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Cell adhesion and mechanical stimulation in the regulation of neuronal induced mesenchymalstem cell differentiation.afm measurements

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Herein, we report a new in-vitro strategy to obtain differentiated neuronal stem cells progenitors from placental-derived MSCs. The placental-derived MSCs cultivated on gold metalized collagen scaffold were electrically stimulated, by a clinically used pacemaker, with concomitant treatment of the cells with neuronal differentiation induction media. Electrical stimulation with the neuronal differentiation protocol accelerated the acquisition of neural like morphology (Figure 1)even after 24 h of electrical stimulation, and the cells were largely oriented in the same direction after 2 days. Additionally, we show that, a greater neuronal cellular extension was induced when the collagen were metalized with gold nanoparticles. The biocompatible gold metalized collagen scaffolds and the electrical stimulation, facilitating their differentiation of into neurons.

There are several potential advantages to using collagen-based GNP nanofibers: *in vitro*, predifferentiatedmesenchymal stem cells on metal-absorbed collagen substrates can be used for delivery of biologically active molecules, drugs, or genes for *in vivo* transplantation of stem cells in regenerative medicine. The electrically conductive gold metal-coated collagen nanofibers can be further exploited for a more accelerated differentiation process and stimulation of the mesenchymal stem cells.

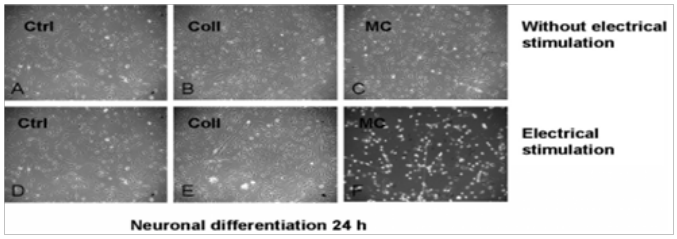

Figure 1. Phase contrast images of neuronal differentiation after 24 h, chorion- derived MSC cells exposed to N1differentiation medium, without electrostimulation. (Top panels) No electrical stimulation: (A) control without substrate, (B) collagen substrate, (C) gold metal-absorbed collagen. (Bottom panels) With electrical stimulation (D) without substrate, (E)collagen substrate, (F) gold-coated collagen, MC. Bar length represents 200 μm.

Biography

Anamaria Orza focuses primarily on the area of development of innovative architectural nano composites for biomedical applications. Prior to her arrival at Emory in the fall of 2013, Dr. Orza served as a postdoctoral researcher at the Center for Integrative Nanotechnology Sciences at the University of Arkansas at Little Rock. Dr.Orza has been recognized as a European Union fellow, receiving her PhD in Chemistry from Babes Bolyai University, Romania and working in close collaboration with Liverpool University, United Kingdom. Dr. Orza has authored and co-authored 2 patents and over 32 papers in leading journals and at leading international conferences in the field (with over 170 citations) and 2 book chapters in the fields of Applied Nanotechnology in Cancer Research and Tissue Engineering.

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