History of maggots: nature’s best surgeons brought back to fight the war

J. Natkunarajah, A. Abdul-Wahab, S. George and C.C. Harland

Dermatology – Epsom and St.Helier University Hospitals NHS Trust

Trials and tribulations

“Tis a lesson you should heed, try, try again”


Maggots: an ancient remedy

“Leave them, they will clean it, wait and see”

(Gladiator, DreamWorks SKG, 2000)

Ancient cultures throughout the world have successfully used maggots (fly larvae) to cleanse suppurating or gangrenous wounds. The Mayan Indians of Central America used to ceremoniously wrap wounds with dressings made of sun-exposed beef blood that would pulsat with larvae a few days after they were applied.1 The Njmeba aboriginal tribe of New South Wales, Australia, have also used maggot therapy for thousands of years.2 During World War II, the Burma Hill People were observed placing maggots on wounds and covering them with mud and wet grass.3 The Old Testament is the oldest known document to cite myiasis, in which humans are infected with maggots. It described Job who complained, “My body is clothed with worms and scabs, my skin is broken and festering.”4 However, the first medical reference to maggots appeared in the Hortus Sanitatis, one of the earliest European medical texts, published in 1491.5 (Figure 1)

Nature’s best surgeons at work during the wars

“...Shall worms, inheritors of excess,
Eat up thy charge? Is this thy body’s end?”

(William Shakespeare, Sonnet 146)

Ambrose Pare (1510-1590), the chief surgeon to Charles IX and Henri III was the first to observe the beneficial effects of fly larvae on suppurating wounds of soldiers on the battlefield of St Quentin, 1557.6 (Figure 2) He observed a wounded soldier with a deep penetrating skull wound filled with a “great number of worms... from underneath the patefied skull” and he noticed that the “patient recovered beyond all men’s expectation.”7,8 Pare, like many of his contemporaries, believed that maggots developed spontaneously as part of the putrefaction process of necrotic tissue.6

Baeer carried out a “great many experiments... using various sterilizing solutions, such as bicloride of mercury, strength one part in 1,000, phenol, alcohol, argyrol, mercurochrome, gentian violet, hexylresorcinol and silver nitrate... Most of these experiments were very unsuccessful, due to the fact that either the egg embryo was killed or the bacteria survived.”9 Eventually, Baeer pioneered a sterilization technique of the eggs using a solution containing mercurochrome 1 in 1000, 25% alcohol and 0.5% hydrochloric acid.

Followings Baer’s scientific published work in 1931,10 maggot therapy soon flourished in North America and Europe during the 1930s and early 1940s. During the 1930s, the Lederle Laboratories were the first pharmaceutical company to mass produce sterile Lucilia sericata larvae commercially in the USA.11 (Figure 5)

However, the use of maggot therapy declined by the 1940s, following Alexander Fleming’s discovery of penicillin and its mass production and advances in surgical techniques.12 Maggot therapy was soon reduced to a ‘treatment of last resort’ for intractable wounds and went into hibernation for almost 40 years.13

THE WAR AGAINST ANTIBiotic RESISTANCE

Maggot therapy has been rediscovered and undergone a quiet renaissance with the emergence of antibiotic resistance. Although the mechanisms of action are not fully understood, maggots’ therapeutic effects include debridement, disinfection, and promotion of healing.14 During the 1980s, Dr Ronald Sherman in the United States conducted a series of prospective and retrospective studies which showed convincing evidence that maggot therapy was more effective and efficient in wound healing than other non-surgical methods.15,16 Maggots have been shown to secrete substances with activity against methicillin-resistant Staphylococcus aureus (MRSA) and other bacteria.17 (Figure 6) There is now an increasing trend to use maggots for wounds infected with MRSA.

If history has taught us anything, it is that the ancient remedy of maggot therapy still has an active role to play in modern medicine.

An ancient Roman proverb states: “Medicus curat, natura sanat”: the physician treats, nature does the healing.

Figure 3- Dissection of William Baer (1782-1797), Department of Orthopaedic Surgery, Johns Hopkins School of Medicine (Courtesy of Carl Nachtigal-Helker, John Hopkins School of Medicine, Baltimore)

Figure 4- Life cycle of maggot, Courtesy of Dr. J.W Morgan, Zoological Inst, Bridgwater, UK

Figure 5- Pupa 10-20 days

Figure 6- Blood agar plate showing Staphylococcus aureus—courtesy of microbiologist St. Helier Hospital

Supplemental references:


*Figure 1- Hortus Sanitatis, 1491. Wellcome Library, London. *Figure 2- Coloured line engraving of Ambrose Pare healing the wounded By C. Marpurg. ‘Welcome Library, London.’

In 1829, the famous Baron Dominique Larrey (1766-1842), Napoleon’s battlefield surgeon who invented the field ambulances, also recognized the accelerated healing and enhanced granulation tissue following myiasis in battle wounds during the Syrian campaigns. He observed that, “while the process of suppuration of their wounds was going on, the wounded were much annoyed by the worms or larva of the blue fly... These larvae are, indeed, greedy only after putrefying substances, and never touch the parts which are endowed with life.”1

The first official documented application of maggots took place during the American Civil War (1861-1865), John Zacharias (1857-1901), a Confederate surgeon, reported that, “I used maggots to remove the decayed tissue in hospital gangrene and with eminent satisfaction. Maggots in a single day would chew a wound much better than any agent we had at our command. I am sure I saved many lives by their use.”18 However, it was not until William Baeer (1872-1931) also noted the beneficial effects of myiasis in wounds on the battlefield in France during World War I that I had the therapeutic use of maggots gained popularity. He observed two soldiers with various compound fractures of the femur that presented without irradiation at a time where the mortality rate for compound fractures of femurs was around 75-80%.19

“The removing the clothing from the wounded part, much was my surprise to see the wound filled with thousands and thousands of maggots, apparently those of the blow fly. Instead of having a wound filled with pus, as one would have expected...these wounds were filled with the most beautiful pink granulation tissue.”19