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TITLE

Mesoporous silica coated upconversion nanoparticles for vaccine delivery

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Infection with *Mycobacterium tuberculosis* (M.tb), the etiological agent of tuberculosis (TB), is a global health threat, in which the current available vaccine, *Mycobacterium bovis* Bacille Calmette-Guérin (BCG), a live attenuated strain of mycobacteria, only provides limited protection, thus calling for the development of novel TB vaccine candidates. Due to safety concerns of the BCG vaccine in immunocompromised individuals, purified subunit vaccine candidates have been preferentially investigated and developed. However, co-administration with a strong adjuvant is compulsory to overcome

the low immunogenicity of the purified subunit vaccine candidates. Here, we explore the feasibility of using mesoporous silica coated upconversion nanoparticles (MS-UCNs) as both delivery system and adjuvant for the promising M.tb subunit vaccine candidate CFP-10 (71-85). In addition, the optical properties of UCNs allow their easy tracking *in vivo*, thereby informing on the fate of the vaccine candidate upon administration.

CFP-10 (71-85) peptides were loaded into MS-UCNs via physical absorption with an efficiency of 18wt%. At physiological pH, about 60% of the loaded peptide can easily be released from the particles within the first 6 hours. An additional 20% of the peptide was released gradually over 6 days, thus suggesting that mesoporous silica coated nanoparticles can possibly act as controlled delivery vehicle with sustained release characteristics. Preliminary studies showed that peptide-loaded MS-UCNs display good biocompatibility (at a concentration lower than 10μg/10,000cells) and can be effectively internalized into bone marrow-derived dendritic cells, hence suggesting their suitability as an antigen carrier and possibility to be an effective vaccine approach in the future.

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Biography

Ms. Ang has completed her Bachelor of Medical & Pharmaceutical Biotechnology (Biotechnology) in the year 2007 from University of South Australia. She is currently working as a research engineer under the guidance of A/Prof. Yong Zhang and Dr. Sylvie Alonso in the field of Bioengineering, focusing on vaccine delivery.