UNIVERSITÀ
DEGLI STUDI DI TRIESTE

Dipartimento di Scienze Chimiche e Farmaceutiche

AVVISO DI SEMINARIO

Biomimetic Scaffolds for Tissue Engineering

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giovedì 22 settembre 2011 alle ore 11.30

aula A1 del Dipartimento di Scienze Chimiche e Farmaceutiche

In the field of regenerative medicine, there is a need for novel biomaterials that combine - among other qualities – biocompatibility, mechanical support and functionality. Poly (γ-glutamic acid) (γ-PGA) is a biocompatible, enzyme-degradable, naturally produced polymer with a higher resistance to hydrolysis than commonly used synthetic polyesters. Notably, γ-PGA's free carboxyl side groups allows for simple chemical functionalisation, making it a versatile candidate for tissue engineering.[1,2]

For scaffold applications, the water solubility of γ-PGA was tailored by esterification of the carboxylic groups by short-chain alkyl and aryl bromides.[3] An integrin-binding RGD peptide sequence was also conjugated in order to provide a material with enhanced cell adhesion properties. As part of the material characterisation, conformations of γ-PGA produced by Bacillus subtilis and of its esterified derivatives were explored by means of circular dichroism and nuclear magnetic resonance spectroscopies.

In view of possible applications of γ-PGA as a scaffold in orthopaedic tissue engineering, nanofibres of modified γ-PGA were produced by electrospinning, a leading technique used to assemble biomimetic scaffolds by generating fibres with a morphology closely resembling that of native extracellular matrix. Scaffolds were evaluated *in vitro* for cell adhesion and viability of human mesenchymal stem cells.

In a second approach, tensile deformation was used to produce highly-aligned films with ultra-high tensile strength.[4] This enabled us to tailor γ-PGA's mechanical properties over a broad range, targeting that of native ligaments.

1. Sung, M.-H.; Park, C.; Kim, C.-J.; Poo, H.; Soda, K.; Ashiuchi, M. *Chem. Rec.* 5: 352-366, 2005.
2. Place, E.S.; George, J.H.; Williams C.K.; Stevens M.M. *Chem. Soc. Rev.* 38: 1139-1151, 2009.
3. Kubota, H.; Nambu, Y.; Endo, T. *J. Polym. Sci. Part A Polym. Chem.* 31: 2877-2878, 1993.
4. P. Smith, P.J. Lemstra, *J. Mater. Sci.* 15: 505, 1980.

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