

# Evaluation of Inflammatory Biomarkers Associated With Oxidative Stress and Histological Assessment of Low-Level Laser Therapy in Experimental Myopathy

Natalia Servetto, Biol,<sup>1,2</sup> David Cremonuzzi, PhD,<sup>3,4</sup> Juan C. Simes, PhD,<sup>1</sup> Monica Moya, PhD,<sup>1,5</sup> Fernando Soriano, PhD,<sup>6</sup> Jose A. Palma, PhD,<sup>1,5</sup> and Vilma R. Campana, PhD<sup>1,5,6\*</sup>

<sup>1</sup>Cátedra de Física Biomédica, Facultad de Ciencias Médicas, Universidad Nacional de Córdoba, Santa Rosa 1085, (5000) Córdoba, Argentina

<sup>2</sup>Facultad de Ciencias Exactas Físicas y Naturales, Universidad Nacional de Córdoba, Av. Vélez Sársfield 299, (5000) Córdoba, Argentina

<sup>3</sup>Cátedra de Patología, Carrera de Medicina, Universidad Nacional de La Rioja, René Favaloro y Carlos Saúl Menem, (5300) La Rioja, Argentina

<sup>4</sup>I Cátedra de Patología, Hospital Nacional de Clínicas, Universidad Nacional de Córdoba, Santa Rosa 1564, (5000) Córdoba, Argentina

<sup>5</sup>Cátedra de Física Biomédica, Carrera de Medicina, Universidad Nacional de La Rioja, René Favaloro y Carlos Saúl Menem, (5300) La Rioja, Argentina

<sup>6</sup>Instituto Argentino de Medicina Láser, Urquiza 1763, (2000) Rosario, Argentina

The objective of the present work was to study the effect of helium–neon (He–Ne) and gallium–arsenide (Ga–As) laser upon inflammatory biomarkers associated with oxidative stress: fibrinogen, nitric oxide (NO), L-citrulline, and superoxide dismutase (SOD). These were evaluated through histological assessment, in rats with experimental myopathy. *Materials and Methods:* The groups studied were: (A) control, (B) injured, (C) injured and treated with He–Ne laser, (D) injured and treated with Ga–As laser, (E) irradiated with He–Ne; and (F) irradiated with Ga–As laser. Myopathy was induced by injecting 0.05 mg/rat/day of adrenaline in the left posterior limb muscle at the same point on 5 consecutive days, in groups B, C, and D. Low-level laser therapy (LLLT) was applied with 9.5 J/cm<sup>2</sup> daily for 7 consecutive days with each laser. The determination of the biomarkers was made by spectrophotometry. The muscles (5/8, single blinded) were stained with Gomori Trichrome and examined by optic microscopy. The quantitative variables were statistically analyzed by the Fisher's test and categorical data by the Axionvision 4.8 program. Pearson's chi-squared test was applied, setting significant difference at  $P < 0.05$  for all cases. *Results:* In group B, the biomarkers were significantly increased compared to the other groups ( $P < 0.001$ ), except for NO which in group B decreased significantly ( $P < 0.001$ ). In group B, there was a higher inflammatory infiltration level (80.67%) in relation to destroyed fibers. *Conclusions:* LLLT caused significant changes in inflammatory biomarkers and oxidative stress: decreased levels of fibrinogen, L-citrulline and SOD as opposed to the increase of NO in rats with experimental myopathies and significant muscle recovery. *Lasers Surg. Med.* 42:577–583, 2010. © 2010 Wiley-Liss, Inc.