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FIRST NON-CONVENTIONAL VETERINARY TREATMENT OF SKIN INFECTIONS WITH BLOWFLY LARVAE *(CALLIPHORIDAE)* IN SLOVAKIA

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Blowfly larvae were used to accelerate the cleansing and healing process of chronic bedsores and suppurative ulcers in experimental rabbits. *Phormia regina* larvae were put directly into the treated wounds. A beneficial effect of a single application was observed after 3-6 days. Cleansing of wounds was selective and rapid. The animals tolerated the treatment well. A new layer of granular tissue developed over the entire treated surface. We proved that a single application of larvae can result in cleansing of the respective wounds.

Key words: rabbit, maggot therapy, bedsore, chronic ulcer.

At present, when the application of natural substances in medicine becomes increasingly popular, we witness again the use of arthropods in medical practice. A beneficial effect of flies in the treatment of difficult-to-heal wounds was observed first by Ambroise Paré in the 16th century. During the World War I, Dr W.S. Baer started to investigate scientifically the potential of fly larvae in the treatment of refractory wounds. During the twenties and thirties of the past century, he treated successfully osteomyelitis and chronic ulcers in more than 90 patients. However, in the middle forties, the larval treatment was replaced gradually by antibiotics and new treatment procedures. This resulted, however, in increasing development of resistance of micro-organisms to antibiotics (meticillin resistant strain of *Staphylococcus aureus* (MRSA), penicillin resistant *Streptococcus pneumoniae*, increasing resistance of *Salmonella typhimurium*, and similar), which forced the professionals to return back to many treatment methods that had been established in the pre-antibiotic era.

Larval therapy is currently enjoying a renaissance. Several hundreds of hospitals round the world, namely in the USA, Great Britain, Germany, Austria, Russia, Israel, Hungary, and other European states use blowfly larvae for treatment. This treatment has no side effects, larvae can be applied without narcosis, and the treatment is suitable also for patients allergic to penicillin. New ongoing clinical studies

have been initiated in the nineties by Dr Ronald Sherman at the California University. Dr Sherman proved that larval therapy is highly effective, particularly in association with excision of infected and gangrenous wounds and decubiti (5).

The treatment of wounds by the method of larval biotherapy can only be carried out using larvae of flies from the family *Calliphoridae*, genera *Lucilia*, *Phormia*, and *Protophormia*. An optimum combination of larval therapy with modern treatment methods can adjust biological processes in the body and supplement treatment of chronic wounds.

Despite the successful use of this therapy in advanced countries, our experience with this method is scarce. In the present paper, the specialists from the University of Veterinary Medicine, Medical Faculty of UPJŠ, and Faculty Hospital of Louis Pasteur in Košice decided to join their forces and investigated the application of this non-conventional treatment in human and veterinary medicine in Slovakia.

Material and Methods

Rabbits with chronic bedsores on their hind limbs and in one case also with knee joint abscess were used as experimental animals. Altogether, three animals were treated.

Flies and the larvae needed for the experiment were bred under laboratory conditions. Larvae of *Phormia regina* species were used. The total development of flies at 24-26°C and relative humidity ranging between 40 and 60% lasted 14 to 17 d.

The wounds were treated with larvae of the I st developmental stage. The bacterial flora present on their surface was devitalized with 0.5% solution of peracetic acid. From 90 to 100% of larvae survived the decontamination (3). The treatment of rabbits consisted of application of 8-12 larvae per 1 cm^2 of wound area depending on the quantity of necrotic tissue. After the application of blowfly larvae, the wounds were covered with perforated cellophane with tamponade and dressed with sterile bandage. In one case a starch bandage was applied.

Results

After application of larvae to the patients with bedsores and a knee joint abscess, the larvae were capable to remove most of the necrotic tissue within three days and healthy granular tissue started to develop and gradually overlaid the entire wounds (Fig. 1). The affected knee joint required two applications, and already after the first one, a visible marked regression of the inflammatory process and suppurative exudate could be observed.

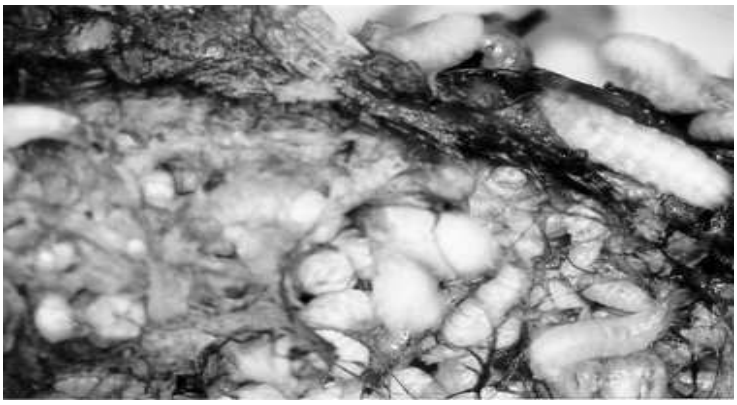

Fig. 1. A healing wound containing *Phormia regina* larvae of the II nd and III rd developmental stages.

One day after the initial treatment, inflammation had subsided and the surrounding area had healed up. The maggots had quickly and efficiently debrided necrotic tissue from a wound and promoted the healing of abscesses and the formation of healthy granulation tissue. Single application was sufficient in two cases, while in the third one, the knee joint had to be redressed again.

Discussion

Larvae of the majority of blowflies are necrophagous due to the secretion of proteolytic enzymes which decompose the necrotic tissue and accelerate its disintegration. Scientific studies showed that the larvae remove most of the necrotic tissue within 7 d after the application. It is assumed that the wound-healing process is related to the use of the necrotic tissue as a food for the larvae after its enzymatic liquefaction due to secretion of proteolytic enzymes by the larvae (6). At the same time, the irritative action of the larvae introduced into the wounds causes production of serous exudate which washes bacteria out of the wound. In addition to that, secretions of the salivary glands of the larvae have antibacterial effects and contain also ammonia, allantoin, urea, and calcium carbonate which change the acidic environment of the wound to the beneficial alkaline one. The constantly moving larvae massage the healthy tissue and by the mechanical stimulation initiate production of granular tissue (4).

Contamination of wounds with pathogenic micro-organisms when using non-sterile larvae presents the most serious problem that can occur in this non-conventional treatment. In addition to that, there is a theoretical possibility that the patient may develop allergic reaction to foreign larval proteins, although such an effect has not been reported yet. Provided that the larvae of the fly species are applied to the patient, they neither bury in the skin and the surrounding healthy tissue nor remain and multiply in the wound. The mature (fully developed) larva has to leave the wound to be able to turn into a pupa. When the larva reaches the final stage of its development, it stops feeding and migrates to the surface of the wound from where it can be easily removed either with tweezers or by rinsing with a saline. Great care should be given to the preparation

of larvae for the application. Normally, the surface of eggs and larvae is highly contaminated with bacteria which can cause contamination of wounds. In our experiments, sterilization of larval surface with 0.5% peracetic acid appeared successful. The number of larvae used depends on the size of the wound, but it is not recommended to use more than 10 larvae per 10 cm^2 area. Our experiments on rabbits showed beneficial effects of the treatment already after one or two applications. Experience with the use of larvae in human medicine is much more extensive than that gained in veterinary medicine (2). In fact, only three papers were published in the field of veterinary medicine describing a successful use of larval therapy in the treatment of actinomycosis in cattle (1) and experimental burns in rats (6). The use of larvae in veterinary medicine can be adapted in elimination of abscesses, chronic wounds of cutis and subcutis, and certain types of malignant and benign tumours, and as a replacement for expensive surgical interventions. It may also help to restrict the administration of antibiotics to farm animals and to decrease in this way the risk of contamination of food with their residues.

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