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Vascular cell response to human elastin-like polypeptide-based matrices and coatings

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Elastin-like polypeptides (ELPs) are artificial biopolymers inspired by the hydrophobic domains of tropoelastin. They are composed of repetitive amino acid sequences such as (VPGXG)n, where X is any amino acid other than proline (P), valine (V) and glycine (G), and n represents the number of pentapeptide repeats.1 ELPs represent a promising class of biopolymers for the fabrication of scaffolds for use in tissue engineering for several reasons. Since they are derived from an extracellular matrix (ECM) protein, they can provide an environment suitable for cell adhesion, growth and differentiation.

In the present work we have evaluated whether a recombinant polypeptide derived from human tropoelastin (HELP) could support the adhesion and growth of blood vessel wall main constituents. In our experimental setup they are represented by the endothelial cells that provide a non-thrombogenic coating and by the smooth muscle cells responsible for the vasal tone. Exploiting the presence of the cross-linking domains, the biopolymer has been employed to prepare stable three-dimensional matrices. Furthermore, the recombinant product has also been assayed as coating agent to prepare culture surfaces. Although no cytotoxicity was evidenced, collectively our data indicate that cross-linked HELP matrices are not suitable for the culture of both endothelial and smooth muscle cells. On the contrary, HELP coatings support adhesion and growth of both cell types while maintaining their phenotype. In particular, the best results were obtained with HELP biopolymer density levels comparable to those employed for coating with other proteins routinely used for surface conditioning. These results suggest that HELP coatings could be suitable for vascular tissue engineering.

Keywords: elastin, blood vessel, tissue engineering