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Liquid chromatography-electrospray-mass spectrometry lipid profile of human fibroblast cells exposed to 3D printed chitosan scaffolds developed for soft tissue regeneration

Tissue engineering is a promising field of regenerative medicine that relies on the developing synthetic or naturally-derived biological substitutes (scaffolds) capable to help injured tissues to heal properly. Polymeric materials are often selected as promising candidates for scaffolding thanks to their high surface-to-volume ratio, their structural similarity to the matrix and in function of their final biomedical purpose. Furthermore, 3D biomaterial manufacturing strategies show an extraordinary driving force for the development of innovative therapies in the tissue engineering field, based on the interaction of three main elements: a supporting material, growth factors, and cells. Interaction mechanisms are the entanglement of macromolecules, lipids and interdigitation of the ECM with the physical biomaterial 3D structure, for example, pores. Here, the lipid profile of human fibroblast cells growth on 3D printed chitosan (CH) scaffolds was explored in terms of qualitative and quantitative profile, as a function of the time. Lipids play multiple roles within cells, such as those in energy storage, autocrine and paracrine signaling, and autophagy. Scaffolds were made by a home-made 3D cryo-printing process from formulations at the 6% w/w of chitosan, gelled in 1.5 M potassium hydroxide. Human fibroblast were grown on the 3D scaffolds and the lipid extraction was carried out by evaluating the performance of three different exctration protocols: butanol/methnol (BUME), metyl-tert-buthyl ether (MTBE) and hexane/isopropanol (HI). Three different classes of lipids were analyzed: fatty acyls, phospholipids and sterol lipids by liquid chromatography-triple quadrupole mass spectrometry. The results will be presented and discussed as a function of the extraction protocol, the scaffold properties and the growing time.

Biography

Lisa Elviri has completed her PhD at Parma University, IT in 2001. She is an Associate Professor of Analytical Chemistry at the Food and Drug Department of the University of Parma. She works mainly on sample preparation, liquid chromatography, mass spectrometry based techniques, 3D printing and biomaterial for regenerative medicine. She has over 90 publications that have been cited over 2300 times, and her publication H-index is 27. She is the Founder and President of M3datek Srl an innovative start-up dedicated to the 3D printing of biomaterial-based medical devices for regenerative medicine.

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