



# All Wales Tissue Viability Nurse Forum

*Fforwm Nyrsys Hyfywedd  
Meinwe Cymru Gyfan*

*All Wales Guidance for the use of:*

# Larval Debridement Therapy

*Endorsed by*



**All Wales Tissue  
Viability Nurse Forum**

*Fforwm Nyrsys Hyfywedd  
Meinwe Cymru Gyfan*



**BioMonde®**





# The All Wales Guidance for the Use of Larval Debridement Therapy (LDT)

This guidance for the use of Larval Debridement Therapy has been written in collaboration with the All Wales Tissue Viability Nurse Forum and BioMonde\*.

## Guideline development group:

### On behalf of the All Wales Tissue Viability Nurse Forum:

Julie Evans — Tissue viability nurse, Abertawe Bro Morgannwg University Health Board

Ceri Harris — Clinical nurse specialist, Cardiff and Vale University Health Board

Marilyn Jenkins — Tissue viability nurse, Abertawe Bro Morgannwg University Health Board

Karen Kembery — Tissue viability nurse, Abertawe Bro Morgannwg University Health Board

Rhian Parry-Ellis — Tissue viability nurse, Betsi Cadwaladr University Health Board

Denise Roberts — Tissue viability specialist nurse, Betsi Cadwaladr University Health Board

Jayne Warren — Clinical nurse specialist, Aneurin Bevan Health Board

### On behalf of BioMonde\*:

Jane Arnold — National sales manager

Kris Flinn — European sales and marketing director

Willi Jung — Group director scientific affairs

Ewan Murray — European marketing manager

### Published by:

Wounds UK, London. Web: [www.wounds-uk.com](http://www.wounds-uk.com)

## All Wales Tissue Viability Nurse Forum

The All Wales Tissue Viability Forum was formed in September 2003 and has the following aims that form part of the six key principles from the Institute of Medicine (Welsh Assembly Government, 2005):

### Safety, Effectiveness, Patient-centred, Timely, Efficient and Equitable

1. To raise awareness of tissue viability in order to improve patient outcomes
2. To raise awareness of the impact of tissue viability in health economics
3. To promote evidence-based practice in tissue viability and influence appropriate policy across Wales
4. To be recognised by the Welsh Assembly Government as a knowledgeable and valuable resource
5. To contribute to the body of knowledge by initiating and participating in tissue viability research and audit
6. To improve patient outcomes by maintaining the links with academia and disseminating knowledge relating to tissue viability to all healthcare providers
7. To work in partnership with industry in order to improve patient care
8. To provide peer support to all tissue viability nurses working in Wales.

# Contents

		Page
1	Purpose	4
2	Introduction	4
3	What is debridement?	4
4	Mode of action	4
5	Indications for use	5
6	Cost-effectiveness	5
7	Patient assessment prior to use	5
8	Treatment pathway	7
9	Contraindications and associated risks	8
10	Interactions with other medicinal products	8
11	Choosing mode of application	9
12	Application options	9
13	Prescribing and ordering	11
14	Step-by-step application instructions: BioBag	13
15	Step-by-step application instructions: Free range larvae	14
16	Looking after your larval therapy: management plan	18
17	Removal and disposal	18
18	Discharge guidance	18
19	References	19
20	Appendix 1: Frequently asked questions	20
21	Appendix 2: Application guide and daily care	22

## 1. Purpose

The purpose of these guidelines is to provide knowledge for the appropriate use of larval debridement therapy and the management of patients receiving this therapy.

The guideline is designed to support qualified healthcare professionals in managing wound debridement using larval therapy and to make sure it is carried out in a safe and clinically effective manner, acceptable to patients and carers.

These guidelines aim to ensure the appropriate use of larval therapy within all Welsh NHS Trusts and Health Boards. These organisations are required to provide care services within commissioned services which meet these requirements, and to provide guidance for healthcare professionals to establish how suitable larval treatment is for each individual patient. It is suggested that this guidance should form part of tissue viability and infection prevention protocols.

The guidance provided by this document is based on expert consensus which, along with audit, has been suggested as a positive method of directing care (Ousey et al, 2010).

## 2. Introduction

There are, at present, no national guidelines available for the appropriate use of larval debridement therapy and the management of patients receiving this therapy. The National Institute for Health and Care Excellence (NICE, 2001) states that, to date, there is no robust evidence to support any particular method of debridement and recommends that health professionals consider biosurgical techniques (sterile maggots) as one method of debridement that may also reduce pain and be acceptable to patients (NICE, 2001).

The choice of debriding agent should be based on impact on comfort, odour control and other aspects relevant to patient acceptability, type and location of wound and total cost. (NICE, 2001).

## 3. What is debridement?

NICE describes debridement as ‘the removal of devitalised or infected tissue, fibrin, or foreign material from a wound (“debris”). The body can remove these by natural processes, but large quantities of debris can delay healing and provide an environment for infection’ (NICE, 2001).

Wound debridement is a component of wound bed preparation (Fletcher, 2005). Wound bed preparation involves producing an optimal healing environment by removing

sloughy and necrotic tissue, managing wound exudate and restoring bacterial balance (Dowsett, 2002).

There is consensus about the need for effective debridement among wound healing experts (EWMA, 2004; EWMA, 2013; Wounds UK, 2013). Debridement is considered to be a beneficial component of wound management due to the following factors:

1. Without debridement, a wound will never heal. Furthermore, surgical skin grafting, or other therapeutic methods supporting wound closure can only be applied after the wound is clean and well granulated (Schultz et al 2003)
2. There is an inherent risk of infection if wound debris is not removed as quickly as possible, as it harbours bacteria which may penetrate into the wound environment and cause local or systemic infections with the risk of sepsis
3. The presence of necrotic tissue may prevent a clinician from gaining an accurate picture of the extent of tissue destruction, thus inhibiting the clinician’s ability to assess the wound correctly (Vowden and Vowden, 1999a; Leaper, 2002; Weir et al, 2007).

Where surgical debridement is not an option and rapid removal of devitalised tissue is required, larval therapy is a recognised option (Boulton, 2007).

Due to the essential role of debridement in wound management, it is important that the method of debridement selected is the most effective for the patient, and that this effectiveness is not limited by the skills of the practitioner (Gray et al, 2010). Selection of debridement methods should reflect the needs of the patient and be based on the knowledge and appropriate skills of the clinician, ensuring that every patient has access to the most appropriate method.

## 4. Mode of action

The larvae of the greenbottle fly (*Lucilia sericata*) physically feed on dead tissue, cellular debris and serous drainage (exudate) present in sloughy wounds. It is their characteristic feeding action that physically breaks up the necrotic or sloughy tissue, which is then consumed and digested. The process involves the physical actions of the larvae and proteolytic enzymatic digestion. They feed mainly by a process of extracorporeal digestion. Secreting collagenases, trypsin-like and chymotrypsin-like enzymes which breakdown devitalised tissue into a semi-liquid form which the larvae can ingest. The larvae of *Lucilia sericata* do not digest living human tissue. This selective process is one of the major advantages of larval debridement therapy as it spares the healthy tissues necessary for healing (Gottrup and

Jørgensen, 2011). Larvae also have an antibacterial effect within the wound as bacteria contained in liquefied material is ingested and digested at the same time, thus reducing the bioburden within the wound. In addition, larval secretions can prevent the formation of, and reduce pre-formed, biofilms (Harris, 2009; Cazander et al, 2009).

## 5. Indications for use

The application of larval therapy is an effective mode of debridement and may be applied and managed by any qualified healthcare practitioner who has reached an appropriate level of competency through training and who has adequate provision of clinical support.

However, the decision and approval to administer larval therapy must be sought from an appropriate prescriber as per local policy (i.e. surgeon, medical team, tissue viability nurse/clinical nurse specialist, podiatrist, advanced nurse practitioner or non-medical prescriber such as district nurses).

Larval therapy is indicated where an overall clinical decision has been made for the rapid debridement of devitalised tissue which is delaying wound healing. This will prepare the wound bed for products and treatments designed to enhance wound healing.

## 6. Cost-effectiveness

A recent study by Professor Ceri Philips and the Swansea Centre for Health Economics at Swansea University, examining the clinical efficacy and cost-effectiveness of larval debridement therapy in wound debridement, concluded that larval therapy is cost-effective when compared with other mainstream debridement interventions, including surgical, sharp, mechanical and autolytic debridement.



Figure 1. From eggs to debridement. Lifecycle of the fly

The cost of wound care is not simply determined by dressing cost, but is influenced by a multiplicity of factors. The factors that specifically impact on the cost-effectiveness of debridement include:

- Unit cost of treatment
- Length of treatment
- Number of procedures required
- Cost and likelihood of infection
- Cost and likelihood of adverse events.

## 7. Patient assessment prior to use

Wound assessment prior to the application of larval debridement therapy should be carried out by a qualified healthcare professional according to local policy. Application and evaluation may be undertaken by a competent qualified healthcare professional who has received training on the management of patients receiving larval debridement therapy. Every healthcare professional is responsible for maintaining his or her competence.

A holistic assessment should be undertaken and include the following:

1. A full assessment of the patient, wound type and wound bed. This should be undertaken and the results documented prior to larval debridement therapy, taking into account:
  - a) Ability to offload pressure.
  - b) Any results of vascular studies (see contraindications for use of larval debridement therapy)
2. Patient consent — informed verbal consent should be obtained and documented where appropriate.
3. A patient's and carer guide should be provided for all patients.

Table 1. The types of wounds for which larval debridement therapy may be used

- Diabetic ulcers
- Venous ulcers
- Arterial/ischaemic ulcers
- Mixed arterial-venous ulcer
- Pressure ulcers
- Post-traumatic wounds/ulcers, i.e. haematomas
- Necrotising fasciitis\* post debridement
- Pilonidal sinus\* post surgery
- Non-healing surgical wound
- MRSA-infected wound

Adapted from: Chan et al (2007)

\*See contraindications



## Types of wound for which larval debridement may be used

### Heel pressure ulcer



*Before treatment*



*After treatment (pictures with permission of Julie Evans)*

### Sacral pressure ulcer



*Before treatment*



*After treatment (pictures with permission of Alison Chandler)*

### Lower limb haematoma

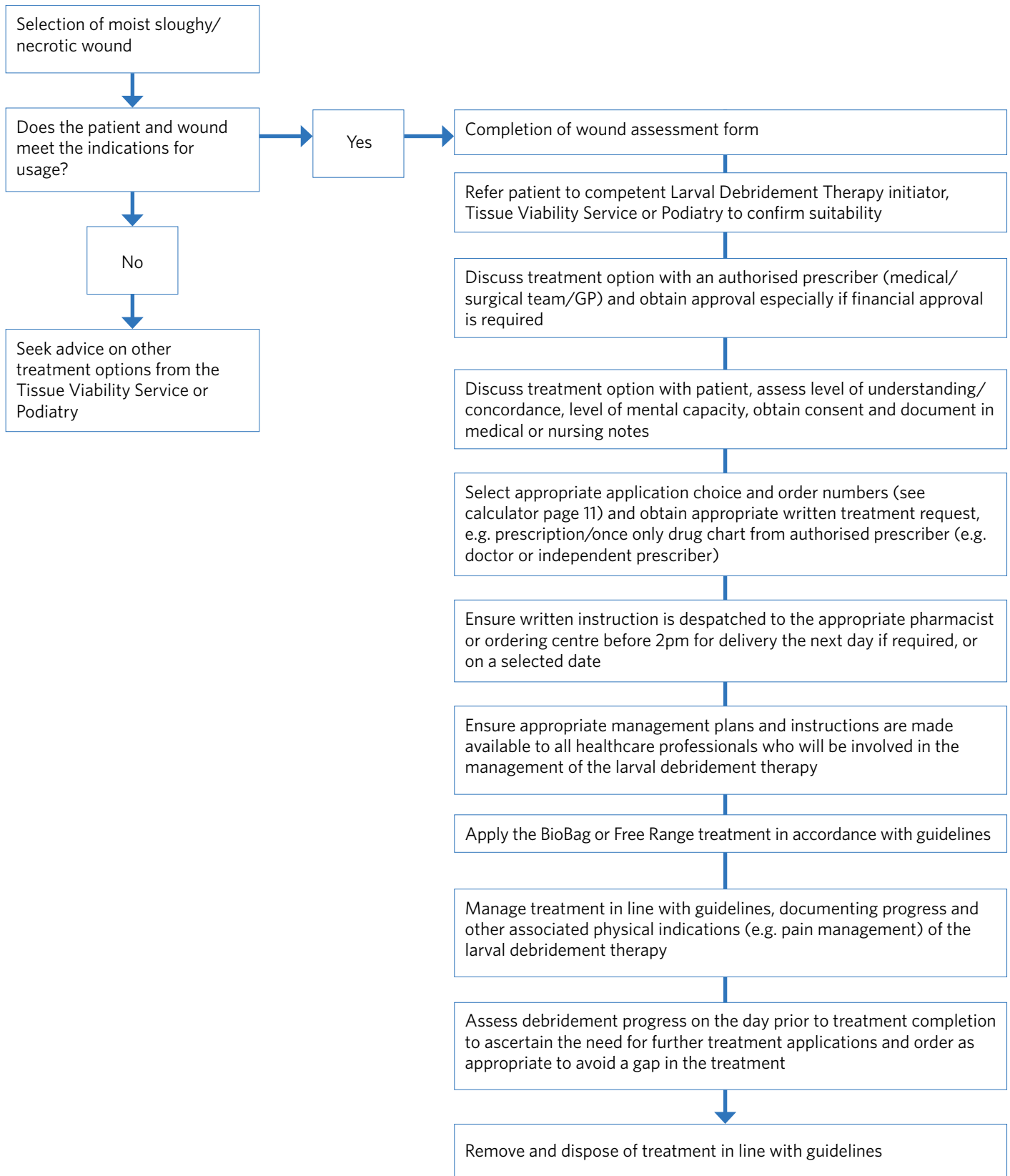


*Before treatment*



*After treatment (pictures with permission of Jayne Warren)*

## 8. Treatment pathway: for the use of Larval Debridement Therapy



## 9. Contraindications and associated risks

### Contraindications:

- Bagged or loose larvae *must not be used on wounds that have a tendency to bleed or on wounds close to an exposed major blood vessel*
- Complex wounds such as sinuses (known as fistulae) *should be treated with caution in conjunction with medical supervision*
- Bagged or loose larvae *should not be used on wounds with dry necrotic eschar*; rehydration is required in the first instance
- Bagged or loose larvae *should not be used on a patient on anticoagulants where the relevant clotting marker is not within an acceptable clinical range*
- Bagged or loose larvae *should be used with caution on wounds over adjacent exposed organs or leading to a body cavity*, and only under the close supervision of the doctor or nurse responsible for the patient
- Bagged or loose larvae can be used on suspected necrotising fasciitis, *but only once a thorough assessment has been carried out and surgical intervention rejected*, or as an adjunct to surgery.

### Associated risks:

There have been reports of increased pain at the wound site (particularly in wounds where pain is already present prior to the application of larval debridement therapy and some wounds with an ischaemic component). This can be control-

led by reviewing the patient's analgesia for use prior to, and during, the treatment. If severe pain is experienced, it will be immediately alleviated if the larvae are removed and the wound is irrigated.

As with any method of debridement, bleeding can result from damage to small capillaries and a regular daily inspection of the wound bed is recommended.

## 10. Interactions with other medical products

Simultaneous treatment of the patient with systemic or topical cytostatic/cytotoxic substances would need to be discussed with the treatment prescriber. Topical disinfectants, local anaesthetics and some hydrogels (those that contain propylene glycol as a humectant and preservative) may have a negative effect on the growth and vitality of the larvae and, consequently, on the result of the treatment. Therefore, simultaneous treatment with the above substances should be avoided and any topical residues should be removed by irrigating the wound bed prior to the application of larval debridement therapy.

Furthermore, factors such as radiation and reduced oxygen levels, e.g. caused by a too tight or occlusive secondary dressing, can lead to a decrease of the therapeutic outcome. The bagged larvae can be used in conjunction with a non-occlusive compression bandaging system.



## 11. Choosing mode of application

Investigations have demonstrated that free range and bagged larvae are equally efficacious in terms of debriding the wound (Blake et al, 2007). Two modes of treatment application are available and appropriate selection will depend on the following factors:

- Size of wound
- Depth of wound
- Location of wound
- Pre-existing or expected pain
- Patient acceptability (including mental capacity or concordance).

## 12. Application options

### **Bagged larvae (BioBag)**

The larvae are sealed within a dressing which is a finely woven pouch containing a small piece, or pieces, of foam that protect the larvae during the early days of treatment. The BioBag dressings come in varying sizes and are applied according to the nature and size of the wound being treated. The larvae remain sealed within the dressing throughout the treatment.

### **Dosage and duration of treatment:**

One or more BioBags should be applied to cover the entire area of devitalised tissue, taking care not to overlap the dressings. BioBags can be left in place for a maximum of four days, depending on the wound environment and the progress of the treatment. An application period of three days is typical. If the wound is not completely clean within four days, treatment can be repeated with a fresh BioBag. Treatment should be discontinued once the wound is suitably debrided, or if no progress can be observed after three or more applications.



*Figure 2. BioBag prior to application*



*Figure 3. Applying the BioBag.*

### **Free range larvae (Larvae300)**

The loose larvae are applied directly on to the wound and retained within a special dressing system. The exact nature of this is determined by the size and location of the area to be treated. Free range larvae are generally indicated for use on wounds where sufficient surface contact cannot be attained by bagged larvae and/or where the intention for usage is diagnostic to uncover the depth of tissue damage.

### **Dosage and duration of treatment:**

According to published literature, five to eight free range larvae should be applied per cm<sup>2</sup> of necrotic/sloughy tissue. A larvae free range calculator can be of use in determining the approximate number of larvae required for treatment (See Prescribing and ordering page 11).

Free range larvae can be left in place for a maximum of three days, depending on the wound environment and the progress of the treatment. An application period of three days is typical but if the wound is not completely clean within this time, treatment can be repeated with fresh free range larvae. Treatment should be discontinued once the wound is suitably debrided, or if no progress can be observed after three or more applications.



*Figure 4. Free range larvae (Larvae300) in transportation vial.*



*Figure 5. Loose larvae.*



*Figure 6. Larvae on the wound (Picture with permission of Julie Evans).*

### 13. Prescribing and ordering

Using the BioBag size guide (see page 12), select the appropriate size of dressing, or combination of dressings, to cover the entire treatment area including margins. The Larvae free range calculator (see below) can be used to provide guidance on the number of larvae that should be used for each application.

#### Ordering

1. Community orders will need to be raised on an FP10 prescription by a doctor or registered prescriber
2. Hospital orders should be written on the patient's prescription sheet according to local protocol for ordering
3. Ordering should be carried out by the community or hospital pharmacist (or stores) by phoning or faxing BioMonde (the single producer of larval debridement therapy) providing the following information:

- Size and quantity of BioBag dressings/number of pots and retention nets required
- Official order number
- Intended delivery date
- Full delivery address (all deliveries must be signed for)
- Invoice address.

Orders can be accepted up to 2pm the day before the intended application date and delivery is available from Monday to Saturday.

#### Storage

- Larvae should be kept in transit containers until application
- Store at a temperature of 6-25°C (products do not need to be refrigerated)
- Larvae should be applied by the expiry date for optimal results (up to 24 hours following delivery).

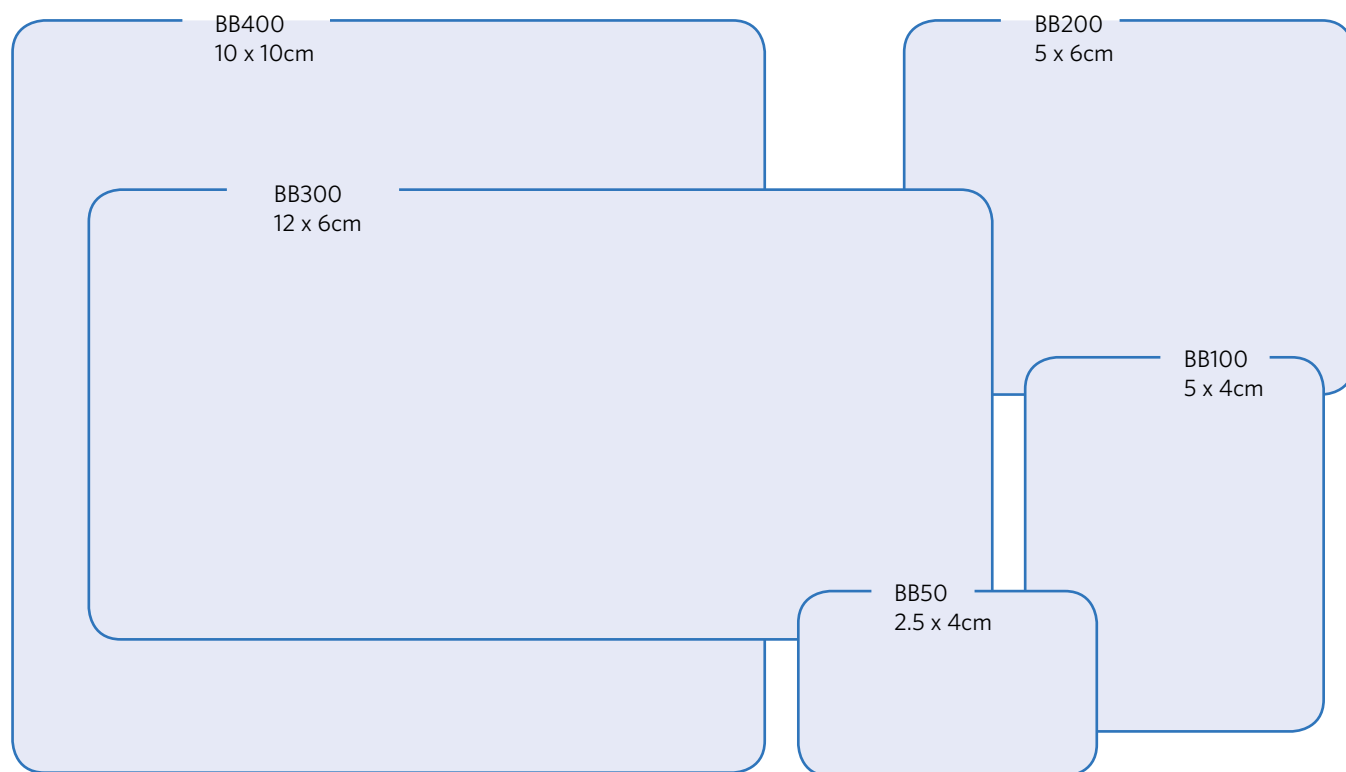
### Larvae free range calculator

1. Measure the dimensions of the wound in centimetres
2. Pick the nearest size from the measurements on the left of the chart
3. Move sideways to the appropriate percentage of wound coverage
4. State the number of pots required from within the coloured cell.

Maximum wound size (cm)	Percentage of wound that is covered with slough/necrotic tissue				
	20%	40%	60%	80%	100%
Up to 2x2	1	1	1	1	1
5x5	1	1	1	1	2
5x10	1	1	1	2	2
10x10	1	1	2	2	2
10x15	1	2	2	2	3
15x15	2	2	2	3	3
15x20	2	2	3	3	3
20x20	2	3	3	3	4
20x25	3	3	3	4	4
25x25	3	3	4	4	5
25x30	3	4	4	5	5
30x30	4	4	5	5	5

Note that the calculator only measures the surface of the wound. If the wound has significant depth, more larvae may be required.

## BioBag sizes and codes



## 14. Step-by-step application instructions: BioBag

### Materials required for the application of BioBag:

- Single BioBag, or combination of BioBag sizes, suitable for the wound size
- A sterile wound cleansing pack/dressing pack.
- Zinc-based barrier cream or zinc bandage to protect intact periwound skin — Sudocrem (Forest Laboratories UK Limited) or other suitable alternative
- An absorbent (non-occlusive) dressing pad and a lightweight retention bandage
- Sterile saline for irrigation of the wound or dressing residues and moistening of primary swab.

### Preparation of the wound site (figure 7):

1. Irrigate the wound to remove dressing residues and loose material
2. Protect intact periwound skin with a layer of zinc-based barrier cream (Sudocrem) or zinc bandage.

### Application of BioBag (figures 8–9):

1. Remove the BioBag from the transport vial
2. Place on to wound so that wherever possible the wound margin is covered and fold/double back away from the periwound skin
3. At the time of application, and subsequent dressing changes, place a moistened gauze swab over the BioBag dressing to ensure the larvae are dampened (especially if the wound is very dry)
4. Apply an absorbent outer dressing which should be selected to manage increased exudate and maintain a non-occlusive environment for the larvae
5. Finally, secure all dressings in place by taping outer edges of the absorbent dressing or apply a light bandage.

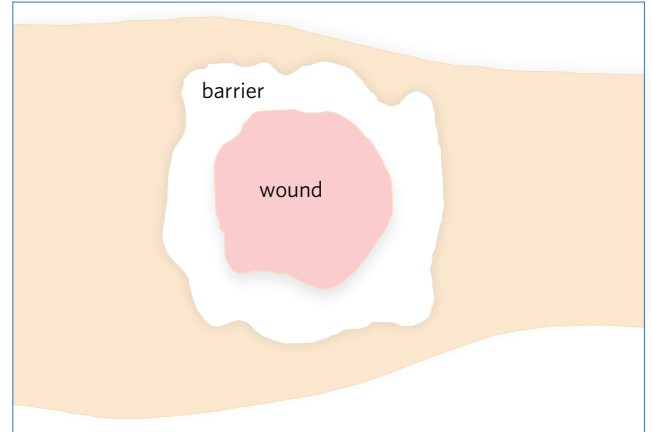


Figure 7. Prepare the wound site.



Figure 8. Place BioBag on wound.

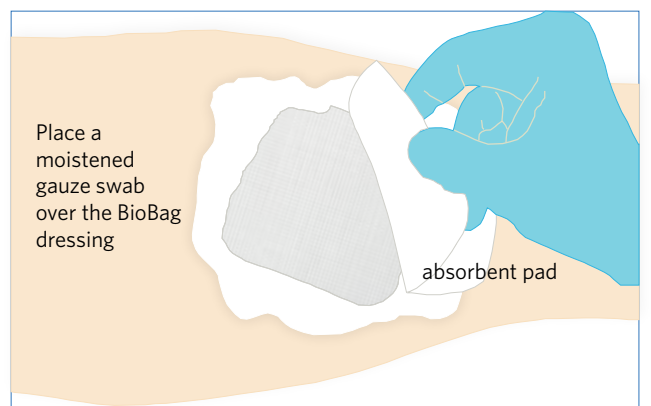


Figure 9. Ensure the larvae are moist.

## 15. Step-by-step application instructions: free range larvae

### Materials required for application of free range larvae:

- A sterile wound cleansing pack/dressing pack
- Sterile saline for irrigation of the wound and to remove the larvae from the transport vial
- Hydrocolloid to border the wound
- Sterile scissors for cutting retention net and hydrocolloid to size
- Retention net (flat net, boot net)
- Impermeable plastic adhesive tape, e.g. Leukoplast® Sleek® (BSN medical) (Note: other tapes may not retain the larvae).

### Preparation of the wound site:

Irrigate the wound to remove dressing residues and loose material.

### Application of free range larvae (flat net) (figures 10-16):

1. Ensuring the skin is dry and clean, place strips of hydrocolloid around the periwound area to protect the healthy skin from larval enzymes and increased exudate levels and also to serve as a border to fix the retention net. For a smaller wound a hole can be cut in the centre of the hydrocolloid matching the size of the wound.
2. Remove the larvae from the transport vial by adding approximately 5ml of sterile saline to the container and gently agitate to remove the larvae from the sides of the vial. If more than one pot of larvae is to be applied, tip the contents of the first container into the second and agitate as before. Repeat this process as many times as necessary adding additional saline as required.
3. Place the retention net provided (cut to size as required) on top of a sterile gauze swab and pre-moisten with saline to overcome surface tension effects and stop larvae moving off the net. Slowly pour the saline containing the larvae onto the net and invert the net onto the wound.

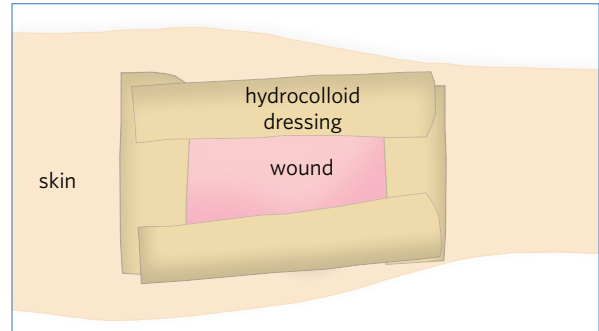


Figure 10. Use hydrocolloid sheet.



Figure 11. Re-suspend the larvae.

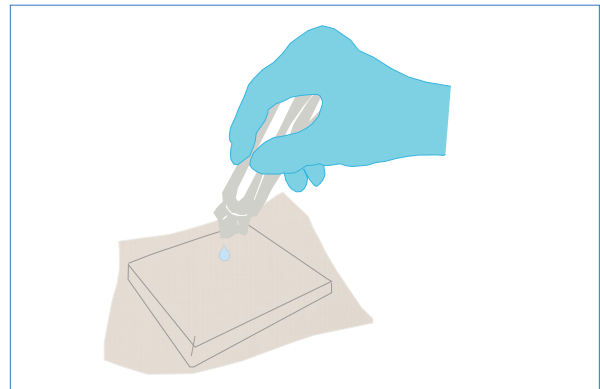


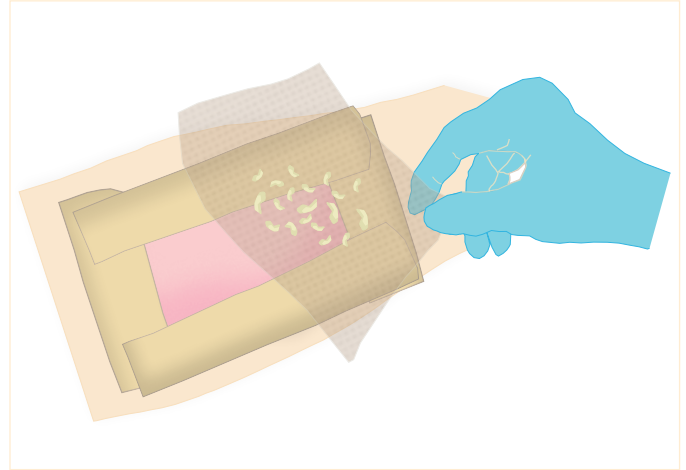
Figure 12. Wet the net.



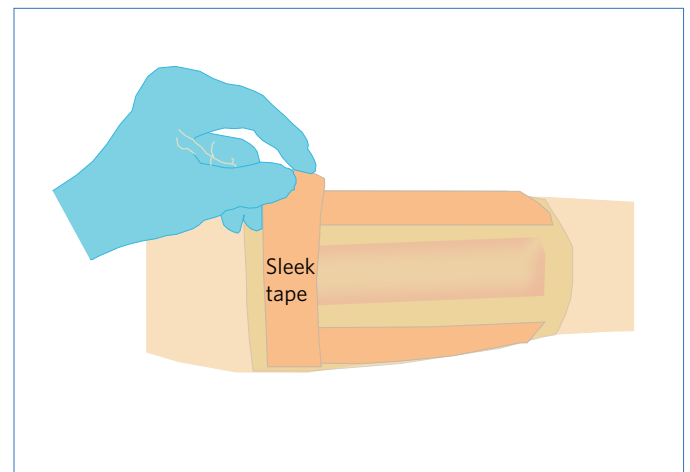
Figure 13. Pour out the larvae.



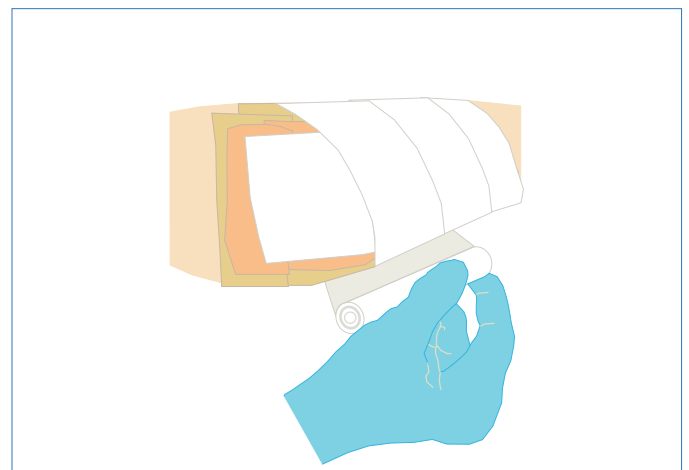
4. Attach the net securely to the hydrocolloid border using the impermeable plastic adhesive tape, e.g. Sleek Tape. Ensure the tape does not come into contact with skin so as to avoid skin trauma in the way of skin stripping due to the adhesives in the tape.
5. Apply a saline-moistened swab over the outside of the net and cover with an absorbent pad. In the event of a dry wound environment, moisten the dressings to create an optimal environment for the larvae and the wound (the dressings should be moist to the touch but do not over saturate). Secure the dressings in place with a non-occlusive bandage or adhesive tape to ensure the adequate provision of oxygen to the wound surface. Occlusive dressings or film dressings should not be used, as these will cause larvae to suffocate. The dressing may be checked on a daily basis and the outer absorbent padding changed as required.



*Figure 14. Invert net over the wound.*



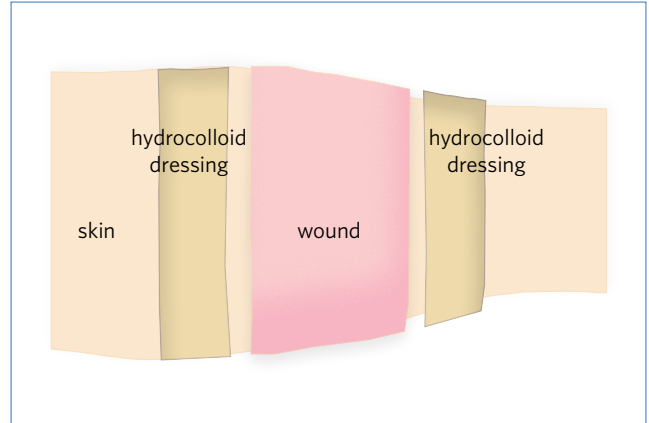
*Figure 15. Tape the net in position.*



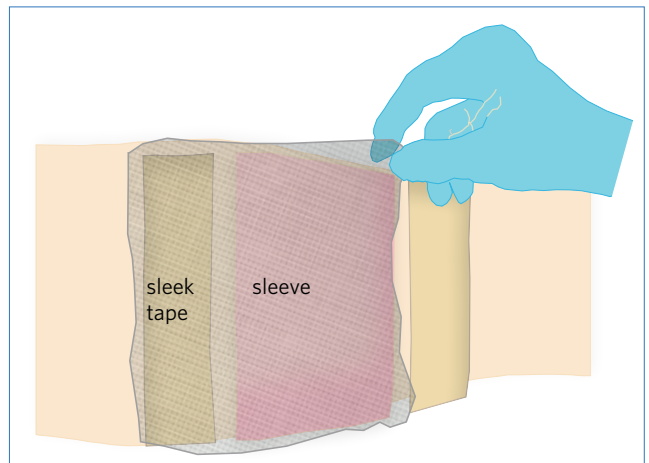
*Figure 16. Bandage or secure as appropriate.*

**Application of free range larvae (using a boot net as a sleeve)**

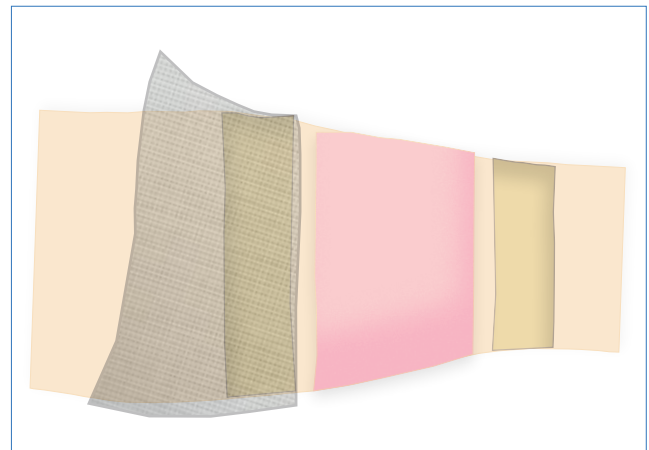
1. Cut boot net to size by cutting along the sealed edge to provide a net which is open at both ends
2. Fix hydrocolloid at either end of the area to be treated and tape one end of the sleeve to the hydrocolloid border prior to application of the larvae
3. Protect good skin from larval enzymes and increased exudate by applying a barrier cream, e.g. Sudocrem.
4. Transfer the larvae from the transport vial as per flat net application onto a pre-moistened sterile swab which can be used as a vehicle to transfer the larvae directly onto the wound bed by applying in a dabbing motion
5. Fix remaining end of the net in position and apply additional dressings as per flat net application.



*Figure 17. Hydrocolloid strips in position.*



*Figure 18. Checking for length of sleeve.*



*Figure 19. Sleeve rolled back.*

### Application of free range larvae (using a boot net)

1. Cut boot net to size, to be measured either to half way along the foot or to the ankle
2. Protect good skin from larval enzymes and increased exudate by applying a barrier cream, e.g. Sudocrem
3. Transfer the larvae from the transport vial as per flat net application onto a pre-moistened sterile swab which can be used as a vehicle to transfer the larvae directly onto the wound bed by applying in a dabbing motion
4. Secure boot net to the hydrocolloid border with adhesive tape (Sleek Tape) and apply ancillary absorbent dressings as per flat net application.

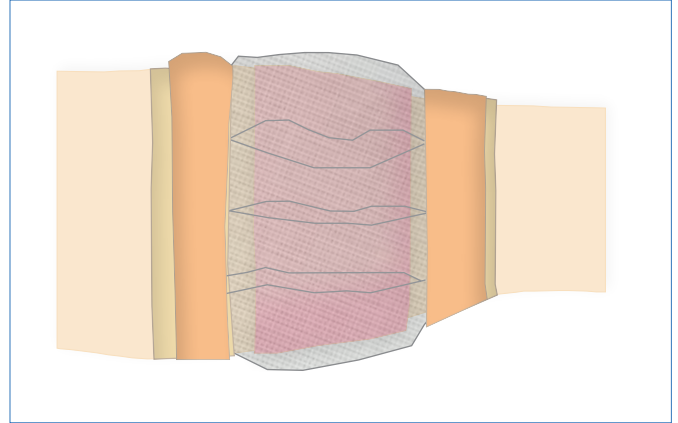
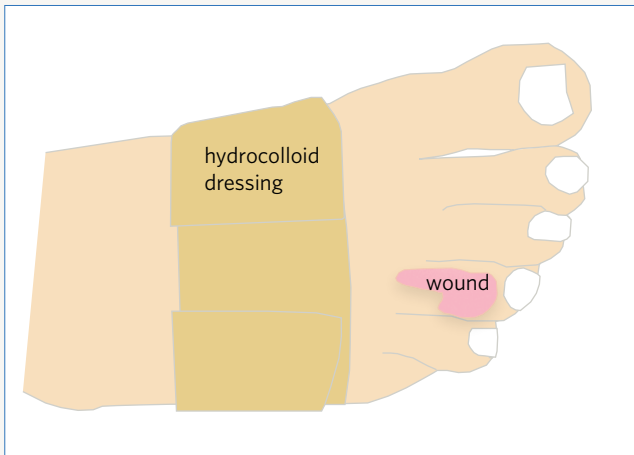
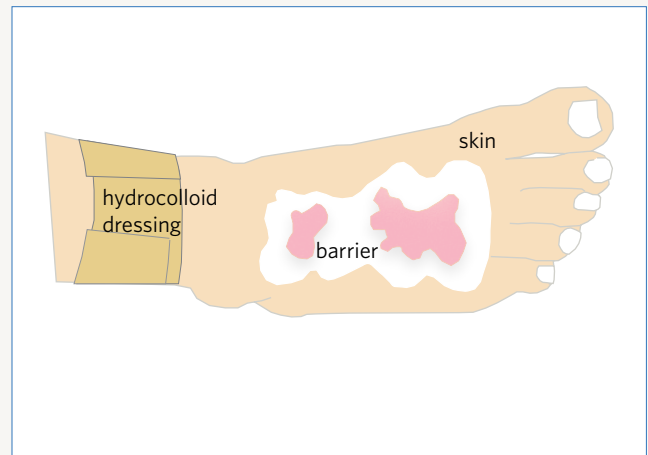


Figure 20. Fix sleeve in position.

### Prepare the wound site



Hydrocolloid dressing in position for half boot dressing.

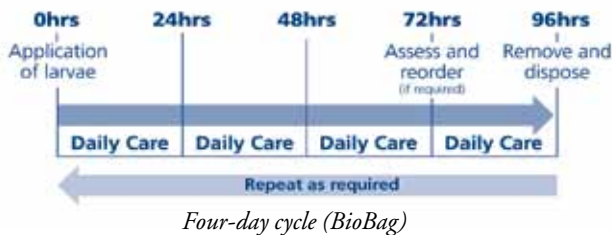


Hydrocolloid dressing in position for whole boot dressing.

## 16. Looking after larval therapy (management plan)

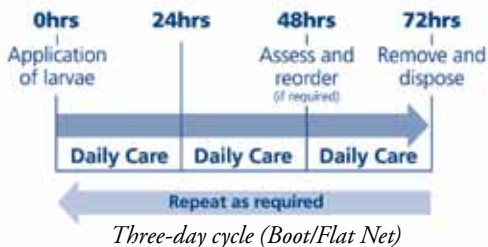
### Bagged larvae (up to four days duration)

1. Check outer dressings daily and change where necessary (i.e. when saturated with exudate)
2. Reapply barrier where necessary to the periwound area
3. Ensure damp gauze is replaced on top of the bag at each secondary dressing change
4. Ensure that all outer/secondary dressings are not occlusive and are permeable to the air
5. Ensure that all secondary dressings are secured well to avoid slippage and to ensure surface contact of the bag is maintained
6. Do not immerse in water.



### Free range larvae (up to three days duration)

1. Check outer/secondary dressings daily and change where necessary (i.e. when saturated with exudate)
2. Ensure damp gauze is replaced on top of the netting at each secondary dressing change
3. Ensure a good seal is maintained between the tape and the hydrocolloid border.



### General care instructions

1. If the application is to a pressure ulcer, ensure that there is no pressure on the larvae for the duration of the treatment (short periods of pressure for the purpose of mobilising are permissible)

2. Check larvae are viable at secondary dressing changes — movement of larvae and presence of dark red exudate are indications that larvae are alive
3. If the patient complains of pain and discomfort reassess and consider the appropriateness of continuing larval debridement therapy
4. Assess necessity for subsequent application 24 hours before the end of treatment.

## 17. Removal and disposal

### Removal

Bagged larvae should be removed from the wound using a clean technique and disposed of according to local policy.

When removing free range larvae, all outer dressings should be removed together with the hydrocolloid border. The larvae should then be gently wiped off or irrigated from the wound and disposed of according to local policy.

Any larvae that have found their way into the depths of the wound will generally come to the surface if the wound is irrigated with a stream of sterile water or saline. If it is not possible to remove all the larvae, the wound may be covered with an occlusive dressing and the remainder will be broken down in the wound bed without any harm to the patient.

### Disposal

Used larvae products and ancillary dressings should be regarded as potentially contaminated and disposed of in accordance with the local infection control policy. This normally involves placing them in clinical waste bags, which should be sealed and sent for destruction in the usual way.

### On the death of the patient

In the event of a patient dying unexpectedly while receiving larval debridement therapy, the larvae should be removed from the wound prior to the transfer of the patient to the mortuary and disposed of as described above.

## 18. Discharge guidance

Patients who are being treated with larval debridement therapy can be discharged from secondary care to primary care if agreed in advance with the Practice/District Nursing teams who can ensure that there is a suitable level of home care has been established.

An appropriate level of knowledge of receiving community healthcare professionals should also be established prior to discharge.



## References

- Blake F, Abromeit N, Bubenheim M, et al (2007) The biosurgical wound debridement: Experimental investigation of efficiency and practicability. *Wound Repair Regen* 15(5): 756–61
- Boulton A (2007) Maggots rid patients of MRSA, Press release. Available online at: [www.medicine.manchester.ac.uk/aboutus/news/mrsamaggots](http://www.medicine.manchester.ac.uk/aboutus/news/mrsamaggots) (accessed 21 March 2013)
- Cazander G, van Veen KE, Bouwman LH, et al (2009) The influence of maggot excretions on PAO1 biofilm formation on different biomaterials. *Clin Orthop Relat Res* 467(2): 536–45
- Chan DC, Fong DH, Leung JY, et al (2007) Maggot debridement therapy in chronic wound care. *Hong Kong Med J* 13(5): 382–6
- Dowsett C (2002) The role of the nurse in wound bed preparation. *Nurs Standard*. 16(44): 69–76
- EWMA (2004) *Position Document wound bed preparation in practice*. MEP Ltd: London. Accessed online at: [www.ewma.org](http://www.ewma.org) (accessed 12 March 2013)
- EWMA (2013). *Debridement. An updated overview and clarification of the principle role of debridement*. EWMA Document. Accessed online at: [www.ewma.org](http://www.ewma.org)
- Fletcher, J. (2005) Wound bed preparation and TIME principles. *Nurs Standard*. 20(12): 57–65
- Gottrup F, Jørgensen B (2011) Maggot debridement: an alternative method for debridement. *Eplasty*. 11:e33.
- Gray D, Acton C, Chadwick P, et al (2010) Consensus guidance for the use of debridement techniques in the UK. *Wounds UK* 7(1): 77–84.
- Harris LG, Bexfield A, Nigam Y, et al (2007) Disruption of *Staphylococcus epidermidis* biofilms by medicinal maggot *Lucilia sericata* excretions/secretions. *Int J Artif Organs* 32(9): 555–64.
- Leaper D (2002) Surgical debridement. *World Wide Wounds*. Available online at: [www.worldwidewounds.com/2002/december/Leaper/Sharp-Debridement.html](http://www.worldwidewounds.com/2002/december/Leaper/Sharp-Debridement.html) (accessed 12 March 2013).
- NICE (2001) *Technology Appraisal Guidance 24: Guidance on the use of debriding agents and specialist wound care clinics for difficult to heal surgical wounds*. NICE, London.
- Ousey K, Pankhurst S, Bale S, et al (2010) The Quality Agenda — What does it mean for tissue viability? A Debate. *Wounds UK* 6(1): 150–4
- Schultz GS, Sibbald RG, Falanga V, et al (2003) Wound bed preparation: a systematic approach to wound management *Wound Repair Regen* 11(2): S1–S27
- Vowden K, Vowden P (1999) Wound debridement Part 1: non-sharp techniques. *J Wound Care* 8(5): 237–40
- Weir D, Scarborough P, Niezgoda JA (2007) Wound debridement. In: Krasner DL, Rodeheaver GT, Sibbald RG (eds.) *Chronic Wound Care: A Clinical Source Book for Healthcare professionals*. 4th edn. HMP Communications, Malvern: 343–55
- Welsh Assembly Government (2005) *Designed for Life-Creating World Class Health and Social Care for Wales*. Welsh Assembly Government, Cardiff
- Wounds UK (2013) *Effective debridement in a changing NHS*. *Wounds UK*. Accessed online at: [www.wounds-uk.com](http://www.wounds-uk.com)

## Appendix 1: Frequently asked questions

This section is intended to provide patients with information on larval therapy and give answers to some of the questions they might have

### What is larval therapy?

Larval therapy, also known as ‘maggot therapy’ or ‘biosurgery’ involves the use of larvae of the greenbottle fly, which are introduced into a wound to remove necrotic sloughy and/or infected tissue. Larvae can also be used to maintain a clean wound after debridement if a particular wound is considered prone to resloughing.

The technique, which has been used for centuries, has been reintroduced into modern medicine by doctors and wound care specialists who have found that larvae are able to cleanse wounds much more rapidly than conventional dressings.

Whilst larvae should not be regarded as a cure for all types of wounds, by removing dead tissue and any associated bacteria, in most instances they will improve the condition of a wound and allow the process of healing to begin.

### How does larval therapy work?

The processes by which larvae clean wounds are very complex, but in simple terms they physically feed on dead tissue and release special chemicals into the wound that breakdown dead tissue into a liquid form that the larvae can easily remove and digest. During this process the actively feeding larvae also take up bacteria, which are then destroyed within their gut. This process is so effective that larvae can often clean a wound within a few days.

### How big are the larvae?

The larvae that are applied to your wound are very small — only a few millimeters in length — smaller than a grain of rice. During the treatment time they will increase in size as they clean the wound, to a maximum of 12mm.

### How are the larvae applied?

There are two methods of application:

#### 1) *BioBag Dressing*

The larvae are sealed within a dressing which is a finely woven net pouch containing a small piece, or pieces of foam, which aid the growth of the larvae and manage exudate. The BioBag

Dressings come in varying sizes and are applied according to the nature and size of the wound being treated. The larvae remain sealed within the dressing throughout the treatment.

#### 2) *Free Range Larvae*

The larvae are applied directly onto the wound and retained within a special dressing system. The exact nature of this is determined by the size and location of the area to be treated.

### How long does the treatment last?

This can vary with each treatment of larvae and the method of application being used. BioBag Dressings can be left in place for up to four days; it is possible for the dressing to be removed on a daily basis to allow inspection of the wound site.

Free range larvae are generally left in place for up to three days before being removed from the wound site.

With both application methods, it is impossible to predict how long a course of treatment will take. Sometimes a wound is completely cleansed by a single application of larvae but other wounds may require two or more treatments to achieve the desired effect.

### Will I notice anything different during larval therapy?

During larval therapy you may notice some changes in the wound:

- The wound may become a little wetter than usual or show the presence of a dark red or pink discharge. This is due to the action of the larvae breaking down the dead tissue.
- Sometimes a wound that contains a lot of dead tissue will develop a characteristic smell during treatment. This is nothing to worry about, it is just due to the activity of the larvae and should disappear when the dressing is changed.
- Most people are unaware of the larvae’s presence, although a small number of patients claim that they can feel the larvae moving but only describe this as a tickling sensation.
- Some patients, particularly those with poor circulation, report that their wounds become more painful during larval therapy but this can generally be controlled with medication.
- Some patients have found that the pain associated with infected wounds is reduced following larval therapy.



### **Will larvae burrow into healthy tissue?**

The larvae used in wound management will not attack or burrow into healthy tissue, they only remove dead tissue.

### **Will the larvae multiply in my wound?**

Only adult flies can lay eggs, so the larvae cannot reproduce or multiply within the wound.

### **Where do the larvae come from?**

Larvae are produced in a special unit by highly trained staff at BioMonde®, a company with many years experience in wound management.

### **Are there any activities that should be avoided during treatment?**

Although it is possible for the patient to carry out most normal activities whilst undergoing larval therapy, they should ideally not bathe or immerse the wound in water.

It is also not a good idea to sit with the wound too close to a source of heat e.g. fire or radiator, as the larvae may dry out. Similarly, sitting or walking on a wound treated with larvae should also be avoided as much as possible.

### **Why use larval therapy instead of a conventional dressing?**

Clinical experience with larvae has shown that they can clean wounds in a fraction of the time taken by more conventional dressings, which could potentially speed up healing times. They are also useful in the management of infected wounds containing bacteria that are difficult to kill with more conventional treatments. Larvae have also been shown to be successful at eliminating MRSA from wounds.

### **What is the ethical position relating to the use of larvae?**

The use of larvae in wound management has a sound basis in literature. It appears to be free of any serious or significant side effects and can have major advantages over conventional treatments for certain types of wounds. Provided that a specific patient has no objection to the use of larvae there appear to be no ethical barriers to their use.

## **Further Information:**

### **Healthcare Professional Competences:**

See Agored Cymru  
[www.agored.org.uk/](http://www.agored.org.uk/)

### **Support from BioMonde®:**

Healthcare Professionals: 0845 230 1810  
After 5pm Monday to Friday, and all day Saturday and Sunday.

Clinical Helpline: 0845 230 6806  
[www.biomonde.com/](http://www.biomonde.com/)

## Larval Debridement Therapy

### Application guide and daily care

#### BioBag

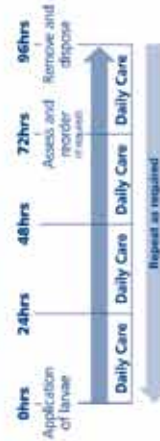


#### Daily care

- Daily change of the secondary dressings where possible is recommended and when strike-through is present.
- Avoid sustained, direct pressure as this may occlude the larvae. Short periods for the purposes of mobilisation are permissible.
- Check larvae are viable at secondary dressing changes – movement of larvae and presence of dark red exudate indicate the larvae are alive.
- Re-apply barrier where necessary to the peri-wound area.
- Ensure damp gauze is replaced on top of the BioBag at each secondary dressing change.
- Ensure that all outer/secondary dressings are not occlusive and are permeable to the air.
- After 72 hours, reassess wound to decide on further treatment. If a further NEW larval treatment is required, schedule a new order.

- If debridement is near completion and no further NEW larval treatment is required, plan follow on dressing treatment to be completed at end of day 4
- On removal, double bag and treat as clinical waste in line with your local Grade A Clinical Waste Disposal Protocol
- Do not immerse in water. Do not occlude.

#### Larvae (BioBag) 4 Day Treatment Cycle



### Larvae application guide (BioBag)

**Fig.1** Apply barrier cream/bandage



**Fig.3** Place a moistened gauze swab over the BioBag dressing



**Fig.2** Apply the BioBag dressing



**Fig.4** Secure the dressing



#### 1. Materials required

- BioBag or combination of BioBag sizes, suitable for the wound size
- A wound dressing pack
- Barrier cream or Zinc paste to protect intact peri-wound skin (Sudocreme or other suitable)
- An absorbent (non-occlusive) dressing pad and a lightweight retention bandage
- Sterile saline for irrigation of wound or dressing residues & moistening the primary swab.

#### 2. Preparation

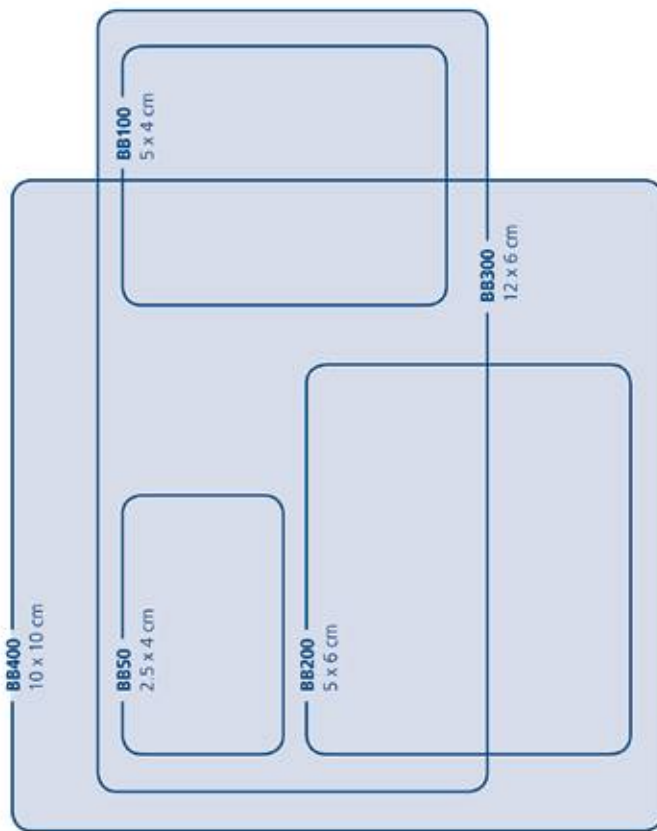
1. Prepare the peri-wound area and wound bed, irrigate to remove residue and loose material
2. Protect intact skin around the margin of the wound by applying a thin layer of the barrier cream/bandage (**fig.1**)

#### 3. Applying larvae to the wound

1. Remove the BioBag from the transport vial
  2. Place onto wound so that where possible the wound margin is covered. Fold/double back excess net of the bag away from peri-wound skin (**fig.2**)
  3. Place a saline moistened gauze swab over the BioBag dressing (especially if it is a very dry wound) (**fig.3**)
  4. Secure well with a secondary dressing to avoid slippage and to ensure surface contact of BioBag is maintained (**fig.4**)
- Ancillary dressings should be selected in order to manage exudates
  - All outer dressings MUST be non-occlusive as the larvae need oxygen to survive
  - Very wet outer dressings may occlude and suffocate the larvae.

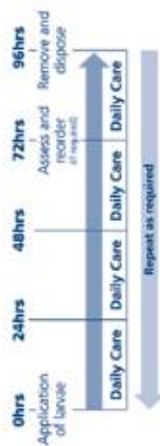
See overleaf for sizing guide and ordering information.

## BioBag sizes and codes



Code	Description
BB50	2.5x4cm
BB100	5x4cm
BB200	5x6cm
BB300	12x6cm
BB400	10x10cm

## Larvae (BioBag) 4 Day Treatment Cycle



## Notes:

### Ordering larvae

Orders received by us before 2pm will qualify for inclusive next day delivery, or a future planned date of your choosing.

Please allow time for your own internal procurement/pharmacy to process the order.

### Telephone:

**0845 230 1810**

E-mail : [orders@biomonde.com](mailto:orders@biomonde.com)

Fax : 01656 668 047

### Office Hours

Monday to Friday 8:30am – 5:00pm

For assistance outside working hours please call our **Clinical Helpline: 0845 230 6806**.

### Storage

- Keep in transit containers
- Store at a temperature of 6°C to 25°C (products do not need to be refrigerated)
- Must be applied by expiry date, usually the day after delivery, for optimal results
- BioBag dressings can be left in place for up to 4 days.

See overleaf for application guide and daily care.



**BioMonde®**

[www.biomonde.com](http://www.biomonde.com)

