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TITLE

Upconversion nanoparticles for bacterial labelling

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Trafficking profiles of pathogens are important in elucidating the mechanisms leading to their pathogenicity and disease manifestations. Current approaches for such studies have typically involved the use of conventional fluorophores or fluorescent proteins that are excited by ultraviolet or visible light. Hence, autofluorescence and photodamage are the common problems encountered in these studies. Here, we propose the use of unique luminescent nanomaterial, upconversion nanoparticles (UCNs), for bacterial labeling so as to circumvent these problems. Excitation wavelengths of these nanoparticles lies in this near-infrared (NIR) spectral region in which biological materials have low absorption and scattering coefficients. Thus, the use of UCNs as pathogens' contrast agents could allow for deeper tissue penetration, low autofluorescence and minimal photodamage. Moreover, the particles' high photostability and environmental insensitivity mean that continuous monitoring of the pathogens can be carried out without any diminishing of the signal intensities. A model pathogen, *Mycobacterium bovis* Bacillus Calmette-Guérin (BCG), was surface-labelled with carboxyl-functionalized UCNs by a general carboiidime-based conjugation strategy in which the bacterial surface amine groups were linked to the functionalized nanoparticles via a covalent amide bond. Our study showed that the conjugation process did not drastically affect on the bacterialbiological behavior. Characterization of the labelled BCG by transmission electron microscopy revealed that the nanoparticles were attached to the outer capsular layer. Results from the preliminary time point studies suggest that the UCN-labelled bacteria could be possibly be used to study outer surface dynamics of BCG during infection.

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Biography

Ms. Ong has completed her Bachelor of Engineering (Chemical) in the year of 2009 from National University of Singapore. She is currently pursuing her Ph.D, under the supervision of A/Prof. Yong Zhang and Dr. Sylvie Alonso, focusing on upconversion nanoparticles and their applications in imaging and delivery.