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STUDY OF THE INTERACTION OF ACTIVE COMPOUNDS WITH 3D PRINTED CHITOSAN/HYALURONIC ACID SCAFFOLDS IN CELL CULTURE MEDIUM: A MASS SPECTROMETRY APPROACH

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One of the purposes of tissue engineering is that of 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. Here, the behavior of 3D printed chitosan (CH) or CH/hyaluronic acid-based scaffolds was explored in terms of mechanical, morphological properties, and adsorbing properties of low molecular weight molecules and proteins contained in Dulbecco's modified medium High Glucose (DMEM) and bovine fetal serum (FBS), as a function of the gelation process. Scaffolds were made by a home-made 3D cryo-printing process from formulations with different concentrations of chitosan and chitosan and hyaluronic acid, gelled in 1.5 M potassium hydroxide, 1.5 M sodium carbonate or 28% w / v ammonia vapors. The water content of the scaffolds together with their mechanical strength and SEM morphological analyzes were evaluated. Finally, absorption tests were performed in order to qualitatively and qualitatively evaluate which substances the scaffold absorbs from the fetal bovine serum and the medium DMEM High Glucose. The analysis conducted by triple quadrupole and high resolution Orbitrap mass spectrometry, revealed that the scaffolds are able to absorb biological molecules present in medium and serum, and electrostatic interactions are the main driving forces. Furthermore, molecules presenting an aromatic ring or a sulfur group exhibited a preferred interaction pathway with the CH/HA scaffolds. The results as a function of the scaffold properties were presented and discussed.

BIOGRAPHY

Lisa Elviri has completed her PhD in 2001 from Parma University, IT. She is associate professor of analytical chemistry at the Food and Drug Department of the University of Parma. She work 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 2100 times, and her publication H-index is 26. 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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