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Collagen nanoparticles for cartilage therapies – the first breaking steps

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Human cartilage tissue presents a very low regeneration power due to lack of vascularization. The application of nanotechnology and tissue engineering in cartilage regeneration is of the utmost importance for the treatment of cartilage diseases [1]. Compounds from marine resources can potential be applied in biomedical applications and tissue engineering due to their interesting properties, such as biocompatibility, biodegradability and specific capacity to target and mimic human natural tissues [2].

In this work, we took advantage of the collagen from marine resources such as jellyfish and blue shark to produce nanodelivery systems for the incorporation of growth factors (GFs) for cartilage regeneration. Type II collagen is the major constituent of cartilage, whereas GFs such as insulin growth factor-1 (IGF-1), transforming growth factor-β (TGF-β) and basic fibroblast growth factor (bFGF) are known to promote chondrogenesis [3]. However, these GFs have short half-life *in vivo*, while prolonged stimulation can cause side effects. Therefore, the development of collagen nanogels for protection and controlled delivery of GFs may represent a promising strategy for cartilage tissue engineering.

Two different methods for the production of collagen nanoparticles have been tested in order to obtain small sizes in the range of 300-400 nm. Nanoparticles have been characterized according to their size and surface charge by dynamic light scattering, while their visual and morphological characterization was made using transmission electron microscopy. In the future, the nanosystems will be tested for their ability to incorporate GFs and their therapeutic efficacy for proliferation and differentiation of cells, prior to the use in 3D matrices.

References:

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