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Smart nanostructured implants for regenerative nanomedicine

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Abstract

Recently, we have reported a "Smart Hybrid Materials Equipped by Nanoreservoirs of Therapeutics". This unique nanotechnology strategy is used to entrap, protect, and stabilize therapeutic agents into polymer coatings acting as nanoreservoirs enrobing nanofibers of implantable membranes. Upon contact with cells, therapeutic agents become available through enzymatic degradation of the nanoreservoirs. As cells grow, divide, and infiltrate deeper into the porous membrane, they trigger slow and progressive release of therapeutic agents that, in turn, stimulate further cell proliferation. This constitutes the first instance of a smart living nanostructured hybrid membrane for regenerative medicine. The cell contact-dependent bioerodable nanoreservoirs described here will permit sustained release of drugs, genes, growth factors, etc., opening a general route to the design of sophisticated cell-therapy implants capable of robust and durable regeneration of a broad variety of tissues.

Biography

Dr. Nadia Jessel is the Leader of the “Active Biomaterials and Tissue Engineering” team at INSERM (French National Institute for Health and Medical Research), UMR 977, Strasbourg. She received her Ph.D. from University Louis Pasteur, ULP, Strasbourg, France for the work on Development of pseudopeptides as synthetic vaccines. Dr. Jessel (Benkirane) then held a postdoctoral position in collaboration with the Institut Pasteur, Paris, France, working on Immunotherapy HIV, and another postdoctoral position on the application of modified peptides as vaccines against FMDV (Plum Island Animal Disease Center, ARS, USDA, *Greenport*, *NY* 11944-0848, USA). She joined the INSERM U595 in 2002 as a post-doc, and received the diploma to direct the research (HDR) in 2004. Dr. Jessel got the permanent position (CR1) in the INSERM 595 laboratory in 2004 and currently Research Director (DR1) in the INSERM UMR 1109 (Osteoarticular and Dental Regenerative Nanomedicine" and heads the team. Dr. Jessel possesses expertise in diverse fields of molecular and cellular biology, immunochemistry, tissue engineering and biomedical engineering. In the last 10 years, she focused her research on the bio-functionalization of multilayered polyelectrolyte architectures with emphasis on the use of these architectures to induce specific cellular responses and gain control over cell proliferation and differentiation. Dr. Benkirane-Jessel is a co-author of 60 peer-reviewed publications in high impact factor journals (Proc. Nat. Acad. Sci. USA; Adv. Mater.; Adv. Funct. Mater.; Small; Nanoletters, Biomaterials, ACS Nano), 5 chapters reviews and 5 international patents, she is a regular referee for a number of scientific journals (Nature nanotechnology, Nature Materials, ACS nano, Biomaterials, Nanoletters…). She is under the contract (Interface INSERM/Clinic 2008-2013) and she got also *(Prime d’Excellence Scientifique from the INSERM, 2010-2014).*