

# Induction of Autologous Mesenchymal Stem Cells in the Bone Marrow by Low-Level Laser Therapy Has Profound Beneficial Effects on the Infarcted Rat Heart

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**Background and Objectives:** The adult mammalian heart is known to have a very limited regenerative capacity following acute ischemia. In this study we investigated the hypothesis that photobiostimulation of autologous bone-marrow-derived mesenchymal stem cells (MSCs) by low-level laser therapy (LLLT) applied to the bone marrow (BM), may migrate to the infarcted area and thus attenuate the scarring processes following myocardial infarction (MI).

**Materials and Methods:** Sprague-Dawley rats underwent experimental MI. LLLT (Ga-Al-As diode laser, power density 10 mW/cm<sup>2</sup>, for 100 seconds) was then applied to the BM of the exposed tibia at different time intervals post-MI (20 minutes and 4 hours). Sham-operated infarcted rats served as control.

**Results:** Infarct size and ventricular dilatation were significantly reduced (76% and 75%, respectively) in the laser-treated rats 20 minutes post-MI as compared to the control-non-treated rats at 3 weeks post-MI. There was also a significant 25-fold increase in cell density of c-kit<sup>+</sup> cells in the infarcted area of the laser-treated rats (20 minutes post-MI) as compared to the non-lasertreated controls.

**Conclusion:** The application of LLLT to autologous BM of rats post-MI offers a novel approach to induce BM-derived MSCs, which are consequently recruited from the circulation to the infarcted heart and markedly attenuate the scarring process post-MI. *Lasers Surg. Med.* 43:401–409, 2011. © 2011 Wiley-Liss, Inc.