

Critical Review on Maggot Therapy

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Abstract:- Healing of ulcers is one of the major problem starting from *Vedas & Puranas* till now, and now a days ulcers are becoming resistance to conventional therapy. But when modern medicine fails it is useful to draw ideas from ancient methods. Maggot therapy is such an alternative method for treatment for treatment of chronic, Non-healing, infected wounds. And now a day's recently increasing around the world due to its efficacy, safety and simplicity. A very few references are available related to maggot therapy in our Samhitas, But the first reference related to maggot therapy was found in Sushruta Samhita¹ Chikitsa Sthana 18th chapter in contest of *Kaphaja Arbuda Chikitsa*. Similar concept is explained in Ashtanga Sangraha² 35th chapter, and Ashtanga Haridaya³ 30th chapter in *kaphaja Arbuda Chikitsa*. Hence, Acharya Sushruta is not only the father of surgery but father of maggot therapy too. In this article an attempt is made to understand the maggot therapy.

Keywords:- Alternative procedure, Tiny surgeons, Maggot therapy, Ancient method.

I. INTRODUCTION

The available references say that maggot therapy was started during the late 1920s by Dr. William Bear, at Johns Hopkins University in Baltimore, Maryland. He first studied lifecycle of maggots, successfully treated the wounds and published a series of articles. And he recommended to rear and disinfects the maggots and he is the one to recommend application of specific species of blow flies. This method of Wound debridement has been explained in our classical treaties in *Sushruta Samhita*¹ by the name of *Krimi Utpattikara Chikitsa* in the context of *Kaphaja Arbuda Chikitsa* in :*chikitsa Sthana* 18th Chapter : *Granthypachyarbudagalagandachikitsam*

Kapotaparavathavidvimishraihi Sakansyaneelaihi
Shukalanganalakhayaihi| Mutraisthu Kakadanimoolamihraihi
Ksharapradighairathva Pradihyath|| ||18\36||

*Nishpavapinyakakulathakalkairmamamsapraghadairdh
adhimastuyuktaihi| Lepam Vidadyath Krimayo yatha atra
murchanti munchanyatha makshikashcha ||37||
Alpavashisthe krimibhaskshisthe cha likheth tathiagnim
Vidadheetha Paschath | (18\ 36- 37)*

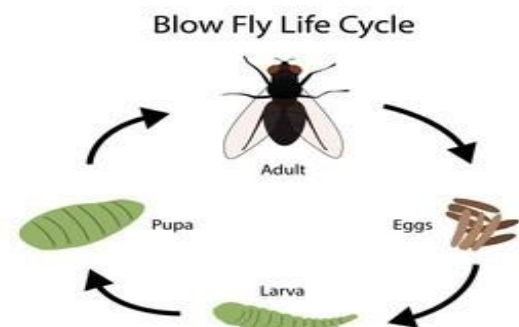
While explaining the *Chikitsa* for *Kaphja Arbuda* Acharya advices to apply *Kalka* of *Nishpava* (*Shimbi Dhanya* -*Cyamopsis tetragolobus*, *Vigna catjang*, *Dolichos lablab*), *Pinyaka* (*Tilakitta*), *Kulattha* (*Dolichos biflorus*) mixed with *Mamsa*, *Dadhi* and *Mastu*. This application attracts the flies,

and the flies produce *Krimi*. In turn these *Krimi* ingest the unhealthy part of *Arbuda* and thus cleaning the lesion.

II. BIOLOGY OF MAGGOTS

- Maggots are whitish transparent, worm like organism , Average length is 3 to 9mm.
- Body of maggot is tapered and the end where mouth is located is smaller than rest of their body. Pair of Mandibles (Hook), helps in: Locomotion & Attachment.

III. LIFE CYCLE OF BLOW FLY



IV. REARING OF MAGGOTS

- Selection of fly species:
Mainly the species which fed over putrefied materials only are used. For eg. *Lucilica Sericata*, *Phormia Regina*.
- Fly cage design:
These are square or rectangular frames, covered by nets.
- Collection of eggs:
Twice a week.
- Maggots rearing chambers:
These are made up of plastic.
- Maggots sterilization and clinical preparation:
Eg. Lysol, Mercuric chloride.

V. MAGGOT THERAPY

Maggot therapy is a type of biotherapy involving the introduction of live, disinfected maggots into non-healing skin and soft tissue wounds of humans for the purpose of cleaning out the necrotic tissue. It is also called MDT. In 2004 FDA granted permission for maggots as "Medical device" in the US for the purpose of treatment.

Synonyms : Larval therapy, Bio –debridement, Bio-surgery, Maggot debridement therapy, Larval debridement therapy.

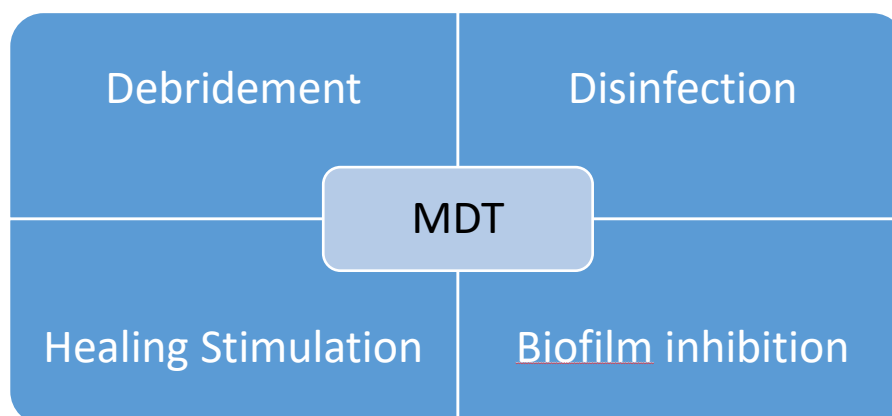
VI. INDICATIONS OF MAGGOT THERAPY⁵

Sr. No.	Indications
1	Non- healing soft tissue wounds
2	Chronic, infected wounds
3	Pus producing infections
4	Gangrenous wounds
5	Necrotic tumors

VII. CONTRAINDICATIONS OF MAGGOT THERAPY⁵

Sr. No.	Contraindications
1	Sinus
2	Fistula
3	Dry eschar
4	Heavily exudating wounds
5	Clotting disorders
6	Patients under anti-coagulant therapy

VIII. PRINCIPLES⁶ OF MAGGOT THERAPY



• **Debridement:**

With the help of proteolytic enzymes (metalloproteinase, aspartylproteinase) and mechanical, physical (crawling, poking, scratching) action of maggots leads to debridement.

• **Disinfection:**

Maggots secretions contain a broad spectrum antimicrobial effect due to presence of allantoin, urea, phenyl acetic acid etc.

• **Biofilm inhibition:**

Maggots secretions contains chymotrypsin I. This chymotrypsin I is responsible for collagen fibers present in biofilm.

• **Healing stimulation:**

Maggots are clinically effective to debride the necrotic tissue, thus promotes healing.

• **Anti tumour activity:**

Maggots are clinically effective to debride the necrotic tissue, thus effective in debriding the necrotic tumor mass.

• **Anti- inflammatory activity :**

Maggots secretions inhibits the production of the pro-inflammatory cytokines and macrophage migration inhibitory factors by lipo- poly sacchrides and lipoteichoic acid stimulated monocytes, while enhancing production of anti-inflammatory cytokine.

• **Fibroblast Migration \ Proliferation:**

Maggots secretions contains Serin-proteinase, that increases fibroblast motility and co-ordinates cellular response, increases cell metabolism and leads to fibroplasias.

• **Anti atherosclerosis activity:**

Maggots secretion decreases level of serum triglyceride, total cholesterol and low density lipoprotein, thus having a effective role in atherosclerosis.

IX. PHARMACOLOGICAL PROPERTIES⁷

• **Antibacterial & Anti fungal activity:**

Maggots secretions are alkaline in nature, they inhibits bacterial and fungal growth by rising the wound P_H for Eg. Calcium carbonate, Ammonium carbonate etc.

X. GUIDELINES^{8,9} FOR USING STERILE MAGGOTS

Sr. No.	Guidelines
1.	Assessment to determine maggot therapy is appropriate
2.	Obtain informed consent
3.	Documentation of wound (Size, site, depth etc.)
4.	Selection of procedure (Direct, Indirect method)
5.	Determine the no. of maggots required (Approx. 10 maggots per sq. cm of wound)
6.	Storing sterile maggots (should not be stored)*
7.	Preparation of maggots (5ml sterile saline is added)
8.	Removing of maggots from container (Pouring the saline over sterile net), it should not be done too quickly.
9.	Preparation of wound site(Cleaning)
10.	Applying maggots to wound (Direct, Indirect method)
11.	Dressing (two layered cage like dressing) Bottom Layer: Hydrocolloid sheet, and top layer: Gauze that can be replaced periodically.

*Can be stored under exceptional circumstances over floor of the fridge, upto 3 days, and before using the stored maggots they are allowed to return to room temperature.

XI. METHODOLOGY^{10,11,12,13}

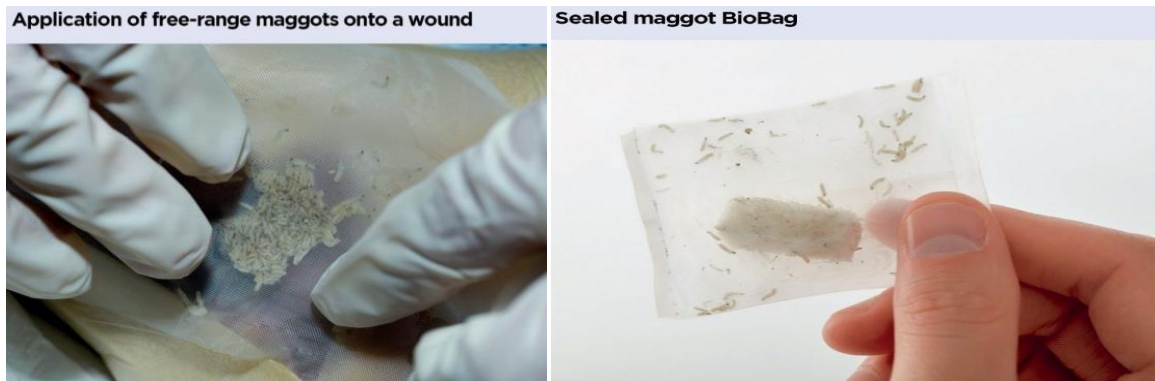
• PROCEDURE OF MAGGOTS APPLICATION¹¹

Currently, there are two methods of larval application:

Methods of larval application

Sr. No.	Methods	Procedure
1.	Free-range method (Direct method)	They arrive in a sterile tube and, with the help of a small pod of sterile saline, can be gently poured over a sterile gauze and are directly onto the wound. Free-range maggots are applied directly onto the wound, The wound is then well sealed with a breathable dressing. The maggots are free to roam within the wound bed.
2.	Bagged method (Indirect method)	Larvae are enclosed between two layers of thin polyvinyl netting. After placing the bag over the the site, it is covered with wet gauze and a light bandage are wrapped over the net. The larvae remain sealed inside the bag throughout the whole treatment period.

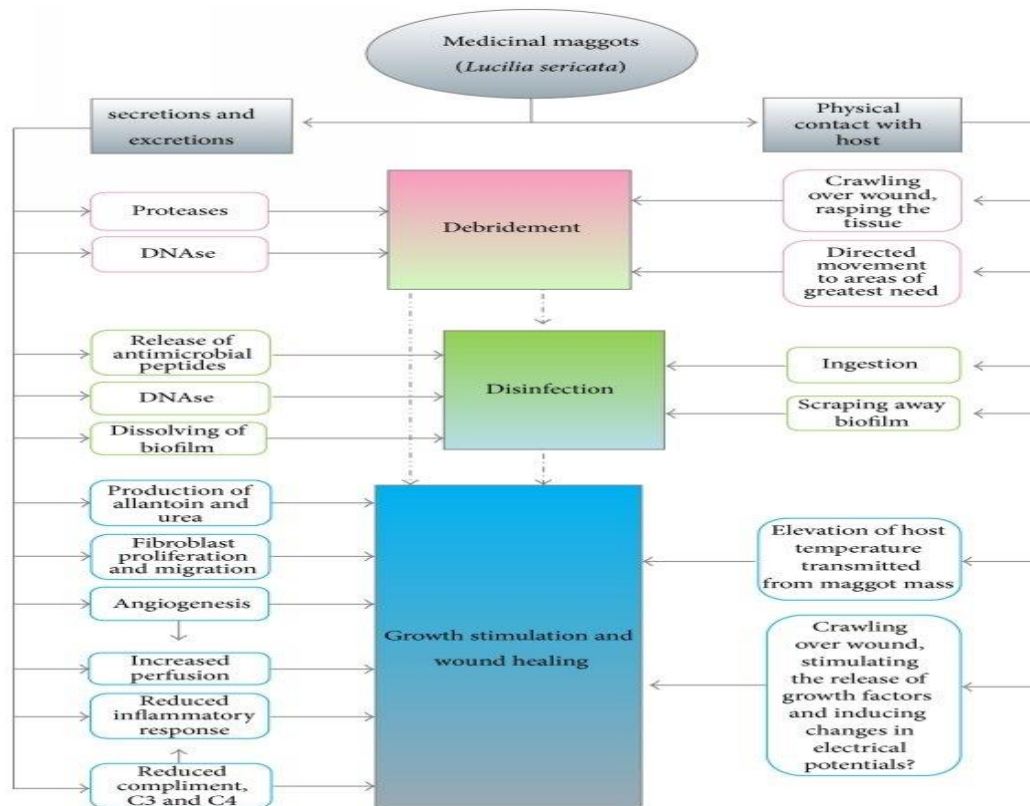
Pictures Showing Methods of larval application



• Duration of therapy^{14,15}

- Bio-Bags or free-range larvae remain on the wound for three to seven days per application.
- The number of fresh maggot therapy applications required for complete wound.

Overall Mechanism of Maggot therapy¹³



XII. DISCUSSION

Damp surfaces, compost, manure, decomposing organic material, old rotting food are the favourite habitat

for the larvae. These rotting food/waste materials release methane gas which attracts flies. In the same way a moist, exudating wound with sufficient oxygen supply is a prerequisite for maggot therapy. Wounds which are dry or

open wounds of body cavities do not provide a good environment for the maggots to feed.

Maggot therapy is widely practiced in the Western countries as a main stream of treatment in wound debridement. Current status of maggot therapy: Near about 23 laboratories, >30 countries, >50,000 treatment/year are under maggot therapy.

XIII. CONCLUSION

- Bio Therapeutics Education and Research foundation (www.BTERfoundation.org) is dedicated to advancing health care by supporting education and research in biotherapy.
- Maggot therapy is a controlled, therapeutic myiasis (maggot's infestation). The method of treatment and the potential complications are predicated by studying the natural history of myiasis.
- Not all species are therapeutic or safe. Clarity is still needed regarding maggot therapy's role in promoting wound closure.
- Maggots are clinically effective for debridement, leaving a wound free of necrotic tissue. Secondary benefits of maggot therapy includes reduction of wound bacterial load and an promotes wound healing.

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