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Sogang CBE Online Talk Series

Bio-inspired Nanotechnology Approaches for Advanced Stem Cell Therapies: Promises and Challenges

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This presentation will focus on the interface between nanotechnology and stem cell biology. Even though it is well established that stem cell fate is regulated by interactions that occur between microenvironmental cues and intrinsic cellular programs, our understanding of the function of the microenvironment and gene expression in stem cells is hampered by the limitations of conventional methods and the lack of extensive knowledge of multiple regulatory signals.

Addressing the aforementioned challenges, the long-term goal of our research program is to develop both approaches from nanotechnology—the "top-down" patterning of extracellular matrix (ECM) and signal molecules, and the "bottom-up" synthesis of multifunctional nanoparticles and their surface modification with specific signal molecules, which can be combined synergistically. Our bottom-up approaches mainly focus on the synthesis and utilization of multifunctional nanoparticles as drug and gene delivery vehicles to manipulate the expression of key genes in stem cells and somatic cells for cellular reprogramming. As another example, we recently developed combinatorial nanoarrays of hybrid nanostructures using chemically modified graphenes and Biodegradable Hybrid Nanoscaffolds (BHI), which were further utilized to deliver genetic materials into stem cells for controlling their neural-differentiation pathways and neuronal behaviors in vitro and in vivo [Figure 1.].

In this presentation, a summary of the most updated results from these efforts and future directions will be discussed.

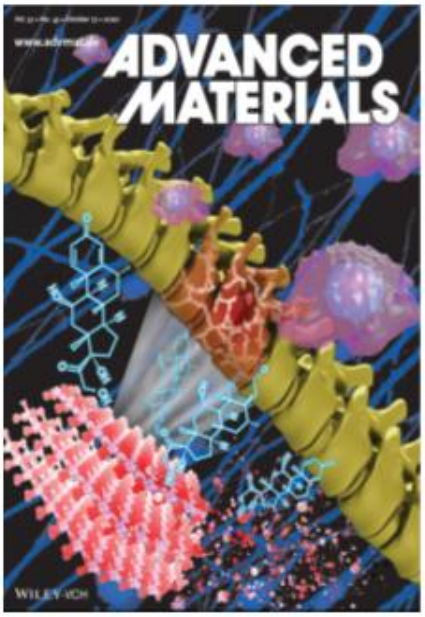


Figure 1: A novel drug delivery method to effectively treat CNS injuries by delivering anti-inflammatory drugs in vivo and providing a permissive neural matrix using biodegradable nanoscaffolds. Implantation of drug-loaded nanoscaffolds to spinal-cord injury sites reduces macrophage infiltration, suppresses fibrotic scarring, and thereby promotes functional

ZOOM LINK

https://sogang-ac-kr.zoom.us/j/82109166832?pwd=VzlGV3RxYTJ5am1oQ1BsYUhMenlvdz09