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Functionalisation of methacrylated gellan gum hydrogels by anti-angiogenic dendrons

V Perugini, J Silva-Correia, JM Oliveira,
ST Meikle, AL Guildford, RL Reis and M Santin
School of Pharmacy & Biomolecular Sciences, University of Brighton, UK; 3B's - University of Minho, Portugal

The regeneration of cartilage in the intervertebral disc nucleus pulposus and joints is impaired by the formation of fibrocartilage that is caused by the invasion of the tissue by blood vessels. Peptides have been identified by phage display technique which are able to bind VEGF thus inhibiting angiogenesis. The present works focusses on the synthesis of poly(epsilon-lysine) dendrons of three branching generations in which the molecular root of the dendron bears a di-phenylalanine sequence to promote hydrophobic interactions with material surfaces and the uppermost molecular branches are functionalised with the amino acid sequence WHLPFKC that is known to block VEGF. These biofunctionalised dendrons were entrapped in methacrylated Gellan Gum (GG-MA) hydrogels and tested for their ability to inhibit endothelial cell sprouting by both a 3D *in vitro* cell models and an in ovo model. The results show that when GG-MA is functionalised with the dendronised VEGF blockers, a regression of angiogenesis takes place around the hydrogel boundary. The in ovo study supports these findings as the GG-MA functionalised with the dendronised VEGF blockers did not elicit any acute inflammatory response, and decrease the number of converging macroscopic blood vessels as compared to positive controls. Moreover, the hydrogels prevented the infiltration of blood vessels, after 4 days of implantation.

Acknowledgements: This work was supported by the EC FP7 Project Disc Regeneration, n. NMP3-LA-2008-21390