SUPRASORB X + PHMB: A UNIQUE HYDROBALANCE ANTI-MICROBIAL DRESSING

Andrew Kingsley, John Timmons

Suprasorb X+PHMB is a new antiseptic dressing that combines Suprasorb X, a unique HydroBalance dressing that is able to both absorb and donate moisture, with PHMB, an antiseptic compound with no known cytotoxicity or resistance. Studies have shown that Suprasorb X+PHMB effectively reduces wound bioburden, promotes autolytic debridement, improves the rate of wound closure through an increase in granulation and epithelialisation, and effectively reduces wound-related pain. A series of case reports which evaluated the dressing’s performance on a variety of wound types support these findings and are presented in this article.

**Key Words**

Suprasorb X+PHMB
Antiseptic
Wound infection
Case report evaluation

Antiseptics have been in use for much longer than antibiotics yet resistance to antiseptics presents much less of a problem. This may be because antiseptics differ from antibiotics in that they are generally active against a broader spectrum of organisms including common pathogenic anaerobic and aerobic bacteria, and fungi. Unlike antibiotics, antiseptics also tend to have multiple target sites, including the bacterial cell wall or membranes, in the organisms on which they exert their effects. This means that the micro-organisms are less likely to mount an effective defence and survive as resistant strains (Gilbert, 2006).

Once the need for topical antiseptic intervention has been identified, it is important to select a product that will provide optimum conditions to support rapid healing. The ability of the agent to reduce or eradicate micro-organisms, must also be considered, along with its specificity, cytotoxicity to human cells, its potential to select resistant strains and its allergenicity (Vowden and Cooper, 2006). The ability of the barrier dressing to handle exudate and remove necrotic tissue from the wound is beneficial, since purulent exudate, necrotic tissue and slough are all growth mediums for bacteria (Cutting, 2008). The dressing’s ability to reduce malodour, conform to the site and shape of the wound, perform wound bed preparation functions, satisfy patients’ expectations and to meet treatment goals also need careful consideration (Vowden and Cooper, 2006).

The range of topical antiseptic agents currently in common use in wound dressings in the UK include silver; iodine, and honey. Polyhexamethylene biguanide (PHMB) is a relatively new addition and provides an alternative to the anti-microbials currently available.

**Polyhexamethylene Biguanide**

PHMB is a synthetic compound which is structurally similar to naturally occurring antimicrobial peptides (AMPs). AMPs are produced by the majority of living organisms and have a broad spectrum of activity against bacteria, viruses and fungi (Moore and Gray, 2007). AMPs are positively charged molecules that bind to bacterial cell membranes and induce cell lysis by destroying membrane integrity, in a similar way to penicillin and cephalosporin antibiotics. AMPs are produced by many cells within the wound, such as keratinocytes and inflammatory neutrophils, where they are thought to play a role in protection against infection (Sorensen et al., 2003).

The structural similarities between AMPs and PHMB mean that the latter can insert into bacterial cell membranes and kill bacteria in a similar way to AMPs (Moore and Gray, 2007). Some bacterial cells use an efflux pump to protect themselves from the effects of some antiseptics. However, the effect of PHMB on the bacterial cell membrane mean that the pump is unable to remove antiseptic, so bacterial concentrations are maintained in the cell. This mechanism of action is quick and means that bacteria are unlikely to develop resistance to PHMB (Sepp and Korber, 2008).

**PHMB in Wound Management**

Polyhexamethylene biguanide (PHMB) is a
commonly used antiseptic which appears in a variety of products including contact lens cleaning solutions, perioperative cleansing solutions and swimming pool cleaners. Its safety and effectiveness as an antiseptic both in vitro and in vivo in these different applications is well documented (Motta, 2004; Motta and Triglia, 2005; Larkin et al., 1992). It exerts little toxicity and has been in general use for approximately 60 years with no evidence of the development of resistance (Moore and Gray, 2007). In wound care, specifically, PHMB has previously been demonstrated to block Pseudomonas aeruginosa-induced infection (Cazzaniga et al., 2000) and prevent its degradation of wound fluid and skin proteins in vitro (Werthen et al., 2004). It can also kill a diverse range of bacteria and fungi (Lee et al., 2004).

Furthermore, to date PHMB has been used successfully in wound dressings, including non-adherent products, gauze, drains and intravenous sponges (Motta and Triglia, 2005; Moore and Gray, 2007). The long-term use of PHMB in other indications without cytotoxicity or the development of resistance suggests this is unlikely to happen when the antiseptic is used in wound management (Gilbert, 2006). PHMB has been incorporated into a new wound management product, Suprasorb® X + PHMB, which gives antimicrobial activity to the unique HydroBalance dressing, Suprasorb X.

THE SUPRASORB X DRESSING RANGE

Suprasorb X dressings have a unique structure made up of biosynthetic HydroBalance fibres. These fibres are the products of a cellulose fermentation process using a proprietary strain of Acetobacter xylinum. The bacteria produce fibrils of cellulose which are 200 times finer than cotton, giving the material an exceptionally high surface area. The same microbes weave a mesh structure of fibrils that enhances both its moisture handling capabilities and its tensile strength.

As a result of the biosynthetic HydroBalance fibres, Suprasorb X is able to regulate the absorption and donation of moisture at the wound-dressing interface (Figure 1). Depending on the status of the wound, surplus exudate can be absorbed by the dressing, or donated in the case of lightly exuding wounds. This moisture absorbing and donating capacity can also be exerted within the same wound, removing exudate and donating moisture to drier areas.

It also protects the wound against abrasion, desiccation and external contamination. These unique fluid-handling capabilities of the dressing mean that Suprasorb X can be used on moderately exuding, non-exuding and dry wounds. The most environment also has a cooling effect that has demonstrated a significant reduction in pain (Alvarez, 2004; Davis, 2006; Wild and Eberlein, 2009).

In a 24 patient, multicentre randomised controlled study carried out by Alvarez et al. (2004) to determine effectiveness of Suprasorb X compared with care already being received in patients venous leg ulcers, Suprasorb X was found to significantly promote autolytic debridement and significantly reduce wound pain at weeks three, six and eight of the 12-week study. An improved rate of wound closure, in terms of increased epithelialisation and granulation tissue was also noted (Alvarez, 2004). Results of increased pain (Gallitz et al., 2009), increased granulation and epithelialisation and an improved rate of wound closure have also been observed by Vigerberg et al. (2007), Eberlein et al. (2007) and Baindurasthi et al. (2009).

The findings of pain relief and promotion of wound healing were also observed when Suprasorb X was used under compression in a 12-week prospective, randomised controlled pilot study of patients with leg ulcers (Mosti et al., 2009).

The new dressing, Suprasorb X + PHMB, combines the proven efficacy of Suprasorb X with the antimicrobial action of PHMB (0.3%), and is indicated for use on lightly to moderately exuding superficial and deep, infected wounds in all phases of wound healing. The PHMB component exerts its antimicrobial effects both within the dressing but also at the wound-dressing interface (Figure 2). As the PHMB is not bound to the HydroBalance fibres of the dressing; it is released into the surrounding fluid along a concentration gradient.

The presence of fluid in the dressing means that antimicrobial activity is possible even on dry wounds, unlike silver-containing dressings which require the mechanical action of wound fluid to initiate antimicrobial activity.

SUPRASORB X + PHMB IN CLINICAL PRACTICE

A clinical case series performed by Mulder (2007) to determine the antimicrobial effects of Suprasorb X + PHMB showed that PHMB effectively reduced wound bioburden and had a positive effect on wound healing. Twelve patients with a total of 26 wounds were evaluated, 11 of whom had previously been unresponsive to silver- or iodine-containing dressings.

Wound swabs were taken before and after treatment with Suprasorb X + PHMB. Before treatment, organisms were identified in the wounds of eight patients, most commonly Pseudomonas aeruginosa and Staphylococcus (including MRSA). At the end of the evaluation, levels of bacteria were decreased in five of the eight patients (two patients were lost to follow up, and one patient experienced no change in bioburden). For the eight patients, there was a mean reduction in wound size from 6.79 cm² to 4.57 cm² in a mean of 25 days. Two wounds healed during the study and 13 showed improvement.

An evaluation of Suprasorb X + PHMB in the treatment of four patients with wounds which had previously been treated unsuccessfully with various silver-containing dressings was undertaken by Davis (2006). Although two wounds were locally infected, application of Suprasorb X + PHMB healed three of the four wounds, protected peri-
wound environment that promotes wound healing. Such a dressing, however, must be used wisely to minimize the cytotoxic effects on the cells needed for wound healing and to reduce the selection of resistant bacterial strains (Vowden and Cooper 2006). Suprasorb X + PHMB is able to effectively reduce the number of pathogens in the wound. Currently, PHMB does not have a history of resistance or cytotoxicity, making it a good alternative to antiseptics for which the development of bacterial resistance and toxicity is an issue. Suprasorb X’s unique ability to absorb and/or donate moisture depending on the needs of the individual wound provides a moist environment that will allow the wound to progress towards healing and lead to a reduction in pain. These unique properties of Suprasorb X + PHMB make it an attractive alternative to the antiseptic dressings that are currently available.

REFERENCES


Davis C (2006) Evaluation of pain control and healing rates using an advanced cellulose dressing with 0.3% PHMB. Poster presentation, SAWC Annual Congress, Tampa


