

3rd International Conference on Tissue Science & Regenerative Medicine

September 24-26, 2014 Valencia Convention Centre, Spain

Guanidine substituted polyamidoamine hydrogels as scaffolds for cell culturing and tissue regeneration

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Polyamidoamines (PAAs) are synthetic *tert*-amine polymers prepared by polyaddition of amines to bisacrylamides. They can be planned to be biocompatible and biodegradable. Guanidine-substituted amines, such as 4-aminobutylguanidine (agmatine), lead to PAAs carrying guanidine side substituents. Agmatine combined with the carboxylated bisacrylamide 2,2-bisacrylamidoacetic acid gives a PAA called AGMA1 whose repeating unit mimics the RGA peptide:

Crosslinked AGMA1 in aqueous media gives hydrogels that exhibit excellent properties as scaffolds for many cell types culturing *in vitro*, including neural cells. AGMA1 tubular conduits were also used *in vivo* as scaffolds for nerve regeneration in a rat sciatic nerve cut model. Good surgical outcomes were achieved with no sign of inflammation or neuroma. Moreover, nerve regeneration was morphologically sound and the quality of functional recovery was satisfactory. However, AGMA1 hydrogels did not possess the mechanical properties needed to promote the osteoblastic differentiation of pre-osteoblastic cells, hence they were unsuitable as scaffolds for hard tissue regeneration. However, AGMA1 hydrogels responded favourably to MMT reinforcement, giving rise in aqueous media to nanocomposite hydrogels with shear storage modulus, G' , in the swollen state up to 20 times higher than those of the corresponding virgin hydrogels. The AGMA1-MMT nanocomposites definitely proved to warrant potential for the osteoblastic differentiation of mouse calvaria-derived pre-osteoblastic cells MC3T3-E1.

Biography

Paolo Ferruti took his degrees at the historical College "Collegio Borromeo" of the University of Pavia, and then was summoned by Giulio Natta at the Polytechnic of Milan. In 1968, he worked with Melvin Calvin in Berkeley at the Lawrence Radiation Laboratory of the University of California. In 1976, he became Full Professor at the University of Naples and then commuted to Bologna, Brescia and finally Milan. He authored more than 400 papers and 50 patents. Functional polymers for tecnica and biotechnological applications are his chief interest. His main scientific achievement has been the discovery of poly (amidoamine)s.

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