The benefits of honey in wound management

Date of acceptance: October 10 2005.

Summary
In recent years there has been a renewed interest in honey in wound management. There is a range of regulated wound care products that contain honey available on the Drug Tariff. This article addresses key issues associated with the use of honey, outlining how it may be best used, in which wounds, and which clinical outcomes may be anticipated.

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Keywords
Dressings; Infection control; Malodour; Wounds

These keywords are based on the subject headings from the British Nursing Index. This article has been subject to double-blind review.

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Aim and intended learning outcomes
In recent years there has been a growing interest in the use of honey in wound management. This has led to the development of regulated medical products in the form of sterile dressings designed for use on wounds. The aim of this article is to raise nurses’ awareness of the role of honey-based dressings in wound management. After reading this article you should be able to:

- Know how honey dressings work in relation to wound management.
- Identify the types of wounds for which honey dressings are indicated.
- Discuss the evidence to support the use of these dressings.

Background
According to Molan (2002): ‘Dressing wounds with honey, a standard practice in past times, went out of fashion when antibiotics came into use. As antibiotic-resistant bacteria have become a widespread clinical problem, a renaissance in honey use has occurred.’ This alone is sufficient justification to consider the use of honey in dressings and, in conjunction with increasing scientific and clinical data, it may make honey even more appealing. Clinically, topical honey treatment has been shown to (White and Molan 2005):

- Possess antimicrobial properties.
- Promote autolytic debridement.
- Deodorise malodorous wounds.
- Stimulate growth of wound tissues to hasten healing and to start the healing process in dormant wounds.
- Stimulate anti-inflammatory activity that rapidly reduces pain, oedema and exudate, and minimises hypertrophic scarring.
- Promote moist wound healing.

These actions are encapsulated in the modern systematic approaches to wound management known as ‘applied wound management’ (Gray et al 2005), ‘wound bed preparation’ and TIME (Tissue, Infection or inflammation, Moisture balance, Edge of wound) – a clinical framework based on the assessment and treatment of the barriers to wound healing (Schultz et al 2003).
Learning Zone  

Tissue Viability

**Time out 1**

Consider the clinical environment in which you work. Compile a list of the types of wounds you encounter on a regular basis and the range of dressing types that you use.

**Clinical evidence on honey**

When evaluating clinical evidence it is important to rank the available information according to current standards. Thus, a randomised controlled trial (RCT) is recognised as the highest level of clinical evidence. Such trials are time-consuming to plan, conduct, analyse and report, and have financial costs. However, RCTs should not, and do not, discount all other evidence (Rolfe 1999). There is a hierarchy of evidence ranging from meta-analyses of RCTs to case studies and expert opinion. In the absence of RCT evidence practitioners should consider ‘lower’ grades of evidence. However, it should be acknowledged that lower grades of evidence have limitations. In the opinion of the author, there is now sufficient evidence to justify the clinical use of honey according to manufacturer’s instructions. The evidence supporting the use of honey is already more substantial than for many other wound treatments.

A systematic review has been conducted on the published evidence for RCTs on honey in wound care (Moore et al 2001). This concluded that the evidence available (at that time) from seven comparative studies on 264 patients was limited by lack of blinding, poor reporting and poor validity. Much has changed since the Moore review – many comparative studies have been set up and more data are available on the new generation of ‘medical device grade’ honey products, that is, the standards of quality and purity as set out in the medical device directives (Johnson et al 2005, Marshall et al 2005, Simon et al 2005, Val Robson, Tissue Viability Nurse, University Hospital Aintree, Liverpool, 2005, personal communication).

Until recently, the honey used in wound management has generally been non-sterile material from non-specified floral sources, obtained from supplies intended for nutritional rather than medical use. However, a number of honey-based wound treatments have been introduced to the UK market. They have the European conformity (CE) mark and regulatory approval as sterile medical devices for use on full-thickness wounds. Many honey-based dressings bearing the CE mark are now available in the UK and are listed on Drug Tariff (Prescription Pricing Authority, Department of Health 2005).

**Clinical reports**

The topical application of generic honey has been reported to clear existing wound infection rapidly (Lusby et al 2002, Sofka et al 2004, White and Molan 2005), to facilitate healing of deeply infected surgical wounds (McInerney 1990, Vardi et al 1998, Al-Waili and Saloom 1999, Cooper et al 2001, Ahmed et al 2003) and halt spreading necrotising fasciitis (Hejase et al 1996). In some cases, the application of honey has promoted healing in infected wounds that were not responding to conventional therapy, such as antibiotics and antiseptics (Harris 1994, Wood et al 1997, Dunford et al 2000a, 2000b, Ahmed et al 2003), including wounds infected with antibiotic-resistant bacteria such as methicillin-resistant *Staphylococcus aureus* (Dunford et al 2000a, Natarajan et al 2001).

Honey deodorises wounds (Subrahmanym 1994, Kingsley 2001, Molan 2002, Van der Weyden 2003, Stephen-Haynes 2004) and promotes autolytic debridement to facilitate the rapid development of a clean, granulating wound bed (Subrahmanym 1998, Stephen-Haynes 2004). A rapid rate of healing has been reported in wounds treated with honey (Bloomfield 1976, Hejase et al 1996, Ahmed et al 2003). Honey also serves to kick-start the healing process in otherwise ‘dormant’ wounds (Bloomfield 1976, Elem 1988, Somerfield 1991, Wood et al 1997, Stephen-Haynes 2004). Such wounds might be ‘critically colonised’ and the response occurs because of the antibacterial action of honey (Gray and White 2005). These claims are valid because they have been reproduced by other investigators; the level of the evidence is grade IIb according to the Scottish Intercollegiate Guidelines Network (www.sign.ac.uk).

In addition, honey has been used successfully on skin grafts (Schumacher 2004), infected skin graft donor sites (Misirlioglu et al 2003), infected traumatic wounds (Green 1988), paediatric oncological lesions (Sofka et al 2004, Simon et al 2005), radiation mucositis (Biswal et al 2003), necrotising fasciitis (or Fournier’s gangrene) (Hejase et al 1996), abscesses (Okeniyi et al 2005), catheter-associated infections (Johnson et al 2005), diabetic foot ulcers (Eddy and Gideonsen 2003), and malignant ulcers (Simon et al 2005). Honey is also claimed to be a reliable alternative to conventional dressings for managing skin excretion around stomas (ileostomy and colostomy) by facilitating epithelialisation of the damaged surface.
This aspect of skin care is supported by reports of the beneficial effects of honey on paediatric (napkin/diaper) dermatitis (Al-Waili 2005), and on atopic eczema and psoriasis (Al-Waili 2003). Validity was established by reproducibility, evidence level IIa.

An outline of the wound types suitable for honey treatment is given in Box 1. The key areas with regard to wound assessment are highlighted in Box 2.

In the selection of the most appropriate honey dressing to use for particular wounds it is essential to undertake a full assessment of the wound type (Box 2) as the choice of dressing will be dictated by this assessment. Box 3 provides useful indicators in the correct choice of dressing. Figures 1-3 show the wound healing process in a patient with a left below knee amputation that was treated using honey ointment and dressings.

Comparative effectiveness

In prospective, clinical RCTs, honey was found to help heal superficial burns quicker than polyurethane film (OpSite®), to be superior to silver sulfadiazine 1% cream (Flamazine®) in preventing infection in burn wounds, and to be no different to mupirocin (Bactroban®) in preventing catheter-associated infections in haemodialysis patients (Johnson et al 2005).

In a study comparing honey-impregnated gauze with polyurethane film, the mean times to healing in each group (n=46) were 10.8 days and 15.3 days respectively (P<0.001). In addition, significantly fewer honey-dressed wounds became infected (P<0.001) (Subrahmanyam 1993). In the first of the two studies that compared honey-impregnated gauze with silver sulfadiazine (SSD)-impregnated gauze (n=52 patients in each group), 87 per cent of the wounds treated with honey healed within 15 days, compared with 10 per cent of those treated with SSD (P<0.001) (Subrahmanyam 1991). In this study a statistically significant difference (P<0.001) was found in the clearance of bacteria from the burns. In the 43 out of 52 cases that presented positive swab cultures on admission in the group treated with honey, 39 (91 per cent) became sterile within seven days. In the comparison (SSD) group, only three (7 per cent) of 41 wounds with positive

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**Time out 2**

Consider the different wound types that may benefit from a honey dressing. What is the nature of the evidence to support the use of honey on these wounds? A useful exercise would be to access some of the references that advocate the benefits of honey as cited in this article and consider whether they are sufficiently valid to influence your practice or whether you need to seek further information.

**Time out 3**

Make a list of the signs that indicate a wound's suitability for a honey-based dressing or treatment. Write down three different wound types and decide the best application of honey for each.

**Box 1**

**Indications for the use of honey in wound management**

- On chronic wounds, for example, leg ulcers and pressure ulcers.
- When there is delayed healing and local infection.
- On acute wounds, for example, burns, locally infected wounds (not cellulitis).
- When preparing the wound bed for grafting.

Note: diabetic foot ulcers can be treated with honey by experienced practitioners. Honey is a potential source of glucose absorption and experienced clinicians will be aware of this; honey can be a valuable aid to wound bed preparation because it can control bioburden, debride, and promote healing.

**Box 2**

**Wound assessment**

Assess the patient’s wound and note the following signs: presence of slough and/or necrosis, signs and symptoms of infection, wound malodour.

With reference to the previous progress of the wound towards healing: is the wound showing evidence of healing, that is, granulation and epithelialisation? Is the wound failing to heal, despite ‘appropriate’ treatment?

If the wound is sloughy or necrotic, malodorous, or locally infected, consider using honey. This should debride the wound, reduce the malodour, and control the local infection rapidly. Honey is also appropriate for non-healing wounds, provided that the reasons for a lack of healing have been eliminated. It is important to exclude misdiagnosis, treatment with systemic steroids or cytotoxics and local radiotherapy. One can expect to see positive outcomes in days.

(Van der Weyden 2003, Stephen-Haynes 2005)
swab cultures became sterile. This provides evidence of the antibacterial effect of honey in vivo (in a living organism).

In the second burns trial (25 patients in each group), all of the wounds treated with honey healed within 21 days, compared to 21 (84 per cent) of those treated with SSD (P<0.001) (Subrahmanyam 1998). In a RCT of honey versus mupirocin (Bactroban®) in 101 haemodialysis patients, no exit site infections occurred in either group (Johnson et al 2005).

A prospective RCT on severe post-operative wound infections following Caesarean section or abdominal hysterectomy was conducted to compare dressing with honey (n=26) to washing wounds with 70 per cent ethanol and applying povidone iodine (n=24). Both groups received systemic antibiotics according to culture and sensitivity. In the group treated with honey, infection was rapidly eradicated (6±1.9 days v 14.8±4.2 days), wounds healed faster (10.7±2.5 days v 22±7.3 days), post-operative scars were less than half the size, and the period of hospitalisation was less than half that for the patients in the control group (9.4±1.8 days v 19.9±7.4 days: P<0.05 for each parameter (Al-Waili and Saloom 1999)). This study was of particular interest because all patients were treated with appropriate antibiotics, yet the topical application of honey still proved to be effective in reducing wound bioburden. This might be because of low local tissue levels of antibiotic from poor perfusion of the wound.

When compared with other products in these trials, honey offered better or equivalent control of infection.

In recent reports where selected honey was used on infected wounds following surgical treatment of hidradenitis suppurativa (a chronic disease of the apocrine gland) (Cooper et al 2001) and infected skin lesions from meningococcal septicaemia (Dunford et al 2000a), the antibacterial activity gave rise to rapid clearance of infection and healing of the wounds. In both these studies, it had not been possible to achieve
healing with the many systemic antibiotics and modern dressing materials previously used over a long period.

Good infection control was reported in a crossover study of nine infants with large infected surgical wounds (Vardi et al 1998). Honey was used on the wounds after they failed to heal following at least 14 days of treatment with intravenous antibiotics – a combination of vancomycin and cefotaxime, subsequently changed according to bacterial sensitivity – fusidic acid ointment, and wound cleaning with aqueous 0.05% chlorhexidine solution. Marked clinical improvement was seen in all cases after five days of treatment. All wounds were closed, clean and sterile after 21 days of honey application. It is of interest that in-vitro (in the experimental laboratory situation of the test tube or culture dish) studies have shown a synergy between honey and common antibiotics in multidrug-resistant Pseudomonas spp. (Karayil et al 1998). This would, therefore, appear to justify the combination of systemic antibiotics with use of topical antibacterials, such as honey, in wounds where poor perfusion and drug resistance might compromise healing.

Wound malodour and deodorising

Malodour is a common feature of chronic wounds and is attributed to the presence of anaerobic bacterial species such as Bacteroides spp., Peptostreptococcus spp. and Prevotella spp. (Bowler et al 1999, Cooper and Gray 2005). It is reasonable to interpret the reduction in malodour when treating wounds with honey as an antibacterial action in vivo; honey has also been demonstrated to be active against anaerobes in vitro (Elbagoury and Rasmy 1993).

However, the rapid deodorising of wounds observed when honey dressings are used is probably the result of more than just the antibacterial action of honey against these anaerobes. The malodorous substances produced by bacteria are short-chain fatty acids, ammonia, amines, and sulphur compounds. These are formed by the metabolism of amino acids from decomposed serum and tissue proteins. Honey provides a copious quantity of glucose, a substrate metabolised by bacteria in preference to amino acids (Molan 2005).

Wound debridement

Like any other moist wound dressings, honey facilitates the debridement of wounds by autolysis. Honey promotes conversion of inactive plasminogen in the wound matrix to the active form, plasmin (Molan 2005), which is the major proteolytic enzyme involved in blood clot retraction or the lysis of fibrin. It is an enzyme that is able to break down fibrin clots which attach slough and eschar to the wound bed (Esmon 2004).

Honey, through its strong osmotic action, may create a moist environment by drawing out lymph fluid from the wound tissues. This osmotic action provides a constantly replenished supply of proteases at the interface of the wound bed and the overlying necrotic tissue, which may in part explain the rapid debridement brought about by honey (Stephen-Haynes 2005). It also ‘washes’ the surface of the wound bed from beneath, which explains the frequent observation of honey dressings removing debris, for example, foreign bodies such as dirt and grit (Molan 2002). The action also helps to explain the painless lifting off of slough and necrotic tissue that is observed (Efem 1988, 1993, Hejase et al 1996, Subrahmanyam 1993, 1998). In black necrotic heels, the steady softening/debriding action of honey allows granulation to begin before the eschar is removed (Gray and White 2005).

Anti-inflammatory action

Clinical observations of reduced inflammation following application of honey to a wound are substantiated by the results of in-vivo studies that have shown that honey, when compared to various controls, reduces inflammation. Histological evidence of reduced numbers of inflammatory cells present in wounds dressed with honey exists from studies of deep and superficial burns as well as full-thickness wounds (Postmes et al 1997). These effects were the result of components other than the sugar in honey (Postmes et al 1997). Evidence also has come from findings in biopsy samples from burn wound tissue of hospital patients (Subrahmanyam 1998).

Although it is a vital part of the normal response to infection or injury, excessive or prolonged inflammation can prevent healing or cause further damage to tissues (Agren et al 2000). Suppressing inflammation, as well as reducing pain for the patient, also reduces the opening of blood vessels, thus lessening oedema and exudate (Molan 2005). Pressure in tissues secondary to oedema restricts the flow of blood through the capillaries, starving the tissues of the oxygen and the nutrients that are vital for leucocytes to fight infection and for fibroblasts to multiply for wound healing.

Stimulation of tissue growth

With regard to the stimulation of tissue growth, the evidence provided supports the following statements:
Honey is a bioactive wound dressing that promotes rapid wound healing (White and Molan 2005).

Honey promotes the formation of clean, healthy granulation tissue and re-epithelialisation (Stephen-Haynes 2005).

Honey stimulates the healing process in chronic wounds that have demonstrated delayed healing (Dunford 2005).

**Immune system activity**

The clearance of infection may not just be the result of the antibacterial action of honey. Recent research indicates that honey may work by stimulating the activity of the immune system (Cooper 2005). Honey at concentrations as low as 0.1% has been found to stimulate proliferation of peripheral blood B and T lymphocytes and activate phagocytes from blood. Also, honey at a concentration of 1% has been reported to stimulate monocytes in cell culture to release the cytokines tumour necrosis factor (TNF)-1, interleukin (IL)-1, and IL-6, which are intermediates in the immune response (Tonks et al 2003).

In addition to the reported stimulation of leucocytes, honey has the potential to augment further the immune response by supplying glucose. This is essential for the ‘respiratory burst’ in macrophages that generates endogenous hydrogen peroxide, the dominant component of the natural bacteria-destroying activity of these cells (Molan 2002).

**Time out 4**

What are the different stages of wound healing? It is important to revise these stages otherwise you may have difficulty deciding on which is the most appropriate dressing for different wounds. List the key actions of medical grade honey and consider why honey is a useful addition to the range of wound management products.

**Honey: in-use characteristics and safety**

Given the wide range of honey-based dressings available in the UK (Box 4), it is appropriate to provide some guidance for their clinical use. As with all medical products, it is important to read and follow the manufacturer’s instructions as provided on the package insert. The tube presentations of honey, honey gel and ointment may be applied directly to the wound or to a suitable dressing. It is important not to let these preparations dry out. Occlusive dressings, selected according to wound exudate levels, will help to maintain a moist environment (Bolton et al 2000). Foams, hydrocolloids and films are useful secondary dressings. The honey-impregnated tulle dressing will require a suitable secondary, retaining dressing. The bordered sheet hydrogel

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**Box 4**

**Honey dressings available on the Drug Tariff**

- Honey (liquid), gel, ointment, soft ointment, all in tube presentations.
- Honey-impregnated tulle.
- Honey-based sheet hydrogel.
- Honey-based mesh.
- Honey-impregnated alginate.

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**Table 1**

<table>
<thead>
<tr>
<th>Wound type</th>
<th>No pain</th>
<th>Mild pain</th>
<th>Severe pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Venous ulcers</td>
<td>31</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Burns</td>
<td>5</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Diabetic foot ulcers</td>
<td>5</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Mixed wounds</td>
<td>9</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Pressure ulcers</td>
<td>15</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Skin tears</td>
<td>8</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: not all medical honey dressings are advocated for the treatment of full-thickness burns; always read the manufacturer’s instructions before use (Vandeputte and Van Waeyenberge 2003)
serves as an effective secondary dressing, without fixation, on wounds with low to high exudate. The honey mesh dressing acts as a non-adherent wound contact layer. It can be used in conjunction with honey ointment and will, when used on heavily exuding wounds, require an absorbent pad as a secondary dressing.

In general, honey is a safe treatment; however, some patients report a stinging sensation on application which they find painful (Vandeputte and Van Waeyenberge 2003) (Table 1). This may be transient, reducing within one hour, or longer lasting. It may be overcome by the use of analgesia or a more dilute honey preparation. Conversely, honey can have a ‘soothing’ effect when applied to wounds, including burns (Subrahmanyan 1993), breast wounds (Keast-Butler 1980), and donor sites (Misirlioglu et al 2003).

### References


of the problems of messiness and difficulty in handling, making honey-based products as convenient to use as the more familiar modern wound dressings. Some involve the combination of honey with a modern dressing such as alginate or sheet hydrogel. Others present honey as an ointment formulation with additional agents known to support wound healing, or as a wound gel comprising honey, oils and waxes.

This brings the most ancient form of wound dressing known into the realms of the most modern, easy-to-use, bioactive dressing that provides a moist healing environment. There is the added advantage of having within a single product a range of actions usually available only individually in a range of products. Honey provides an ideal wound bed preparation for many wounds NS.

Acknowledgement
The author is indebted to Professor Peter Molan and Dr Rose Cooper for their contributions to research on honey, without which we would not have the evidence base to develop these dressings. Thanks to Gill Weaver and Kath Crawford at Manchester Royal Infirmary for the use of the photographs in this article.

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References (continued)


