DESIGNING MICRO AND NANOPATTERNED SURFACES FOR CELL STUDIES AND BIOSENSOR APPLICATIONS

E. Martínez[1,3], A. Lagunas[3,1], S. Rodríguez-Seguí[1,2,3], M. Estévez[1,2], S. Oberhansl[1], J. Comelles[1], M. Pla-Roca[1],C. A. Mills[1], A. Ruiz[4], P. Colpo[4], F. Rossi[4] and J. Samitier[1,2,3]

1 Nanobioengineering group, Institute for Bioengineering of Catalonia (IBEC), Baldiri Reixac 10-12, 08028 Barcelona, Spain.
2 Centro de Investigación Biomédica en Red en Bioingeniería, Biomateriales y Nanomedicina (CIBER-BBN), Spain
3 Department of Electronics, University of Barcelona, C/ Martí i Franquès 1, 08028 Barcelona, Spain
4 European Commission, Joint Research Centre, Institute for Health and Consumer Protection, TP 203. Via Fermi, 21027 Ispra (VA) Italy

emartinez@pcb.ub.es

New fabrication technologies and, in particular, new nanotechnologies, have provided biomaterial and biomedical scientists with enormous possibilities when designing customized surfaces that can be used as novel supports for cell culture studies or in other biomedical applications as biosensors. The main issue now is how to effectively design these components and choose the appropriate combination of structure and chemistry to tailor towards applications as challenging and complex as stem cell differentiation. In this talk, the main strategies developed by the Nanobioengineering group at IBEC for the design and fabrication of surfaces with controlled topography and chemistry at the micro and nanoscale will be reviewed. The group has been working in new applications of techniques as nanoimprint lithography, focused ion beam lithography, microcontact printing, piezo-jet deposition and dip-pen nanolithography in the biomedical field.

References:

[1] E. Martínez, A. Lagunas, C.A. Mills, S. Rodríguez-Seguí, M. Estévez, S. Oberhansl, J. Comelles and J. Samitier, Stem cell differentiation by functionalised micro and nanostructured surfaces, Nanomedicine (in press, invited review)
[2] E. Engel, E. Martínez, CA. Mills, M. Funes, J.A. Planell, J. Samitier, Mesenchymal stem cell differentiation on microstructured Poly(methylmethacrylate) substrates, Annals of anatomy (in press)
[3] J. Issle, M. Pla-Roca, E. Martínez, U. Hartmann, Patterning of magnetic nanobeads on surfaces by PDMS stamp, Langmuir 24 (2008) 888-893
[4] E. Martínez, E. Engel, C. López-Iglesias, C.A. Mills, J.A. Planell and J. Samitier, Focused Ion Beam/Scanning Electron Microscopy characterization of cell behavior on polymer micro-/nanopatterned substrates: A study of cell-substrate interactions, Micron 39 (2) 111 (2008)
[5] A. Mills, J. G. Fernandez, E. Martinez, M. Funes, Elisabeth Engel, Abdelhamid Errachid, Josep Planell and Josep Samitier, Directional Alignment of MG63 Cells on Polymer Surfaces Containing Point Microstructures, Small 3 (5): 871-879 (2007)
[6] M. Pla-Roca, J. G. Fernandez, C.A. Mills, E. Martínez, J. Samitier, Micro-/nano-patterning of proteins using a nanoimprint-based contact printing technique and high aspect ratio poly(methyl methacrylate) stamps, Langmuir 23 (16) 8614-8618 (2007)