ENZYMATICALLY-MODIFIED NANOFIBERS FOR BIOMEDICAL APPLICATIONS

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Abstract

Influence of proteases entrapped in polysaccharide films on cutaneous wound healing has been already tested on mice skin and the results indicate that this system could be new promising approach for wound therapy. The aim of our team is to enzymatically functionalize newly developed nanomaterials like nanofibers prepared by technology NanospiderTM. Nanofibers produced by this unique technology based on electrospinning process are the ultra-fine solid fibers notable for their very small diameters, their large surface area per unit mass and small pore size.

The goal of this work was to covalently immobilize trypsin and chymotrypsin on cellulose and chitosan nanofibers, which were chosen for our experiments for its nontoxic, hydrophilic, biocompatible and biodegradable properties. The effect of immobilization procedure and reaction conditions on enzyme activity as well as storage and operational stability was observed. Finally, inhibition tests (influence of pH, ionic strength etc.) important for practical use of the newly developed material were performed. The proteolytic activity was quantified by low-molecular substrate BApNA, the reaction was followed by yellow color production and absorbance at 405 nm measuring. Model high-molecular protein (bovine serum albumin) was digested by the modified nanofiber material and then analyzed by Tricine-SDS-PAGE and mass spectrometry to prove its digestion potential. Our results demonstrated that enzyme-immobilized nanofibers could well serve in wound healing applications and drug delivery system.

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