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Comparing the simultaneous effect of a low power laser and nitrogen-rich plasma films with synovial fluid on chondrocytes differentiation of mesenchymal stem cellsSara Babaei¹, Babak Shokri², Shirin Farivar³, Ali Esmaeilzadeh³

¹Shahid Beheshti University, Tehran, Iran ²Laser and Plasma Research Institute, Shahid Beheshti University, Tehran, Iran ³Faculty of Biological Sciences, Shahid Beheshti University, Tehran, Iran

s.babaei@mail.sbu.ac.ir

Mesenchymal stem cells have shown to be an appealing source for cell therapy and tissue engineering. Previous studies have confirmed that the application of low-level laser irradiation could affect the cellular process. In this research, the simultaneous effect of nitrogen-rich organic thin films and a low power diode laser on differentiation of mesenchymal stem cells were investigated. In addition, the results were compared to synovial fluid which was used for differentiation of mesenchymal stem cell in our previous works. Nitrogen-rich plasma films were deposited on biaxially oriented polypropylene (BOPP) via low-pressure radio-frequency glow discharges with flow of nitrogen in two separate systems, one mixed with acetylene and the other in combination with methane. The effect of mixtures of varying ratios was also investigated on the differentiation of stem cells. The films were characterized by X-ray photoelectron spectroscopy, fourier transform infrared spectroscopy and contact angle goniometry measurements. The results showed that the cells were well adhered to nitrogen-rich films, and chondrocytes differentiation of mesenchymal stem cells was more remarkable in nitrogen-rich plasma films and diode laser in comparison to synovial fluid.

Keywords

nitrogen-rich
plasma
mesenchymal stem cells
cell differentiation
tissue engineering