



A Review of Antimicrobial Agents for Chronic Wounds with Infection

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Abstract

Given the rising threat of antibiotic resistance worldwide, it is crucial to explore alternatives or complementary treatments to antibiotics. Wound care is a significant aspect of emergency care, day clinics, and elderly care. Managing chronic ulcers, such as diabetic foot ulcers and leg ulcers, often incurs high costs [1]. Many patients with wound colonization automatically receive antibiotics [2]. However, alternative therapies have shown potential to significantly reduce the need for antibiotic treatment, as indicated by results from the Swedish National Quality Register for chronic ulcers [3].

Keywords: Antimicrobial Agents; Chronic Wounds; Infection

Introduction

Compared to antibiotics, biocides generally have a broader spectrum of activity and may have multiple targets, making them less prone to resistance. Antiseptics are effective through many mechanisms of action, unlike antibiotics, which makes the development of resistance to them unlikely. There is little evidence to support the theoretical risk that antiseptics select resistant pathogens. Maintenance debridement and the use of topical antimicrobials (antiseptics) have proven to be more effective than antibiotic therapy. In recent years, topical antimicrobial agents have become the first line of treatment in managing bacterial burden, particularly in chronic ulcers, although, there has been debate regarding the appropriateness and efficacy of the various local and systemic methods available for wound disinfection [4-8]. The use of many antimicrobials in wound management must be subject to a risk-benefit assessment of possible local toxicity and beneficial antibacterial action. In short, it is advised that, before use, the beneficial antimicrobial effects and bioavailability should be weighed against any possible cellular toxicity [9-10]. Furthermore, all chronic ulcers can be complicated with biofilm. Once the biofilm is well established in a wound environment, it will show resistance to both the host immune system and antimicrobial substances [11]. Polyhexamethylene biguanide (PHMB) is an antimicrobial agent that has been used for more than 60 years with no report of resistance development. It has insignificant toxicity and is used in,

for example, lens fluid and in the treatment of eye infections, also as preoperative cleansing in cataract surgery [8,12]. Its safety is well documented in both in vitro and in vivo studies. In a study, investigators from Nebraska, USA demonstrated that if replacing ordinary compressors with PHMB impregnated compressors, total postoperative infections were reduced by 24% and postoperative MRSA infections by 47%. It was estimated that the use of PHMB impregnated compressor resulted in a net saving of \$ 508,605 over a one-year evaluation period [13]. Similar results have also been reported by Mulder et. al, Beneke et. al. and Penn., et al. [14-16]. There are a number of products containing PHMB as active substance e.g., Prontosan in form of Solution and gel, e.g., Suprasorb + PHMB. Prontosan is a known PHMB-based antiseptic agent combined with a surfactant Betaine produced in form of solution and gel, and for more than 10 years has been used for infected wounds and chronic ulcers in the world. However, Prontosan has shown an inadequate antiseptic effect [17] on some bacteria e.g., Staphylococcus aureus and Pseudomonas aeruginosa which are biofilm producing bacteria.

Prolavacid is designed by composition of EDTA, PHMB, and Betaine for an increased antiseptic property and, above all, an improved antibiofilm effect relative to other modern wound products available in the market. EDTA is a well-known agent with good biocompatibility which has proven to have a strong antibiofilm effect [18]. Through a microbiological study, Prolavacid solution has sig-

nificantly greater antiseptic effects on bacteria such as *Staphylococcus aureus*, *Enterococcus hirae*, and *Pseudomonas aeruginosa* when compared to Prontosan solution. At the same time, Prolavacid solution has demonstrated good biocompatibility similar to medical honey in an experimental animal study [19].

Conclusion

In conclusion, the review of antimicrobial agents for chronic wounds with infection highlights the need for alternative treatments to antibiotics due to the rising threat of antibiotic resistance. Topical antimicrobial agents, such as biocides and antiseptics, have shown potential in reducing the need for antibiotic treatment and managing bacterial burden in chronic ulcers. However, the efficacy of different local and systemic methods for wound disinfection is still a subject of debate and must be carefully assessed for their antibacterial effects and risk of local toxicity.

Overall, the review emphasizes the importance of exploring alternative antimicrobial agents and treatments to combat antibiotic resistance. Prolavacid shows promise in addressing the limitations of existing products and offering improved efficacy in managing chronic wounds with infection. Further research and clinical trials are needed to validate its effectiveness and assess its long-term safety in wound management.

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