Examining the efficacy of silver and cadexomer iodine dressings in treating wounds compromised by bacterial burden: A review of the literature

C. Miller1

1 Helen Macpherson Smith Institute of Community Health, Royal District Nursing Service, 31 Alma Road, St Kilda, Victoria, Australia, 3182

Topical antimicrobial agents provide an opportunity to prevent the spread of bacterial burden beyond critical colonisation and local infection, aid in the swift and effective management of systemic infection, reduce excessive and prolonged use of antibiotic therapy for people living with chronic wounds [1, 2], and reduce the risk of developing bacterial resistance associated with the use of antibiotics. The role of topical antimicrobials is well established within the principles of wound bed preparation; however the selection of antimicrobial agents is vast. This paper explores evidence regarding the clinical and cost effectiveness of two commonly used topical antimicrobials; cadexomer iodine and silver dressings.

Keywords silver; cadexomer iodine; antimicrobial; wound

1. When wound healing is compromised

Wound bed preparation is a concept that focuses health professionals on aspects of the wound that suggest the wound’s status and progress towards healing as well as implies the need for particular interventions. Four components considered in the notion of wound bed preparation became focal concepts in the TIME framework which first emerged in 2003 [3] which was subsequently refined by the International Wound Bed Preparation Advisory Board in 2004 [4]. The TIME framework has been one well recognised paradigm that encourages a focus on the principles of wound bed preparation. Its four components bring attention to pathophysiological abnormalities underlying chronic wounds of Tissue Management (T), Inflammation and Infection Control (I), Moisture Balance (M), and Epithelial (Edge) Advancement (E). Although all of these aspects of wound bed preparation represent some relevance to the topic of bacteriology, of particular importance is the Inflammation and Infection Control module which recognises that chronic wounds may become delayed in their progression to healing by bacterial colonisation. Unmanaged bacterial burden can develop into wound infection which can progress to other complications such as cellulitis, sepsis or death, unless an effective intervention is instigated.

The use of a topical antimicrobial agent is clinically indicated when a wound is regarded as critically colonised [5]. For the purpose of this paper, topical antimicrobial agents are considered to refer to topical substances capable of bactericidal activity including antiseptics, usually but not exclusively a dressing, and exclude topical antibiotics. In conjunction with other wound management techniques such as debridement and antibiotics if spreading and/or systemic infection is indicated, topical antimicrobial treatment can reduce the overall bioburden of the wound and thus expedite the healing process. The role of topical antimicrobials in prophylaxis is more controversial [6]. While prolonged use without clinical indication of covert infection is discouraged [5, 6], further examination of the use of topical antimicrobial agents not only for the ‘at risk wound’ but the ‘at risk client’ has been called for [6].

Silver and cadexomer iodine are topical antimicrobial agents commonly used for the treatment of critically colonised or infected wounds. Whilst evidence has been accrued with respect to both of these types of antimicrobials, much less research has been conducted directly comparing these treatments for their clinical or cost effectiveness. This chapter will overview the evidence for both of these topical antimicrobials and will raise factors relevant to the use of these agents such as in the presence of biofilms and wound inflammation. Concluding remarks will be made as to the implications for clinical practice and future research.

2. Silver and nanocrystalline silver

The application of silver in healthcare has a significant history. Its first known use, lining water vessels to preserve the water, dates back to ancient Greek and Roman civilizations [7]. In wound care, the use of silver nitrate as a topical application for chronic wounds or ulcers was documented by John Woodall in ‘The Surgeons Mate’ (1617) to instruct practice among ships’ surgeons [8]. Although not forgotten in subsequent years, it was Moyer in 1965 who is credited with sparking the silver renaissance with the development of silver applications for the treatment of burns. The use of topical silver agents were subsequently developed and adopted in the treatment of critically colonised or infected wounds.
Silver compounds offer broad bactericidal spectrum activity [9, 10] with efficacy against several common wound pathogens, including methicillin-resistant Staphylococcus aureus (MRSA), vancomycin-resistant enterococci (VRE), and extended-spectrum-lactamase producers [10]. Documented bacterial resistance is presently regarded as rare although some has been noted [11, 12]. Silver ions kill bacteria by damaging their cell walls, membranes, respiratory enzymes and ribonucleoproteins [10]. Evidence of the effectiveness of silver in the presence of biofilms—complex communities of bacteria which attach to solid surfaces before forming microcolonies which finally differentiate into an exopolysaccharide-encased mature biofilm [13]—is limited and mixed [14, 15]. (For a detailed review of the biochemical composition of silver and mechanisms of action in wound care see Maillard & Denyer, 2006).

Silver ions can be rendered inactive in the wound environment [10] thus the mechanism through which silver ions are delivered to the wound is highly relevant for the efficacy of the different commercially available silver agents. Silver ions are typically released from dressings through oxidation occurring upon contact between the silver ions and fluid in the wound environment. Nanocrystalline silver products were developed to release smaller silver particles faster with the aim of increasing the antimicrobial activity [16]. In addition to variations in antimicrobial performance, products vary in the contribution of the carrier dressing [17]. Differences in the effectiveness of commercially available silver products have important implications for product selection in clinical practice and presents difficulty when drawing conclusions across trials which have utilised different products.

One recent Randomised Controlled Trial (RCT) evaluating topical silver antimicrobials—the VULCAN trial [18]—received considerable attention and backlash for its pragmatic research design which included a variety of silver products considered within the ‘silver treatment group’ without differentiation during statistical comparison with a ‘non-silver low adherence’ treatment group and for its use of topical silver antimicrobials on wounds not necessarily displaying signs of critical colonisation or infection [5, 19]. The VULCAN trial and subsequent commentary was landmark for its impact on restrictions, especially in the United Kingdom, on the accessibility of silver products given its finding that there was no difference between treatment conditions for ulcer healing or quality of life after 12 weeks. A Best Practice Statement regarding the use of topical anti-septic antimicrobial agents in wound management was developed in its wake [5], which reaffirmed the role for antimicrobial dressings (though not mentioning silver or any other antimicrobial product specifically) in the presence of bacterial burden.

Systematic reviews considering silver antimicrobial agents have been hampered by the lack of RCTs of an acceptable quality [20-24]. Systematic reviews would suggest modest if not contrary support that silver sulphadiazine (SSD) cream (with limited evidence of silver dressings in comparison to non-silver products) prevents infection [23]. In 2001, it was only SSD cream which was included in a systematic reviews’ list of topical preparations which may aid healing [22]. Silver dressings were not recommended [22] perhaps due to a finding that significant reductions in ulcer size observed at two and four week intervals for a silver impregnated activated charcoal dressing (Actisorb Plus®, Johnson & Johnson) when compared to control treatment (various preparations), were not sustained at a six week follow-up [25].

This early effectiveness of silver, that was ultimately not sustained, was also evident in systematic review conducted in 2007 considering three RCT’s including silver antimicrobials [24]. One trial involved a four week follow-up and observed a significantly higher closure rate for a silver alginat (Silvercel®, Ethicon Inc.) when compared to a calcium alginate dressing (Algosterr®, Smith & Nephew Ltd.) [26]. A significant reduction during the first four weeks in wound size was observed for a silver foam (Contreet® Foam, Coloplast) compared to a hydrocellular foam (Allevyn® hydrocellular, Smith & Nephew Ltd.) but this was not sustained during follow-up [27]. In a six week study, relative wound size reduction was significantly quicker when silver foam (Contreet® Foam) was compared to best local practice (i.e. a range of dressing: foam and alginates, hydrocolloids, gauze, silver dressings, other antimicrobial dressings or other active dressings) [28] though elements of the group comparability at baseline [21] and data used in the endpoint analysis have been queried [24].

The most recent systematic reviews of silver antimicrobials were published in 2010. The review by Carter and colleagues [20] incorporated a trial comparing Restore® Contact Layer, Silver (Hollister Wound Care, also marketed as Urgotul® Silver) with an equivalent non-silver containing dressing, Restore® Contact Layer (Hollister Wound Care, also marketed as Urgotul®) [29]. Clients with wounds with signs of bacterial burden who were randomised to the silver treatment for four weeks followed by a further four weeks of non-silver treatment had a significantly quicker healing rate and fewer signs of bacterial burden at both four and eight weeks than clients who received the non-silver treatment. The weight of this evidence lead the reviewers to conclude that there is some evidence of short term healing effects with the use of silver-impregnated dressings but that the long term effects remained unclear [20].

Another clinical trial was reported in 2010 [30] which found a silver alginate/carboxymethylcellulose (unspecified) to be effective in reducing the risk of infection, with the effect on wound healing potentially mitigated by considerable (and statistically uncontrolled for) baseline differences in wound size, when compared to a non-silver calcium alginate fibre dressing, Kaltostat (Convatec Ltd.). This trial, however, involved a follow-up period of only four weeks.

Support for the use of topical silver antimicrobials to prevent or treat wound infection or promote healing as assessed by systemic reviews has generally been underwhelming suggesting, at best, a short-term effectiveness in contrast to other treatments. The absence of rigorous RCT evidence is a major constraint. However, the evidence amassed is not altogether without promise for the role of silver antimicrobials in chronic wound management and would seem incongruent with the notoriety associated with silver in recent years.
2.1 Comparison among silver products

In contrast to the need for more research contrasting silver antimicrobials to other types of antimicrobials and non-antimicrobial treatments, there is a proliferation of studies comparing silver products with each other. In a clinical trial utilising sequential allocation to one of three silver antimicrobial dressing groups, clients receiving a nanocrystalline silver dressing Acticoat® (Smith & Nephew Ltd.) had signs of infection eliminated with fewer treatments and had a quicker healing rate than clients who received either the Comfeel® Ag hydrocolloid / Biatain® Ag polyurethane foam (Coloplast) or Aquacel® Ag (Convatec) [31].

Six silver-containing dressings were compared in vitro using log reduction, silver release, and corrected zone of inhibition assays [32]. Acticoat® was the only dressing bactericidal against Staphylococcus aureus, with Biostep® Ag (Smith and Nephew Ltd.), a silver collagen matrix dressing, also producing log reductions. These two dressings, along with Algicell® Ag (Derma Sciences Inc.) a silver alginate dressing, produced zones of inhibition with Algicell® Ag generating the largest zone on the first day but smallest zone on all subsequent days. Silver release was greatest for Acticoat® and Mepilex® Ag Antimicrobial Soft Silicone Foam Dressing (Molnlycke Health Care LLC), a silver sulphate dressing which although having the highest release was not seen to have any bacteriostatic activity. It was suggested by the authors that the hydrophobic nature of the dressing inhibited the release of silver [32].

Acticoat® and Contreet-H® have been observed to exhibit sustained antibacterial action with no or limited bacterial transfer, while Acticoat® was deemed the most effective due to its rapid release of silver ions [33]. Actisorb® Silver 220 (Johnson & Johnson) demonstrated moderate effectiveness and Avance® (SSL International) performed poorly. An extension of this study (incorporating data from the original) compared the performance of 10 silver-containing dressings [34] and concluded that although the total amount of silver present in a dressing influenced its antimicrobial activity, other factors such as the location of the silver (on the surface or dispersed throughout the dressings), its chemical and physical form (whether it is in a metallic, bound or ionic state), and the dressings ability to absorb moisture in order to activate the release of silver were important for the dressing’s overall performance.

Further evidence for Acticoat® has showed that this dressing achieved better clinical outcomes in comparison to silver nitrate [35-37] and silver sulphadiazine [36, 37]. Acticoat® has also been reported to reduce matrix metalloproteinases to assist in wound healing [38]. In contrast, silver sulphadiazine and 0.2% chlorhexidine digluconate was more effective than Acticoat® against a greater variety of burn pathogens [39] with its effectiveness confined to the length of time the dressing is able to stay in contact with burn pathogens [40].

2.2 Safety of silver treatments

Transient staining of the surrounding skin can occur with silver dressings, and although this hyperpigmentation is usually not considered permanent [41, 42], a porcine study found that discolouration was correlated with the duration of use and permanent discouloration was possible [43]. Argyria (systemic toxicity) is considered unlikely and, although thought to be somewhat dependent on wound size [41], an examination of major burns patients found that while serum silver levels were elevated (with the application of Acticoat®) the treatment was not associated with clinical indications of toxicity [44].

More generally, it has been suggested that evidence of cytotoxicity in vitro has limited relevance to what has been observed in vivo [45, 46].

Perhaps the main note of caution relates to the use of silver on skin grafts. Acticoat® was found to be cytotoxic to cultured keratinocytes [47, 48] and fibroblasts [47]. Another reported dressing related adverse event involved a partial skin graft loss [44].

Other contraindications for use are denoted on manufacturer instructions and should be observed. These commonly include any known sensitivity to silver and for people undergoing Magnetic Resonance Imaging (MRI) examination.

2.3 Cost effectiveness of silver treatments

Silver products are generally perceived to be expensive in comparison to other treatments. The absence of strong evidence regarding the clinical effectiveness of topical silver antimicrobials fuelling consternation regarding their use given the need for judicious spend of the health dollar. A 33 per cent reduction in labour and supply costs was observed when Acticoat® was used once every three to four days compared to SSD treatment [49]. A retrospective analysis of wound care episodes found clients treated with silver antimicrobials received more visits, had a longer treatment duration, with shorter intervals between visits than clients treated with ‘other’ dressings [50]. However, this study was unable to compare the severity of the wounds in both groups; a factor critical to control for as silver would be indicated for use on compromised wounds likely to be associated with poorer and more costly outcomes.
3. Cadexomer iodine

Cadexomer iodine is noted, alongside silver antimicrobials, as among the newer advanced treatments for wounds compromised by bacterial burden [10, 51]. Yet, cadexomer iodine has not been the focus of such vigorous research activities in the last decade as that observed for silver treatments. It would seem that the clinical effectiveness of cadexomer iodine is well accepted, and as such investigations of late have focused on understanding the pro-inflammatory mechanisms through which cadexomer iodine operates [52, 53].

Historically, iodine preparations were regarded with caution given concerns that they might be cytotoxic and could hinder rather than foster wound healing [54]. Cadexomer iodine represented an advancement in iodine preparations because it was the first preparation to be water-soluble and able to provide sustained release of iodine at the wound site. As described by Falanga (1997), cadexomer iodine preparations consist of cadexomer microspheres with a diameter of 0.1-0.3mm which contain 0.9% iodine. A gel is formed from the absorption of exudate and iodine is release into the wound environment. An acid pH is promoted in the wound which supports the antimicrobial activity of the iodine. In addition to its antimicrobial properties, the ability of cadexomer iodine to absorb exudate, debride, stimulate macrophages and increase re-epithelialisation has also been reported [51, 54, 55].

Reviews of cadexomer iodine with other dressings converge with the conclusion that cadexomer iodine promotes wound healing more than other (non-silver) dressings as shown by both animal and human research [45, 56-58]. With respect to human comparison studies, the use of cadexomer iodine has resulted in improved wound healing when compared to hydrocolloid dressing or paraffin gauze [59], saline wet-to-dry compressive dressings [60], zinc paste dressing [61], saline dressings, enzyme-based debriding agents or non-adhesive dressings [62], dextranomer [63], non-adherent dressings [64], and other standard treatment [65].

In contrast to the many clinical trials finding cadexomer iodine to be more effective than alternatives, cadexomer iodine was not found to result in superior healing when compared to gentamicin solution, streptodornase/strepto-kinase, or dry saline gauze for diabetic foot wounds [66] and dextranomer beads [67].

Despite these exceptions, the weight of clinical evidence indicates cadexomer iodine aids the resolution of bacterial burden and supports wound healing. Animal studies indicate that Cadexomer Iodine is effective in significantly reducing the number of organisms in the wound without hindering wound healing [68] and aiding the rate of wound epithelialisation [68, 69].

There have been few cost effectiveness studies conducted involving cadexomer iodine. What investigations have been undertaken found cadexomer iodine to be a more cost effective treatment when compared to hydrocolloid dressings and paraffin gauze [59] and standard treatment (gentamicin solution, streptodornase/strepto-kinase, dry saline gauze) [66].

Contraindications for use are denoted on manufacturer instructions with caution indicated for people with thyroid disorders or undergoing thyroid function tests, during pregnancy or lactation, or for any person with known iodine sensitivity.

4. Comparing silver and cadexomer iodine antimicrobials

Cadexomer iodine has been a well accepted topical antimicrobial used to control bacterial burden in wounds over the last few decades; a position that has been validated empirically [45, 56-58]. Topical silver antimicrobials, on the other hand, have been the impetus for considerable debate across clinical, scientific, and political arenas. The use of topical silver antimicrobials on chronic wounds was embraced following the high profile use of silver on burn injuries; this zeal perhaps proving to be the impetus for the backlash against silver antimicrobial use in the presence of limited as well as unconvincing evidence and the perceived high cost of treatment. Commentary as to the role of topical silver antimicrobials in wound management has been charged, with the debate fodder for more general criticism of the reliance on levels of evidence within the evidence-based practice healthcare paradigm.

Despite the clinical popularity of both cadexomer iodine and silver antimicrobials, it has only been in recent years that the first evidence directly comparing their clinical and cost effectiveness has emerged.

An in vitro study compared the performance of cadexomer iodine and a hydrofiber dressing with silver (unspecified) over a 24 hours period against three organisms; MRSA, Pseudomonas aeruginosa, and VRE [70]. The in vitro performance of cadexomer iodine was better than the silver dressing, producing greater log reductions against all three organisms and at all assessed time points; from 30 minutes through to 24 hours.

In 2010, the first RCT evidence comparing these treatments was published [71]. Comparable clinical effectiveness on these measures was observed between cadexomer iodine (Iodosorb®, Smith & Nephew Ltd.) and silver (Acticoat®, Smith & Nephew Inc.), with some exceptions noted. Silver achieved a significantly quicker healing rate in the first fortnight than cadexomer iodine; the cadexomer iodine group recorded a slight negative average healing rate suggesting wounds in this group grew larger rather than smaller. Wounds which did not heal within the 12 week period, thus the group likely to be at risk of delayed healing, also performed better when receiving the silver antimicrobial dressing. These wounds tended to be larger, of longer duration, and were more likely to have moderate to high levels of exudate at baseline.
Comparable cost effectiveness was observed [72], with two exceptions again noted. The product cost (but not nursing or combined product/nursing costs) for cadexomer iodine was less for young wounds (<12 weeks). Nursing care costs and the combined product-nursing care costs (but not product costs) were less for large wounds (>3.6cm²) when treated with silver.

There was no difference in the healing rate observed in the presence of moderate or high growth for any bacterial colony [73]. Healing was quicker for silver when there was nil or low growth for leucocytes, gram + bacilli, gram + cocci, and gram – cocci (only gram – bacilli had no significant difference).

Product acceptability was high among participants with no significant differences between cadexomer iodine and silver [74]. The results emerging from this RCT reiterate the general acceptability of both treatments, which is unsurprising given their widespread use in clinical practice. The results would also suggest the antimicrobials to be of comparable clinical effectiveness and that expenses associated with both treatments are equivalent, with a few exceptions noted.

A recurrent theme emerging from research involving topical silver antimicrobials is its swift early effect on healing and/or resolution of bacterial burden. Yet, despite the difference in the first two to four weeks of silver treatment in comparison to cadexomer iodine and other wound treatments, most studies reveal comparable outcomes at follow-up. This suggests that different mechanisms, which are ultimately as effective as each other, are involved in how these topical antimicrobials address bacterial burden and aid wound healing.

5. When topical antimicrobials should be used on chronic wounds

5.1 Wound inflammation

Two reasons have been proposed as to why a wound will stall in the inflammatory phase [52]. First, the pro-inflammatory response is out of control due to various factors such as local tissue ischemia, bioburden, necrotic tissues and repeated trauma. Second, the lack of activity of the biochemical players responsible for a pro-inflammatory response; that is, cells such as macrophages are present but in a non-functioning state. In the former scenario it is suggested that the appropriate treatment response would be the use of a therapy with anti-inflammatory activity. In the latter scenario, a treatment which encouraged the macrophages to become active again is implied.

While more research is required to corroborate this developing understanding of wound healing (or non-healing), it is speculated that cadexomer iodine’s noted inflammatory mechanism [53, 75] which contrasts to silver’s anti-inflammatory action [29, 76] might explain the differences observed in the first few weeks of antimicrobial application as well as inferring information about the state of the wound that is at risk of delayed healing.

There is a role for more research assessing the clinical effectiveness of these antimicrobial dressings in light of the inflammation present in the wound. It is possible that, if a role for these antimicrobials can be differentiated on the basis of the amount and nature of wound inflammation, and is supported by reliable, detailed assessment of inflammation available at the ‘bed-side’, the use of antimicrobial treatments to address bacterial burden and aid healing could reach a new level of sophistication.

5.2 Assessing stages of bacterial burden

The ability to appraise when a wound is critically colonised, has local infection, or when systemic infection has occurred, is critical for ascertaining when to initiate antimicrobial treatment (and antibiotic treatment), especially as the colonisation of open wounds with micro-organisms is a normative state and one which can have no consequences for healing. Several discussion papers have been developed to reconcile views from quite a large literature on how these terms are defined, how bacterial burden is assessed, and the implications of infection for treatment decisions [77-82]. A review of this literature is beyond the scope of this chapter, other than to note that it is appropriate to conceptualise the identification of wound infection as a ‘clinical skill’ [5], for which the appropriate avenues to evolve this skill must be established by providers of healthcare services and education.

The 2010 Best Practice Statement regarding the use of topical antiseptics / antimicrobial agents in wound management provided recommendations for practice [5]. These guidelines address the role of antimicrobial treatments for critically colonised and locally infected wounds, and for systemic infection.

The prophylactic use of antimicrobial treatments is controversial. Some of the host issues identified to be associated with an increased risk of developing wound infection reflect sub-optimal immune functioning such as older age, poorly controlled diabetes mellitus, dietary imbalances, and lifestyles factors such as stress, alcohol and drug abused, smoking and lack of exercise or sleep [83]. The amount of antimicrobial transfer required for this purpose may differ from the infected wound and may influence product selection. More research and subsequent practice recommendations are required regarding the use of antimicrobials in this respect. The prophylactic use of antimicrobials should be an accompaniment to proficient wound bed preparation.
5.3 Recommendations for practice and research

This review of the literature has identified that although cadexomer iodine and silver antimicrobials are used frequently to treat bacterial burden in chronic wounds, research evidence clarifying their relative clinical and cost effectiveness, and indeed, circumstances when one would be preferred over the other, is surprisingly and disappointingly limited. The following recommendations for practice and research draw upon what is known from in vitro and in vivo evidence as well as consensus opinion garnered in the development of clinical guidelines.

Recommendations for practice:

1. Consensus expert opinion/guidelines would suggest that topical antimicrobial treatment is indicated for wounds showing signs of critical colonisation, local infection, and systemic infection. Antimicrobial treatment should be ceased when consistent progress towards healing is made and signs of bacterial burden are resolved. Antibiotic treatment should be used for systemic infections and if there is no improvement in the locally infected wound.

2. Silver and cadexomer iodine antimicrobials have been revealed to be safe and acceptable wound treatments. Some discolouration may occur with the use of silver antimicrobials. Caution is advised with respect to the use of silver on cultured skin grafts. Manufacturer guidelines should be followed with regard to further contraindications for these agents.

3. The performance of silver antimicrobials varies markedly and the amount of antimicrobial activity and performance of the carrier dressing, given the state of the wound, should be considered when selecting a product.

4. Silver and cadexomer iodine antimicrobials offer equivalent clinical effectiveness in the long-term (approximately >4 weeks). Clinicians can allow other factors of significance to influence their dressing selection knowing that either antimicrobial will provide effective antimicrobial activity.

5. Silver antimicrobials can achieve swifter healing in the short-term (approximately <4 weeks). Clinicians might select a silver product when an initial swift healing response would be advantageous; noting that a swifter healing rate in contrast to other products is unlikely in the long-term.

Recommendations for research:

1. Additional rigorous clinical and cost evidence from a direct comparison of cadexomer iodine and silver treatments is required to validate and extend the limited findings currently available.

2. The relationship between wound inflammation and the action of antimicrobials treatments requires investigation.

3. The presence of biofilms is not well understood both with respect to how bacterial burden develops or can be assessed. The relationship between the presence of biofilms, assessing bacterial burden, and the effectiveness of antimicrobial treatments is an area requiring exploration.

4. Research is needed to determine whether there is scientific merit to the proposition that there is prophylactic role for antimicrobial treatments in chronic wound management.

6. Conclusion

Both cadexomer iodine and silver are topical antimicrobial treatments commonly used and well accepted in the treatment of bacterial burden in chronic wounds. Though topical silver antimicrobials have been the focus of some contentious debate, the clinical effectiveness of silver has promise, and the evidence for cadexomer iodine (in contrast to other non-silver treatments) seems accepted. In a direct comparison, there was no basis to suggest that silver was more expensive than cadexomer iodine. Until more research is available, it would seem prudent that current practice continue with treatment selection driven by clinician discretion, seeking client concordance with the treatment strategy, and is supported by funding structures enabling access to both treatments. The pursuit of further topical antimicrobial research will help to shape future practices as to when, given certain wound bed conditions, one of these treatments would be the preferred choice to achieve the best outcomes for healthcare service providers and people who experience chronic wounds.

References


