Wound infection

***Wounds International's* clinical innovations section presents recent developments in wound care. This issue, we focus on innovations in wound infection.**

Innovations in topical antimicrobials

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The need for topical antimicrobials in the treatment of wounds is self-evident. Acute injuries will often be contaminated by the surroundings where the injury occurred and the risk of subsequent infection developing in these wounds is high, while chronic wounds will be contaminated, colonised, critically colonised, or infected due simply to their chronicity, and so requires local management of bioburden.

Antibiotics selectively target micro-organisms and, in general, should not be used topically, due to the risk of inducing resistant strains. On the other hand, antiseptics are nonselective and may damage all cells they come into contact with.

In recent decades, the topical antiseptics iodine and silver have been widely used in wound care, but – given the relative novelty and wide variety of products containing these agents – selecting the most appropriate topical antimicrobial and the most appropriate formulation for a specific wound can be challenging (Sibbald et al, 2011; MacGregor, 2012). In this review, innovations in topical antimicrobials will be discussed with special attention to Prontosan® (B. Braun), Flaminal® (Crawford Healthcare), and Cutimed® Sorbact® (BSN Medical).

NEW TOPICAL ANTISEPTICS

Prontosan

Prontosan is an irrigant containing polyhexamethylene biguanide (PHMB; an antimicrobial) and undecylenamidopropyl betaine (a surfactant). It is available as a solution and a gel.

PHMB is a polymeric cationic agent that was recognised as having superior antimicrobial properties to other cationic biocides, but could only be poorly defined chemically. Early attempts to rationalise PHMB mixtures were unsuccessful and precluded their use in pharmaceutical products. While it shares many attributes with the simpler cationic agents, it has additional mechanisms of action that render i unique among this class of antimicrobials (Arch Chemicals, 2008). Nevertheless, PHMB was marketed as a broad-spectrum antimicrobial agent in a number of diverse applications and has been available in consumer applications for more than 40 years (Horrocks, 2006; Kaehn and Eberlein, 2009).

As with the bisbiguanides, PHMB was shown to rapidly bind to the envelope of both Gram-positive and -negative bacteria and so displace the otherwise stabilising presence of Ca2+ (Messick et al, 1999). PHMB binds to the cytoplasmic membrane itself, as well as to the lipopolysaccharide and peptidoglycan components of the cells wall (Kaehn, 2009).

The toxicity profile of both the biguanides and polymeric biguanides is excellent; neither molecule is a primary skin irritant, nor a hypersensitising agent (Gilbert et al, 1990). With respect to the deployment of PHMB as part of a wound care system, there is little or no evidence to suggest that this would lead to the emergence of PHMB-resistant strains.

The other key ingredient of Prontosan is undecylenamidopropyl betaine, which is a mild, active surfactant with dual water and oil solubility. It is a highly pure betaine based on undecylenic acid, developed for the specific demands of the wound care industry. This betaine is used to reduce surface tension and allow wound contaminants to lift (Burnett et al, 2012).

A number of case studies in which Prontosan has been used to manage a range of wound types is available online (Andriessen and Eberlein, 2008). A case study booklet comprising 29 cases is also available (B. Braun, 2010).

Flaminal

Flaminal is available in two hydrogel formulations with a high alginate content, which are indicated for the reduction of bacterial growth in wounds. Flaminal hydrogels are based on alginate gel, not on other polymers, and use the enzymes glucose oxidase and lactoperoxidase to control bioburden in a similar way to honey (van den Plas et al, 2006; White, 2006).

Flaminal contains lactoperoxidase, an enzyme derived from milk, and acts as an important natural antimicrobial. It has been shown to be bacteriostatic against Gram-positive organisms and exhibits pH-dependent bactericidal action against Gram-negative organisms in the presence of hydrogen peroxide and thiocyanate. Peroxidases are enzymes that belong to the natural, non-immune defence systems found in milk and in the secretions of exocrine glands, such as saliva, tears, intestinal secretions, cervical mucus, and the thyroid (Thomas and Hay, 1996; White, 2006). The combination of glucose oxidase with lactoperoxidase serves to provide a sustained source of safe and effective broad-spectrum antimicrobial protection in a manner similar to the human body's own natural white cell defences (Vandenbulcke et al, 2006).

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From the available laboratory and clinical evidence, it is clear that Flaminal products are safe and effective, both clinically and microbiologically, although some studies have shown methicillin-resistant Staphylococcus aureus is not always eradicated (de la Brassinne et al, 2006). However, there is currently little published evidence in support of Flaminal products (Lacarrubba et al, 2005; Kyripoulos et al, 2010; Durante, 2012).

Sorbact

Sorbact is a non-allergic, non-toxic hydrophobic fibre dressing made of acetate or cotton fabric impregnated with a fatty acid ester that makes it strongly hydrophobic (Ljungh et al, 2006). It is available in ribbons, foams, absorbent dressings, and gels. The green Sorbact surface binds with, and deactivates, pathogenic microorganisms, and, as such, is recommended for use in colonised and infected wounds, as well as for fungal skin infections (Ljungh et al, 2006).

Sorbact is indicated for the treatment of colonised and infection wounds as well as fungal infection (Wadström et al, 1985; Johansson et al, 2009; Powell, 2009; Derbyshire, 2010; Skinner and Hampton, 2010; Lee et al, 2011). As with Flaminal, there is currently limited published evidence in support of this product.

CONCLUSION

Despite topical antiseptics being used in a wide range of clinical situations, evidence supporting their efficacy in the treatment of wound infection is more limited. For newer products, it is important that clinical research be undertaken and published to validate their efficacy in wound management. The problem arises in that bacteria not only develop resistance to certain antimicrobials, but also produce biofilms to prevent their destruction. It is important that new agents continue to be developed that have the ability to penetrate biofilm and, in doing so, lessen the burden of wound infection and improve outcomes. ■

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