

# MULTIPHOTON FLUORESCENCE LIFETIME AND SPECTRAL IMAGING OF STEM CELLS

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**KEY WORDS:** stem cell, spheroid, multiphoton imaging, differentiation, autofluorescence

## ABSTRACT

Monolayer and 3D aggregates of human and animal stem cells are investigated by marker-free multiphoton microscopy. Autofluorescence and SHG imaging of human pancreatic and salivary gland stem cell spheroids has been performed with submicron spatial resolution, 10.5 nm spectral resolution, and picosecond temporal resolution. In particular, the coenzymes NAD(P)H and flavins have been detected by time-correlated single photon counting (TCSPC) of two-photon excited autofluorescence during differentiation. In addition, the onset of the biosynthesis of lipid droplets and extracellular matrix collagen was monitored over a period of several weeks in stem cell spheroids as a result of adipogenic, osteogenic and chondrogenic differentiation. Time-resolved multiphoton autofluorescence imaging microscopes may become promising tools for marker-free stem cell characterization and on-line monitoring of differentiation within a 3D microenvironment.