

Polymer Honeycomb Scaffolds for Control Cellular Adhesion, Proliferation, and Differentiation by Altering Mechanical and Topological Properties.



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Cell culture scaffolds act as a template for tissue regeneration, and encourages cells to form healthy and functional tissues. Cell behaviors, including cellular adhesion, proliferation, migration, and differentiation, are regulated by the interactions between cells and the microenvironment of the cells; therefore, the chemical, topological, and mechanical properties of scaffold surfaces are significant for regulating the cell behavior.

We have reported that honeycomb-patterned porous polymer films can be prepared by casting a polymer solution under humid conditions and using condensed water droplets as templates of pores¹. We have prepared polymer honeycomb scaffolds for cell culturing by using above-mentioned “breath figure” method, and we found that their mechanical and topographical properties strongly affect the adhesion of fibroblasts².

We also found that honeycomb scaffolds led human mesenchymal stem cells (hMSCs) to osteospecific and myospecific differentiations depending on the size of pores without any hazardous chemicals and supplements³. This selective differentiation suggested that surface microtopography can be effective for using hMSCs in regenerative medicine and tissue engineering.

¹ O. Karthaus, N. Maruyama, X. Cieren, M. Shimomura, H. Hasegawa, T. Hashimoto, *Langmuir*, **16** (15), 6071-6076 (2000)

² T. Kawano, Y. Nakamichi, S. Fujinami, K. Nakajima, H. Yabu, M. Shimomura, *Biomacromolecules*, **14**(4), 1208-1213 (2013)

³ T. Kawano, M. Sato, H. Yabu, M. Shimomura, *Biomaterials Science*, in press.