Honey as a dressing for chronic wounds in adults

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ABSTRACT

The aim of this review was to identify whether in adults with chronic wounds the use of honey as a wound dressing improves wound management outcomes. As no randomized controlled trials or comparative studies comparing the use of honey as a chronic wound dressing with usual treatment could be found, the review is based on case studies and serial case studies. These were reviewed using a framework broadly based on wound care case study guidelines (Nelson, 2000) and cohort study guidelines (Greenhalgh and Donald, 2000). Based on the case studies reviewed, honey appears to be a useful dressing in adults with chronic wounds, but the available evidence is weak and therefore must be interpreted with caution.

Honey has been used in wound care since the time of the ancient Egyptians. As more reports of its effectiveness are published, it is becoming increasingly popular as a modern wound dressing material. Honey contains digested sugars, vitamins, minerals and enzymes, and there are numerous reports of animal model clinical studies and randomized controlled trials demonstrating the benefits of honey as a wound dressing. Clinical observations from these studies are that:

- Infection is rapidly cleared
- Inflammation, swelling and pain are quickly reduced
- Odour is reduced
- Shedding of necrotic tissue is induced
- Granulation and epithelialization are hastened
- Healing occurs rapidly with minimal scarring (Molan, 1999).

Laboratory studies have demonstrated the significant antibacterial activity of honey (Molan, 1999). In addition, the antimicrobial properties of honey prevent microbial growth in a moist healing environment (Cooper et al, 1999). Unlike other antiseptics honey is said to cause no tissue damage (Molan, 1999). Complete inhibition of the major wound-infecting species of bacteria has been achieved (Cooper et al, 1999).

Solutions of high osmolarity, such as honey, inhibit microbial growth because the sugar molecules 'tie up' the water molecules so that the bacteria have insufficient water to support their growth. Dilution by wound exudate may reduce the osmolarity to a level where it ceases to control infection (Molan, 1999). Nevertheless, the antibacterial activity of honey has been demonstrated in vivo, with reports of improvement in infected wounds (Molan, 1999).

Honey's antibacterial activity is thought to be primarily due to the presence of hydrogen peroxide, generated by the action of an enzyme that the bees add to nectar (Molan, 1999). Some types of honey (e.g. manuka honey) may also contain antibacterial substances derived from flowers visited by the bee (Willix et al, 1993).

Honey is reported to have a powerful deodorizing action, probably due to the rich provision of glucose, which is used by bacteria in preference to amino acids, resulting in the formation of lactic acids and not malodourous compounds (Molan, 1999). Histological studies using experimental wounds in animals have shown that honey has an anti-inflammatory action, confirming a number of clinical observations (Efem, 1993). Honey is also thought to stimulate tissue growth (Subrahmanyam, 1998).

Evidence exists to support the use of honey as a wound dressing for burns and infected surgical wounds, but requests are frequently made by both patients and clinicians to use topical honey as a treatment for chronic wounds. Practitioners must then make a clinical decision as to the potential effectiveness of honey as a dressing for chronic wounds. Given the increasing interest, a review of the clinical evidence is timely and pertinent in order to reveal whether the use of honey as a wound dressing improves wound management outcomes in adults with chronic wounds.

The term 'chronic wound' is multi-faceted, encompassing wounds of differing aetiologies, but for the purposes of this review is defined as wounds healing by secondary intention, including leg ulcers, pressure ulcers and recalcitrant wounds (Dealey 1994). Improvement in wound management outcomes includes factors such as wound healing, exudate management, odour control, pain

reduction, management of infection and reduction in devitalized tissue.

Research design

A mini systematic review (Griffiths, 2002) was performed involving a comprehensive explicit search for research evidence meeting pre-defined criteria.

Search strategy

The aim of the search was to identify all the relevant evidence. Terms for the search were identified by isolating the components of the clinical question and breaking them down into facets, including population, intervention, comparison and outcome. The facet analysis identified terms that described the components, which were then translated into a search strategy (*Table 1*). Search terms and synonyms were only used for the facets of population and intervention. The facets of comparison and outcome were not specified in the literature search as they themselves are clearly multifaceted and inclusion would have complicated the search strategy unnecessarily and potentially lost relevant information. In addition, dropping facets such as outcome increased the sensitivity of the literature search. Adopting a comprehensive search strategy obviously identified a lot of irrelevant material but did ensure that relevant studies were not missed.

The following databases were searched:

- Cochrane Library
- Medline (1966–present)
- Cumulative Index to Nursing and Allied Health Literature (CINAHL, 1984–present)
- Embase (1980–present)
- Amed (1985–March 2002).

The search strategy avoided long multicomponent terms and phrases, as this would have further complicated the search. Medical subject headings (MeSH) were used where available and exploded to ensure a comprehensive search. Free text searching using truncation (e.g. wound$) was used in Medline, Embase, Amed and CINAHL. The Boolean operator OR was used to combine the population facet search terms and then the intervention facet search terms in Medline, Embase, Amed and CINAHL. Finally, the Boolean operator AND was used to combine both the population and intervention facet searches (*Table 1*).

In addition unpublished literature was sought from the companies manufacturing honey-based dressing products. Hand searching of books and documents available through the tissue viability service was also undertaken to identify additional evidence. The internet was searched, particularly an electronic wound journal, *World Wide Wounds* (http://www.smtl.co.uk/WorldWideWounds/), and the University of Waikato Honey Research Unit website (http://www.honey.bio.waikato.ac.nz).

Due to the limited quantity and quality of the available literature, it was considered legitimate to include all case studies. Generally case studies should be excluded from any review of effectiveness (Sackett et al, 2000), but in this situation weaker evidence was reviewed. A review of the available evidence – however weak – remains valid as decisions concerning the use of topical honey as a treatment for chronic wounds still have to be made in clinical practice. Papers were included for review if they adopted a single or multiple case study approach that described the use of honey as a wound dressing in adults with chronic wounds. In addition, the search was limited to studies published in journals available to the author through the hospital library, hospital tissue viability service and King's College Library, Waterloo and Guy's Campus. All papers that described animal studies, laboratory studies and expert narrative were excluded from the review. Moreover, studies that explored the impact of topical honey on acute wounds (including burns) were also excluded.

The final search yielded a total of 100 citations. The titles and abstracts were scanned to identify their relevance to the review question. Six papers met the review criteria and were available to be included in the body of the review. Two of these were published papers that could not be obtained through library sources; two others were papers presented at conferences in New Zealand and Australia. Based on the title and abstract, none of the these studies appeared to meet the inclusion criteria, although further investigation would be required to be certain. One case study was excluded, as the paper was old and focused on the use of comb honey (Hutton, 1966). One systematic review (Moore et al, 2001) was identified but not included as it did not present any evidence on chronic wounds.

Table 1. Facet analysis and search strategy

Population		Intervention	Comparison	Outcome
Wound$ **OR** Wounds **OR** Ulcer$ **OR** Ulcers	**A** **N** **D**	Honey **OR** Manuka	Usual treatment	Healing Exudate ↓ Odour ↓ Debridement Pain ↓ Bacterial load ↓
			Not specified in search	*Not specified in search*

Critical review

There is clearly a paucity of high-quality literature relating to the use of topical honey in adults suffering from chronic wounds. The evidence is weak and focuses on case studies, with the emphasis on the case rather than the method. Case studies are one of the weakest forms of evidence in terms of the hierarchy of clinical evidence (Greenhalgh, 2001); consequently little is published to enable the reviewer to determine the possible benefit of such papers. Nevertheless, a structured and systematic method of evaluating those studies was required in the form of a framework or guidelines. The case studies were reviewed using a quality framework devised by the author, broadly based on wound care case study guidelines (Nelson, 2000) and cohort study guidelines (Greenhalgh and Donald, 2000). The search yielded case studies of relatively poor quality, summarized in *Table 2*. The case study findings were based on the documented benefits of topical honey and were extracted from the papers if the authors described those particular attributes in relation to the case study. The findings of this analysis are summarized in *Table 3*.

All the studies reviewed had major weaknesses in answering the question whether the use of honey as a dressing improves wound management outcomes in adults with chronic wounds. The fundamental flaw was that the studies were not of a comparative design and this form of evidence is less convincing than when there is a control group of patients treated simultaneously. However, all the studies were critically appraised using the previously described framework (*Table 3*).

Analysis of findings

Cooper et al (2000) discussed the management of a patient who received manuka honey as a therapeutic intervention for the treatment of a recalcitrant surgical wound. The clinical problem was clearly identified, but no outcomes are specified. The study was retrospective, which increases the risk of bias. The observational data could have been greatly improved by using objective data, such as wound measurement repeated at predetermined intervals. The paper did not report a standardized dressing procedure or provide enough detail to reproduce the dressing technique. Despite the limitations of the paper in terms of case study reporting, the authors reported a positive outcome, describing tissue stimulation, antibacterial activity and anti-inflammatory action.

Kingsley (2000) described the care of two patients with chronic wounds and topical honey selected as almost a last resort to facilitate wound healing. As with the majority of the other studies, the report was retrospective, increasing the potential for bias. Outcomes were not specified in advance and inferences were not supported by objective data

Table 2. Summary of papers reviewed using adapted criteria

	Cooper et al (2000)	Kingsley (2000)	Natarajan et al (2001)	Dunford et al (2000a)	Dunford et al (2000b)	Efem (1988)
Single/multiple cases?	Single case	Two cases	Single case	Single case	Two cases	Multiple cases
Definition of clinical problem?	Yes	Yes	Yes	Yes	Yes	Yes
Did the case study provide clear outcome measures?	No	No	No	No	No	Yes
Case study – prospective/ retrospective?	Retrospective	Retrospective	Retrospective	Retrospective	Retrospective	Prospective
Outcome measures: Baseline wound assessment?	No	No	No	No	No	Yes
Wound measurement?	No	No	No	No	No	No
Wound photography?	No	No	No	No	Some	Some
Post-wound assessment?	No	No	No	No	No	Yes
Study participants from usual population?	Yes	Yes	Yes	No	Yes	Yes
Standardized treatment procedures?	No	No	No	Yes	No	No
Treatment described in detail?	No	Yes (case 1 only)	No	No	No	No
Adverse events?	No	Yes	No	No	No	No

Table 3. Main study findings

	Cooper et al (2000)	Kingsley (2000)	Natarajan et al (2001)	Dunford et al (2000a)	Dunford et al (2000b)	Efem (1988)
Debridement of devitalised tissue	Not described	No	Not described	Not described	Yes	Yes
Stimulation tissue	Yes	No	Yes	Yes	Yes	Yes
Anti-inflammatory	Yes	No	Not described	Yes	Not described	Yes
Decreased odour	Not described	Yes	Not described	Not described	Yes	Yes
Decreased exudate	Not described	No	Not described	Not described	Yes	Yes
Decreased antibacterial activity	Yes	Not described	Yes	Yes	Yes	Yes
Decreased pain	Yes	No	Not described	Yes	No	Yes

collection. Unusually, Kingsley reported negative outcomes, with the exception of odour control.

Natarajan et al (2001) reported retrospectively the positive benefits of honey when used to treat ulceration. Unfortunately the paper did not report baseline objective data collection or measurement-taking during or after the study period, which would have improved the validity of inferences made. Once again, outcomes were not specified in advance but described throughout the study, reducing the paper's credibility. However, the authors described success in terms of both tissue stimulation and antibacterial activity.

Dunford et al (2000a) discussed the wound care interventions received by a single patient with chronic infected wounds. As with the other papers reviewed, the overall quality of the case report was poor – it was retrospective and did not use any objective forms of data collection to support the positive inferences; this reduces both its validity and its credibility. Treatment objectives were not described and although photographs were used to illustrate positive outcomes, they were not standardized, which reduces their clinical usefulness. However, the authors did describe tissue stimulation, antibacterial activity, reduction in pain and anti-inflammatory action.

Dunford et al (2000b) described the care of a patient with leg ulceration, but similar flaws exist in this study. It was retrospective and did not provide outcome measures at the outset. Objective wound assessment techniques were not employed to improve the confidence in the inferences made, with the exception of wound photography, but this is not serial photography, which could potentially have demonstrated healing. Inferences made included removal of devitalized tissue, reduction in odour, antibacterial action, reduction in pain, reduction in exudate and tissue stimulation.

Efem (1988) briefly described the treatment with honey of 59 patients with recalcitrant wounds and ulcers, 47 of whom had been treated for what clinicians deemed a sufficiently long time with conventional treatment. The study was prospective in design and the author stated the wound appearance was noted at each dressing change, improving the validity of inferences made. Serial wound photography was also used to support the inferences. However, outcome measures were not specified at the outset and no standardized dressing procedure was described. The wounds were of varied aetiology but included chronic wounds. Microbiological examination of swabs revealed that 51 wounds with bacteria present became sterile within one week and the others remained sterile. According to Efem, the outcome of 58 cases was 'remarkable' following the topical application of honey. Some general observations following treatment of these recalcitrant wounds were that sloughed necrotic tissue was debrided and rapidly replaced with granulation tissue and advancing epithelialization. Surrounding oedema subsided, exudate levels reduced and malodourous wounds were rendered odourless.

Validity and credibility

All except one of the case studies discussed one or two cases. This could be attributed to the fact that, with the exception of the clinical observation conducted by Efem (1988), they all adopted a retrospective approach, which increases the risk of bias on the part of the author (Nelson, 2000). The case studies appraised were based on observational data. The validity of inferences would have been improved by using objective data gathered with a high degree of accuracy and reliability (Nelson, 2000), such as wound measurement, wound assessment and photography, and by repeating measurements at a number of time points, such as before, during and after the treatment with honey.

Although all the studies gave a clear definition of the clinical problem, they they did not provide treatment objectives at the outset. According to Nelson (2000), stating the treatment objectives at the outset improves the credibility of the case study. To further enhance credibility, the intervention should be applied to patients with a range of characteristics and in a range of care settings (Nelson, 2000). With the exception of the clinical observations conducted by Efem (1988), none of the studies achieved this. None of the case studies described standardized treatment procedures.

Conclusion

Positive results have been reported on the use of honey as a dressing for chronic wounds in adults in a number of case studies. This review identified a clearly focused question with a defined population, intervention, comparison and outcome. It is unlikely that any important studies were missed, as the search strategy was comprehensive, including relevant databases and unpublished sources. There was a paucity of high-quality relevant studies, making it necessary to include case studies. As case studies are a weak form of evidence, the research question cannot be answered with any certainty. The quality of the case studies was assessed using a framework broadly based on wound care case report guidelines (Nelson, 2000) and cohort study guidelines (Greenhalgh and Donald, 2000). The case studies were all of limited quality when judged against the adapted framework, although this is not a recognized method of reviewing evidence. In addition, in statistical terms the small number of cases included in the body of the review could feasibly represent a chance cluster of unusually good outcomes.

Notwithstanding the fact that these case studies provide the lowest level of evidence on which to base a clinical decision, five out of the six papers describe honey as a superior treatment and indicate that it has some actions and attributes that have the potential to make it a useful wound dressing. In clinical practice this creates a dilemma for clinicians approached by patients requesting honey as a therapeutic intervention. Nevertheless the clinician can help the patient to make an informed decision based on the available evidence.

At present, clinical decisions on the use of honey as a dressing for chronic wounds must be based on limited and weak evidence, as no cause and effect can be determined from case studies. Randomized controlled trials and comparative studies are required to add to the body of knowledge. In reality this may not happen, as many wound care interventions are based on weak evidence. Both conventional and unconventional treatments in wound care lack the support of high-quality comparative evidence. The nature of the available evidence suggests that caution needs to be exercised. ■

KEY POINTS

- An extensive literature search yields no randomized controlled trials and comparative studies on the use of honey in the management of chronic wounds in adults.
- Several case studies indicate that honey has some actions and attributes that have the potential to make it a useful wound dressing, but case studies offer a low level of validity and credibility.
- Randomized controlled trials and comparative studies would be required to provide unequivocal evidence to clinicians to help patients make informed decisions.

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