

## **ABSTRACT**

The time span needed for obtaining a functional cartilage substitute using tissue engineering strategies, together with the need for specific patient oriented constructs has stimulated the growing interest for developing “off-the shelf” products. One way to deliver such products is based on long-term storage processes, such as cryopreservation, that will provide clinical substitute available as needed and could be adapted to an autologous immediate solution for the patient.

The aim of this study was to examine the effects of cryopreservation on the chondrogenic differentiation characteristics of human mesenchymal derived stem cells isolated from adipose tissue and encapsulated in  $\kappa$ -carrageenan hydrogels. These bioengineered constructs are anticipated to participate in a cartilage regeneration strategy providing temporary habitation for cell survival, proliferation and production of extracellular matrix which is expected to replace the hydrogel, enhancing the regeneration of native tissues in clinical settings. The results obtained show that the hydrogels withstand the cryopreservation with dimethyl sulfoxide, maintaining their structural integrity, while assisting cells proliferation and chondrogenic potential after cryopreservation. Thus, cell encapsulation systems of natural based hydrogels seem to be an interesting approach for the preservation of cartilage tissue engineered products.

*Keywords:* Cryopreservation, natural origin polymers, hydrogels, cell encapsulation,  $\kappa$ -carrageenan.