

Heparin-Functionalized Biomaterials for Tissue Engineering

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Various kinds of key biomolecules in tissue engineering including growth factors have heparin binding domains, and heparin acts as a regulator of these biomolecules.¹⁾ Thus, heparin-functionalized biomaterials can be an ideal candidate for protection and sustained release of the target molecules. It has been demonstrated that heparin-PEG crosslinked hydrogels can show a sustained release of vascular endothelial growth factor (VEGF), a key factor associated with angiogenesis, without initial burst over several weeks, maintaining its bioactivity.²⁾ To use as an injectable system or as a component in tissue engineering scaffold, heparin-functionalized nanoparticles (HEP-PLGA NP), composed of PLGA as a hydrophobic core, Pluronic F-127 as a hydrophilic surface layer, and heparin as the functional moiety, were prepared by a solvent-diffusion method.³⁾ This system is noble since 1) all three components are proven-biocompatible materials by FDA, and 2) more importantly, no chemical modification of any component, including heparin, was employed, thus, further biocompatibility issues from the chemical reaction are avoided. As a model in vitro release experiment, lysozyme was loaded into HEP-PLGA NPs, and a sustained release profile over two weeks was obtained with maintaining its bioactivity. The release of VEGF from HEP-PLGA NP showed a more sustained and prolonged profile over one month without initial burst.

References

1. BL Allen, MS Filla, AC Rapraeger, Role of heparan sulfate as a tissue-specific regulator of FGF-4 and FGF receptor recognition (2001), J Cell Biol 155, 845.
2. G Tae, M Scatena, PS Stayton, AS Hoffma, PEG-Crosslinked Heparin is an

Affinity Hydrogel for Sustained Release of Vascular Endothelial Growth Factor, J Biomater Sci, Polm Ed, in press.

3. YI Chung, G Tae, SH Yuk, A Facile Method to Prepare Heparin-Functionalized Nanoparticles for Controlled Release of Growth Factor, submitted to Biomaterials.

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