PREPARATION OF CHITOSAN-BASED NANOFIBERS WITH MULTILAYERED STRUCTURE

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Chitosan is a natural polymer derived from the chitin of crustacean or mushroom shells, that intrinsically presents haemostatic, mucoadhesive, antimicrobial and immunostimulant properties. This polysaccharide has shown a great potential for biomedical and pharmaceutical applications, on account of its remarkable compatibility with physiological medium. Besides, it is degraded in a physiological environment into non-toxic products, which make chitosan an outstanding candidate for short- to medium-term applications.
In this respect, nanometric fibers are highly interesting as their assembly mimics the skin extracellular matrix structure. Such nanofibrous materials can be prepared by electrospinning – this technique uses a high voltage to create an electrically charged jet of polymer solution or melt which leads to fibers formation – and can be used as potential scaffolds, a.o. to form a temporary, artificial extracellular matrix.

A prerequisite to the application of any polymer as nanofibrous biomaterial scaffolds is the investigation of its mechanical strength. Indeed, the strength and deformability of nanofibers have been demonstrated to influence *in vitro* cell migration, proliferation, differentiation, along with cell morphology. Moreover, the structural integrity and the mechanical strength of the scaffold are very important for maintaining the desired pattern before the new tissue is formed.
However, mechanical testing of fibers and fibrils with diameter less than one micron is challenging for conventional measurement methods, as it leads to disentangling and handling issues. Atomic Force Microscopy (AFM) turns out to be a powerful tool, not only for morphology studies, but also for mechanical characterization of individual fibers through force spectroscopy mode.

In the present study, electrospinning technique was combined with layer-by-layer deposition method (LBL) – a well-known method for surface coating, based on electrostatic interactions – in order to prepare multilayered chitosan-based nanofibers. The properties of the obtained material were then assessed, and the presence of a multilayered deposit was confirmed by several techniques.

References:

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F.C. is grateful to the Belgian « Fonds pour la Formation à la Recherche dans l'Industrie et dans l'Agriculture » (FRIA) for financial support. This work has been supported by the Science Policy Office of the Belgian Federal Government (BELSPO - IAP 6/27).