Tissue Engineering Part A > VOL. 19, NO. 23-24 | Original Articles

normal

Tooth Tissue Engineering: The Influence of Hydrophilic Surface on Nanocrystalline Diamond Films for Human Dental Stem Cells

Silvio Eduardo Duailibi, Monica Talarico Duailibi, Lydia Masako Ferreira, Karina Inacio Ladislau Carvalho Salmazi, Maria Cecília Salvadori, Fernanda de Sá Teixeira, Alberto Pasquarelli, … See all authors

Published Online: 14 Oct 2013

Doi: https://doi.org/10.1089/ten.tea.2012.0628

Abstract

New techniques for tissue engineering (TE) are rapidly emerging. The basic concept of autologous TE is to isolate cells from small biopsy specimens, and to expand these cells in culture for subsequent seeding onto

biodegradable scaffolds. Nanocrystalline diamond films have attracted the attention of researchers from a variety of different areas in recent years, due to their unique and exceptional properties. In this approach, human dental stem cells (hDSCs) were characterized by flow cytometry and grown on diamond films with hydrogen (H)-terminated and oxygen (O)-terminated surfaces for 28 days, and then removed by lysis and washing with distilled water. Energy dispersive spectroscopy analysis was performed, showing that the regions with O-terminated surfaces contained much higher levels of deposited calcium, oxygen, and phosphorus. These results suggest that the extracellular matrix was considerably more developed in the O-terminated regions, as compared with the H-terminated regions. In addition, optical microscopy of hDSCs cultured on the diamond substrate with H- and O-terminated surfaces, before washing with distilled water, showed preferential directions of the cells arrangement, where orthogonal lines suggest that the cells appeared to be following the O-terminated regions or hydrophilic surface. These findings suggest that O-terminated diamond surfaces prepared on biodegradable scaffolds can be useful for mineralized dental tissue formation.

>