CORE
Metadata, citation and similar papers at core.ac.uk
Provided by PUblication MAnagement

XV Congresso Nazionale della SOCIETA' ITALIANA DI RICERCHE CARDIOVASCOLARI (SIRC)
Imola (BO), 9 - 11 ottobre 2008 - Fondazione Cassa di Risparmio di Imola

Title DEVELOPMENT OF A NEW TECHNOLOGY FOR 3-D NANOSTRUCTURED SCAFFOLDS WITH POTENTIAL CARDIOVASCULAR APPLICATIONS

Authors: Monica Lemmi, Enrica Briganti, Angela Magera, Roberta Arici, Chiara Ristori, Elisa Simonetti, Federica Chiellini, Giorgio Soldani, Alberto Balbarini, Rossella Di Stefano

Aims The in situ release and maintaining of cells to promote revascularization is a new goal of cardiovascular therapy. Endothelial progenitor cells (EPC) may contribute to the process of vascular repair. Medical devices realized according to tissue engineering are composed by a cellular component and by an artificial component, usually made of a biocompatible polymer. Scaffolds may be coated with bio-polymers like fibrin to enhance cell adhesion and growth.
Aim of this study was to realize nanocomposite 3D scaffolds composed by a synthetic polymer coated with fibrin to support EPC growth and to promote *in vivo* angiogenesis.
Methods 3D PEtU-PDMS scaffolds were studied *in vitro* for their biocompatibility (viability and proliferation tests; citokine release). *In vivo* biocompatibility was studied by intramuscular implant in a rabbit model. The scaffolds were fabricated by spray-phase inversion technique. 25U/mL thrombin was sprayed during the fabrication process. The composite scaffold was then incubated o.n. at 37°C with 18mg/mL fibrinogen. The scaffold morphology was analysed by stereo-microscopy and by scanning electron microscopy (SEM).
EPC obtained from peripheral blood were cultured for 1 week on the scaffolds at the concentration of $1x10^6$ cell/ml. Fibronectin coating was used as a control. Cell viability was assessed by confocal laser (Calcein-AM incorporation).
To test *in vivo* angiogenesis, EPC-seeded scaffolds were subcutaneously implanted into the back of rats for 14 days. After harvesting, the scaffolds were examined histologically and immunohistochemically to evaluate inflammatory response and neovascularization.
Results *In vitro* and *in vivo* biocompatibility data demonstrated absence of any citotoxic effect, immunocompatibility and a slight inflammatory reaction without any sign of encapsulation and implant rejection. Morphological analyses showed an homogeneus fibrin coating of the scaffolds, tightly bound and interconnected to the PEtU-PDMS surface. SEM showed the presence of a well organized layer of fibres in a nm scale (mean diameter ~140nm). Cell viability and phenotype were not affected when EPC were seeded on PEtU-PDMS/fibrin scaffolds. The histological observation of explanted scaffolds revealed a slightly inflammatory response and a significant increased numbers of neovessels in tissues surrounding the EPC-seeded scaffold as compared to the scaffold without cells.
Conclusions Our data suggest that PEtU-PDMS/fibrin scaffold obtained with a new spray manufacturing technology can support *in vitro* EPC growth and promote *in vivo* neovascularisation. Further studies are currently under way in an ischemic hindlimb rat model.