

Comparison Between the Effects of Hypergravity and Photomechanical Stress on Cells Producing ECM

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Abstract In the body, connective tissues have a major function in sustaining mechanical stresses. On the other hand, mechanical forces are important factors for connective tissue homeostasis. Connective tissues dynamically interact with mechanical and gravitational stimuli, changing their mechanical properties through the continuous modification of their composition, and thus improving their function. In connective tissues, mechanical forces are major regulators of extracellular matrix turnover, strongly affecting the production of extracellular matrix proteins. On the contrary, unloading conditions, such as bed rest or space flight, have a negative effect on these tissues, with loss of mass and impairment of mechanical properties. Here we describe the effect of photomechanical stress, supplied by a pulsed Nd:YAG laser, on extracellular matrix production by fibroblasts and chondrocytes, and compare it with the effect produced by hypergravity conditions. Cell morphology and structure, extracellular matrix production, cell adhesion, cell energy metabolism have been studied in treated human fibroblasts and chondrocytes by using immunocytochemistry, fluorescence and autofluorescence microscopy. The results show that

photomechanical stress induce cytoskeleton remodelling, redistribution of membrane integrins, increase in production of ECM molecules, changes in cell energy metabolism. The effects are similar to those observed in the same cells exposed to cyclic hypergravitational stress ($10 \times g$).

Keywords Hypergravity · ECM · PM stress · Connective tissues · Fibroblasts · Chondrocytes

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