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**SUPRASORB® X +PHMB: A NEW WOUND DRESSING**

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The indiscriminate use of antibiotics is widely considered to be a crucial factor contributing to the rise of resistant microorganisms such as Methicillin-resistant Staphylococcus aureus (MRSA) (Kingsley et al, 2006; Moffatt, 2006). This has led to a renewed interest in the use of antiseptics in wound care. Antiseptics offer many benefits as they can be relatively easy to use, are widely available, frequently cost less than antibiotics, and can be administered without prescription (Principles of Best Practice, 2008). However, they too should not be used indiscriminately or indefinitely, as there is also evidence for bacterial resistance to some antiseptics, such as silver (Mallard and Denyer, 2006). There is also a lack of clinical evidence surrounding the cytotoxicity of some antiseptic products (Principles of Best Practice, 2008).

When should antiseptics be used?

It is almost inevitable that the majority of wounds will become contaminated with bacteria to some extent. However, contamination, which describes the presence of organisms in a wound, with no active growth and no host response, is of no relevance to clinical practice (Kingsley et al, 2006). However, when wound bioburden increases, clinical effects may be noted and may require intervention. The increasing bacterial numbers in wound tissue can be described using conceptual names:

- Colonisation
- Critical colonisation
- Local infection
- Spreading infection (Kingsley, 2006).

Colonised wounds contain multiplying bacteria, however, the host does not have an overt clinical response or clinical symptoms, meaning that the need for topical antimicrobial intervention is unnecessary, unless there are concerns regarding the patient’s immune response or overall medical condition.

Critically colonised wounds require a reduction in the level of bacteria present, if the wound is to progress towards healing. In chronic wounds, critical colonisation may cause delayed healing in the absence of any indicators of infection, thus the clinician should be alert to this and microbial involvement must be suspected when other causes of indolence have been eliminated. The topical application of an antimicrobial is probably the most effective way in which to reduce the critically colonised wound’s bioburden to levels that allow the wound to heal (Sibbald et al, 2001; Fumal et al, 2002).

Localised infection is often characterised by the classic signs and symptoms of inflammation, including redness, heat and pain (Cutting and Harding, 1994). If local infection is identified, in most instances it can be managed with topical antimicrobials, providing the practitioner is satisfied that the patient’s overall condition does not suggest that there is a risk of the infection spreading. However, the clinician should remain alert to the possibility of spreading infection, and be prepared to alter treatment as required (Kingsley et al, 2006). If, however, infection has invaded soft tissues or is spreading, then treatment with both local and systemic measures is indicated. Wound dressing choice will have little impact on the spreading infection, but can help to reduce the level of bacteria at the wound surface.

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 microorganisms 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 carrier 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).

Antiseptic agents
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 microorganisms are less likely to mount an effective defence and survive as resistant strains (Gilbert, 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 entrant to the UK wound care market, although it is in common use in Europe and US.

**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). This mechanism of action is quick and means that bacteria are unlikely to develop resistance to PHMB (Seipp and Korber, 2008).

**PHMB in wound management**
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 et al, 2004; Motta and Trigilia, 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 Trigilia, 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 (Activa Healthcare), giving antimicrobial activity to the Hydro-Balance dressing, Suprasorb X.

**The Suprasorb X dressing range**
Suprasorb X dressings have a unique structure made up of biosynthetic HydroBalance fibres, that enhance both its moisture handling capabilities and its tensile strength. Thus, 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 moist environment also has a cooling effect that has demonstrated a significant reduction in pain (Alvarez et al, 2004; Davis, 2006).

In a 24-patient, multicentre randomised controlled study carried out by Alvarez et al (2004) to determine the 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 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 decreased pain, increased granulation and epithelialisation and an improved rate of wound closure were also observed by Vijverberg et al (2007) and Eberlein et al (2007).

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 et al (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 6.79cm² to 4.57cm² 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 periwound tissue and resulted in a decrease in wound pain (Davis, 2006).

Similarly, an evaluation of Suprasorb X +PHMB in the treatment of 79 wounds of varying aetiology by Cavorsi (2006) revealed that healing or clinical improvement was achieved in >80% of the cases receiving treatment with Suprasorb X +PHMB. In a subset of wounds that had not been responsive to prior treatment with
silver dressings, a decrease in wound size of 33% was observed after three weeks.

**Conclusion**

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 antisepsics 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 leads 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.

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


