

# UNCOVERING THE EVIDENCE ON LARVAL THERAPY

The purpose of this article is to critically review the evidence for the use of larval therapy in the management of chronic wounds. The history of larval therapy and its advantages and disadvantages in clinical practice will be analysed, along with staff and patient attitudes to the technique. Recommendations for improving clinical practice will be drawn from the literature.

- ▶▶ *Debridement*
- ▶▶ *Education*
- ▶▶ *Assessment*
- ▶▶ *Application*
- ▶▶ *Evidence-based practice*

Larval therapy, commonly known as bio-surgery or maggot therapy, has been a treatment for chronic infected wounds for centuries and was routinely used in US hospitals until the mid-1940s. However, it was largely abandoned due to the discovery of antibiotics (Jones, 2009). Today, larval therapy is widely accepted and promoted for its efficacy, safety and simplicity in wound debridement (Benbow, 2007).



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The literature identifies positive evidence for the use of larval therapy and the increase in popularity as an effective form of wound debridement. However, before widespread use, it is clear that many practitioners would need further education to prove their competency in using the technique (Twedell, 2009). Also, the use of maggots as a wound therapy engenders feelings of distaste among some patients and staff, which would need to be overcome

through education. Furthermore, it is important to appreciate the efficacy of larval therapy debridement on the chronic wound in comparison with other techniques.

## **Chronic wounds**

There are many different types of wounds that clinicians come across regularly (Collier, 2003). According to Jones et al (2011), chronic wounds can be defined as 'those that do not heal progressively through a set of particular stages,' in an anticipated recovery time. The National Institute for Health and Clinical Evidence (NICE, 2001) state that a chronic wound is a non-healing site that

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contains bacteria-laden slough. Therefore, the wound is in need of debridement in order for it to heal. Dealey and Cameron (2008) suggest that wounds can be split into four categories:

- ▶▶ Chronic wounds
- ▶▶ Mechanical wounds
- ▶▶ Burns
- ▶▶ Malignant wounds.

Chronic wounds can have various complications that prevent them from healing, for example, they can often appear wet, due to exudate. Exudate is a fluid that is a product of the inflammatory process and contains leukocytes, both dead and living, and bacterial cells suspended in serum (Hampton and Collins, 2004). Normally, exudate is a healthy essential and includes many growth factors that stimulate the healing process. However, when the wound becomes chronic, the situation reverses and exudate becomes destructive due to colonisation of bacteria and proteolytic enzymes, resulting in delayed healing (Hampton and Collins, 2004).

Evidence shows that failure to debride a wound of exudate delays healing and the sooner debridement can be commenced the sooner the wound will begin to heal (Gray et al, 2005).

As well as the presence of exudate, chronic wounds can also be defined as those that do not heal progressively through a set of particular stages, thus prolonging the recovery period (Ayello and Cuddigan, 2004). On the other hand, Dealey and Cameron (2008) define chronic wounds specifically as 'leg ulcers, pressure ulcers, diabetic foot ulcers and malignant fungating wounds,' without a timescale or acknowledgement that traumatic wounds or surgical wounds may persist beyond the acute stage.

Chronic is defined by Weller and Pratt (2005) as 'a long period of time; the opposite of acute.' The length of

time is usually due to a number of intrinsic or extrinsic factors, however, it is important to recognise that the wound may have become 'stuck' in the proliferative stage of healing. It is, therefore, vital that the factors surrounding this issue are recognised and modified (Benbow, 2008).

### **Wound debridement**

The importance of debridement is well accepted. In healthy, progressing wounds, debridement takes place naturally (autolytic debridement), however, research shows that if the process is accelerated then the rate of healing increases (Gray et al, 2011). It is important that devitalised tissue is removed as it impedes topical preparations, and hinders the process of angiogenesis, granulation tissue formation and epidermal resurfacing (O'Brien, 2002; Gray et al, 2011).

Until debridement is complete, a full wound assessment cannot be conducted, slowing the healing process down and hindering the wound management plan (Leaper, 2002).

Several options for debridement are available to clinicians, including mechanical debridement (requiring a wet-to-dry technique and wound irrigation), chemical debridement (involving the use of enzymatic gels to break down necrotic material), and sharp debridement (the surgical removal of tissue). Chemical debridement and sharp debridement should only be practised by experienced practitioners (Singhal et al, 2001).

However, Stephen-Haynes and Thompson (2007) argue that the selection of debridement method should be based on resources, skills and the financial support available to the clinician. Debridement may be conducted over a period of time and may use one single technique, or a range of techniques if necessary, to promote the proliferative stage of healing (Nissen et al, 1998).

### **Larval therapy**

The most common larvae used in wound management today are produced from the common greenbottle (*Lucilia sericata*) and are bred in a sterile environment (Acton, 2007). Not all species of fly can be used for medicinal purposes as some attack healthy human skin (Bonn, 2000). The approximate life cycle of the greenbottle is 21 days, however, larvae are removed from the wound site long before they fully develop (Twedell, 2009).

Clinicians sometimes fear that larvae may disappear into wound sinuses, but there is no corroborating evidence to support this. The normal behaviour of the larvae is to feed solely on necrotic tissue and expose healthy tissue, thus promoting granulation (Geary et al, 2009).

Larvae for the use of wound debridement are available loose (they are kept in place using a mesh and a series of dressings), or in a pouch version (where the larvae are applied already contained in a mesh bag along with foam chips that help to absorb excess exudate).

Larvae grow to 1–3mm in length (Hall, 2010) and, when applied to a wound, secrete proteolytic enzymes, including trypsin- and chymotrypsin-like enzymes, and collagenase (Parnes and Lagan, 2007). These enzymes break down the necrotic tissue into a semi-liquid form, enabling the larvae to ingest exudate and debris (Thomas, 2002). It has also been noted that larvae have the ability to kill or inhibit the growth of pathogenic bacterium such as methicillin-resistant *Staphylococcus Aureus* (MRSA), Streptococci and *Pseudomonas* (Gialanell and Margdin, 2010).

Dougherty and Lister (2008) propose that larvae also change wound pH and stimulate healing, which also increases the oxygen within the tissue. Hall (2010) notes that larvae promote

angiogenesis (the growth of new capillary blood vessels) (Stoddard et al, 1995).

### Assessment

Following a full assessment, patients should be counselled as to what is involved with the use of larvae and also how to manage the treated area. Documentation of the assessment must be made to provide baseline data from which a plan of care can be formulated (Benbow, 2005).

It is also wise to consider pain levels so that analgesia can be prescribed before dressing changes and on a regular basis if required (Acton, 2007). Wound assessment can be achieved by using a range of tools such as the TIME principle (Time, Infection, Moisture and Edge advancement) — this provides the clinician with a simple systematic approach for evaluating the wound and monitoring each stage of healing (Dowsett and Newton, 2011).

It is important to assess the wound, for any signs of dry, necrotic areas as the wound site must be moist to maintain a 'healthy' environment in which the larvae are able to live (Jones, 2009).

As well as recording visual observations of the wound, it is also advisable to trace the wound and to make a clear note of the measurements (length and breadth) enabling a visual comparison to be made post-debridement (Flanagan, 2002). This will aid the practitioner in producing a management plan for the duration of the debridement process and also deciding on the treatment to be used post-debridement (Dougherty and Lister, 2008).

After the use of larval therapy has been agreed by both the patient and the practitioner, the number of larvae needed must be calculated and ordered, according to the size of the wound site. The decision to use

loose larvae or the dressing variety must be made.

### Application

Loose larvae should initially be removed from the container using saline (Benbow, 2005). The surrounding skin of the wound should be protected with a hydrocolloid sheet. It is also wise to protect the periwound area during application and removal of the dressings, to prevent any larvae escaping and to provide the correct environment (Dealey and Cameron, 2008).

A fine mesh is placed over the larvae and secured with waterproof tape (Benbow, 2005). A foam dressing is then applied to soak up any exudate (Hampton and Collins, 2004). The therapy should be removed after 3–5 days. This is a simple procedure as many of the larvae will have been cannibalised. Further applications can be applied if necessary following re-assessment of the wound.

The same principle can be used to apply the dressing version, however, no hydrocolloid is needed to protect the surrounding skin, instead a barrier cream should be applied (Acton, 2007).

### Indications for larval therapy

Larval therapy can be used on a variety of wounds, such as leg ulcers, pressure ulcers, traumatic wounds, burns, infected wounds, wounds containing MRSA and also amputation sites (Baker et al, 2010).

Larvae have the ability to deodorise wounds and can stimulate the production of granulation tissue efficiently and in a short period of time (Benbow, 2005). They can also eradicate pathogens and various bacteria. If a wound has had a hydrogel dressing applied as an initial debridement measure but there is no improvement, then larval therapy should be considered.

As well as necessitating regular changes, which require more nursing intervention, hydrogel dressings also have a propensity to macerate the surface area of a wound if left in place for too long (Jones and Milton, 2000). Therefore, it is not advisable to use a hydrogel in a wound with a high exudate content. It is also debatable whether a hydrogel should be used on an infected wound due to the increase in moisture, which enlarges the surface area available for microorganisms to multiply — larval therapy should be considered as an alternative (Myles, 2006).

### Contraindications for larval therapy

Although there are many advantages to the use of larval therapy, there are some disadvantages that need to be considered. For instance, many patients and clinicians still find the idea of the treatment unacceptable (Thomas, 2002).

Other than the negative viewpoint of some clinicians, larval therapy is also seen as a complicated technique to perform. This is due to the construction of the 'cage' which contains the larvae at the wound site (Jones, 2009), although this issue has somewhat been resolved by the introduction of the sealed dressing that, as mentioned above, contains small pieces of foam, helping to aid the growth of the concealed larvae and manage exudate (BioMonde, 2011).

However, evidence suggests that the larvae in this dressing may be unable to interact with the wound as effectively — they still remove exudate from the site but it is not possible for them to agitate the wound bed in the way that 'free' larvae can (Hampton and Collins, 2004).

Larval therapy also requires an optimal wound environment if the larvae are to survive (Gray et al, 2011). The larvae need atmospheric air to thrive and begin debriding the wound

site, therefore, an adequate supply of moisture and oxygen is necessary (Benbow, 2007).

If a wound is dry and necrotic, autolytic debridement with hydrogels or hydrocolloid dressings should be used to soften and re-hydrate the devitalised tissue (Jones, 2009). Acton (2007) advises that larval therapy is best avoided if the wound site bleeds easily.

As larvae are living organisms, they can be affected by synthetic conventional dressings and the topical substances included in other dressings. For example, most hydrogel dressings contain propylene-glycol, which is toxic to larvae — therefore, if a hydrogel has been previously used, then the wound site should be thoroughly irrigated before larvae are applied (MA Healthcare, 2011).

### Practice improvement

Larval therapy may have declined in use a number of years ago but it has increased in popularity recently after the rise of MRSA. Larval therapy is intended for specialist use only and should only be undertaken by a registered healthcare professional who has received the relevant training (Baker et al, 2010). It is, therefore, important that education programmes are put into place so that healthcare professionals who assess patients with wounds are confident, knowledgeable, competent and willing to use larval therapy.

The involvement of tissue viability link nurses is one way that knowledge can be shared with ward staff. They can offer advice and promote larval therapy, ensuring that any suggested treatment options are evidence-based (Cowan, 2009).

There is evidence that service users are broadly positive about the effects of larval therapy as an alternative debridement method, especially where they have experienced failure with other treatments (Kitching, 2004).

The value of larval therapy needs to be publicised so that the general public become accustomed to hearing the word 'maggot' in relation to wound care and are not shocked or surprised when the possibility is presented. It is not just the public that need education — it has been found that nurses often choose larval therapy only as a last resort (Sherman, 2003).

### Cost-effectiveness

Approximately 20,000 people each year in the UK experience a chronic wound at any one time, costing the NHS in excess of £2.3–£3.1bn per year (Jones et al, 2011). Today in the UK, a 'typical' chronic wound costs, on average, £2,225 to debride, with the process taking 89 days. The equipment needed to debride the same wound using bio-surgery costs £200 and takes, on average, only five days (Thomas, 2006). Similarly, Snyder (2009) reported that larval therapy is a cost-effective way of debridement, being more economical than the use of hydrogels. In the study, wounds treated with larval therapy were successfully debrided using one application at a median cost of £78.64. However, one-third of hydrogel-dressed wounds needed further treatment after one month.

On the other hand, Gray (2008) disagrees by highlighting that there is limited evidence to suggest larval therapy is more cost-effective than other debridement techniques. However, Snyder, (2009) highlights that larvae are left in place for 3–4 days with little clinical input throughout, whereas conventional dressings need to be changed either daily, or every other day, highlighting that less nursing intervention is required in larval debridement, decreasing the cost to the NHS.

Jones et al (2011) reviewed the literature on cost-effectiveness and found that while one single application of maggot therapy may initially be more costly than the use of a hydrogel, a reduction in healing time is gained, reducing nursing visits.

### Conclusion

Unfortunately, for some, larval therapy will continue to be a distasteful method of debridement. This is unfortunate as the technique has many benefits, which have been recognised in the UK and beyond (Geary et al, 2009). Research is ongoing and controlled studies are required to push larval therapy into the mainstream of tissue viability, especially in the case of chronic wounds.

Despite the barriers, larval therapy is becoming better accepted through education and health promotion. Wound debridement, however, is a challenging concept and the skill levels of staff, in conjunction with practice issues, means that it remains a complex area for the tissue viability nurse (Hampton, 2011). Though the argument regarding the efficacy of larval therapy and other methods of debridement will continue, the evidence is slowly being disseminated to healthcare professionals. **WE**

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