

Low Level Laser (Light) Therapy (LLLT) for Cosmetic Medicine and Dermatology

Mossum K. Sawhney [1] and Michael R. Hamblin [1],[2]

[1] Wellman Center for Photomedicine, Massachusetts General Hospital,
Boston, Massachusetts, 02114
sawhney.mossum@gmail.com

[2] Department of Dermatology, Harvard Medical School,
Boston, Massachusetts, 02114
Hamblin@helix.mgh.harvard.edu

Introduction

Low level laser (light) therapy (LLLT), phototherapy or photobiomodulation, refers to the use of light for altering biological activity of certain target(s) of interest. Fundamentally, it involves the use of light within a specific range of wavelengths (optical window), to effectively stimulate specific tissue chromophores (with absorption bands in the red and near-infrared spectral regions), which leads to the induction of desirable effects in the target tissues. Photon absorption has been demonstrated to be effective in causing cellular reactions capable of promoting cellular growth, cellular proliferation, and cell migration. The most widely accepted mode of action of LLLT involves the activation of cellular mitochondria, where components of the electron transport chain (ETC) or respiratory chain serve as natural chromophores or "light receptors" for the action of LLLT. Mitochondrial activation stimulates ATP production, causes the release of nitric oxide, and promotes the formation of reactive oxygen species (ROS), all of which acting together, result in the stimulation of redox sensitive transcription factors, and the expression of proteins that are specific gene products. Hence, LLLT is capable of stimulating processes responsible for tissue repair, wound healing and prevention of cell death (Hamblin and Demidova, 2006).

Non-thermal, coherent (lasers) or non-coherent light sources consisting of filtered lamps or light-emitting diodes (LED) are primarily used in the therapeutic applications of LLLT for reducing pain and inflammation, augmenting tissue repair, regenerating tissues and nerves, and preventing tissue damage (Chung et al., 2012; Gupta et al., 2012). Over the last few years, LLLT has been demonstrated to be a promising therapeutic modality for a wide range of dermatological and cosmetic applications. In this article, we discuss the applications of LLLT as well as its efficacy for a number of cosmetic and dermatological conditions, including the treatment of alopecia (hair loss), cellulite, and undesirable