Abstract for Presentation

Studying cellular uptake of protein-coated gold nanoparticles via Four-Wave Mixing Imaging and Fluorescence Confocal microscopy

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In recent years, gold nanoparticles (NPs) have attracted enormous attention for their life-science applications as drug delivery vehicles, novel optical labels or local probes and sensors[1-3]. Gold NPs are excellent optical labels as they exhibit high optical cross sections near their morphology-dependent surface plasmon resonance (SPR) frequencies[4]. Owing to their high photostability and biocompatibility, together with their photothermal properties and electron microscopy contrast, gold NPs are among the most promising systems utilised in the biomedical research community[5, 6]. In this work, we present a study which combines two optical imaging modalities: confocal fluorescence and Four-wave mixing (FWM) microscopy in order to shed light on the endosomal trafficking of ligand-conjugated gold nanoparticles[7]. The samples consisted of fluorescently labelled Transferrin (Tf)-conjugated gold nanoparticles (AuNPs) of two different diameter sizes (15nm and 40nm) taken up by HeLa cells via clathrin mediated endocytosis. Resonant FWM microscopy, a coherent third-order non-linear imaging technique recently developed in our laboratory, enabled us to detect single gold nanoparticles completely background free[8]. We studied the correlation between fluorescent confocal imaging of the Tf labelled ligand and the label-free FWM imaging of the AuNPs to elucidate the stability of the Tf-AuNP construct during cellular uptake, and whether cellular trafficking separates the ligand from the AuNP cargo. This study opens new perspectives to correlative microscopy and aims to devise a protocol for specifically transporting gold NPs into cells.

References

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