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Mechanisms for Low-Light Therapy V

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Introduction

The use of low levels of visible or near infrared light known as low level laser (light) therapy (LLLT) for preventing tissue damage and cell death, reducing pain, inflammation and edema, promoting healing of wounds, deeper tissues and nerves, has been known for almost 40 years since the invention of lasers. Originally thought to be a peculiar property of laser light (soft or cold lasers), the subject has now broadened to include photobiomodulation and photobiostimulation using non-coherent light.

Despite many reports of positive findings from experiments conducted in vitro, in animal models, and in randomized controlled clinical trials, LLLT remains controversial. This likely is due to two main reasons; firstly the biochemical and cellular mechanisms underlying the positive effects are incompletely understood, and secondly the complexity of rationally choosing amongst a large number of illumination parameters such as wavelength, fluence, power density, pulse structure, and treatment timing has led to the publication of a number of negative studies as well as many positive ones. In particular a biphasic dose response has been frequently observed where low levels of light have a much better effect than higher levels.

In 2006 SPIE Photonics West reinstated a conference series on this topic entitled "Mechanisms for Low Light Therapy" and the present volume of the Proceedings of SPIE contains the papers presented in the fifth conference of this series in 2010. These proceedings contain several studies that report on the effects of LLLT on the nervous system and in particular on the brain. Two papers from Photothera discussed the clinical trials of transcranial laser therapy for stroke (7552-18 Catanzaro and 7552-31 Lapchak), while LLLT for traumatic brain injury was covered in mice (7552-5 Wu) and in humans (7552-20, Naeser). Reduction of ototoxicty after gentamycin by LLLT was covered by 7552-10 Rhee. Other studies covered bone healing after radiation damage (7552-116 Freire) and wound healing in rats with polarized light (7552-25 Ramalho).

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