DEVELOPMENT OF NOVEL NANOFIBROUS MATERIALS MADE OF CHEMICALLY MODIFIED HYALURONIC ACID

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Abstract

European medical device regulations usually request a supplier to provide basic physical, chemical and biocompatibility data for the development of any novel dressing. A nanofibrous material made in based of biocompatible polymers was designed. For this application, a new way of chemical modification of Hyaluronan (HA), which has to be robust, reproducible and possible to be scale up, was developed. Additionally, a derivative of HA was produced: sodium furyl-acryl hyaluronate (FA-HA) and electrospinned together with polyethylene oxide (PEO) in order to obtain nanofibers. Additionally, the feasibility of the reaction was tested from laboratory to semi-production scales. Analytical characterization was performed in several batches in order to characterize, identify and eliminate reaction components and solvents which may cause any potential toxicity or harm and were used for the chemical modification. Various formulations were subjected to a series of tests for a dressing planned to be in contact with exudates over a prolonged period of time and absorb. The nanofibers have to be cross-linked to obtain an insoluble material (hydrogel type). Different formulations were cross-linked in solid state by UV-vis without using any external initiator, due to the high reactivity of the linker and large specific surface of the nanofibers. The most adequate formulation was used for the production of wound dressings (pads), which were characterized by high absorption capacity without dissolving. Biocompatibility of the derivatives and cross-linked material were tested before and after irradiation. Furthermore, these derivatives were enzymatically hydrolyzed and the degradation products were studied without revealing any apparent cytotoxicity of the used components.

Keywords: Nanofibers, hyaluronan

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