

What is the evidence base for wound management products?

This article reviews the natural healing process, wound-bed preparation and summarises the evidence for some of the available wound dressing products.

Phases of natural wound healing^{1,2}

The wound healing process is a complex series of events that begins at the moment of injury and can continue for months – or even years. The stages of wound healing are summarised in Box 1.

Wound assessment

Before a dressing choice can be made nursing staff generally make a systematic assessment of the patient to determine any factors that might influence compliance, including their ability and interest in dressing the wound. Any co-morbidities that could affect wound healing potential, such as diabetes, cardiovascular disease, connective tissue disorders, or chemotherapy or steroid use are also noted. Wound-healing potential can then be identified and appropriate measures taken to optimise wound healing conditions.

Wound bed assessment³

Wound-bed preparation is essential to accelerate endogenous healing and to facilitate the effectiveness of other therapeutic measures. The wound should be carefully inspected to identify factors that might delay wound healing. This might include the presence of dead tissue (T), infection (I), large amounts of exudates indicating a moisture (M) imbalance or the edge of the wound may not be advancing (E) and therefore not healing. Thus, the acronym TIME is often followed during the clinical assessment with the focus on deciding how to correct any imbalances to progress the wound healing — or in palliative care management, how to manage the wound in a manner that is acceptable to the patient.

Ideal properties of wound management products⁴

The care of wounds has evolved from using dry dressings to using products that keep the wound moist and to advanced silver-containing products.⁵ The ideal dressing needs to have the following characteristics:

- be capable of maintaining a high humidity at the wound site while removing excess exudate
- be free of particles and toxic wound contaminants
- be non-toxic and non-allergenic
- be capable of protecting the wound from further trauma
- be removed without causing further trauma
- be impermeable to bacteria
- be thermally insulating

- allow gaseous exchange
- be comfortable and conformable
- require only infrequent changes
- be cost-effective
- have a long shelf-life.⁴

Alginate dressings

Alginates are formed from alginic acid, found in seaweed. Alginates They can absorb 15–20 times their weight in fluid so are particularly suitable for highly exuding wounds. If, however, they are used on wounds with little or no exudate they will adhere to the healing wound surface causing pain and damaging tissue on removal.⁴

Foam dressings

Foam dressings are manufactured from either polyurethane or silicone foam.

Box 1. Stages of wound healing^{1,2}

Inflammatory phase 2–5 days

This phase starts immediately. Damaged tissue releases cytokines, chemical mediators that trigger processes such as blood clotting and phagocytosis of debris, which begins the healing process.



Proliferative phase — 2 days to 3 weeks

Macrophages recruit fibroblasts, which lay down collagen fibres. When adequate oxygen and vitamin C are present, granulation tissue forms. During granulation fibroblasts create a collagen bed to fill the lesion and grow new capillaries. This process requires a moist surface. The wound edges gradually pull together and epithelialise.



Remodeling phase — 3 weeks to 2 years

The fragile tissue that has been deposited over the wound is strengthened by more robust collagen. New tissue will only have 80% of the original tissue's strength.

They transmit moisture and oxygen and provide thermal insulation. A variety of foam dressings are available as adhesive or non-adhesive sheet or as cavity wound fillers.⁴ Foam dressings rely on exudate to gain a moist healing environment and are therefore not suitable for dry wounds.⁵

Hydrogel dressings

These are generally supplied as a cohesive material without a distinct shape that conforms to the shape of the wound. A secondary covering is needed. These dressings have a 96% water content allowing them to donate water to the wound surface. Hydrogels promote debridement by rehydration of non-viable tissue facilitating natural healing.⁶



sheet to create a dressing that forms a gel on the wound surface. They are impermeable to water and allow the patient to shower normally. They are used as a primary or secondary semi-permeable interactive dressing that provides a moist healing environment, which facilitates rehydration and autolytic debridement of dry, sloughy necrotic wounds. Hydrocolloids also promote granulation. These dressings should not be used on diabetic foot ulcers or other wounds that require frequent observation.⁷

Vapour permeable films and membranes

These absorbent plastic film faced dressings are impermeable to fluids and bacteria but permeable to air and water vapour. They are unable to cope with large amounts of exudate.⁶

Low adherence dressings and wound contact materials

These dressings are low-cost and widely available. Contact layer dressings, such as these, are ideal for patients with fragile or sensitive skin. They allow exudate to pass to a secondary dressing and most are tulle soaked in soft paraffin.⁴

Antimicrobial dressings

Honey

Honey provides a primary antibacterial layer in a dressing, which reduces bacterial load; hydrates necrotic, sloughy wounds and facilitates autolytic debridement; deodorises malodorous wounds and promotes granulation.⁸ This area will be covered more thoroughly in a subsequent article.

Silver impregnated dressings

Silver ions have an antimicrobial action by interacting with sulfhydryl groups on proteins on multiple sites causing structural and metabolic disruption.⁹ Treatment of wounds with silver preparations may help wound healing by treating local infection. Saline can react with silver to form the white solid silver chloride deposits and

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thus reduce the efficacy of sustained release dressings.

Which products satisfy the ideal criteria?

A review of 13 RCTs including gauze, foam and alginate did not find any evidence that one dressing or topical agent sped up healing more than another.¹⁰ Gauze and other traditional products do not meet the characteristics of an ideal wound product because of negative properties such as shedding fibres. Gauze was also associated with greater pain or discomfort for the patient.¹⁰ When NICE appraised debriding agents¹¹ they concluded that there is no RCT evidence to support any particular method of debridement (See the *British National Formulary*⁶ for details of individual products and *The Drug Tariff*¹² for details of sizes available).



Honey bees on a frame from their hive

Hydrogel dressings containing iodine

Iodine lowers the microbiological load in chronic wounds. Caution should be exercised in patients with severe renal impairment or in those with thyroid disorders. Two products are available:

- Povidone-iodine — available as an impregnated tulle and provides a good wound contact layer for abrasion and superficial wounds.
- Cadexomer iodine — a three dimensional starch lattice, this form has good absorptive properties, which is particularly suitable for heavily exuding chronic wounds. As fluid is absorbed iodine is released over a prolonged time period maintaining a constant level of iodine in the wound bed.⁶

Hydrocolloid dressings

These are sodium carboxymethylcellulose, gelatin, pectin, elastomers and adhesives bonded to a semi-permeable film or a foam

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containing dressings in this condition.¹³ A more recent systematic review found no evidence that silver-based dressings reduced infection and encouraged wound healing in diabetic foot ulcers.¹⁴

A review of 99 studies¹⁴ of dressings found no high-quality grade A studies, but with this major limitation the authors concluded that the studies indicated that for complete healing of chronic wounds hydrocolloid dressings were better than saline gauze or paraffin gauze.¹⁴ They also concluded that alginates — either alone or in sequential treatment with hydrocolloids

— were better than silver dressings for debriding, necrotic wounds.¹⁴ For acute wounds hydrofibre and foam dressings reduced healing time in comparison with other traditional dressings and with modern silver dressings respectively.¹⁴

Conclusions

In the absence of good clinical and cost-effectiveness evidence to support superiority of one product over another, each patient's wound should be treated according to their assessed wound-bed, personal circumstances, and product costs. To gain maximum benefit the wound bed

should be properly prepared; regularly assessed and product choice should be unique to each patient's wound at different stages of healing. ✚

Declaration of competing interests

The author declares that she has no competing interests.

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Reminder: Improvement Foundation 2008 Guy Rotherham Award deadline approaches

The 2008 Guy Rotherham Award was set up to celebrate the work of Guy Rotherham who died in 2003. It is administered by the Improvement Foundation and is open to any NHS community-based team in the UK that is providing services to patients in primary care. This includes applications from primary care trusts, general practices, community nursing teams, primary care consortia, or any other community-based NHS team. If you are submitting an application for this award, remember, judges will be looking for inspirational entrants who can demonstrate they have delivered improved services for patients under any of the following Improvement Foundation's current themes of work:

- Commissioning healthcare services
- Improving access to healthcare
- Reducing health inequalities
- Improving the management of long term conditions
- Reducing admissions through integrated care
- Reducing healthcare associated infections
- Leadership development

The winning team will receive an educational grant of £3,000 and will be invited to attend two presentation ceremonies, one at the 2008 NHS Alliance Conference (16/17 October 2008) and the second at the Palace of Westminster in November 2008.

Deadline: All entries must be received by **5pm on Friday 1st August 2008**.