Something Old Is New Again:
Debriding and Reducing Local Wound Infection with Maggots

Maggot debridement therapy (MDT) is the practice of using live medical-grade fly larvae for removing dead tissue from non-healing wounds. MDT is also known as maggot therapy, larval therapy, biodebridement or biosurgery.

Debridement or removal of dead tissue is a cornerstone of good wound bed preparation. Slough, eschar and debris in the wound are a good food source for bacteria and must be removed to prevent or treat infection and to promote healing.

History of MDT
Using maggots for wound care has been documented since about the 1500s. Throughout centuries of war, physicians have noticed that soldiers with maggot-infested wounds tended to heal better than those with non-infested wounds. The Confederate army surgeon J.F. Zacharias was one of the first American physicians to intentionally use maggots for infected wounds. In the 1930s, orthopaedic surgeon William Baer spearheaded and promoted the use of MDT in more than 300 U.S. hospitals. Then World War II brought the advent of antibiotic therapy and better surgical techniques, so maggots were relegated to the back shelf and were rarely used for the next five decades.

We have now found that in some cases antibiotics and high-tech treatments have become ineffective in treating poorly vascularized wounds and necrotic wounds and that some bacteria have developed resistance.

In the 1990s Sherman et al. in the U.S. and Mumcuoglu et al. in Israel reintroduced maggots for treating intractable wounds. Currently, MDT is successfully used to save lives and limbs in 20 different countries.

About Maggots
Not all flies are created equal; there are thousands of species of flies. The maggots of choice for MDT are from the species Lucilia sericata (green bottle or blowfly). This species has been found to be safe and effective; they eat dead tissue and do not harm living tissue. Blowflies are often metallic green, blue or black in colour.

The life cycle of the fly (see Figure 1) starts with the newly hatched fly, continued on page 24

Prior to using MDT you need to assess and optimize the patient’s condition (pain managed, nutrition assessed, pressure relieved, positioning/seating addressed, sufficient arterial perfusion present, etc.)

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Christine Pearson, RN, IIWCC, is a wound clinician for Vancouver Coastal Health on the North Shore. She has worked in community nursing on interdisciplinary teams for 27 years. She develops and presents wound education sessions and provides consultations on difficult-to-heal wounds for physicians, nurses, students and long-term-care facilities.

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which matures in one to two weeks. The adult female seeks out a food source (e.g., a dead animal) where she can lay 2,000 to 3,000 eggs. She does this so when the eggs hatch eight to 24 hours later, the new larvae have something to eat. The larvae eat for several days (three to seven) and then look for somewhere warm and dry to burrow (usually into dirt) where they form a hardened shell for the pupating phase. They stay buried in the dirt for seven to 20 days, depending on the temperature and the weather. When they emerge from the dirt they are fully developed flies, and the cycle begins again.

If unclean flies infest a wound there is a risk they could be carrying diseases (e.g., tetanus, cholera or dysentery) or could be a more aggressive species that could cause harm to the wound. To make maggots “medical grade” they are produced in a sterile laboratory where the eggs are washed in an antiseptic solution and then placed on a clean food source of brewer’s yeast and soy. This food source keeps them alive until they can be transported in a sterile jar to the patient (see Figure 2).

How Maggots Work

Five to 10 maggots per square centimetre of wound base are placed in the wound. Using fewer maggots may be ineffective, and using too many can cause pressure as they grow. When the maggots are in the wound they secrete proteolytic enzymes to liquefy the necrotic tissue in the wound, making it easier for them to ingest the slough and bacteria. The bacteria are killed both in the digestive tract of the maggots and by the antibacterial substances the maggots excrete.\(^1\) The maggots also secrete allantoin, urea and other substances that can act as tissue growth factors.\(^2\)

MDT has three functions: (1) to remove dead and infected tissue (debridement), (2) to eat and kill bacteria and (3) to speed healing. MDT can be used on any non-healing wound that contains sloughy dead tissue: pressure ulcers, venous ulcers, traumatic wounds, surgical wounds and diabetic ulcers. MDT can be used simultaneously with systemic antibiotics with no ill effects. In many cases, maggots have prevented the need to amputate limbs.\(^3\) MDT can even be used on foul-smelling, non-healable ischemic wounds to lower the amount of bacteria, thereby reducing the odour and improving the patient’s and caregiver’s quality of life.

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The biggest deterrent to MDT is the yuk factor. I have heard of clinicians that will refuse to work with maggots, but I have never yet had a patient refuse the treatment. Most patients with non-healing wounds are frustrated and fed up with myriad treatments that have been ineffective and are happy to accept any treatment that may get their wound healing—even if it is maggots. Patient teaching is imperative so the patient is very aware of what is involved and that some of the maggots may escape from the dressing.

Contraindications for MDT include the following:

- patient does not consent to their use
- a wound that requires frequent inspection
- necrotic bone or tendon
- exposed blood vessels
- bleeding disorders (natural or pharmacological)
- patient allergic to soy or brewer’s yeast
- where debridement is contraindicated

MDT is not usually the first treatment of choice, but if other methods of debridement and decreasing the local bacterial load in the wound have failed or are progressing too slowly then MDT may be an appropriate choice. Experience shows that MDT can be an efficient, cost-effective and beneficial treatment for many people with non-healing necrotic wounds.

References


Currently in North America, only one place, in Irvine, California, produces medical-grade maggots. To order a batch of maggots for use in Canada you must have an import permit from the Canadian Food Inspection Agency and a border broker to handle issues at customs. This process can be cumbersome and slow at times and it adds to the expense of the treatment.

If you or your facility may be interested in using MDT in Canada, please contact Dr. Chris Harvey-Clark at the University of British Columbia (chclark@interchange.ubc.ca). He is considering producing maggots in Canada but needs to know the level of interest nationally to see if it is feasible.
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Pulling Back the Mask: Detecting Infection in the Diabetic Foot
BY Kyle Goettl, RN, BScN, AND Stephan Landis, MD, FRCP(C)

Steps for Identifying Infection in Diabetic Foot Wounds
- Examine the old dressings and peri-wound area noting any increase in wound drainage or a change in the character of the wound fluid.
- Irrigate and debride the wound if appropriate. (You must be sure there is sufficient blood flow to support healing prior to debridement.)
- Measure the length, width and depth of the wound in a standardized, reproducible way. Record and compare with earlier measurements. The increasing size of a wound can be a sign of infection.
- Probe the wound. Probing to the wound base and contacting bone suggests osteomyelitis and should be treated as such until proven otherwise.
- Compare the patient’s recent blood sugar readings to those from the week before and note any erratic changes. Increased impairment in glucose regulation without an obvious reason can be indicative of an infection.

When the diabetic foot wound is not progressing as it should, even when best practice is being followed, this enabler can be utilized to help cue the clinician that there may be an underlying infection. By “unmasking” an infection, we are then able to proceed with appropriate interventions in the best interest of the people we serve.
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