Using SILVERCEL® Non-Adherent antimicrobial dressings

Silver-containing antimicrobial dressings have been available for many years. The silver ions in these dressings have antimicrobial properties as they interfere with chemical bonds essential to bacteria. SILVERCEL® Non-Adherent has been designed to eliminate the potential problems of adherence and fibre shed that are sometimes associated with some fibrous wound dressings. This article describes the origins of silver as an antimicrobial and looks at the evidence and use of SILVERCEL Non-Adherent dressings.

It is not breaking news that silver can be used as an antimicrobial. Evidence exists that it was used in ancient Greece and Rome as well as by American settlers in the 1800s as a disinfectant agent for the storage of water and other fluids; NASA used silver for the same reason on their space shuttle[1].

The origins of silver in wound care
In the 18th century, silver nitrate was used in ulcer management[2], and was it regulated by the US Food and Drug Administration in the 1920s as an antimicrobial for wound management[3]. The American surgeon Halstead used silver foil dressings in the early 19th century.

The use of silver for wound management was mainly replaced early after World War II due to the arrival of antibiotics[4]. However, as wound infection continued to be an issue affecting wound healing, silver in the form of silver sulfadiazine re-emerged in 1968. Silver sulfadiazine was used for burns as a broad-spectrum antibacterial agent and more recently in general wound care, probably due to the spread of methicillin-resistant Staphylococcus aureus (MRSA) and the toxicity of topical antiseptics[5, 6, 7, 8].

Silver works as an antimicrobial wound care agent as silver ions bind to and hinder bacterial proteins and nucleic acids, and stimulate the generation of reactive oxygen species[9]. The silver ions bind to bacterial walls, disrupting the walls and leading to cell death[10]. The ions also bind to bacterial enzymes, preventing them from functioning, and bind to the bacterial cell DNA, interfering with cell division and replication[11]. The Silver Institute explains the mode of action of silver as an antimicrobial, stating: “Quite simply, silver interrupts the bacteria cell’s ability to form the chemical bonds essential to its survival. These bonds produce the cell’s physical structure so when bacteria meet silver it literally falls apart”[11].

As far back as the late 19th century, 1% silver nitrate solution was used for treating eye infections[12]. Later, silver nitrate 0.5% solution was used for treating burn wounds despite this treatment being deemed very labor intensive as it needed to be applied frequently[12]. Silver sulfadiazine cream in burn wound management dramatically revolutionised the management of burn wounds in the late 1960s by reducing the incidence of burn wound infections[12]. However, silver sulfadiazine cream has a relatively short duration of action, its penetration of the burn eschar is poor and it forms a pseudo-eschar. Both silver nitrate dressings and silver sulfadiazine cream require a high frequency of dressing changes[12].

Modern dressings and the challenges
During World War I, Lumiere developed a dressing that consisted of two layers — paraffin and balsam that were in contact with the wound bed, while a second layer of gauze enabled drainage[13]. This use of different layers for mechanical integrity and excess exudate absorption forms the basis of modern, advanced wound care modalities[14]. Some of these modern, layered dressings use silver as their antimicrobial agent.

It is interesting to note that two systematic reviews, one by O’Meara et al and another by Bergin and Wraight, suggest that no randomised controlled trials (RCTs) or controlled clinical trials (CCTs) have evaluated the clinical efficacy of silver dressings or topical agents. This lack of high-quality trials did not enable the authors to reach a conclusion over whether silver-based dressings and topical agents benefit or harm people with diabetes-related foot ulcers[15, 16].

In addition to challenges the evidence base presents, non-adherence has also been an issue for wound care specialists. Pain on dressing removal is a type of procedural pain (discomfort
resulting from a routine, basic procedure) and adherence of the dressing to the wound contributes to this pain\[18\]. Besides causing pain, dressing removal may also damage newly-formed granulation tissue and peri-wound skin\[17\]. Therefore, it is of utmost importance for wound care specialists to consider an appropriate dressing that allows atraumatic removal\[17\]. To address these issues, a dressing must maintain moist wound healing, be atraumatic to the wound bed as well as the peri-wound skin and have an absorbency capacity (fluid retention capacity)\[17\]. Another consideration is that dressings which shed fibres in the wound bed may trigger a foreign body reaction, thus aggravating inflammation that may prolong the inflammatory phase of wound healing\[15, 16\].

What is SILVERCEL® Non-Adherent? SILVERCEL Non-Adherent is a next-generation, advanced wound care product. SILVERCEL Non-Adherent is related to the silver/alginate dressing SILVERCEL but SILVERCEL Non-Adherent is encapsulated in an ethylene methyl acrylate (EMA) outer film layer that uses EasyLIFT™ Precision Film technology\[20\]. The components of the dressing are: high G calcium alginate for absorption and tensile strength; carboxymethyl cellulose (CMC) for absorption; silver-coated fibres as an antimicrobial; and EasyLIFT™ Precision Film (EMA)\[20\].

Alginates are extracted from seaweeds harvested in a number of countries\[21\]. G-rich alginites hold calcium and form a gel slowly\[21\]. These fibres are very effective at providing a moist wound environment at the wound bed interface and are able to absorb wound exudate\[20\]. It is suggested that as SILVERCEL Non-Adherent contains a high proportion of the G-type alginate, it maintains its structural integrity when it absorbs exudate\[20\].

The super absorbent polymer CMC is a derivative of cellulose\[21\]. It is used in SILVERCEL Non-Adherent to increase the absorbency capacity of the dressing\[20\].

Silver compounds ionise (i.e. forming Ag+) when they interact with water, body fluids or tissue exudate\[20\]. Incorporating silver ions with alginate fibres allows for not only a highly absorbent dressing but also allows for antimicrobial action\[20\]. The silver-containing alginate fibres provide a sustained release of silver ions when they come into contact with the wound exudate\[20\].

The EasyLIFT™ Precision Film (EMA) is a thin, flexible and strong synthetic polymer that in vitro studies suggest have a very low propensity to stick to other surfaces\[20, 28\]. The evenly-sized perforations are configured to maximise absorption without allowing the fibres to move to the wound bed; this ensures low adherence to the wound bed and provides effective protection of the newly-formed tissue\[20, 24\].

What does the evidence say? SILVERCEL has been clinically evaluated and assessed in various studies, including level 1 and level 2 clinical evidence\[27–36\]. SILVERCEL is basically the core of the SILVERCEL Non-Adherent dressing and its primary functions are absorbency and antimicrobial action\[20\].

Toet et al conducted a randomised, open-label, multi-centre, comparative, two-arm, parallel-group study; it involved 13 centres where 99 patients with either a venous leg ulcer or a pressure ulcer were recruited\[31\]. The patients were allocated to receive either a SILVERCEL or a pure calcium alginate dressing, and wounds were assessed daily over 14 days\[31\]. The study’s authors concluded that using silver-releasing dressings for managing wounds with a high risk of infection was well tolerated and may positively influence wound prognosis\[31\].

Kirienko et al conducted a study involving 20 patients with trophic venous leg ulcers, where patients were managed with SILVERCEL under compression\[31\]. They concluded that the treatment was highly effective as it arrested inflammation and cleansed the wound surfaces without using antiseptics or antibiotics\[31\].

Kammerlander et al conducted a retrospective case series of 76 patients with wounds of varying aetiology, which were treated with SILVERCEL for up to 33 days\[31\]. At the end of the 33 days, 72% of the wounds showed no signs of infection, 80% had improved and 8% were fully healed; there was also a marked reduction in wound pain\[31\].

Bradbury et al conducted a study in which SILVERCEL Non-Adherent was applied to 26 patients with systemically- or locally-infected wounds, critically colonised wounds, or wounds at high risk of developing infection\[31\]. By the end of the trial, 16 of the patients had an evident decrease in wound size and three of these patients experienced complete wound closure 1 week after stopping the treatment\[31\]. The clinicians and pain assessments in the study indicated that the dressing minimised patients’ pain and discomfort during and between dressing changes; this addressed adherence and fibre-shedding issues\[31\].

Edwards conducted a case series of studies for burns patients\[31\], to assess the potential of SILVERCEL Non-Adherent dressing for use...
in these patients. The author evaluated the outcomes in three patients and concluded that SILVERCEL Non-Adherent is as efficacious as other silver dressings and does not dry out or adhere to wounds [39].

Ivins et al presented a non-comparative case series in 13 patients who had wounds of different aetiologies treated with SILVERCEL Non-Adherent for up to 12 weeks [40]. There were no reports of dressing adherence or dressing residue, and wound exudate level was reduced in over 50% of the patients. The clinicians in the study found the dressing easy to apply and remove, and seven of the patients reported reduced ulcer-related pain while two wounds healed completely within 2 months of starting treatment [40].

When to use SILVERCEL Non-Adherent
Understanding a dressing’s properties helps wound care specialists to know when use of this non-adherent antimicrobial dressing is indicated. The EasyLIFT® Precision Film facilitates easy and pain-free intact removal [40, 41], minimising the risk of fibres shedding [42] and protecting the newly-formed tissue [43]. The dressing’s antimicrobial action: provides a sustained release of silver ions for up to 7 days [43]; is effective against a broad spectrum of wound pathogens, including MRSA, methicillin resistant Staphylococcus epidermidis (MRSE) and vancomycin-resistant Enterococcus (VRE) [20, 40]; and effectively prevents and disrupts biofilms in vitro [44].

The dressing’s properties indicate that SILVERCEL Non-Adherent should be used for wounds that have moderate to high exudate levels, where the wound is painful particularly during dressing change and when antimicrobial action is desirable. From the author’s experience, SILVERCEL Non-Adherent can also be used in wounds that have minimal exudate; however, the dressing should be moistened with normal saline prior to application.

In their clinical guidelines, Hess et al suggest SILVERCEL is indicated for: moderate to heavily exuding, partial- and full-thickness, chronic and acute wounds (e.g. pressure ulcers, venous ulcers, diabetic ulcers, donor sites, and traumatic surgical wounds); helping to control minor bleeds in superficial wounds; and managing wounds that are infected or at risk of infection [20, 43].

Prophylactic use of the dressing may be indicated: in open wounds with delayed healing; in patients with a history of recurrent infections; for immunocompromised patients; for patients with conditions that may diminish signs of infection (e.g. diabetes); and in heavily contaminated surgical wounds [20, 44, 47]. The manufacturer’s guidelines indicate that the dressing may also be used under compression therapy in combination with an absorbent secondary dressing if necessary [40].

In his case series, Edwards also shows that SILVERCEL Non-Adherent is a very effective dressing when dealing with burns [42]. Edwards reported that the burn wounds responded well to the dressing, healing almost completely within 3–4 weeks, and that patients experienced no problems with the dressing and found it comfortable [46]. The dressing did not adhere to the wounds, allowing for removal without pain or trauma to the wound bed, and wound infection was resolved without any abnormal scarring [46].

Contraindications
SILVERCEL Non-Adherent should not be used in patients who are known to be sensitive to any of the dressing components [20]. The dressing should be removed prior to any magnetic resonance imaging (MRI) scanning [20].

How the dressing is applied
The dressing may be applied either side down and can be cut to size [20, 44]. If the rope version is available, the wound should be packed lightly and the rope should not be cut lengthwise [20, 45]. A secondary non-occlusive dressing, such as any of the hydropolymer foams from the Tielle family, can be applied.

SILVERCEL Non-Adherent slowly releases silver ions for up to 7 days [43], but dressing changes should be dependent on the wound itself [20, 45]. Daily dressing may be indicated in the initial few days; thereafter, it may be changed once the secondary dressing has reached its absorbency capacity [20, 47]. The peri-wound skin assessment can also indicate frequency of change, e.g. if eczema is present more frequent changes are necessary [20, 47].

Upon removal, if the dressing is dry, it is suggested to saturate the dressing with sterile saline solution [20, 44]. Once the wound bed is drier and the bioburden is not evident, the regime may be changed to a simple non-adherent dressing, such as Adaptic Touch [20, 47].

Conclusion
SILVERCEL Non-Adherent is a very versatile dressing and its indications are wide. It can be suggested that this dressing gives you the best of not both but three worlds — absorption, non-adherence and antimicrobial effect. All three are indicated for improving patients’ health-related quality of life as their dressings will not be wet or painful, and their infection will be resolved in an
efficient manner. The healthcare provider’s clinical judgment is imperative for the appropriate and most effective use of the product. A fairly large body of evidence supports the use of SILVERCEL Non-Adherent, which suggests that using the dressing will provide the clinician with good outcomes for their patient.

References