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Comparison of the Alendronate and irradiation with a light-emitting diode (LED) on murine osteoclastogenesis

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Low-level laser therapy (LLLT)/LED therapy has been proposed as an alternative to conventional osteoporosis therapies. Our aim was to determine the effect of irradiation with a light-emitting diode on receptor activator of NF- κ B ligand (RANKL)-mediated differentiation of mouse bone marrow macrophages into osteoclasts, and compare it to alendronate treatment. The surface of cells was irradiated with LED at 5 mW/cm² for 60 minutes in a CO₂ incubator. The differentiation of irradiated and untreated RANKL-stimulated bone marrow macrophages into osteoclasts was evaluated by tartrate-resistant acid phosphatase (TRAP) staining and by molecular methods. These included assessing mRNA expression of osteoclastic markers such as *c-Fos*, *NFATc1*, *TRAP*, *OSCAR*, *MMP9*, and cathepsin K; phosphorylation of various MAPKs, including extracellular signal-regulated kinase ERK1/2, P38, and JNK; NF- κ B translocation; and resorption pit formation. Results were compared to those obtained with sodium alendronate. Production of reactive oxygen species was measured by a 2', 7'-dihydrodichlorofluorescein diacetate assay. LED irradiation and alendronate inhibited mRNA expression of osteoclast-related genes, such as *TRAP*, *c-Fos*, and *NFATc1*, and reduced the osteoclast activity of RANKL-stimulated bone marrow macrophages. LED irradiation, but not alendronate, also inhibited the production of reactive oxygen species; phosphorylation of ERK, P38, and I κ B; and NF- κ B translocation. These findings suggest that LED irradiation has an inhibitory effect on osteoclast formation; this effect could lead to reduced bone loss and may offer a new therapeutic tool for managing osteoporosis.

Biography

Won Bong Lim has completed his PhD from the Department of Oral Pathology and Post-doctoral studies from Chonnam National University in South Korea. He is an Assistant Professor in the Department of Premedical Science, College of Medicine, Chosun University and Director of Research Lab at Department of Orthopedic Surgery in Chosun University Hospital. He has published more than 50 papers in reputed journals of Low Intensity Laser Therapy and Cancer Biology.

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