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EFFECT OF LASER BIOSTIMULATION ON THE HEALING OF CUTANEOUS SURGICAL WOUNDS IN PIGS

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Abstract

The objective of this study was to investigate the impact of therapeutic laser irradiation on wound healing and skin regeneration in pigs as a supplementary treatment. The experiment was conducted on 32 young pigs divided into four groups: groups I and III served as control, group II comprised pigs with undamaged skin, and group IV consisted of pigs with cutaneous surgical wounds in the dorsal area. Groups II and IV were subjected to laser irradiation. Laser biostimulation was carried out using a CTL 1106 MX semiconductor laser in the continuous wave mode of operation at a wavelength of 810 nm and a maximum output of 100 mW. Following three weeks of observation and clinical skin trials, specimens for a histopathological analysis were collected. The reported results indicate that laser treatment shortens the wound healing process by speeding up the growth of granulation tissue and improving skin elasticity. Laser irradiation of the skin in pigs increases cellular infiltration of the corium and stimulates the proliferation of the *stratum germinativum* cells of the epidermis. Laser irradiation may be recommended as supplementary therapy in the treatment of surgical wounds.

Key words: swine, surgical wounds, laser therapy, biostimulation.

When introduced for medical use, lasers delivered a variety of new options in the treatment of diseases, which are resistant to other forms of therapy. Non-invasive laser irradiation was first used in 1969 by Master (10), who applied low-level laser irradiation to stimulate biological processes in difficult to heal wounds and ulcers. This event gave rise to the development of Low Level Laser Therapy (LLLT). Despite initial doubts concerning the efficacy of laser therapy, LLLT has come to occupy a prominent place in contemporary medicine. Research into the biostimulating effect of laser radiation determined its therapeutic indications, which have been officially recognised by the FDA in 1989 as valid therapeutic methods (1). The efficacy of laser therapy has been determined in view of the following findings:

- Low-level irradiation produces a positive effect at the cellular level,
- irradiation at an approximate wavelength of 1,000 nm is most readily absorbed by the tissue,
- energy is absorbed at the level of cellular chromophores and mitochondrial cytochromes,
- biostimulation involves the stimulation of electron transport in the respiratory chain, which leads to energy accumulation in ATP,
- low-level laser irradiation has few side effects,
- laser biostimulation should be regarded as supplementary rather than the main form of treatment.

Low-energy lasers are widely applied in tissue biostimulation. Research results have shown that LLLT involves non-specific stimulation of tissue regeneration and fibroblast proliferation, and increases the activity of selected metabolic processes at the cellular level. The positive clinical results of laser biostimulation in the treatment of skin diseases have not been sufficiently researched at the level of cellular responses that prevents an objective assessment of the efficacy of this therapeutic method.

Complications in the healing of surgical wounds in animals are frequently encountered in veterinary practice. Most of them result from wound infections contracted during or after surgical treatment or at the first stage of the healing process. In view of previous research investigating the therapeutic value of laser biostimulation (3, 7, 14, 9), therapeutic irradiation was applied to stimulate the regeneration of damaged skin in pigs as a supplementary treatment. Laser irradiation was an alternative to the required surgical treatment involving repeated excision of the wound as a result of skin adhesion complications. A histopathological analysis of cutaneous surgical wounds will verify the results of clinical observations.