Selecting the right dressing is vital for optimum wound healing and nurses can navigate the many options available by understanding how some key dressings work.
The film provides a physical barrier to antimicrobials, mechanical removal and the immune response (Woods et al, 2012). Microbial biofilms are implicated in both the infection of wounds and failure of infected wounds to heal (Percival et al, 2012). It is vital to remove these colonies and the best method for this is debridement. Wound complications and infections are discussed further in part six of this series.

### Debridment agents

Debridement, whereby dead tissue is removed from the wound, is an important aspect of wound management – it prevents the formation of biofilms and infection in the wound. Specialist nurses trained and assessed as competent in debridement, doctors and surgeons may undertake sharp debridement with a scalpel or curette at the bedside, or surgical debride ment in theatre. However, debridement can also be achieved using other methods, including moist dressings, such as hydrogels and/or antibacterial dressings, such as honey or polyhexanide (PHMB) gel.

Maggot therapy is widely used for debridement. Sterile larvae are placed on the wound surface and produce an enzyme that breaks down the biofilm so that the bacteria can be removed.

Maggots have been found to be effective in surgical wounds infected with MRSA and many other wound types (Beasley and Hirst, 2004), and tissue oxygenation is measurably increased during maggot therapy (Wollina et al, 2002). However, they are not as effective for wounds infected with *Pseudomonas*.

Debrisoft is a new product that has been shown to remove devitalised tissue (National Institute for Health and Care Excellence, 2014). Versajet is also an excellent choice for debridement but is often only available to surgeons and TVNs due to cost and training issues.

### Proteolytic activity and pH

Proteases are naturally produced enzymes that act on proteins by breaking them down into peptides and amino acids. In wound healing, the major proteases are the matrix metalloproteinases (MMPs), which are extremely important for healing in acute wounds. However, in chronic wounds, there is an overproduction of MMPs and the increased proteolytic activity is known to damage the wound bed, degrade the extracellular matrix and cause peri-wound skin problems (Romanelli et al, 2010). Immune cells produce the MMPs in response to the inflammatory process during healing and also in response to infection; reducing bacteria in a wound can therefore reduce the MMPs that are creating poor wound-healing conditions.

Since proteolytic activity is sensitive to pH, another way to reduce it is to create a more acidic environment (Hampton, 2008b). The pH of chronic wounds has been measured as 7.15-8.9 (Romanelli et al, 1997; Tsukada et al, 1992), so decreasing the pH level is a simple and effective way of promoting healing (Greener et al, 2005). Antibacterial and interactive dressings change the wound pH (Hampton, 2008b), generally lowering it to a more acidic and wound-friendly level. The dressing must support a moist environment as drying of the wound bed increases pH, making the wound more alkaline (Australian Wound Management Association, 2010).

### Dressing types

As noted above, many types of dressings will reduce wound bacteria, debride and promote an ideal healing environment. They include: honey, PHMB, Zorflex, Sorbac, silver, iodine and highly absorptive dressings, all of which have been shown to reduce bacterial load. These dressings can also reduce chronic proteolytic activity and lower the pH in the wound.

### Silver

Silver has bactericidal properties and was used in the past to prevent or manage infection in its solid form (for example, placing silver wire in wounds); as a solution (for example, using silver nitrate solution as a cleanser); and more recently, as creams or ointments containing a silver-antibiotic compound called silver sulfadiazine (International Consensus, 2012).

Today, the silver component of dressings may appear as a coating on one or both surfaces (elemental or nanocrystalline silver), within the structure of the dressing or a combination of these (International Consensus, 2012). How the silver then interacts with the wound will differ, as with some dressings it will deposit on the wound bed, whereas in others it will remain in the dressing, where it will act on the bacteria that is absorbed. All antimicrobials should be used for a maximum of two weeks.

### Honey

Honey is another effective remedy for healing wounds. It has been found to be an excellent wound dressing with multiple bioactivities that work to expedite the healing process. Honey debrides wounds rapidly, replacing slough with granulation tissue; it also promotes rapid epithelialisation and absorption of oedema from around the ulcer margins (Al-Waili et al, 2011).

However, not all types of honey are equally effective: sensitivity-testing using non-standardised honeys has shown that their antibacterial potency varies greatly (Cooper and Molan, 1999). It is thought that manuka honey, which is derived from the tea tree plant, has more potent antibacterial properties.

Significant antibacterial activity can be maintained easily when using any medical honey as a wound dressing, even on heavily exuding wounds.

### Iodine

Iodine, in the form of impregnated gauze, is extremely useful in acute wounds that may be “dirty” and require protection against infection (scraped knees are a typical example).

However, in wounds colonised with bacteria, iodine in the form of 10% povidone iodine goes white within a few moments of contact with bacteria, indicating that the iodine is no longer effective. Impregnated gauze iodine is therefore useful as a surface protection but not necessarily for deeper and colonised wounds. Cadexomer iodine produces a
When attending to malodorous fungating wounds, dressings can help alleviate symptoms of such wounds; it will continue to destroy bacteria until it turns white.

**Hydrogels**

Hydrogel sheets can be extremely useful in absorbing fluid and keeping the wound bed moist. They offer two benefits: pain reduction and debridement. Amorphous hydrogels generally come in a tube. They do not absorb fluid; instead, they donate fluid to the wound and are therefore extremely useful for wound debridement in completely dry necrotic wounds. However, they can increase the amount of exudate and care should be taken with the surrounding skin.

**Hydrophobic antimicrobial**

Sorbact is an antimicrobial dressing with hydrophobic properties; wound pathogens become bound up with the dressing fibres and are removed when the dressing is changed. Sorbact has been found to be well tolerated and to provide pain relief, as well as reducing inflammation and exudate levels (Skinner and Hampton, 2010).

In one study, Sorbact was found to be effective in 81% of patients with an infected wound. Some 21% had wounds that healed during the study; a further 72% showed an improvement in wound healing; and 7% did not improve.

Reduction in wound pain was reported and the dressing was found to be easy to use (Kammerlander et al, 2008).

**Activated carbon cloth**

The British Ministry of Defence developed activated carbon cloth (ACC) for use in chemical-warfare suits, as it protects the wearer against chemical, biological and nuclear agents. This same protection can now be applied to wound dressings: Zorflex is a 100% ACC dressing that has been woven to have a nano-porous structure. ACC has been successfully used as an odour filter in wound care over many years, but recent in vitro laboratory tests have shown that Zorflex can reduce the bacterial count. It has also been shown to be both antiviral and virucidal, with virus kill rates of up to 98%.

**Alginites**

Alginites are manufactured from different types of algae and seaweed, which form into a gel when they come into contact with liquid. Some break up on contact with wound fluid, others remain intact. Alginate dressings have been available since 1984, although the benefits of seaweed have been cited for centuries. Alginites occur naturally and are fibres that have been entangled to form a strong, cohesive product (Thomas 2000) used as highly absorbent, non-adherent dressings that transmit oxygen and moisture vapour (Choucair and Phillipis, 1998). The dressing is produced from brown seaweed found on the west-Irish coast, the Outer Hebrides, other areas of Europe and the USA. Alginates are manufactured from mixed salts of algic acid (Thomas, 2000), which creates a hydrophilic gel in the presence of exudate.

**Hydrocolloids**

In the presence of wound exudate, hydrocolloids absorb liquid and form a gel, which maintains moisture at the wound bed and so provides an ideal wound-healing environment in wounds that are not already very wet.

These dressings are available in a variety of shapes, sizes and thicknesses.

**Capillary action**

These dressings produce a rapid wicking effect in the wound, drawing the fluid into the central core of the dressing and wicking it sideways into the middle layer and then up into the third layer, keeping the wound moist but not wet. They are particularly useful for wicking fluid away from sinus wounds.

**Dealing with wound exudate**

The production of exudate is a normal part of the wound-healing process, as discussed in part one of the series (Brown, 2015); the exudate provides essential growth factors and nutrients that the wound needs in order to heal (White and Cutting, 2006). However, patients with highly exuding wounds are at increased risk of infection and delayed healing, while inappropriate management of wound exudate can lead to prolonged wound healing, peri-wound maceration and excoriation, and can result in deterioration of the wound.
Sterile maggot larvae can be used to break down the biofilm for the removal of bacteria.