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## A REVIEW ON MAGGOT: NEW APPROACH TO THERAPY

POPAT RR<sup>\*1</sup>, WANKHEDE SB<sup>2</sup>, CHINCHOLE PP<sup>1</sup>, NARKHEDE MB<sup>1</sup>, ZAMBARE YB<sup>3</sup>,  
TENGE RR<sup>1</sup>, MEHETRE GD<sup>1</sup>, BABHULKAR MW AND ADHAO VS<sup>1</sup>

1: Dr. Rajendra Gode College of Pharmacy, Malkapur, Dist. Buldhana, Maharashtra, 443101

2: JSPM's Charak College of Pharmacy and Research, Gate No. 720/1&2, Wagholi, Pune-  
Nagar Road, Pune, India – 412 207

3: Padmashree Dr. D.Y. Patil Institute of Pharmaceutical Sciences & Research, Pimpri Pune,  
India – 411018

\*Corresponding Author: Dr. R.R. Popat: E Mail: [riteshpopat87@gmail.com](mailto:riteshpopat87@gmail.com)

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### ABSTRACT

The use of maggots in wound healing is among the best studied direct medical applications of invertebrates [1, 2] for hundreds of years, leeches, maggots, and various invertebrate based medicinal products and treatments are employed in traditional medical practices worldwide. The increasing prevalence of chronic medical conditions and non healing wounds is one in all the consequences of the flexibility of recent medical advances to prolong life [4]. Diseases that were once fatal have evolved into chronic ailments that result in cardiovascular risk factors related to the emergence of non healing wounds. Maggots are applied on to an ulcer, burn injuries and diabetic wounds with a dressing to hide them and prevent them from escaping. The dressing must allow air flow and moisture to succeed in the maggots.

**Keywords: Maggot, ulcer, burn injuries, diabetic wounds, Chronic wounds**

### INTRODUCTION AND HISTORICAL PERSPECTIVE

One of the most well-studied direct medical applications of invertebrates is the use of maggots in wound healing. Leeches, maggots, and other invertebrate-based medicinal items and therapies have been used in traditional medical practices around the

world for hundreds of years. Maggots have been used in medicine since the 1500s, according to documentation from Ambroise Paré (1509–1590), Dominique Jean Larrey (1766–1842), and surgeons in the Army of the Confederacy during the American Civil War. Maggot-infested wounds were widespread among battlefield men during World War I [1-2].

Maggot-infested wounds were characterised as having "pink granulation" that appeared clean and healthy, encouraging Baer's to use and report on early maggot debridement therapy (MDT) in the setting of complex wounds and osteomyelitis. MDT experiments were first published in the late 1920s and early 1930s and within five years over 1000 surgeons in the United States, Canada, and Europe had incorporated MDT in their wound care practises [3-7]. There were a few downsides to MDT, including the cost (\$5 in 1933) and time-consuming work required to produce a stricture dressing for wounds [8].

MDT was widely used until the 1940s, when penicillin was developed and introduced. Primary indications for MDT, osteomyelitis and soft tissue abscesses, became less prevalent. In circumstances where antibiotics, surgery, and contemporary wound care failed to produce adequate or

complete healing, maggot therapy became a "last resort" treatment [4, 9].

MDT has had resurgence in recent years owing to the appearance of very specialised conditions. Antibiotic resistance, in particular, triggered a fresh search for alternate ways to treating persistently infected wounds. "Germ free" maggots that could be delivered quickly and inexpensively to the treatment location [10-12]. The US Food and Drug Administration (FDA) approved MDT as a "prescription only" treatment in 2004, and maggots were approved as a "one use" medical device [4, 5, 13].

Maggots are controlled as a drug in United Kingdom [4]. Maggot therapy is approved by the US Food and Drug Administration for "debriding chronic wounds, such as pressure ulcers, venous stasis ulcers, neuropathic foot ulcers, and non-healing traumatic, or postsurgical wounds [9]." Any licenced physician in the United States can now prescribe MDT [9]. Chronic wounds, such as pressure sores and diabetic or vascular ulcers, are associated with a high rate of morbidity and mortality [14]. Chronic wounds are difficult to treat due to the presence of fibrotic tissue and necrotic slough [15]. Maggot debridement therapy is one of the 'ancient' wound-care

procedures (MDT). Maggot therapy, debridement, and larval therapy are all terms used to describe MDT. MDT involves applying live, 'medical-grade' fly larvae to a patient's wounds in order to achieve debridement, disinfection, and, eventually, wound healing [18].

MDT uses newly emerged and sterile larvae of the common green-bottle fly, *Phaenicia (Lucilia) sericata*. Debridement, disinfection, and improved healing are primary benefits of this type of larval therapy for wounds and ulcers. With the rise in medication resistance in recent years, there has been increasing interest in utilising maggots [14, 19-20].

This treatment employs live blowfly larvae, produced in sterile laboratory settings. This kind of debridement is considered selective because blowfly maggots destroy dead tissue but not healthy tissue, and it has three therapeutic effects: debridement, disinfection, and skin growth promotion [21-27].

MDT works by scraping necrotic tissue with small spicules on the maggots' bodies. The larvae then release chemicals including proteolytic digestive enzymes, which disintegrate the necrotic tissue; the larvae then consume the extracorporeal digestion product. MDT's antibacterial and

growth-promoting properties may be explained in part by many chemicals found in these secretions. [22, 24, 28-31] Maggots are put to an ulcer and covered with a bandage to keep them from escaping. The dressing must allow for adequate air flow and moisture in the maggots. Due to recent bacterial resistance to various therapies, MDT use has increased. It is now considered a last choice for long-term nonhealing ulcers, and it is approved in more than 30 countries [22, 24 30-32].

#### **MEDICAL RATIONALE FOR MAGGOT DEBRIDEMENT THERAPY**

Once-fatal diseases have morphed into chronic illnesses with cardiovascular risk factors linked to the formation of non-healing wounds [33-34]. The number of patients with non-healing wounds is expected to rise, particularly among populations that use pharmaceutical wound healing modulators. New treatment modalities, such as hyperbaric oxygen administration, negative pressure wound therapy, topical protein applications, enzymatic wound debridement, and many others, have emerged [35-38].

Debridement is the removal of necrotic, contaminated tissue and microbial biofilm. Mechanical, surgical, autolytic, and enzymatic approaches have all been used as debridement procedures. Each has drawbacks

such as low efficacy and the requirement for anaesthesia high pain complaints, and mechanical and/or cellular damage to the underlying healthy tissue [39-41].

MDT is the deliberate administration of live, "medical grade" fly larvae to wounds for debridement, cleaning, and wound healing [4, 42]. The technique starts with chemical disinfection of predetermined maggot species. The lack of inexpensive, well-contained, live, and germ-free maggots has historically been a major impediment to the widespread adoption of MDT [4]. The manufacture of germ-free maggots has become easier because to improved disinfectants and rearing techniques [4, 43]. Maggots can now be delivered quickly via a variety of overnight courier services. The fact that maggots vigorously search the wound bed for necrotic material, devouring more and more necrotic tissue and obtaining access to increasingly deeper tissue layers within the wound, is reflected in their FDA classification as a "medical device." [4, 44]

## APPLICATION OF MAGGOT THERAPY

### 1. Maggot Debridement Therapy In Diabetic Wounds

Maggot therapy (MDT) was found to be more effective than hydrogel in reducing the wound area of diabetic foot ulcers. Maggot

therapy resulted in faster wound debridement and healing than other treatments. There were no differences in healing time or ability to eradicate methicillin-resistant *S. aureus* (MRSA) infection. In 9 days, MDT-treated lesions had a 50% reduction in necrotic surface area, compared to 29 days in the control group. There were no significant differences in the speed of complete wound closure between MDT and non-MDT techniques [45-48].

### 2. Maggot Debridement Therapy In Venous extremity Ulcers

Venous insufficiency, hemosiderin deposition, and lipodermato sclerosis are all symptoms of chronic venous ulcers. Debridement of the ulcer, skin grafting, venous stripping or ligation, and sclera therapy are all traditional treatment methods. Despite treatment, more than half of these ulcers do not heal after a year. The use of MDT in this difficult area of wound care shows some promise. The use of MDT in this area shows some promise, and it's possible that expensive custom dressings aren't required.

Despite the presence of MRSA, vancomycin resistant enterococci, and multi resistant *Psuedomonas aeruginosa*, a positive outcome was described in one case based experience using MDT in the setting of

chronic venous ulcers. A clinical team decided to proceed with skin grafts and negative pressure wound therapy. The patient had 90% graft acceptance at discharge, but a recurrence occurred after several months, requiring additional treatment. Compression plus larval therapy improved outcomes within the first four days but had no effect on wound healing rates after 12 weeks. According to the findings of the VenUS II experiment, ulcerations will heal despite the presence of devitalized tissue if the underlying venous insufficiency is treated. It's also been shown that larvae beneath the bandages may remain undamaged during the four days of MDT treatment [49-51].

### **3. Maggot Debridement Therapy In Arterial extremity Ulcers**

MDT may be useful in the treatment of ischemic extremities ulcers if revascularization attempts are done. Revascularization is essential to facilitate wound healing in the absence of adequate arterial perfusion. Amputation is also required if this is not possible. MDT was used in this case to reduce patient discomfort and odour while attempting to avoid an amputation [52-55].

### **4. Maggot Debridement Therapy In pressure Ulcers**

Pressure ulcers are one of the most common adverse effects in the healthcare setting. The conventional treatment strategy includes adequate "offloading" of the injury's

world, as well as outstanding medical care. MDT has been shown to reduce the number of debridements needed, resulting in less discomfort, bleeding, duration of stay, and total expenses [56-57].

MDT was found to be a safe, straightforward, effective, and reasonable alternative to standard pressure ulcer therapy in all of those investigations. Wounds treated with MDT had approximately one-third the quantity of necrotic tissue and twice the amount of granulation tissue after three weeks compared to non-maggot-treated wounds [58]. MDT was proven to dramatically reduce the quantity of necrotic tissue seen after 1 week in another small prospective controlled trial involving eight medulla spinalis injury patients with pressure ulcers who had been treated with a traditional nonsurgical technique [59]. Observing 25 patients with intractable wounds revealed that MDT was capable of achieving complete debridement in >88 percent of the wounds [60].

### **5. Maggot Debridement Therapy And Burninjuries**

MDT's applicability in the treatment of significant thermal injuries was recently demonstrated in a case study. A 59-year-old man appeared with severe full-thickness burns covering 60% of his body surface area

and substantial muscle necrosis. Surgical debridement was initially considered but rejected because the amount of tissue removed would not allow for significant functional survival. MDT was used as an alternative to debride necrotic regions more selectively [61].

## 6. Oncologic Applications Of Maggotdebridement Therapy

MDT has been used to treat wounds associated with inoperable ulcerating sarcomas and breast carcinomas. The larvae attacked any aberrant structures within the wound, removing cancerous tissue and leaving a healthy granulation bed behind. MDT may also help to debride, clean, and heal necrotic Kaposi sarcoma wounds, potentially avoiding amputation or severe soft tissue infection [62-65].

### COST-EFFECTIVENESS OF MDT

The median healing times for MDT and hydrogel were 9 and 28 weeks, respectively, which means that MDT looks to be the less expensive option. However, because of the range of elements that are deemed costly, several investigators report significant variation in their findings. In one review, half of the research said that the MDT was as cheap as hydrogels, while the other half claimed that maggots were worth twice as much.

MDT was found to be more cost-effective than hydrogel as it treated ulcers faster and improved patient quality of life, saving £8,826 per year per person and £40 per wound-free day. However, the author noted that the results contained an excessive amount of uncertainty. A study of venous ulcer patients found that the value of maggots was much lower than that of hydrogels in treating them [66-69].

### PAIN AND MDT

Opletalová *et al* [70] found that pain levels in the experimental and control groups were similar and modest, with no significant changes. Nonetheless, the final analysis revealed that both groups saw a statistically significant reduction in discomfort over time [71].

Pain scores self-reported by patients in the MDT group were statistically significantly higher than those in the hydrogel group, according to a study published in *Annals of Internal Medicine*. The percentage of patients who were unhappy with their treatment was extremely low and did not affect their quality of life [72].

Another comprehensive review evaluated pain levels in individuals with and without diabetes, indicating that pain levels in the first group were identical before and

after MDT, however pain levels in the second group were higher during MDT than before. Analgesics could effectively treat the majority of people suffering from pain [73].

Finally, Mumcuoglu *et al* [74] found that 38% of patients suffered an increase in pain during the application of maggots, but that in the majority of cases, analgesia may be used to reduce the discomfort before or during the therapy.

#### **ADVERSE EFFECTS OF MAGGOT DEBRIDEMENT THERAPY [75-76]**

1. The unpleasant sensation.
2. The most common side effect of MDT is significant pain.
3. Both patients and providers frequently experience some level of anxiety. Anxiety can be reduced by providing rapid and direct medical support 24 hours a day, seven days a week.
4. Hyper ammonemia is an adverse effect of blow flystrike treatment. It can cause impaired immunological function, encephalopathy, and coma in the most severe cases.
5. Using nonsterile maggots can lead to septicemia.
6. Maggot invasion of healthy tissue is another uncommon adverse effect.

#### **CONCLUSION:**

Maggot therapy is useful in chronic wound healing and it will be alternative to drug based therapy it is cost effective than the other therapy but it have some pain related issues experienced by patients and have some adverse effects to still maggot therapy is best compared to other therapy.

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