DEVELOPMENT OF MULTIFUNCTIONAL NANOPARTICLES FOR THIRD HARMONIC GENERATION IMAGING

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Molecular imaging and cell tracking are big topics for the research of developmental biology, tumor metastasis and cancer therapy. In this decade, several kinds of imaging techniques and nanoparticles have been developed to achieve this purpose. However, how to apply new techniques to the study or confirmation of the important phenomenon is still an important issue. The new nonlinearity harmonic generation technique has been used for the observation of bio-sample. However, since there is no appropriate contrast agent, this technique has been only applied for the morphology imaging. We report a novel function of lipid-coated nanoparticles with third harmonic generation (THG) signals. By using effective cationic lipids as shell, the lipid-coating nanoparticles labeled cells with high efficiency. As a transfection reagent, the lipid-coated nanoparticles are able to be used for gene delivery. The labeled tumors are detectable by both of the two noninvasive imaging systems, magnetic resonance imaging and THG. This is by far the first time to use nanoparticles as THG contrast agents in the animal studies, by which the high resolution images of tumors and their environments are directly obtained *in vivo*. Thus, our study demonstrated the possibility of using multifunctional nanoparticles for live cell imaging and stem cell researches.