

Photobiomodulation (PBM) / Low Level laser Therapy (LLLT)

THOR Photomedicine Research Digest

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Search criteria: Lung function

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Prepared by: Dr. Patricia Burton

Notes: A selection of papers evidencing positive impact of PBM on lung inflammation, lung injury, pneumonia & acute respiratory distress syndrome (ARDS)

[Laser therapy of elderly patients with pneumonia]

Lutai AV, Egorova LA, Shutemova EA

The aim of the study was to evaluate the efficiency of laser therapy included into the treatment of pneumonia in the elderly. A follow-up included the analysis of their clinical status and external respiratory function, pulmonary blood flow, and immunological parameters in 2 matched groups of pneumonia patients aged 60 to 72 years. Low-intensity laser therapy (transcutaneous sliding contact procedure) was used as part of routine treatment in one of the groups. The findings demonstrate that non-drug treatment had an undeniably positive impact. There was an earlier regress of clinical symptoms and a sound recovery of functional parameters. In the absence of side effects of this method, these data allow infrared laser therapy to be recommended for rehabilitation of elderly patients with pneumonia.

Vopr Kurortol Fizioter Lech Fiz Kult 2001 May-Jun -3 38578

<https://pubmed.ncbi.nlm.nih.gov/11550371>

Dual Effect of low-level laser therapy (LLLT) on the acute lung inflammation induced by intestinal ischemia and reperfusion: Action on anti- and pro-inflammatory cytokines.

de Lima FM, Villaverde AB, Albertini R, Correa JC, Carvalho RL, Munin E, Araujo T, Silva JA, Aimbire F

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BACKGROUND AND OBJECTIVE: It is unknown if pro- and anti-inflammatory mediators in acute lung inflammation induced by intestinal ischemia and reperfusion (i-I/R) can be modulated by low-level laser therapy (LLLT). **STUDY DESIGN/MATERIAL AND METHODS:** A controlled ex vivo study was developed in which rats were irradiated (660 nm, 30 mW, 0.08 cm² of spot size) on the skin over the right upper bronchus 1 hour post-mesenteric artery occlusion and euthanized 4 hours later. For pretreatment with anti-tumor necrosis factor (TNF) or IL-10 antibodies, the rats received either one of the agents 15 minutes before the beginning of reperfusion. **METHODS:** Lung edema was measured by the Evans blue extravasation and pulmonary neutrophils influx was determined by myeloperoxidase (MPO) activity. Both TNF and IL-10 expression and protein in lung were evaluated by RT-PCR and ELISA, respectively. **RESULTS:** LLLT reduced the edema (80.1 +/- 41.8 microg g⁻¹ dry weight), neutrophils influx (0.83 +/- 0.02 x 10⁶ cells ml⁻¹), MPO activity (2.91 +/- 0.60), and TNF (153.0 +/- 21.0 pg mg⁻¹ tissue) in lung when compared with respective control groups. Surprisingly, the LLLT increased the IL-10 (0.65 +/- 0.13) in lung from animals subjected to i-I/R. Moreover, LLLT (0.32 +/- 0.07 pg ml⁻¹) reduced the TNF-alpha level in RPAECs when compared with i-I/R group. The presence of anti-TNF or IL-10 antibodies did not alter the LLLT effect on IL-10 (465.1 +/- 21.0 pg mg⁻¹ tissue) or TNF (223.5 +/- 21.0 pg mg⁻¹ tissue) in lung from animals submitted to i-I/R. **CONCLUSION:** The results indicate that the LLLT attenuates the i-I/R-induced acute lung inflammation which favor the IL-10 production and reduce TNF generation. *Lasers Surg. Med.* 43:410-420, 2011. (c) 2011 Wiley-Liss, Inc.

Lasers Surg Med 2011 Jul 43(5) 410-20

<https://pubmed.ncbi.nlm.nih.gov/21674546>

Low level laser therapy reduces acute lung inflammation in a model of pulmonary and extrapulmonary LPS-induced ARDS.

Oliveira MC Jr, Greiffo FR, Rigonato-Oliveira NC, Custodio RW, Silva VR, Damaceno-Rodrigues NR, Almeida FM, Albertini R, Lopes-Martins RA, de Oliveira LV, de Carvalho Pde T, Ligeiro de Oliveira AP, Leal EC Jr, Vieira RP

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The present study aimed to investigate the effects low level laser therapy (LLLT) in a LPS-induced pulmonary and extrapulmonary acute respiratory distress syndrome (ARDS) in BALB/c mice. Laser (830nm laser, 9J/cm², 35mW, 80s per point, 3 points per application) was applied in direct contact with skin, 1h after LPS administration. Mice were distributed in control (n=6; PBS), ARDS IT (n=7; LPS orotracheally 10μg/mouse), ARDS IP (n=7; LPS intra-peritoneally 100μg/mouse), ARDS IT+Laser (n=9; LPS intra-tracheally 10μg/mouse), ARDS IP+Laser (n=9; LPS intra-peritoneally 100μg/mouse). Twenty-four hours after last LPS administration, mice were studied for pulmonary inflammation by total and differential cell count in bronchoalveolar lavage (BAL), cytokines (IL-1β, IL-6, KC and TNF-α) levels in BAL fluid and also by quantitative analysis of neutrophils number in the lung parenchyma. LLLT significantly reduced pulmonary and extrapulmonary inflammation in LPS-induced ARDS, as demonstrated by reduced number of total cells (p<0.001) and neutrophils (p<0.001) in BAL, reduced levels of IL-1β, IL-6, KC and TNF-α in BAL fluid and in serum (p<0.001), as well as the number of neutrophils in lung parenchyma (p<0.001). LLLT is effective to reduce pulmonary inflammation in both pulmonary and extrapulmonary model of LPS-induced ARDS.

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<https://pubmed.ncbi.nlm.nih.gov/24792475>

Low-Level Laser Therapy Restores the Oxidative Stress Balance in Acute Lung Injury Induced by Gut Ischemia and Reperfusion.

de Lima FM, Albertini R, Dantas Y, Maia-Filho A, Castro-Faria-Neto HC, Franca C, Villaverde AB, Aimbire F

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It is unknown if the oxidative stress can be regulated by low-level laser therapy (LLLT) in lung inflammation induced by intestinal reperfusion (i-I/R). A study was developed in which rats were irradiated (660 nm, 30 mW, 5.4 J) on the skin over the bronchus and euthanized 2 h after the initial of intestinal reperfusion. Lung edema and BALF neutrophils were measured by the Evans blue extravasation and myeloperoxidase (MPO) activity, respectively. Lung histology was used for analyzing the injury score. Reactive oxygen species (ROS) was measured by fluorescence. Both expression adhesion molecule (ICAM-1) and peroxisome-proliferator-activated receptor- γ (PPAR γ) were measured by RT-PCR. The lung immunohistochemical localization of ICAM-1 was visualized as a brown stain. Both lung HSP 70 and glutathione protein were evaluated by ELISA. LLLT reduced neatly the edema, neutrophils influx, MPO activity and ICAM-1 mRNA expression. LLLT also reduced the ROS formation and oppositely increased GSH concentration in lung from i-I/R groups. Both HSP 70 and PPAR γ expression also were elevated after laser irradiation. Results indicate that laser effect in attenuating the acute lung inflammation is driven to restore the balance between the pro- and anti-oxidants mediators rising of PPAR γ expression and consequently the HSP 70 production. (c) 2012 Wiley Periodicals, Inc. Photochemistry and Photobiology (c) 2012 The American Society of Photobiology.

Photochem Photobiol 2012 Aug 10

<https://pubmed.ncbi.nlm.nih.gov/22882462>

[The influence of low-intensity laser radiation on the functional activity of neutrophils in the patients presenting with community-acquired pneumonia].

Burduli NM, Gabueva AA

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AIM: The objective of the present study was to elucidate the influence of low-intensity laser radiation on the results of the nitroblue tetrazolium (NBT) test in the patients presenting with community-acquired pneumonia. **PATIENTS AND METHODS:** A total of 100 patients with community-acquired pneumonia were available for the examination of whom 70 were treated with intravenous low-intensity laser irradiation of blood (ILIB) by means of the ILIB-405 technique during 7 days. The functional activity of neutrophils was estimated from their ability to reduce nitroblue tetrazolium in both spontaneous and stimulated NBT-tests. **RESULTS:** The analysis of the data obtained in the study has demonstrated the significant improvement of the results of the NBT tests in the group of patients receiving the ILIB treatments regardless of whether its content was originally elevated or reduced. **CONCLUSION:** The inclusion of intravenous low-intensity laser irradiation of blood in the combined treatment of the patients with community-acquired pneumonia appreciably promotes normalization of the bactericidal activity of neutrophils.

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<https://pubmed.ncbi.nlm.nih.gov/27213942>

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