Femtosecond Laser Microscopy of Stem Cells

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ABSTRACT:

Femtosecond laser multiphoton microscopy is an already well-established method for in vivo imaging of biological cells. The use of innovative femtosecond laser techniques for imaging and nanoprocessing in stem cell research is the subject of this talk. The multiphoton-FLIM tomograph MPTflex was used to investigate stem cells’ autofluorescence originated from the metabolic coenzymes NAD(P)H and FAD/flavoproteins. Significant differences on autofluorescence lifetime signatures have been identified in variety of stem cells as well as their differentiating counterparts. Moreover, metabolic activity of individual cells can also be detected within the complex culture of artificially generated induced pluripotent stem cell (iPS) colonies. Furthermore, femtosecond-laser based transfection found to be a superior method to realize contamination-free delivery of foreign molecules into single cells of interest. In order to achieve transfection of a large cell population, a software-aided automatic and a continuous flow femtosecond laser-assisted cell transfection systems were realized. Such fs laser transfection systems are shown to be beneficial in optical cell reprogramming to generate iPS cells.

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References