THE MODIFICATION OF ENDOTHELIAL CELL CULTURE OPTICAL PARAMETERS DURING LOW LEVEL LASER THERAPY

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Abstract. Low Level Laser Therapy (LLLT) is a new and noninvasive method used both in human and veterinary medicine. Although the action mechanism of low laser radiation at the molecular, cellular, tissular and at of whole body is very complex and not completely understanding, the utilization of LLLT in clinic is raised. In this respect, the scientific explanation of LLLT use, taking into account not only the subjective answers of the patients but in particularly the measurable parameters, like the optical ones, is the main target of this research domain.

The modification of endothelial cell culture optical parameters during Low Level Laser Therapy

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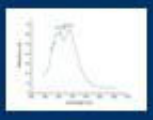
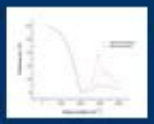
Objective – the estimation of the low level laser radiation efficiency at the cellular level based on the endothelial cell culture optical parameters modifications.

Material & methods – we used the 72 hours HUVEC cultures in RPMI 1640 medium (SIGMA) irradiated for three times; before and after the irradiation the biological answer was evaluated by measuring the optical parameters of cell cultures following the next steps:

1. recording and processing the diffusion reflection spectra;

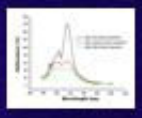


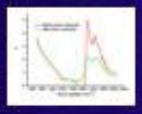
2. extrapolation of reflection data to the spectrum range (500-0)nm and (1100-∞) nm;



3. estimation of phase function $\varphi(\omega)$, from the extended reflection spectrum and the determination of optical constants $n(\omega)$ and $k(\omega)$ from $R(\omega)$ and $\varphi(\omega)$.

Results – irradiated cell culture spectrum of diffusion reflection exhibit two reflection peaks at wavelength λ_1= 611,65 nm and λ_2 = 674,01 nm and a minimum value of diffuse reflection at λ_3 = 630,74 nm. The decrease of main peak value was observed after each laser irradiationindicating an increase of laser beam absorption determined by an increment in cell density. At wavelength (λ = 635 nm) the reflectance variation after each laser irradiation was ΔR_1 = 30,235 % and ΔR_2= 19,012 %.





For cell culture refractive index determination the Kramers-Kronig analyses was applied. It was observed that there is an inverse proportionality between $n(\omega)$ and $k(\omega)$; so, at λ = 635 nm, Δn = 4,4 and Δk_1 = 1,65 accordingly to a 2% increase of cell viability.
There is a good correlation between the optical parameters and the viability of cell cultures.