

EFFECT OF MESENCHYMAL STEM CELLS ON FIBRONECTIN AND COLLAGEN NANOCOMPOSITES

Jyun-Ting Wu¹, Nien-Tzu Lu², Huey-Shan Hung^{1,3}

¹Graduate Institute of Basic Medical Science, China Medical University, Taichung, Taiwan, ROC

²Department of Cosmeceutics, China Medical University, Taichung, Taiwan, ROC

³Center for Neuropsychiatry, China Medical University Hospital, Taichung, Taiwan, ROC.

Abstract

The effect of mesenchymal stem cells (MSCs) on two kind of nanocomposites [fibronectin-nanocomposites, (FN-Au) and collagen-nanocomposites, (Col-Au)] containing smaller amount of nanogold particles (AuNPs) (≈ 43.5 ppm) were used as a model system in this study. The effect of MSCs on FN-Au and Col-Au was investigated by cellular functional assay. MSCs had the higher migration ability on the FN-Au and Col-Au compare than that on pure FN, Col and control group (tissue culture group, TCPS) as well as cell growth effect. Adhesion ability test indicated that actin fiber appeared as a circumferential band surrounding each cell on control group. However, cells margin had spread out and extend with actin fibers in the protruding lamellipodia and filopodium has been obvious evident in FN-Au and Col-Au. The better migration and proliferation ability of MSCs on FN-Au and Col-Au was associated with promoted of nitric oxide (NO)-dependent pathway [PI3K/Akt/endothelial nitric oxide synthase (eNOS)] and NO-independent pathway [$\alpha 5\beta 3$ integrin/focal adhesion kinase (FAK)/ matrix metalloproteinases (MMPs)]. Based on this finding, it was demonstrated that surface morphology change of FN-Au and Col-Au was attributed to the incorporation of optimal concentrations of AuNPs into pure FN and Col matrix and was further caused change the surface roughness morphology of FN-Au and Col-Au. It may lead to had better cellular biological effect of MSCs on these nanocomposites.

Keywords: nanogold particles, collagen, fibronectin, nanocomposites, mesenchymal stem cells