Tailored surface design of biodegradable endovascular implants by functionalization of poly (L-lactide) with elastin-like proteins

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Endovascular implants currently used after cardiovascular events have proven their efficacy. However, strategies are in quest to optimize clinical outcomes. One possibility is the development of polymer surfaces imitating extracellular matrix in order to promote vascular integration of an implanted device. The aim of this study was to develop and investigate methods for covalent immobilization of a synthesized elastin-like protein (ELP) additionally modified with functional domains (RGD, CS5 and P15) promoting endothelial cell proliferation on biodegradable poly (L-lactide) (PLLA) as model endovascular implant surface. Evaluation of the impact of different ELP immobilization methods on PLLA regarding the achievable surface load evidences that the amino activation of PLLA does not have considerable influence, while the reaction sequence as well as the used crosslinker presents determining factors in ELP immobilization. Biocompatibility regarding selective promotion of endothelial cell (EC) adherence and proliferation especially in contrast to smooth muscle cells (SMC) was improved on covalently immobilized but not on physically adsorbed ELP. In summary, we could underline the applicability of a modified ELP-coating for endovascular implant surfaces in vitro and provide information on applicable immobilization procedures. Moreover, the latter builds the basis for a wide variety of implant applications, because the developed immobilization strategy should be easily transferable to any ELP with tailored biological functionality by exchange of the integrated active sequences.
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