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Surface-enhanced Raman Spectroscopy Based 3D Spheroid Culture for Drug Discovery Studies

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Abstract

Three-dimensional (3D) spheroid cultures are more realistic tissue mimicking structures for drug discovery studies. However, analysis of 3D spheroid cultures is a challenge task because available techniques are destructive, which results with the loss of biochemical information confined in a spatial arrangement inside of spheroids. In this study, a surface-enhanced Raman scattering (SERS) based non-destructive approach is reported to study 3D cultures. Since the technique uses gold nanoparticles (AuNPs) as SERS substrates, the cells treated with AuNPs are used for the preparation of spheroids. Since SERS spectra originate from molecular species near AuNPs and their aggregates in endolysosomes, the obtained spectral information can provide significant level of information about biomolecular processes taking place in endolysosomes and dependently in cells. The performance of the approach is evaluated by monitoring the spectral changes upon external stimuli with Doxorubicin (Dox) and Paclitaxel (Pac). A layer-by-layer depth-scan SERS analysis of Dox and Pac treated spheroids reveals the spectral changes at

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