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OPTIMIZED SYNTHESIS AND ASSESSMENT OF FLUORESCENT DYE-LABELLED NANOSYSTEMS

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Research in nanomedicine is receiving increasing attention since the beginning of the twenty-first century. There is a hope that unique properties of nanosystems (NS) may help to improve diagnosis and therapy of diseases. Nanosystems of different design (quantum dots, liposomes, dendrimers, carbon nanotubes, microbubbles, metallic nanoparticles…) were proposed for their use as imaging, therapy or theranostic (therapeutic plus diagnostic) agents. The development of these nanosystems in medicine requires investigating their biodistribution in cells and tissues. For this purpose, a common strategy consists of labelling the nanosystems with a fluorescent dye. However, such a labelling does not always allow a reliable tracking of nanosystems, namely due to: i) the degradation and/or the quenching of fluorophores by interaction with the biological environment; ii) the release of fluorophores from the NS, which prevents to know if the observed fluorescence does correspond to the nanosystem. To circumvent these limitations, we developed a rational NS design and used spectral analysis of the NS fluorescence in solution and in cells. Rationally designed NS were composed of an inorganic core (superparamagnetic iron oxide nanoparticles – SPIONs or gold nanoparticles) coated with an organic shell made of molecules covalently attached to the core (fluorophores and polyethylene glycol, PEG_{5000}). Thus, the fluorescent labels were hidden under the PEG_{5000} layer. This was intended to (i) protect the fluorophores from quenching and degradation, (ii) reduce the risk of their release from the nanoparticles, and (iii) avoid the possible effect of these labels on the nanoparticles surface properties, which are critical for their stability and biological interactions. Labelling was optimized by varying the dye concentration and due to the purification steps. For the more relevant optical assessment of these optimized nanosystems within cancer cells, their fluorescence has been analyzed both by spectroscopy and confocal spectral imaging.

Biography

Katel Herve-Aubert has completed her PhD from University of Rennes 1, France in 2005. She is an Associate Professor in Nanomedicine and Nanoprobes laboratory (EA6295) at the University of Tours since 2006. This interdisciplinary team develops bio-analytical methods and nanomedicine technology for drug delivery and disease diagnostics. Her speciality is the Synthesis and Characterization of Nanomedicines.

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