Hydrogel scaffolds blends to host Spheroids from human adipose stem cells

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INTRODUCTION Adipose stem cells represent a reliable source of stem cells for their widely demonstrated potential in regenerative medicine and tissue engineering applications. New recent insights show that 3D models may properly mimic the native tissue properties; in fact Spheroids from Adipose derived Stem Cells (S-ASCs) displayed enhanced regenerative abilities if compared to 2D models. Stem cell therapy success is determined by "cell-quality" thus the involvement of stress signals and cellular aging need to be deeply investigated. The development of 3D cell-laden hydrogels has enabled to mimic the peculiar scenario of a native tissue. We studied SASCs-cell quality and tested their viability and differentiation abilities in new hydrogels.

METHODS S-ASCs were obtained from liposuction of healthy patients. Analysis of aging, telomeric length and stress-oxidative genes was performed through Real-Time PCR. Physico-chemical, morphological and mechanical properties of k-Carrageenan (k-C, 2%w) and degalactosylated xyloglucan (Deg-XG, 2%w) hydrogels were defined. S-ASCs compatibility with hydrogels was evaluated by viability test and mesenchymal differentiation abilities.

RESULTS Gene expression of genes linked with stemness, senescence and stress-oxidative was evaluated and correlated with SASCs-cell quality. Indeed, aging-related $p16^{INK4a}$ mRNA is downregulated while anti-aging Sirtuin1 is upregulated in 3D-SASCs. Furthermore, vegetal-origin hydrogels have guaranteed an optimal environment for S-ASCs in stemness and mesenchymal differentiation conditions.

CONCLUSION Bio-instructive scaffolds are critical for exploiting stem cells therapeutic potential in tissue engineering. This study provides a versatile approach to investigate the interactions between cells in controlled settings, opening up novel 3D *in vitro* approaches to mimic the tissues complexity.