

The antimicrobial efficacy of silver on antibiotic-resistant bacteria isolated from burn wounds

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The antibiotic-resistant bacteria are a major concern to wound care because of their ability to resist many of the antibiotics used today to treat infections. Consequently, other antimicrobials, in particular ionic silver, are considered ideal topical agents for effectively helping to manage and prevent local infections. Little is known about the antimicrobial efficacy of ionic silver on antibiotic-resistant bacteria at different pH values. Consequently, in this study our aim was to evaluate the effect of pH on the antimicrobial efficacy of a silver alginate (SA) and a silver carboxymethyl cellulose (SCMC) dressing on antibiotic-resistant bacteria isolated from burn patients. Forty-nine antibiotic-resistant bacteria, including Vancomycin-resistant *Enterococcus faecium*, methicillin-resistant *Staphylococcus aureus*, multidrug-resistant (MDR) *Pseudomonas aeruginosa*, MDR *Vibrio* sp, MDR *Stenotrophomonas maltophilia*, extended-spectrum β -lactamase (ESBL) producing *Salmonella* sp, ESBL producing *Klebsiella pneumoniae*, ESBL producing *Proteus mirabilis*, ESBL producing *Escherichia coli* and MDR *Acinetobacter baumannii*, routinely isolated from burn wounds were used in the study and evaluated for their susceptibility to two silver containing wound dressings using a standardised antimicrobial efficacy screening assay [corrected zone of inhibition (CZOI)]. The mean overall CZOI for the Gram-positive isolates at a pH of 5.5 were very similar for both dressings. A mean CZOI of 5 mm was recorded for the SCMC dressing, which was slightly higher, at 5.4 mm for the SA dressing. At a pH of 7.0 both dressings, in general, showed a similar activity. However, at a pH of 8.5 the mean CZOI of the SCMC dressing was found to be significantly ($P < 0.05$) higher than the SA dressing for a select number of isolates. The mean overall CZOI for the Gram-negative bacteria followed a similar pattern as observed with the Gram-positive bacteria. Susceptibility to silver ions did vary significantly between genera and species of bacteria. Interestingly, when pH was changed from 8.5 to 5.5 antimicrobial activity for both dressings in general increased significantly ($P < 0.05$). Overall, all forty-nine antibiotic-resistant bacteria isolated from

burn wounds showed susceptibility to the antimicrobial activity of both silver containing wound dressings over all pH ranges. In addition, the study showed that the performance of both dressings apparently increased when pH became more acidic. The findings in this study may help to further enhance our knowledge of the role pH plays in affecting both bacterial susceptibility and antimicrobial activity of silver containing wound dressings.

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