Mussel Adhesive Protein-based Functional Nanofibrous Scaffolds for Tissue Engineering

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Electrospun nanofibers have great advantages as biomimetic tissue engineering scaffolds. Rendering nanofiber surfaces to be bio-functional can be critical for design of biomimetic tissue engineering scaffolds and successful applications for tissue regeneration. However, currently available surface functionalization strategies are mostly dependent on complicated surface activation procedures followed by chemical conjugation steps. In this study, we propose to use mussel adhesive protein (MAP) as a natural biomaterial that serves as a blending partner for the preparation of sticky nanofibrous scaffolds which provides a facile, efficient, and multifunctionalizing platform for generating novel nanofibrous scaffolds. Our newly developed electrospun nanofibers based on MAPs showed diverse functionalities including versatile coating ability, mechanical reinforcement, efficient surface exposure of functional peptide, and finally wound regeneration ability. Through further property improvements, the MAP-based nanofibers could be promising alternative biomaterials for diverse tissue engineering fields.