Research article

From larva to antibiotics: history of treatment of osteomyelitis

Raffaele Pezzella(1), Enrico Manzi(2), Michele Bisaccia(3), Giovanni Colleluori(3), Andrea Schiavone(3), Giuseppe Rinonapoli(3), Cristina Ibáñez Vicente(3), David Palmieri(3), Pellegrino Ferrara(3), Luigi Meccariello(3), Auro Caraffa(3).

1. Clinic Of Orthopedic and Traumatology, IInd University Of Naples, Naples, Italy.
2. U.O. Orthopedic and Traumatology, Tarquinia Hospital, Tarquinia (Viterbo), Italy.
3. Division of Orthopedics and Trauma Surgery, University of Perugia, S. Maria dellaMisericordia Hospital, Perugia, Italy

Corresponding Author:
Luigi Meccariello, MD
Division of Orthopedics and Trauma Surgery, University of Perugia, S. Maria dellaMisericordia Hospital, Perugia, Italy

E-mail: drlordmec@gmail.com

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Abstract

Maggot therapy (also known as maggot debridement therapy (MDT), larval therapy, larva therapy, larvae therapy, biodebridement or biosurgery) is a type of biotherapy involving the introduction of live, disinfected maggots (fly larvae) into the non-healing skin and soft tissue wound(s) of a human or animal for the purpose of cleaning out the necrotic (dead) tissue within a wound (debridement) and disinfection. Antibiotics, also called antibacterials, are a type of antimicrobial[1] drug used in the treatment and prevention of bacterial infections. They may either kill or inhibit the growth of bacteria. A limited number of antibiotics also possess antiprotozoal activity. Antibiotics are not effective against viruses such as the common cold or influenza, and their inappropriate use allows the emergence of resistant organisms. In 1928, Alexander Fleming identified penicillin, the first chemical compound with antibiotic properties. Fleming was working on a culture of disease-causing bacteria when he noticed the spores of a little green mold (Penicillium chrysogenum), in one of his culture plates. He observed that the presence of the mold killed or prevented the growth of the bacteria. We reported the history from the maggot to the modern antibiotics.

Keyword: Stair, osteomyelitis, antaibheathaigh, sulfonamides, Maggot's larbhaí
Introduction:

Osteomyelitis always have been the consequences of infectious diseases or traumatic events, which have affected the musculoskeletal system, difficult to treat. Since the birth of the doctors medicine have tried to cure them with many different methods by the larvae, boiling oil, through the gunpowder up to the antibiotic therapy and baro therapy.

This was the pre-antibiotic

"I have often seen neglected wounds ... full of worms ... as far as my experience extends, these worms only destroy dead tissue, and not to hurt the parties specifically good"
Dr. Joseph Jones

Before the discovery of antibiotics mortality from osteomyelitis was very high, such as during the Roman wars the sword the sword of the normal equipment of the soldiers was manufactured in a way that does not kill instantly, but to cause peritonitis or osteomyelitis. Already in the era of the ancient Egyptians was proven therapy for the treatment of necrotic wounds. They have written records that document how the larvae in and infected by the Maya Indians and Aborigines in Australia. There were small writings that reported the use of larvae also reports of larvae during the Renaissance. During the war, many military doctors have observed that soldiers whose wounds were colonized by larvae and worms had a significantly lower morbidity and mortality of soldiers whose wounds were infected only. These doctors including those of Napoleon as the general surgeon, Baron Dominique Larrey, who brought various series during the Egyptian campaign in Syria and in France, 1798-1801, that some species of flies could through their larvae destroy dead tissue and had a positive effect on the healing of wounds from bullets. Another surgeon war, Dr. Joseph Jones, reported the same observations The first therapeutic use of maggots is credited to a second Confederate medical officer Dr. JF Zacharias, who reported during the American civil war, "The larvae ... in one day would be able to clean a wound much better than any other agent that we have ... I am sure to save many lives with their use. "He recorded a high survival rate in patients who have dealt with the larvae. During this period the whole way they used causticare wounds with gunpowder causing considerable gangrene in patients, other methods were disinfecting tissue with distilled alcohol. During World War II, Dr. William S. Baer, an orthopedic surgeon, recognized on the battlefield effectiveness of the larvae in the healing of war wounds, which are very easily infested as the soldiers fighting in the muddy trenches. Baer said a soldier remained for several days on the battlefield with compound fractures of the femur and injuries in much of the abdomen and scrotum. When the soldier arrived at the hospital, he had no signs of infection, despite the severity of his injuries and his prolonged exposure to the weather, without food or water. Baer says: << When his clothes were removed, it was seen that "thousands and thousands of larvae had filled the entire wounded area. When these larvae were removed there was virtually no visible bone and tissue were rosy as the surrounding parts, a result that could not >>. This event took place at a time when the death rate for compound fractures of the femur was about 75-80%. Nowadays, modern studies by the work Dr. Baer showed how these larvae have the capacity of debridement and wound repair leveraging their secreted as allantoin, urea, phenylacetic acid, calcium carbonate, and proteolytic enzymes. During World war II there was also the experience Ernest Hervey Groves, who developed a modern extraction system and drainage for infected tissues.

The era of antibiotics

The First World War had shown what they were terrible infections taken in the trenches, or from wounds received in battle fields. Science moved to find some medicine to fight infection. The first was the penicillin of Alexander Fleming. The discovery of antibiotics, however, should be backdated to mold comments from the Molise Vincenzo Tiberio. Tiberius Noo as neighbors to Arzano and the periodic disinfection of the well from which they drew their drinking water. So it was that he began to study the mold and taken the experiments that led him to discover their bactericidal capacity. In 1895 the young doctor wrote a report of its findings, entitled "On the extracts of certain molds" all this in 1895. Once married decided to live in Arzano, Naples. The house Arzano also proved good choice for the professional growth of the young, because that corner of the rustic world allowed him to continue to exercise their powers of observation on the nature; indeed, it was there that he discovered the strange behavior of some mold inside of the house well. In fact, every time the walls of the well were cleared by the presence of such fungi people who drink water drawn from the same well showed intestinal disorders until the formation of new mold. Tiberius, who became the next year assistant at the Institute of Hygiene of the University, headed by Prof.. De Giaxa, turned his attention to the ifomices. However the action of the mold was known to the doctors of ancient Greece and Rome, who used it in the form of a pulp to cover the wounds, in order to prevent festering. In 1895, after the publication of his work Vincenzo Tiberio took part in the competition for 2nd class medical in maritime health body, and won. In Tiberius there was a desire to know the world and to expand their own culture and their own experiences as well as a fervent patriotism as well give up his
career as a brilliant young assistant professor and author of a study of considerable interest to enter the Navy. After several expeditions in which was his prerogative prevention of diseases related to life on the sea administration of precise food rations to sailors, he distinguished himself especially in the expedition to Zanzibar where he managed to treat sailors suffering from smallpox and beriberi through integration of the cinchona plant and iron extracted. Back in Italy was activated to bring relief to the populations hardest hit by the terrible earthquake of 1905 that destroyed Messina and Reggio Calabria, thus managing to rescue more than 2,000 people. "For being reported in industriousness, courage, philanthropy and dedication" he received an important recognition. In March 1912, Tiberius was appointed director of the military hospital bacteriological cabinet of La Maddalena, where he remained until November of the same year; and, even in such a limited time he was able to give his research footprint, focusing in particular on issues related to malarial infections were widespread at that time in that area. Then he was transferred to Libya, on January 13 of 1913 he reached Tobsrück to take the position of director of the Laboratory of analysis of that infirmary. At that he led to complete studies, later documented in an important scientific work on "Libyan Pathology and typhoid vaccine." Vaccination typhoid, which he placed in a timely manner, avoided the taking root of the disease in the Royal Navy personnel so that occurred in 1913 only two cases of modest clinical entity of paratyphoid B. It was in Tobruk that, on August 16, 1913 , he heard the news from the Ministry of promotion to major. With that degree, he was transferred to Naples, where 7 January 1915, his active life he died at the age of only 46 years. It had already started the First World War, which soon would have also involved Italy. Lately it has been raised the hypothesis that Fleming could have been aware of the Tiberius studies. In fact at that time Naples was a very important center of studies internationally and it is possible, despite the fact that the publications were in Italian (it was the custom to publish scientific papers in the mother tongue), that these have been able to be taken as a cue to new research. Alexander Fleming in London, in 1928, observed that in a culture plate contaminated by a mold, bacterial growth was inhibited; so he was born penicillin G progenitor of the whole family, now used only as a prodrug for synthesizing new penicillins. Penicillin G was only active on Gram positive and to perform intravenous injections was to be a salt (penicillin G sodium or potassium) but this made it extremely caustic and painful. Because of the high water solubility of the molecule it is badly distributed in the body and needed a dose every 4 hours. He was thought to a more oily form for intramuscular injections but it was even more painful and gave a few advantages. It is only since 1940, however, that penicillin is used against bacterial infections. In 1943, American industry, driven by the necessities of war, it began production at the industrial level, revolutionizing the world of medicine and creating a new era for the modern pharmacotherapy. Another breakthrough in antibiotic therapy was given by Gerhard Domagk director of the Experimental Pathology Laboratory of I.G. Farbenindustrie, big industry of dyes located near Berlin. In 1932, continuing research initiated by Paul Ehrlich, discovered that a dye, the red prontosil (or sulfocrisoidina) was equipped with antibacterial properties, which is able to destroy infectious microbes, the streptococci. Domagk popularized these results three years later, when he was sure of his observations. Subsequently, it was made clear by Federico Nitti and his collaborators in the laboratory of Ernest Fourneau Pasteur Institute, that the antibiotic action came from sulfanilamide contained in prontosil. The way was open for the production of sulfonamides capable of combating and curing a wide variety of infections. One of the first patient saved by the new drug was precisely the Domagk daughter had accidentally infected in the laboratory. In recognition of his discovery that revolutionized the field of therapy, in 1939 Domagk was awarded the Nobel Prize for medicine and physiology, but the Nazi government forbade him to accept it; He received him in 1947. The sulfa drugs were the great protagonists of the Second World War. The most famous episode of the use of sulfonamides, although not a correct use was the death of General S.S. Nazi Reinhard Tristan Eugen Heydrich. On 27 May 1942 a commando made up of members of the Czechoslovak government in exile trained by the British SOE (Special Operations Executive) attempt on the life of Heydrich. The group, composed of Adolf Opálka (the leader), Josef Valčík, Jan Kubiš and Jozef Gabčík, managed to stop the car in which Heydrich was traveling along with his driver, SS-Oberscharführer Klein, and to throw a grenade anti-tank . However this was not enough to kill Heydrich who got out and tried to chase his attackers before collapsing unconscious. He was sent, on the orders of Himmler, the Prague hospital. Injuries sustained in the attack, however, turned out too serious, and at 4.30 on 4 June at the age of 38 years died of septicemia, also for the decision by doctors who treated him to administer sulfa drugs, proven product of German science , instead of the most effective penicillin, new invention of the English.

Conclusions:

The use of the larvae, even today discussed in the therapy of wounds and osteomyelitis was important for the past and today is that through antibiotics, but yet today day is noted in antibiotic therapy the drug resistance of anaerobic microorganisms, in this regard now is used in these cases the hyperbaric chamber, whose origins belong to another Italian, the diver Alberto Gianni.
Iconography Essential:

Fig. 1 Depiction of an operation for osteomyelitis. Thomas Eakin, Metropolitan Museum of Art, New York

Fig. 2 the Meggot therapy

Fig. 3 Penicillin molecule in 3D

Figure 4 Structure of Sulfamide
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