A Highly Elastic and Rapidly Crosslinkable Elastin-Like Polypeptide-Based Hydrogel for Biomedical Applications

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Abstract

Elastin-like polypeptides (ELPs) are promising for biomedical applications due to their unique thermoresponsive and elastic properties. ELP-based hydrogels have been produced through chemical and enzymatic crosslinking or photocrosslinking of modified ELPs. Herein, a photocrosslinked ELP gel using only canonical amino acids is presented. The inclusion of thiols from a pair of cysteine residues in the ELP sequence allows disulfide bond formation upon exposure to UV light, leading to the formation of a highly elastic hydrogel. The physical properties of the resulting hydrogel such as mechanical properties and swelling behavior can be easily tuned by controlling ELP concentrations. The biocompatibility of the engineered ELP hydrogels is shown in vitro as well as corroborated in vivo with subcutaneous implantation of hydrogels in rats. ELP constructs demonstrate long-term structural stability in vivo, and early and progressive host integration with no immune response, suggesting their potential for supporting wound repair. Ultimately, functionalized ELPs demonstrate the ability to function as an in vivo hemostatic material over bleeding wounds.

Keywords

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