MULTIPHOTON PROCESSING TECHNOLOGIES FOR APPLICATIONS IN BIOLOGY AND TISSUE ENGINEERING

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Conventional 2D cell culture systems used in biology do not accurately reproduce the 3D structure, function, or physiology of living tissue. Resulting behaviour and responses of cells often differ substantially from those observed within natural extracellular matrices (ECM). 3D printing of cell-containing hydrogel structures opens exciting perspectives for the engineering of 3D biomimetic cell culture matrices. In this context multiphoton processing is an outstanding approach as it offers spatial resolution unmatched by other 3D printing methods, while providing a possibility to produce structures in the presence of living cells [1]. Development of cell compatible and photopolymerizable hydrogels is an important step towards the latter goal [2]. Current challenges include possible cell damage, resulting from generation of free radicals, and necessity for faster processing [3]. In this contribution the recent progress on multiphoton processing of cell-containing hydrogel constructs is presented. Our results indicate the general practicability of this approach for fabrication of 3D cell-containing structures. The further development of the multiphoton processing techniques will facilitate the realization of elegant biological in vitro experiments, helping to elucidate biomimetic aspects of cell interaction with the surrounding environment.

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