PREPARATION AND IMMUNOGENICITY OF GOLD GLYCO-NANOPARTICLES AS ANTI-PNEUMOCOCCAL VACCINE MODEL

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Capsular polysaccharides (CPS) of encapsulated bacteria are critical determinants of bacterial virulence and have been used in the development of protective conjugate vaccines. Nanomaterials loaded with carbohydrate antigens are emerging as promising synthetic vaccine candidates, alternative to classic polysaccharide/protein conjugate vaccines. Repetitive antigen display, the ability to potentiate immune responses through enhanced antigen delivery to the immune system and the possibility to tune the loading of well-defined carbohydrates on different scaffolds are key factors supporting nanotechnology-based vaccines. Moreover, other structures can be incorporated onto the nanosystems as active mediators to increase vaccine efficacy. In this context, gold glyco-nanoparticles (GNPs) functionalized with the synthetic tetrasaccharide repeating unit of *Streptococcus pneumoniae* serotype 14 (Pn14PS), and the peptide fragment OVA323-339, serving as a T-helper epitope, have been demonstrated as able to elicit in vivo specific and functional IgG antibodies against native Pn14PS, thus promoting uptake and killing of bacteria Pn14.[1]
Herein, we report the preparation and immunological evaluation of new GNPs containing two synthetic CPS fragments related to serotypes 19F and 14 of *Streptococcus pneumoniae* (Tri-19F and Tetra-14) simultaneously displayed on nanoparticle surface, together with the T-helper peptide fragment OVA323-339. We aimed to explore the effect of these GNPs, coated with different antigen patterns, on the immunological response in mice and whether this response is affected by the presence of both saccharide antigens from diverse bacterial serotypes loaded onto the same nanoparticle. The main goal of this study was to determine whether these GNPs could induce specific antibodies against CPSs of both pneumococcal serotypes 14 and 19F or to affect the immune activity of either of them. Mice immunization showed that the concomitant presence of Tri-19F and Tetra-14 on the same nanoparticle critically enhanced the titers of specific IgG antibodies towards type 14 polysaccharide compared to GNP exclusively displaying Tetra-14. We also found that the bi-antigenic GNPs induced anti-Pn14PS IgG antibodies titers of the same order of magnitude as the currently used PCV13 human vaccine.

[1] Safari D, Marradi M, Chiodo F; Dekker H. A. T.; Shan Y. L.; Adamo R.; Oscarson S.; Rijkers G. T.; Lahmann M.; Kamerling J. P.; Penades S.; Snippe H. Gold nanoparticles as carriers for a synthetic Streptococcus pneumoniae type 14 conjugate vaccine. Nanomedicine-Uk **2012**, *7*, 651-662.