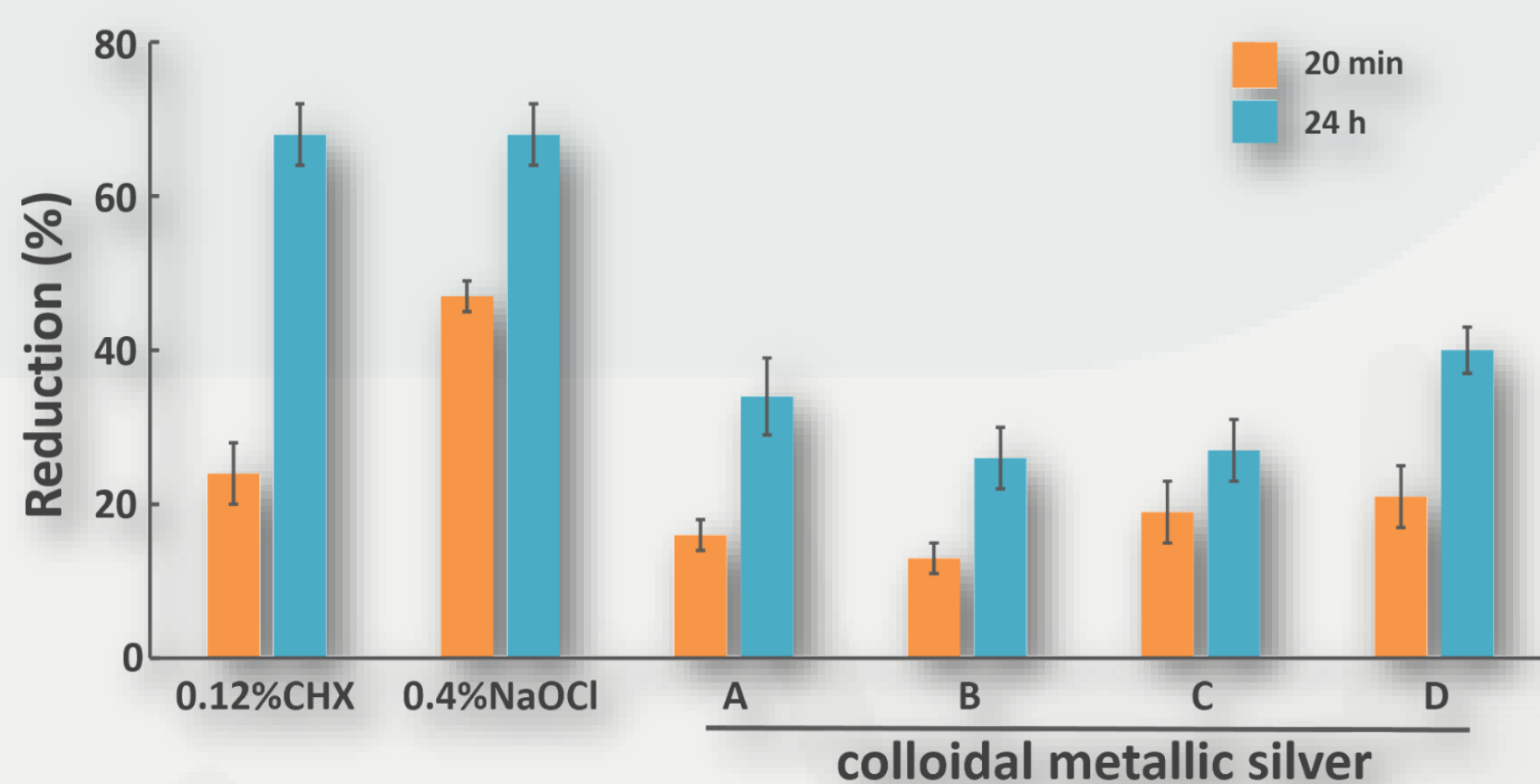
Background

Ions of silver (Ag⁺) are toxic to microorganisms, while metallic silver is inert in the presence of human tissues. Colloidal silver has been reported to show strong bactericidal activity on single species bacteria in suspension. Bacteria in biofilms have much higher resistance against antimicrobial agents than those in planktonic form, which makes infections more difficult to control. The aims of this study was to assess the antimicrobial properties of colloidal metallic silver on a multispecies oral biofilm.

Materials and methods

sample preparation#: Pure silver (99.998 %) and deionised water (at 0.1 micro Siemen) were used to prepare colloidal metallic silver, noted as A, B, C and D. They were prepared via different electro-photochemical production methods e.g. processed at 4°C, 22°C, and irradiated with/without violet 420 nm light. The electrical conditions were 300 volts DC at 500 microampere per electrode across all electrodes for 48 hours. The samples contained around 12 ppm atomic silver (clusters sized from 4 to 10 nm) and were free of ionic silver.

antimicrobial effect: 4-day-old multispecies oral biofilms were cultured from saliva with Brain-heart-infusion broth supplemented with sheep blood in 96-well plates. The biofilms were exposed to colloidal silver, PBS, 0.4% NaOCl and 0.12% chlorhexidine (CHX) for 20 minutes or 24 hours. Cell viability of treated biofilms was assessed using the XTT assay. The relative reduction of viable biomass was calculated vs PBS.



Results

After being exposed to antimicrobial agents, bacteria in biofilms treated for 24 h were less viable than those treated for only 20 min. NaOCl and CHX were effective on biofilms even with a short exposure, and showed stronger effects than colloidal silver, which had milder and slower killing effects. There were variations in performance between the 4 different colloidal silver preparations tested.

Conclusions

The test preparations of colloidal silver gave moderate and prolonged antibacterial effects on multiple-species oral biofilms. The potential use of colloidal silver in long-term control of infections should be explored further.