P0319
Poster Session I
New therapeutic alternatives

IN VITRO ACTIVITY OF EPIGALLOCATECHIN GALLATE (EGCG)-SILVER NANOPARTICLE COMBINATIONS VERSUS BACTERIA ASSOCIATED WITH SKIN AND MEDICAL DEVICE INFECTIONS

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Objectives

Silver nanoparticles (AgNPs) have a range of medical uses, most notably as antimicrobials in bandages/catheters/intravenous lines. Antimicrobial activity has been demonstrated against meticilin-resistant *S. aureus* (MRSA) and *E. coli*. This is reported to be size dependant and linked to the generation of reactive oxygen species on the release of Ag^+ ions. Although beneficial this may also be cytotoxic to human cells. Like AgNPs, polyphenols are a group of compounds that have significant antimicrobial activity. Although antioxidants, they can also act as pro-oxidants via the formation of hydrogen peroxide, which can damage cell membranes. Work using tea polyphenols as reducing and capping agents in the production of silver nanoparticles has shown that AgNPs-polyphenol combinations reduces their cytotoxicity to human cell lines. The objective of this study was to discover if AgNPs in combination with the polyphenol EGCG results in a beneficial or antagonistic activity against bacteria associated with skin and medical device infections.

Methods

Five antibiotic susceptible bacterial type strains including *Escherichia coli* NCTC 12241, *Acinetobacter baumannii* ATCC 19606, *Stenotrophomonas maltophilia* NCTC 10258, *Staphylococcus aureus* ATCC 25923, *Pseudomonas aeruginosa* ATCC 27853 and clinical isolates of *S. epidermidis* and MRSA were tested.

Agar dilution assays were performed on ISO-Sensitest agar supplemented with/without EGCG (1 and 10 mg/L). Discs containing 0.72, 1.04 or 1.46 mg/L mg of AgNPs and antibiotic control discs of gentamicin (10 µg) for Gram-negative isolates and vancomycin (5 µg) for Gram-positive isolates were also added to each plate. Zones of inhibition were measured and recorded after incubation at 37 degrees C for 18-24 h.

The minimal inhibitory concentrations (MICs) of EGCG and AgNPs alone and in combination were determined in ISO-Sensitest broth in microtitre plates in checkerboard style. Fractional inhibitory concentration indices (FICIs) were calculated to determine a synergistic, additive or antagonistic effect.

Results

In agar dilution tests EGCG reduced zones of inhibition surrounding AgNP discs. MICs of Gram-positive isolates ranged from 2.8 to 11.25 mg/L for AgNPs and 128 and 256 mg/L for EGCG. Against Gram-negative isolates MICs ranged between 2.8 and 22.5 mg/L and ≥ 1024 mg/L respectively. In checkerboard assays the addition of EGCG severely reduced the antibacterial effect of AgNPs with FICs of between 4.25 and 20.1 indicating antagonism.

Conclusions

Marked antagonism was observed in the antibacterial activity of AgNPs in the presence of EGCG. This may be due to trapping of reactive oxygen species, which are the major mode of bacterial killing by Ag NPs. Although the cytotoxicity of AgNPs might be improved in combination with polyphenols, this is at the expense of the antibacterial activity, which is sought after in many medical applications.