Maggot debridement therapy in the treatment of non–healing chronic wounds in Kenya Republic

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This work had been funded by the Operational Program of Research and Development and co-financed with the European Fund for Regional Development (EFRD). Grant: ITMS 26240220030: Research and development of new biotherapeutic methods and its application in some illnesses treatment.

- In Slovakia, maggot debridement therapy was used for the first time in August 2003 at the Medical Faculty Hospital in Bratislava
- Sterile larvae of blowfly Lucilia sericata were prepared by the Institute of Zoology, Slovak Academy of Sciences
- A year later, non-profit organization MEDALT was established with the aim to develop biotherapeutic methods and to introduce this methods in clinical praxis in Slovakia
- Since 2010 research in the field of larval therapy is provided by the company SCIENTICA, s.r.o., which received the grant from Operational Program of Research and Development of European Union
- In the frame of this project, modern laboratory for production and research of sterile larvae was developed

- A new facility has been built at the KARI- Trypanosomiasis Research Centre, Muguga, with support from Kenya Government, Slovak Aid, Government National Programme, Scientica, Ltd. and the Institute of Zoology, Slovak Academy of Sciences, to produce sterile maggots for use in Kenyan hospitals

- The staff from the centre have been trained at the Institute of Zoology , Bratislava and in the facility of Scientica,Ltd.

- KARI-TRC is immediately able to introduce the same technique in Kenya, with a view to collaborating with local hospitals to introduce an alternative method of managing wounds in the country.

KARI- Trypanosomiasis Research Centre, Muguga

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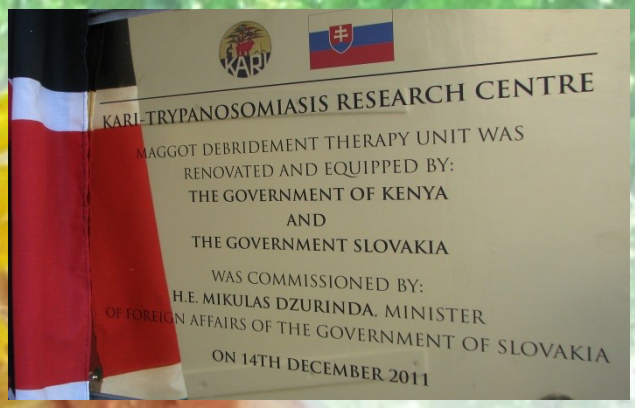


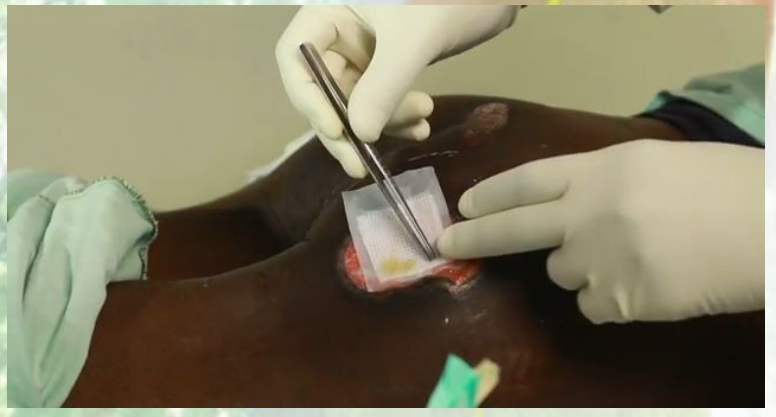
Tenwek Hospital, Bomet, Kenya

Tenwek Hospital, Bomet, Kenya

Training in Slovakia

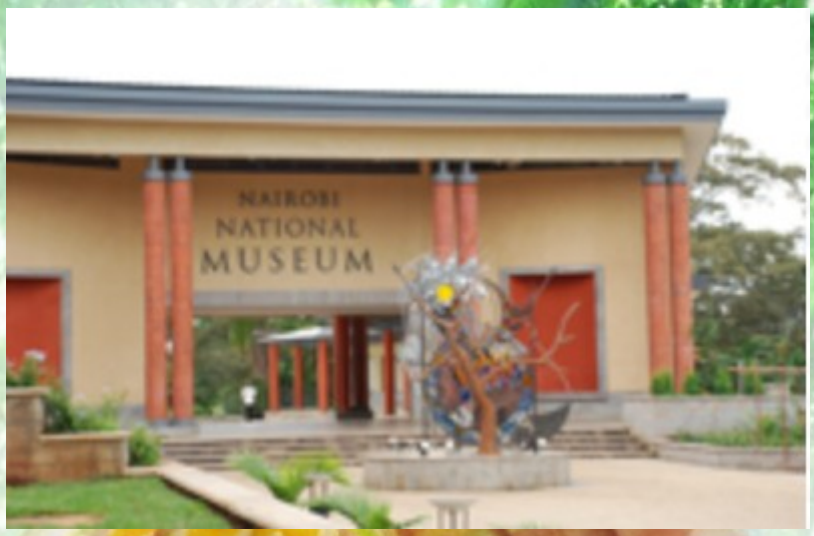
DR. Saratiel Nyabera Luginu
Moi Teaching & Referral Hospital, Eldoret, Kenya

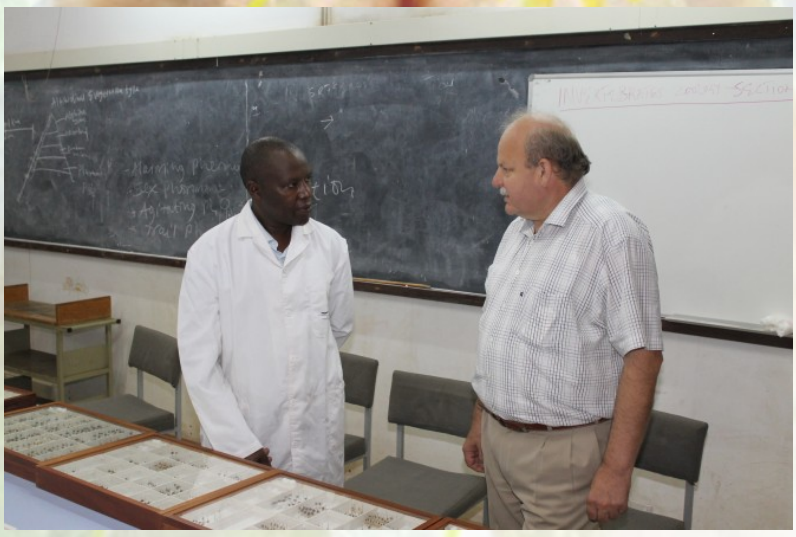
Kenyata National Hospital, Nairobi, Kenya



Včela medonosná *Apis mellifera*

Research on other Dipteran necrophagous insect





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Včela medonosná *Apis mellifera*

- **Maggot therapy (MT) is the therapeutic use of larvae of necrophagic/coprophagic flies**
- **only feed on dead organic material cultured in a sterile manner for the debridement of wounds**
- **The fly most commonly used is *Lucilia sericata* (or green bottle fly) but other species have been used with similar efficacy**
- **MT has also been called biosurgery or larval therapy (larval debridement therapy) and can be described as a carefully controlled process where an artificial theapeutic myiasis is induced**
- **The health care professional makes use of the natural ability of maggots to ingest necrotic or infected tissue without affecting healthy tissue, reducing bacterial burden locally and promoting wound healing**

Včela medonosná *Apis mellifera*

History of MDT

- Ambroise Paré in the 16th century was the first European to describe that the infestation of wounds with fly larvae was not harmful

- However, with the arrival of antibiotics and modern surgical techniques, by the beginning of the 40's, MT was quickly substituted and forgotten

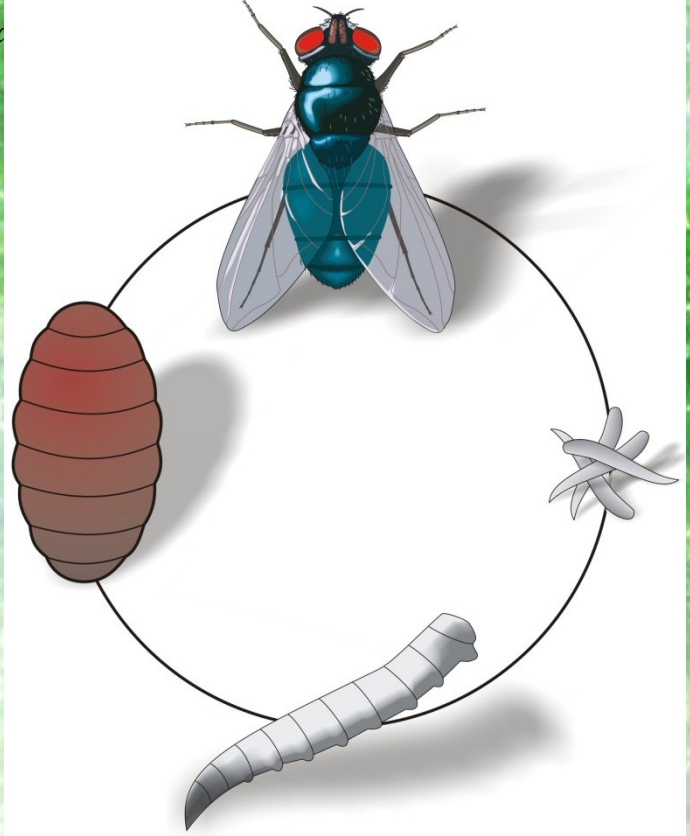
- Given the alarming increase in bacterial resistance, and the elevated cost of the care of patients with chronic wounds, Ronald Sherman, re-explored this therapeutic option beginning in 1982

- With excellent results and a decrease in costs,[20] soon the technique became popular again in all continents, the treatment is now cleared for marketing by the FDA in the United States of America, and it has benefited thousands of patients all over the world

- MDT is used in Slovakia since August 2003

- First sterile blowfly *Lucilia sericata* colony was established in the Institute of Zoology, Slovak Academy of Sciences in Bratislava
- First patients were treated on the 1stDepartment of Surgery, University Hospital and Faculty of Medicine, Comenius University in Bratislava

Včela medonosná *Apis mellifera*



Life cycle of the *Lucilia sericata* fly

- the life cycle of the fly *Lucilia sericata* is significantly influenced by temperature
- at 24°C last two weeks
- once the fly lays the eggs, these will hatch in 24 hours
- after this the minuscule larvae (1 mm) will start feeding and undergo through 3 larval stages
- maggots feed for 4 to 5 days and then look for a dry and dark place away from the necrotic matter to become pupae
- in the pupa stage they will remain for 3 weeks before they emerge as adult flies
- the adult fly will live about 3-5 more weeks and will mate for reproduction and consequently closing the reproductive cycle

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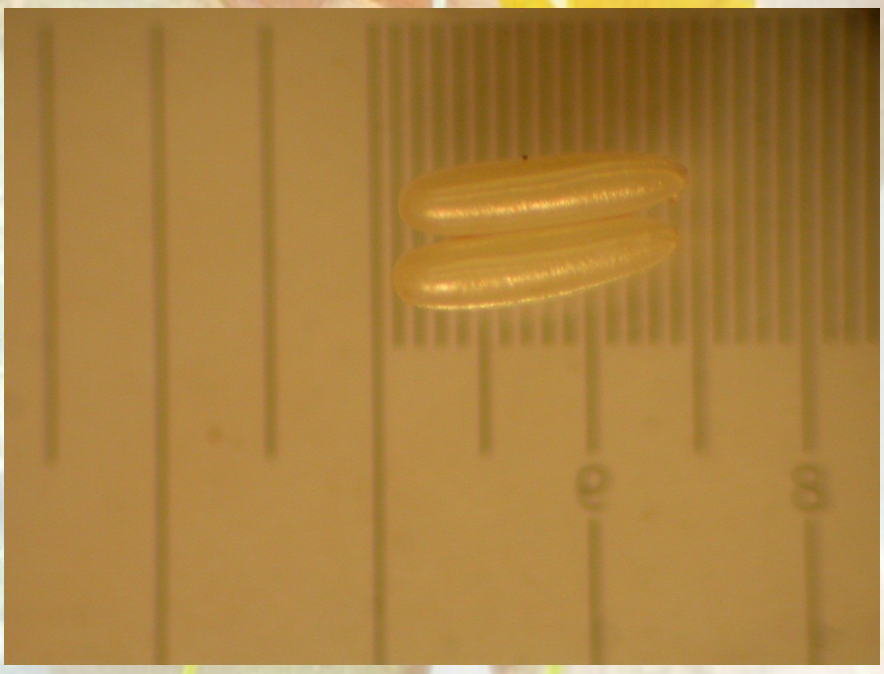
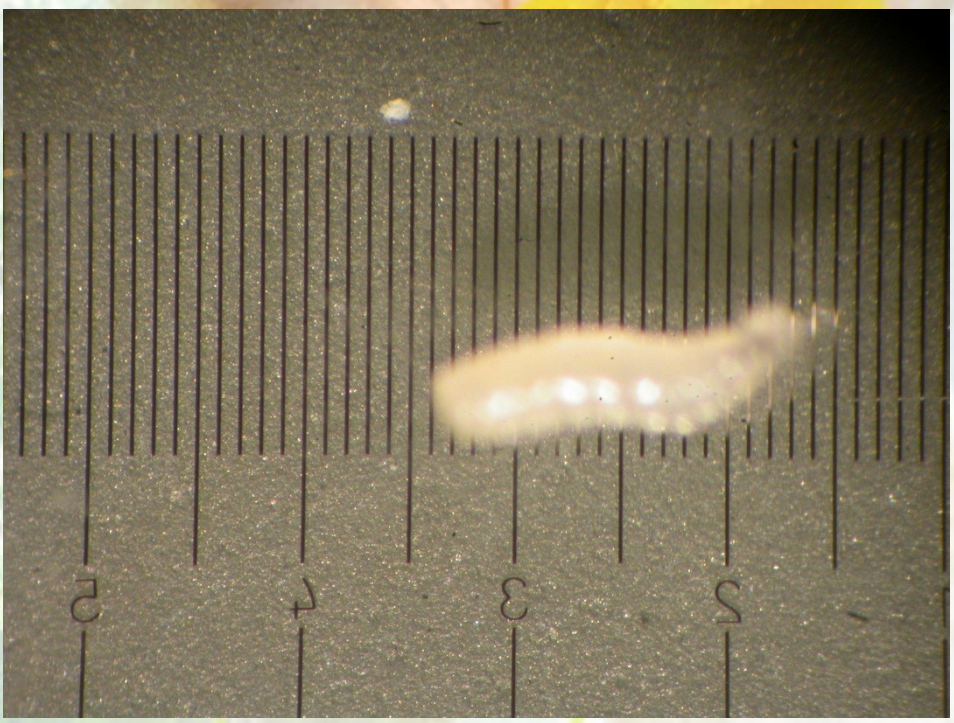
Eggs 1 – 2 mm 1 female – 250 eggs/load

24hours at 24°C



Včela medonosná *Apis mellifera*

1- st. instar larvae – 2mm
30 hours at 24°C



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2nd. Instar larvae 5 – 7mm
20 hours

3rd. Instar larvae 15 – 20 mm
40 hours

Praepupae – leave the food – dry place to pupate
100 hours

Pupa – 10mm
140 hours

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Eggs – incubated on the dried egg yolk

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Freshly hatched larvae 1-2 mm

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Larvae ready for transport to patients

Pupae

Adult Lucilia sericata

Freshly deposited eggs

Sterile larvae of Lucilia sericata

Sterile eggs

Debridement

- **Medical removal of a patient's dead, damaged or infected tissues or foreign bodies from the remaining healthy tissue**

- **In wounds it has the objective of improving the healing potential and decrease bacterial burden and the inflammatory response**

- **It can be carried out using several methods, some of those are:**

Enzymatic: **with the application of exogenous enzymes (collagenase, streptokinase, papain-urea, etc.), that act synergistically with endogenous** enzymes.

Autolytic: **disintegration or liquefaction of necrotic tissues by leucocytes and endogenous enzymes. Their actions depends on the hydration of the tissues** through **the use of water containing dressings such as hydrogels or occlusive dressings.**

Surgical: **it is performed with scalpel, scissors or curette. It is indicated in the presence of thick adherent eschars, devitalized tissue over large areas or deep areas, signs of celullitis and urgently in the presence of sepsis, and to eliminate bone or tendon. It can be performed in the operating room under anesthesia or as an outpatient procedure when there is no risk of bleeding, infection and the pain is controlled.**

Indications of MDT

- Wide spectrum of non-healing skin wounds and soft tissue defects
- Neuropatic, diabetic and ischemic ulcers
- Pressure ulcers
- Venous ulcers
- Non-healing traumatic wounds
- Burned skin
- Eradication of resistent wounds colonized by actinomycetes and meticillin resistant Staphyloccocus aureus (MRSA)

Absolute contraindications

- Rapid spreading infection = urgent surgery
- Patient`s disagreement
- Allergy

Relative contraindications

- Osteomyelitis
- Arterial insuficiency
- Dry wound
- Pseudomonas aeruginosa huge infection

Possible adverse effects

- pain
- anxiety
- escape of maggots
- infection
- „invasive myiasis“
- imune organism reaction
- occasionally strong erytema or eczematose dermatitis
- alergy

- In the last 7 years we have established this technique as a new possibility for patients with chronic non-healing wounds

- We have established a production of sterile maggots, founded a teaching center in University Hospital Bratislava, and have began to spread this method all around in Slovak republic

- Up to now to 15 Hospitals

- We have treated hundreds of patients with chronic non-healing wounds with remarkable results:

- Remarkable microbial changes - only Proteus mirabilis sensitive to all common used antibiotiocs
- MDT – generally very good tolerated by our patients, sometimes painfulness reacting on long-lasting analgetics and in some patients on morphine derivates
- Reduction of wound`s malodour and fluid production
- Massive debridement and granulation tissue growth
- Some patients – complainces on tickling and prickling
- Unpleasant complication – migration of maggots „biobags“

Maggot debridement therapy (MDT) has become a new modern modality to treat chronic non-healing soft tissue wounds, such as pressure ulcers, venous ulcers, neuropatic wounds etc.

MDT - is essentially a wound myiasis controlled such that benefits outweigh the risks.
The effect of MDT is a complex activity of maggots excrements. MDT works in three levels:

1. debridement
2. sterilisation and
3. improving healing and tissue grow due to many cytokines produced by larvae.
4. Inhibition of biofilm

M.D.T.

Effect mechanism

Antibiotics factors produced by larvae

Cytokins and tissue grow factors

Increased oxygenation

metabolic effect of Proteus mirabilis

vasodilation

This method is based on application of sterile maggots of blowfly Lucilia sericata to soft tissue wounds in two possible ways:

1. direct application

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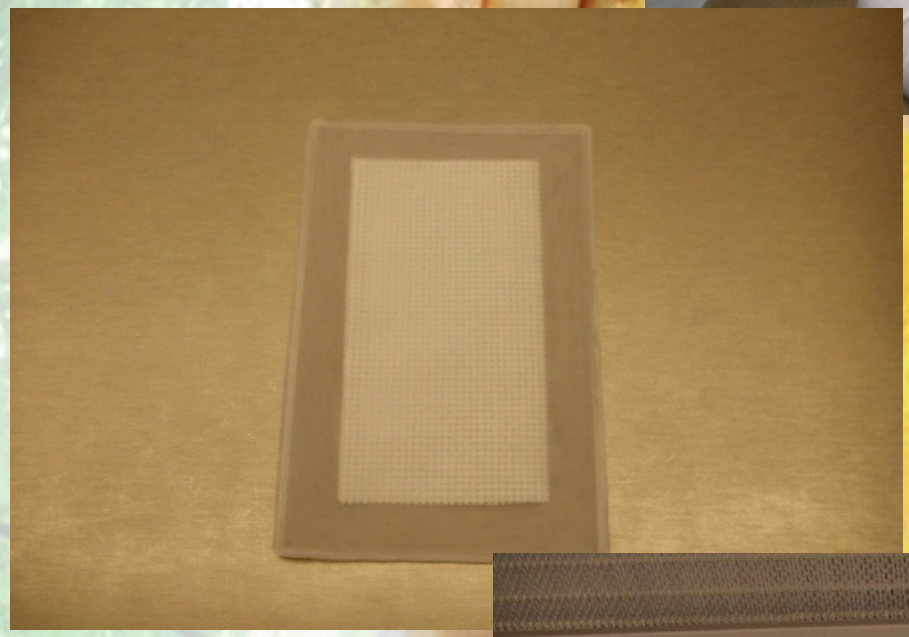
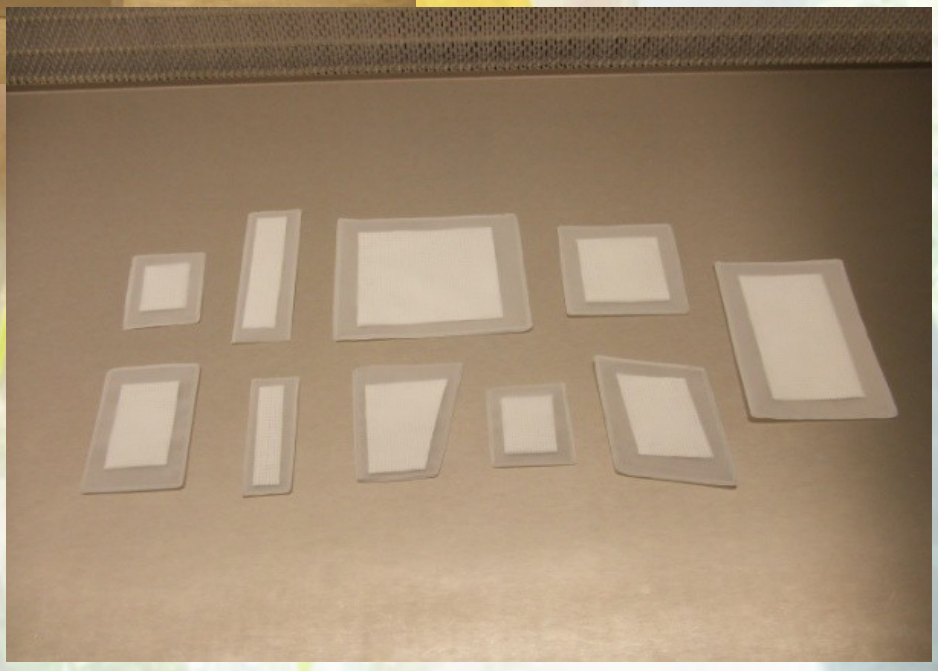
2. „biobag“application





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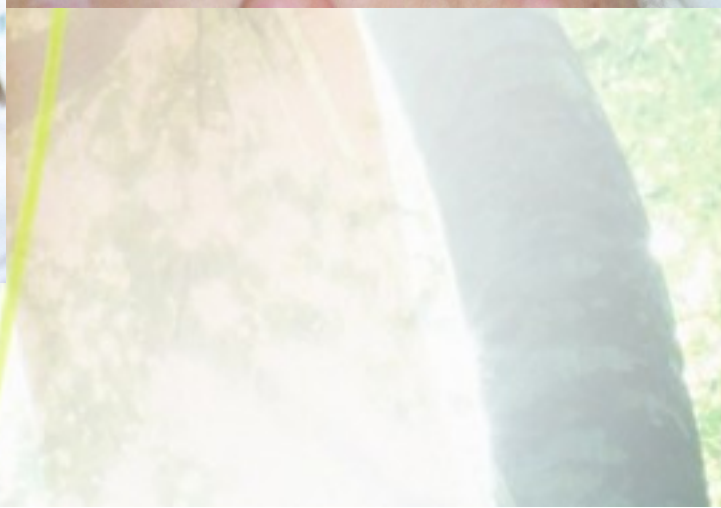

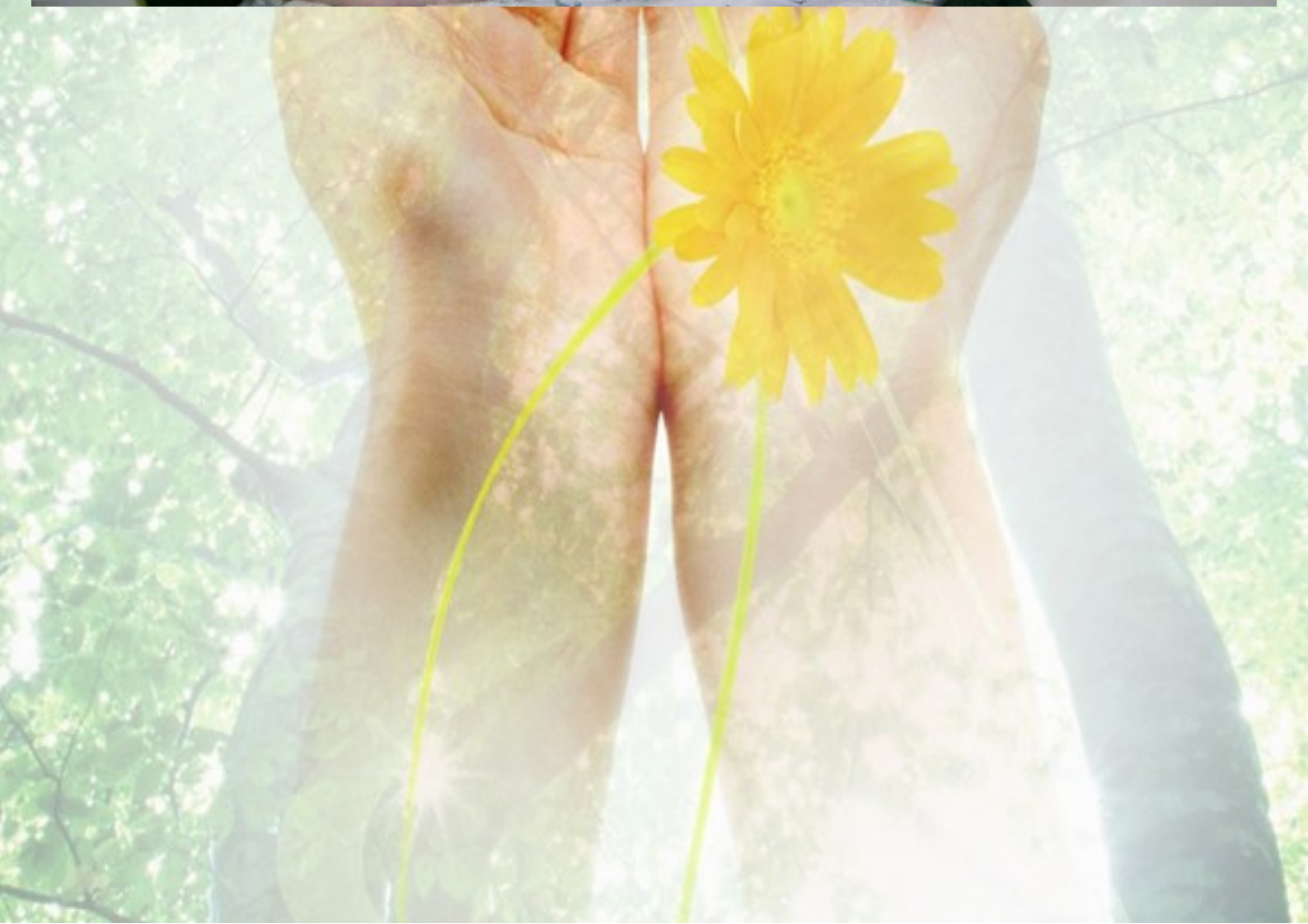








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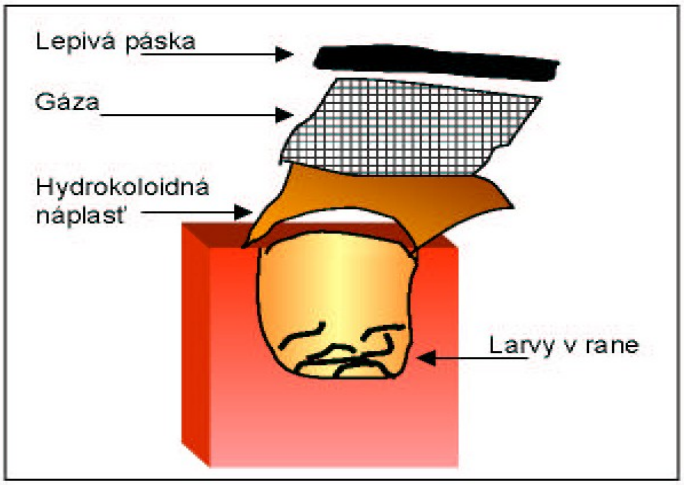
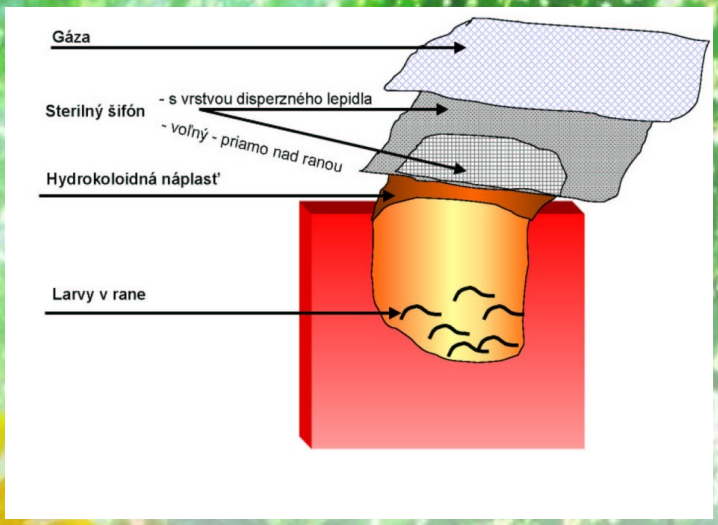
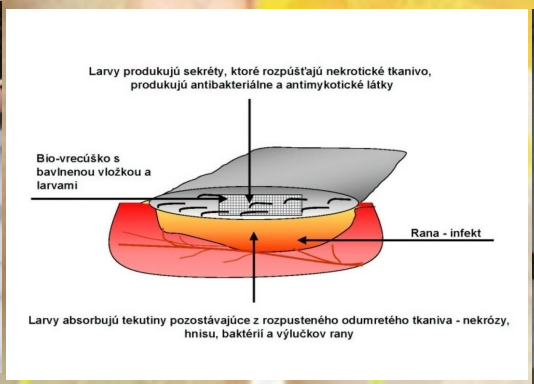
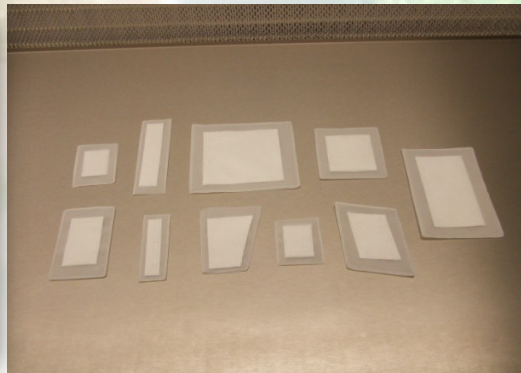

Lepivá páska
Gáza
Hydrokoloidná náplasť
Larvy v rane

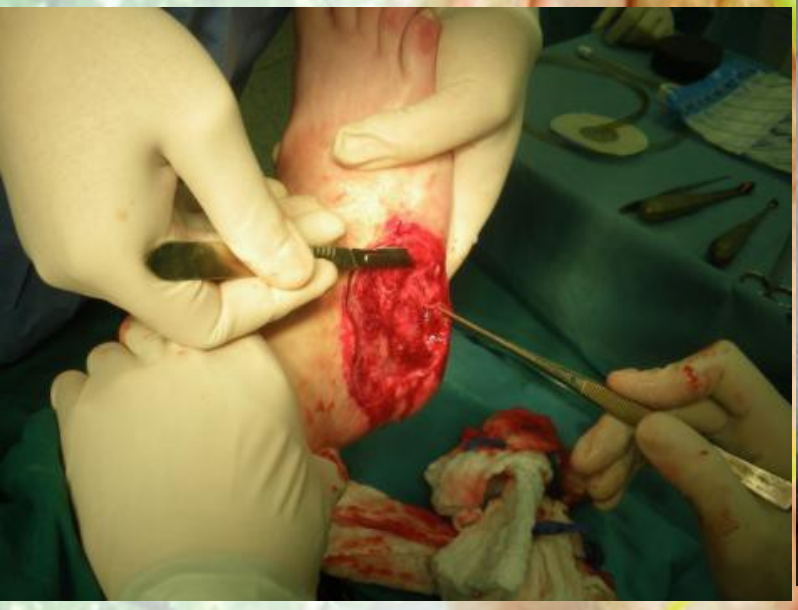

Gáza
Sterilný šifón
- s vrstvou disperzného lepidla
- voľný - priamo nad ranou
Hydrokoloidná náplasť
Larvy v rane

Biobags


Larvy produkujú sekréty, ktoré rozpúšťajú nekrotické tkanivo, produkujú antibakteriálne a antimykotické látky
Bio-vrecúško s bavlnenou vložkou a larvami
Rana - infekt
Larvy absorbujú tekutiny pozostávajúce z rozpusteného odumretého tkaniva - nekrózy, hnisu, baktérií a výlučkov rany



Príklad úspešnej liečby



Včela medonosná *Apis mellifera*

TAKE HOME MESSAGE:

Maggot debridement therapy is a safe, reliable, cost-saving and very effective method in management of chronic non-healing wounds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Thank you for your attention