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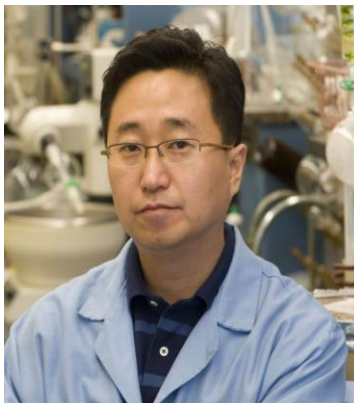

KiBum Lee is an associate professor professor of Chemistry and Chemical Biology at Rutgers University, where he has been a faculty since 2008. He received his Ph.D. in Chemistry from Northwestern University (with *Chad. A. Mikrin*; 2004) and completed his postdoctoral training at The Scripps Research Institute (with *Peter G. Schultz*; 2007). The primary research interest of Dr. Lee's group is to develop and integrate nanotechnologies and chemical functional genomics to modulate signaling pathways in cells (e.g. stem cells and cancer cells) towards specific cell lineages or behaviors. In particular, his group is exploring critical problems in cancer/stem cell biology pertaining to the cell-microenvironmental interactions, and how to control these interactions at the subcellular and single cell level using chemical biology and nanotechnology. In recognition of his outstanding scientific achievement at Rutgers, Dr. Lee has received several awards including NIH Director's New Innovator Awards (2009), Board of Trustees Research Award for Scholarly Excellence (2013), Johnson and Johnson Proof-of-Concept Award (2011), Faculty Research Grant Award (2012), New Jersey Spinal Cord Research Award (2009/2013), and Grant Proposal Development Award (2008). He is the first author, co-author, and corresponding author of approximately 42 articles such as *Science, Cell Stem Cell, J. Am. Chem. Soc., Angew. Chem, Int. Ed., Nano Letters, ACS Nano, Advanced Materials, Scientific Reports, Lab Chip, Small, and Cancer Research*, which are highly cited (>3000).

Nanotechnology approaches for controlling neural stem cell fate

This presentation will focus on the interface between nanomedicine 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 neural stem cells is hampered by the limitations of conventional methods and the lack of extensive knowledge of multiple regulatory signals. If complex stem cell behaviors, such as differentiation and proliferation, are to be fully investigated, both approaches from nanotechnology—the "top-down" patterning of extracellular matrix (ECM) and signal molecules (e.g. ECM compositions, nanotopography, pattern geometry, and pattern density), and the "bottom-up" synthesis of multifunctional nanoparticles and their surface modification with specific signal molecules—should be combined synergistically. To address the aforementioned challenges, our research mainly focuses on two approaches: i) to synthesize well-controlled three-dimensional graphene-nanoparticle hybrid structures, ii) to establish well-defined surface chemistry for functionalizing graphene-hybrid nanostructures, and iii) to develop combinatorial arrays of graphene-nanoparticle hybrid structures for biodetection and other stem cell-based regenerative medicine.

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

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