

An in vivo photodynamic therapy with diode laser to cell activation of kidney dysfunction

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Abstract. This study aims to analyze the effect of photodynamic therapy (PDT) low level laser therapy (LLLT) 650 nm in the experimental animals mice (*Musmuculus*) suffering from kidney organ damage in mice (*Musmuculus*) in vivo. Exposure laser acupuncture was performed on the kidney BL-23. The conditioning of kidney damage in mice used carbofuran 35 at a dose of 0.041697 mg/mice. LLLT 650 nm exposure was done on a wide variety of energy (0.5; 1.0; 1.5; 2.0; 4.0; 5.0; 6.0; 7.0) J. The histopathological kidney cells in mice renal impairment showed that exposure to 650 nm laser energy 1 Joule resulted in the reduction of damaged cells (necrosis) and normal cells were increased with the improvement of renal tubular cells ($64.14 \pm 8.02\%$). Therefore, exposure to 650 nm LLLT on acupuncture points Shenshu (BL-23) has the ability to proliferation of renal tubular cells of mice.

1. Introduction

Since 2008, biostimulation laser, which is now referred to as Low Level Laser Therapy (LLLT), has been applied to medical therapy [1]. He-Ne laser is the first laser used for wound healing. Biostimulation laser is a photobiology phenomenon that involves chemical reactions and enzymes [2]. Photodynamic activation for biostimulation cells using LLLT is laser stimulation of the skin with low intensity and a non-thermal laser irradiation. Deep transmission of laser energy, wavelength, and laser energy are the important factors on therapy. In additional, scattering and absorption by various tissues of different skins need to be considered. The skin is a network of multi-layer in a homogeneous, anisotropic structure; so that the optical properties are very complex [3]. The intensity of light through the skin decreases exponentially due to the scattering and the absorption. Ultraviolet and visible spectrum (~400-600) nm will be absorbed by hemoglobin and melanin, so, a little amount of the light is transmitted back. For blue light, the irradiance depth would be decreased 99% to ~700 μm . Wavelengths above 1400 nm is the area of water absorption that results on less transmission. Red and infrared spectrum are the most widely used for photodynamic biomodulation because the absorption is very small and the transmission is large [4]. However, scattering by collagen is still considered because it could reduce transmission.

Kidney Disease Outcomes Quality Initiative of The National Kidney Foundation defines that chronic renal failure is a state of the occurrence of kidney damage or glomerular filtration rate (GFR) $<60 \text{ mL/min/1.73 m}^2$ within 3 months or more [5]. The disorder is caused by dysfunction of the

