Engineered hybrid hydrogels as 3D bioprintable platform for pre-clinical investigations

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Abstract:

Recently, the synthesis and design of new hybrid hydrogels that can mimic the composition, role, dynamism and structure complexity of the extracellular matrix (ECM) has become a key aspect for the development of innovative 3D advanced platforms for tissue engineering applications and 3D cell cultures.[1] Hybrid biomaterials are highly appealing since they can simplify and mimic the intricate unique ECM network by combining polysaccharidic and proteic components. Gelatin and chitosan, as proteinaceous and polysaccharidic natural polymers, have been selected and functionalized with methylfuran groups to obtain stable matrices for the validation of 3D scaffolds and bioprinted models. The functionalized polymers were crosslinked by Diels Alder reaction using 4-arm-PEG-maleimide, in physiological and cell compatible conditions. To validate the functionality of the obtained hybrid hydrogel, U87 spheroids were employed in cell embedded hydrogel model, whereases the corresponding unaggregated cell line were employed in 3D bioprinting process. Both the 3D advanced models were characterized by LIVE DEAD assay and immunohistochemistry. Furthermore, matrix-assisted laser desorption/ionization mass spectrometry imaging (MALDI-MSI) technique has been optimized and used to analyze embedded spheroid tumor model through protein distribution identification.

Reference:

[1] J. Nicolas, S. Magli, L. Rabbachin, S. Sampaolesi, F. Nicotra and L. Russo, *Biomacromolecules*, **2020**, 21, 1968–1994.

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