INTRODUCTION

Biofilms represent a significant challenge in the management of chronic wounds. A biofilm is a diverse polymicrobial community of aerobic and anaerobic bacteria encased within an extracellular polymeric matrix. Micro-organisms in biofilms have the same genotype as planktonic bacteria, but their phenotype is vastly different. Biofilms display innate resistance to antimicrobial agents, thus protecting associated bacteria. Bacterial bioburden represents the metabolic demands placed on the healing wound by bacteria. A high level of bacterial bioburden overpowers the healing capabilities of the host to progress beyond the inflammatory phase. Control of wound bioburden may be through antibiotics or antimicrobial wound care products. Resistance to common antibiotics is a major problem and naturally occurring antimicrobials, such as honey, have increased in popularity. Many antimicrobial wound care products designed to reduce the dependency on antibiotics in wound care are now known to be cytotoxic. There remains, therefore, a great need to develop antimicrobial wound care products that address these concerns.

The enzyme alginogel* is a new class of wound care healing products which combine the benefits of hydrogels and alginates in an innovative wound care product, an alginogel. They incorporate a novel patented antimicrobial enzymatic complex (glucose oxidase combined with lactoperoxidase, stabilised by guaiacol [GLG]) that selectively targets the microbial cell wall of entrapped bacteria without damaging cells involved in wound healing. The enzymes (glucose oxidase and lactoperoxidase) form free radicals that destroy the cell walls of absorbed bacteria. As this is a selective process only absorbed bacterial cell walls are destroyed and not the cell walls of human cells within the wound bed, such as keratinocytes and fibroblasts.

Previous studies have shown that the enzyme alginogel* is effective against several multiresistant strains of bacteria, including MRSA. In addition, a comparative in vitro test evaluated the toxicity of several silver-based dressings and that of the enzyme alginogel*. Silver dressings tested demonstrated potent antimicrobial activity, however, they also induced rapid cell death in those cells central to wound healing. The enzyme alginogel* combined strong antimicrobial activity with non-cytotoxicity, and thus promoted optimal wound healing.

AIM

To investigate the efficacy of an enzyme alginogel against biofilms and their associated bacteria.

METHODS

Biofilms were grown in defined medium in PVC microtiter plate wells. The biofilm was incubated with enzyme serial dilutions between 4 and 0.008%. Total biofilm mass was indirectly assessed by staining with 1% crystal violet and measuring crystal violet absorbance, using destaining solution. Biofilm quantification was assessed indirectly: resazurin metabolism for S. aureus and S. epidermidis; esterase activity using fluorescein diacetate for P. aeruginosa and S. pyogenes.

RESULTS

Results show the enzyme alginogel significantly reduced the total biofilm mass and viable cells living in the biofilm.

CONCLUSION

Preliminary results demonstrate that the antimicrobial enzymatic complex is active against diverse polymicrobial communities. It reduces total biofilm mass and viable cells in the biofilm, although higher concentrations of the enzymatic complex are required compared to earlier studies investigating efficacy against planktonic bacteria. These results are in agreement with the general findings that bacteria in a biofilm are more resistant than planktonic cells towards classical antimicrobial agents. Additional studies are planned to further investigate this unique antimicrobial enzymatic complex.

*Enzyme alginogel = Flaminal®Forte

Reference List