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Nanomaterials for cardiac regeneraction: Directing the fate of chorion stem cells to cardiomyocytes stem cells using electrically stimulated nanosubstrates

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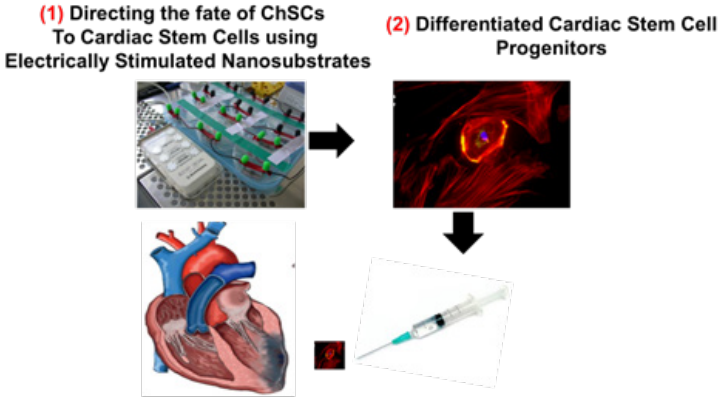
The most devastating and costly problem in health care is the loss or the failure of an organ, especially the heart. Among all, cardiac diseases are the leading cause of death, world-wide (World Health Organization 2012). Herein, we demonstrated the capacity of chorion stem cells (ChSCs) to differentiate into cardiac stem cells in only 24 h by using an electrically stimulated 3D gold nanoparticle metalized protein substrates (Orza et al., 2011). We also show that the unique properties of the synthesized substrate control the intrinsic signaling and dictate stem cell behavior. Using AFM studies we show that, the nexus between the nanoscaffolds properties and their impact on stem cell biology is attributed to various mechanotransduction signaling pathways. The pathways mechanism is poorly understood, however we show that the nanomaterial characteristics (size and stiffness) play an important role in guiding cell fate.



Scheme 1. Cardiac Regeneration using Cardiomyocytes Stem Cells obtained using Electrically Stimulated Nanosubstrates

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, Orza served as a postdoctoral researcher at the Center for Integrative Nanotechnology Sciences at the University of Arkansas at Little Rock. 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. 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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