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MECHANICAL AND ELECTRICAL ENVIRONMENTS TO STIMULATE BONE CELL DEVELOPMENT

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Oral Presentation

Abstract

The aim of this project was to evaluate the effects of mechanical strain and indirect electrical stimulation upon the development of bone forming osteoblast cells and any possible synergistic effects of the two stimulants. This aim was achieved by using a novel device, designed and developed with the capability of creating a cell substrate surface strain along with an exogenous electrical stimulant individually or at the same time. Proliferation and differentiation was determined as a measure of cellular development. The indirect electrical stimulation was achieved through the use of pulsed electromagnetic field (PEMF) stimulation while the mechanical strain was produced from the dynamic stretching of a deformable cell substrate. The PEMF signal mimicked a clinically available bone growth stimulator signal. Results showed reduced proliferation and increased differentiation (alkaline phosphatase activity) with SaOS-2 osteoblast-like cell cultures, which were exposed to indirect electrical stimulation. MG-63 osteoblast-like cell cultures also showed reduced proliferation, however they did not show an increase in their differentiation with PEMF exposure. Mechanical stimulation alone did not have a significant effect over either proliferation or differentiation, while a dual mechanical and electrical stimulation resulted in cellular differentiation significantly increasing. It is possible a synergistic interaction between the two stimulants is occurring on a biological level.