

ISFAHAN UNIVERSITY OF MEDICAL SCIENCES  
SCHOOL OF MEDICINE  
INTERNAL MEDICINE DEPARTMENT

**Title:**

**Efficacy of maggot debridement therapy on refractory atypical  
diabetic foot ulcers, an open label study**

**RESEARCH NUMBER: 293232**

**Authors:**

**Nader Mohseni  
Ali Najjarnezhad**

**Supervisor:**

**Dr. Mansour Siavash  
(Associated Professor of Endocrinology)**

**Advisor:**

**Dr.Sayed Mohammad Abtahi  
(Assistant Professor of Medical Entomology)**

Aug 2016

## **Abstract:**

### **Introduction**

Atypical or refractory diabetic foot ulcers (DFUs) are still a major health problem. Maggot debridement therapy (MDT) by larva of *Lucilia sericata* is an ancient and also modern option for wound healing. It works by debridement, stimulation of wound healing and disinfection. In this study we tried to evaluate the efficacy of MDT for healing Atypical and refractory DFUs.

### **Methods**

Patients with atypical diabetic foot ulcers were selected and further evaluated for some predefined differential diagnoses like atypical fungal, parasitic or bacterial infections, malignancy, trauma, etc. After discussion of different available treatment methods, those patients who selected MDT entered the study.

### **Results**

Forty two DFU patients (26 men, 16 women) with 42 non-healing atypical ulcers were participated in this study from Feb.2014 to Feb.2016. Successful outcome were achieved in 35 patients (83.3%) by MDT and they proceeded to complete debridement and then healing in less than  $1.8 \pm 0.8$  months. Four ulcers persisted, and three more ones (7.1%) led consequently to amputation.

### **Conclusion**

MDT may be considered as an effective treatment for atypical DFUs which are unresponsive to conventional therapies.

**Keywords:** Diabetic foot ulcer, Maggot, *Lucilia sericata*, larva, MDT

# Contents

<b>Chapter 1</b> .....	1
Introduction .....	2
<b>Chapter 2</b> .....	5
Methods and materials .....	6
<b>Chapter 3</b> .....	9
Results .....	10
<b>Chapter 4</b> .....	12
Discussion .....	13
<b>Chapter 5</b> .....	16
References .....	17

## List of Tables

**Table 1-1.** Khorshid hospital DFU classification system ..... 4

**Table 3-1.** Characteristics of patients treated ..... 11

**Table 3-2.** Wound and treatment characteristics of patients ..... 11

## References:

1. Harding K, Morris, HL, Patel, GK. Science, medicine and future: healing chronic wounds  
BMJ. 02 June 2016.
2. Chan DC, Fong DH, Leung JY, Patil N, Leung GK. Maggot debridement therapy in chronic wound care. Hong Kong medical journal. 2007;13(5):382.
3. Tang JC, Vivas A, Rey A, Kirsner RS, Romanelli P. Atypical ulcers: wound biopsy results from a university wound pathology service. Ostomy/wound management. 2012;58(6):20-2, 4, 6-9.
4. Boyko EJ, Ahroni JH, Stensel V, Forsberg RC, Davignon DR, Smith DG. A prospective study of risk factors for diabetic foot ulcer. The Seattle Diabetic Foot Study. Diabetes Care. 1999;22(7):1036-42.
5. Frykberg RG, Habershaw GM, Chrzan JS. Epidemiology of the Diabetic Foot. Clinical Management of Diabetic Neuropathy: Springer; 1998. p. 273-90.
6. Statistics NCfH. Healthy people 2010: Final review: Government Printing Office; 2011.
7. Siavash M, Shokri S, Haghighi S, Shahtalebi MA, Farajzadehgan Z. The efficacy of topical royal jelly on healing of diabetic foot ulcers: a double-blind placebo-controlled clinical trial. International wound journal. 2015;12(2):137-42.
8. Steed DL, Donohoe D, Webster MW, Lindsley L. Effect of extensive debridement and treatment on the healing of diabetic foot ulcers. Diabetic Ulcer Study Group. Journal of the American College of Surgeons. 1996;183(1):61-4.
9. Sieggreen MY, Maklebust J. Debridement: choices and challenges. Advances in Skin & Wound Care. 1997;10(2):32-7.
10. Gottrup F, Jorgensen B. Maggot debridement: an alternative method for debridement. Eplasty. 2011;11(e33):290-301.
11. Bale S. A guide to wound debridement. Journal of wound care. 1997;6(4):179-82.
12. Mumcuoglu KY. Clinical applications for maggots in wound care. American journal of clinical dermatology. 2001;2(4):219-27.
13. Sherman R. Maggot therapy: the last five years. Bull Eur Tissue Repair Soc. 2000;7:97-8.

14. Cazander G, Gottrup F, Jukema G. Maggot therapy for wound healing: clinical relevance, mechanisms of action and future prospects. *J Wound Technol.* 2009;5:18-23.
15. Pavillard E, Wright E. An antibiotic from maggots. 1957.
16. RoBINSoN W, Norwood VH. Destruction of Pyogenic Bacteria in the Alimentary Tract of Surgical Maggots implanted in infected Wounds. *Journal of Laboratory and Clinical Medicine.* 1934;19(6):581-6.
17. Cazander G, van Veen KE, Bouwman LH, Bernards AT, Jukema GN. The influence of maggot excretions on PAO1 biofilm formation on different biomaterials. *Clinical orthopaedics and related research.* 2009;467(2):536-45.
18. van der Plas MJ, Jukema GN, Wai S-W, Dogterom-Ballering HC, Lagendijk EL, van Gulpen C, et al. Maggot excretions/secretions are differentially effective against biofilms of *Staphylococcus aureus* and *Pseudomonas aeruginosa*. *Journal of Antimicrobial Chemotherapy.* 2008;61(1):117-22.
19. Bowling FL, Salgami EV, Boulton AJ. Larval therapy: a novel treatment in eliminating methicillin-resistant *Staphylococcus aureus* from diabetic foot ulcers. *Diabetes care.* 2007;30(2):370-1.
20. Pinheiro MA, Ferraz JB, Junior MA, Moura AD, da Costa ME, Costa FJ, et al. Use of maggot therapy for treating a diabetic foot ulcer colonized by multidrug resistant bacteria in Brazil. *The Indian journal of medical research.* 2015;141(3):340-2.
21. Eron LJ. Maggot debridement therapy in the treatment of complex diabetic wounds. *HAWAII 'I MEDICAL.* 2011;70(6):121.
22. Tian X, Liang X, Song G, Zhao Y, Yang X. Maggot debridement therapy for the treatment of diabetic foot ulcers: a meta-analysis. *J Wound Care.* 2013;22(9):462-9.
23. Sherman RA. Maggot versus conservative debridement therapy for the treatment of pressure ulcers. *Wound Repair and regeneration.* 2002;10(4):208-14.
24. Igari K, Toyofuku T, Uchiyama H, Koizumi S, Yonekura K, Kudo T, et al. Maggot debridement therapy for peripheral arterial disease. *Annals of vascular diseases.* 2013;6(2):145-9.

25. Sherman RA, Pechter EA. Maggot therapy: a review of the therapeutic applications of fly larvae in human medicine, especially for treating osteomyelitis. *Medical and veterinary entomology*. 1988;2(3):225-30.
26. Namias N, Varela EJ, Varas RP, Quintana O, Ward GC. Biodebridement: a case report of maggot therapy for limb salvage after fourth-degree burns. *Journal of Burn Care & Research*. 2000;21(3):254&hyphen.
27. Sherman RA, Tran JM-T, Sullivan R. Maggot therapy for venous stasis ulcers. *Archives of dermatology*. 1996;132(3):254-6.
28. Bexfield A, Nigam Y, Thomas S, Ratcliffe NA. Detection and partial characterisation of two antibacterial factors from the excretions/secretions of the medicinal maggot *Lucilia sericata* and their activity against methicillin-resistant *Staphylococcus aureus* (MRSA). *Microbes and Infection*. 2004;6(14):1297-304.
29. Prete PE. Growth effects of *Phaenicia sericata* larval extracts on fibroblasts: mechanism for wound healing by maggot therapy. *Life sciences*. 1997;60(8):505-10.