



Screening of better cell responses to the nanotopography using gradient nanopatterns

Kyu Back Lee¹

¹Department of Biomedical Engineering, School of Health Science, Korea University, Seoul, 02841, Republic of Korea

Abstract:

Surface nanotopography has been reported as an important physical parameter in the stem cell niche for regulating cell fate and behaviors for various types of cells. Substrates featuring arrays of increasing nanopillar or nanohole diameter were devised to investigate the effects of varying surface nanotopography on the responses of various cells such as human embryonic stem cells (hESCs), fetal liver kinase 1-positive mesodermal precursor cells (Flk1+ MPCs), mesenchymal stem cells (MSCs) and endothelial colony forming cells (ECFCs). hESCs demonstrate a propensity to organize into more compact colonies expressing higher levels of undifferentiated markers towards a smaller nanopillar diameter range ($D = 120\text{--}170\text{ nm}$). Cell-nanotopography interactions modulated the formation of focal adhesions and cytoskeleton reorganization to restrict colony spreading, which reinforced E-cadherin mediated cell-cell adhesions in hESC colonies. hESCs also generate clusters of pancreatic endocrine progenitors (PDX1+ and NGN3+) on the nanopattern with nanopore diameter range ($D = 200\text{--}300\text{ nm}$). The nanopattern-derived clusters generated islet-like 3D spheroids and tested positive for the zinc-chelating dye dithizone. The spheroids consisted of more than 30% CD200 + endocrine cells and expressed NKX6.1 and NKX2.2.

Biography:

Kyu Back Lee is a professor in Department of Biomedical Engineering in Kora University. He has served as a professor in Korea University since 2001. He got a Medical Doctor license from Korean Government in 1995 and a Doctor of Philosophy degree in Biomedical Engineering at the Seoul National University in 1998. He is an expert in chemical surface modification and nanopatterning. He has interests in nanobiotechnologies, especially in nano-bio-interfaces between nanopatterned surfaces and stem cells for the improvement of cell-material interac-



tion and the modulation of cellular responses to biomaterials. He is also interested in the delivery of materials into the hard-to-transfect cells and the modulation of exosome production from stem cells using nanotechnological tools.

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