

# CELL-MATERIALS INTERACTIONS FOR REGENERATIVE MEDICINE

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**ABSTRACT.** Regenerative medicine seeks to devise new therapies for patients with severe injuries or chronic diseases in which body's own response is not enough to restore functional tissue. Regenerative therapies, comprising living cells and scaffold technologies, will lead to successful tissue engineering constructions to replace and repair tissues.

At present the research conducted by the research group on Bio/non-bio Interactions for Regenerative Medicine at the Institute for Bioengineering of Catalonia (IBEC) aims at different applications such as bone, vascular and nervous regeneration. Different substrate materials are studied, with special interest in polymers (preferentially biodegradable). Calcium phosphate glasses with different formulations and manufactured in different ways are also investigated and used to produce composites. Different techniques for scaffold fabrication are at present available, such as solvent casting, solid free form (rapid prototyping) and electro spinning. Surfaces are functionalized with different peptides in order to signal a specific cellular behaviour. Physical signals are also considered, such as topographical modification and mechanical stimuli. The surfaces are conveniently characterized by means of different techniques, such as electron microscopy, XPS, AFM and Z-potential among others. Degradation studies are also a relevant working area. Different cells systems such as stem cells, committed progenitors, primary cells or cell lines are used depending on the application and the type of study to be carried out. Close collaboration with a research group in modelling and simulation allows analyzing the behaviour of constructs (cells and scaffolds) inside a bioreactor.

The present talk will be focused in highlighting how chemical and mechanical properties of surfaces and scaffolds guide

cellular behavior. For this purpose, ion release, surface functionalization and surface topography are key players when analyzing the behavior of mesenchymal stem cells as well as cells with specific phenotypes.

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