The 54th iCeMS

SEMINAR

Mon 23 August 2010

16:00-17:00

Nanotechnology Approaches for Identifying Microenvironmental Cues Regulating Stem Cell Fate

Lecturer: **Asst. Prof. Ki-Bum Lee**

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Venue: 2nd floor Seminar Room (#A207)
Main Building, iCeMS Complex 1
Kyoto University

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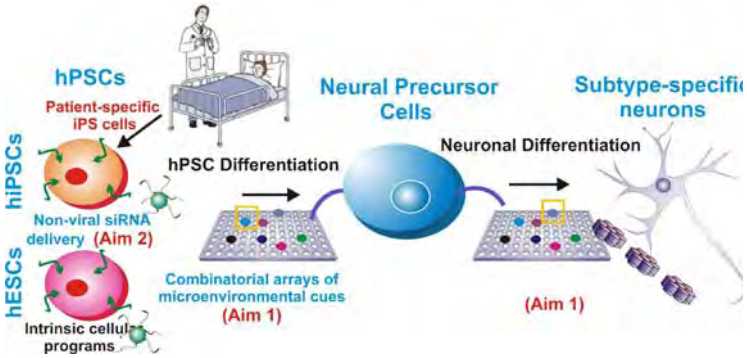
Abstract of Dr. Lee's seminar on Aug 23

This talk will focus on the interface of micro-/nano science and cell biology. Even though stem cell fate (e.g. proliferation, differentiation and migration) is regulated by interactions with microenvironment cues and intrinsic cellular programs, understanding the functions of microenvironments and manipulating gene expression in stem cells are hampered by limitations of conventional methods and the lack of extensive knowledge of multiple regulatory signals. If the complex stem cell behaviors are to be fully investigated, both approaches from nanotechnology—the "top-down" patterning of extracellular matrix (ECM) and signal molecules in combinatorial ways (e.g. ECM compositions, pattern geometry, pattern density and gradient patterns), and the "bottom-up" synthesis of multifunctional nanoparticles and their surface modification with specific signal molecules—should be combined synergistically. To address the aforementioned challenge, our research mainly focuses on two approaches: i) development of combinatorial arrays of microenvironmental signal molecules for investigating stem cell behaviors; ii) synthesis and utilization of multifunctional nanoparticles for highly efficient intracellular delivery of biomolecules (e.g. siRNA, gene plasmids, and small molecules) to stem cells.

More specifically, we have applied the combinatorial signal arrays to study the temporal/spatial effect of microenvironmental cues on adhesion, growth, differentiation of stem cells (e.g. ESCs and NSCs). Furthermore, non-viral siRNA-delivery (combined with drug delivery) methods have been developed to manipulate the specific gene expression level during the neuro-differentiation of stem cells. In this talk, a summary of the results from these efforts and future directions will be discussed.



Combinatorial Nanotechnology Approaches for Stem Research

Key References:
1. *Angew. Chem. Int. Ed.* **2010,** *49*, 103.
2. *ChemBioChem* **2010**, *11*, 755.
3. *Cell Stem Cell* **2009,** *5*, 204
4. *Lab Chip* **2009,** *9*, 555.
5. *Nanomedicine,* **2008**, *3*, 567.
6. *Science,* **2002**, *295*, 1702.

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