Anti-inflammatory effect of low-level laser and light-emitting diode in zymosan-induced arthritis

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Abstract:

Objective: The aim of this work was to investigate the effect of low-level laser therapy (LLLT) and light-emitting diode (LED) on formation of edema, increase in vascular permeability, and articular joint hyperalgesia in zymosan-induced arthritis. Background Data: It has been suggested that low-level laser and LED irradiation can modulate inflammatory processes. Material and Methods: Arthritis was induced in male Wistar rats (250-280 g) by intra-articular injection of zymosan (1 mg in 50 fiL of a sterile saline solution) into one rear knee joint. Animals were irradiated immediately, 1 h, and 2 h after zymosan administration with a semiconductor laser (685 nm and 830 nm) and an LED at 628 nm, with the same dose (2.5J/cm2) for laser and LED. In the positive control group, animals were injected with the anti-inflammatory drug dexamethasone 1 h prior to the zymosan administration. Edema was measured by the wet/dry weight difference of the articular tissue, the increase in vascular permeability was assessed by the extravasation of Evans blue dye, and joint hyperalgesia was measured using the rat knee-joint articular incapacitation test. Results: Irradiation with 685 nm and 830 nm laser wavelengths significantly inhibited edema formation, vascular permeability, and hyperalgesia. Laser irradiation, averaged over the two wavelengths, reduced the vascular permeability by 24%, edema formation by 23%, and articular incapacitation by 59%. Treatment with LED (628 nm), with the same fluence as the laser, had no effect in zymosan-induced arthritis. Conclusion: LLLT reduces inflammatory signs more effectively than LED irradiation with similar irradiation times (100 sec), average outputs (20 mW), and energy doses (2 J) in an animal model of zymosan-induced arthritis. The anti-inflammatory effects of LLLT appear to be a class effect, which is not wavelength specific in the red and infrared parts of the optical spectrum.