

Raman Microscopic Imaging of Cells and Applications Monitoring the Uptake of Liposomal Drug Delivery Systems

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Abstract: Recent developments in combining Raman spectroscopy with optical microscopy provide a new non-invasive technique to assess and image cellular processes. Based on the spectral parameters of a cell's components it is possible to image cellular organelles such as the nucleus or chromatin,^{1, 2} mitochondria³ and lipid bodies,⁴ at sub micrometer spatial resolution. Apparent advantages over conventional staining procedures are the noninvasive character of the technique as well as the associated chemical information. Of particular interest are often uptake mechanisms of various cytologically active compounds. In order to distinguish the species of interest from their cellular environment spectroscopically, compounds may be labeled with deuterium. Here we use this technique to investigate the cellular uptake and intracellular fate of lipid-based pharmaceutical nanocarriers. Currently, liposomes are widely used for drug delivery purposes,⁵ including intracellular drug and gene delivery.⁶ The distribution patterns of two systems have been imaged over time. The associated spectroscopic information provides evidence for dynamic interchange of the liposomes with cellular organelles. Depending on the experimental setup the technique may be applied to fixed or living cell organisms.

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