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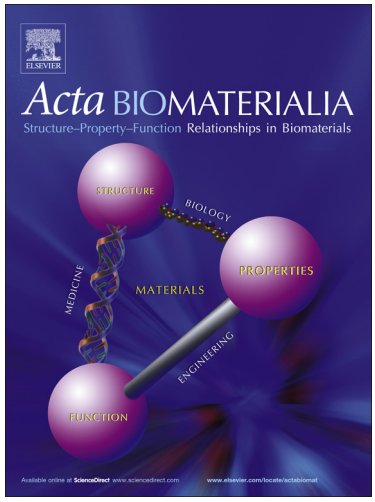

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A highly versatile adaptor protein for the tethering of growth factors to gelatin-based biomaterials

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Abstract— In the field of tissue engineering, the tethering of growth factors to tissue scaffolds in an oriented manner can enhance their activity and increase their half-life. We chose to investigate the capture of the basic Fibroblast Growth Factor (bFGF) and the Epidermal Growth Factor (EGF) on a gelatin layer, as a model for the functionalization of collagen-based biomaterials.

Our strategy relies on the use of two high affinity interactions, that is, the one between two distinct coil peptides as well as the one occurring between a collagen-binding domain (CBD) and gelatin. We expressed a chimeric protein to be used as an adaptor that comprises one of the coil peptides and a CBD derived from the human fibronectin. We proved that it has the ability to bind simultaneously to a gelatin substrate and to form a heterodimeric coiled-coil domain with recombinant growth factors being tagged with the complementary coil peptide. The tethering of the growth factors was characterized by ELISA and surface plasmon resonance-based biosensing. The bioactivity of the immobilized bFGF and EGF was evaluated by a human umbilical vein endothelial cell proliferation assay and a vascular smooth muscle cell survival assay. We found that the tethering of EGF preserved its mitogenic and anti-apoptotic activity. In the case of bFGF, when captured via our adaptor protein, changes in its natural mode of interaction with gelatin were observed.

Keywords — Collagen-binding domain; coiled-coil; growth factor; tethering; biofunctionalization

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