Chitosan-based nanosystem as pneumococcal vaccine delivery platform

Robla Álvarez, Sandra[1]
Prasanna, Maruthi[1,2]; Varela Calviño, Rubén[3]; Grandjean, Cyrille[2]; Csaba, Noemi[1].

1. Center for Research in Molecular Medicine and Chronic Diseases- CIMUS, University of Santiago de Compostela.
2. Unit Function & Protein Engineering, UMR CNRS 6286, University of Nantes, France.
3. Department of Biochemistry and Molecular Biology, University of Santiago de Compostela, Spain.

Sandra.robla@outlook.es

Abstract

Chitosan-based nanosystems have been described as interesting tools for antigen delivery, enhancing the immunogenicity of nasally administered vaccines [1]. The design of chitosan nanocapsules with the *Streptococcus pneumoniae* cell membrane protein PsaA (pneumococcal surface adhesin A), involved in adhesion and nasopharyngeal colonization processes [2] are proposed as an antigen-loaded vaccine delivery system candidate. This nanocarriers should reach to nasal subepithelial lymphoid follicles for their uptake by dendritic cells (DCs), for activation of specific T cells, producing an adaptive immune response against pneumonia [3].

Chitosan nanoparticles with thiol-maleimide conjugation between the polymer (chitosan) and the antigen (PsaA) were designed to enable surface presentation of PsaA for immune cell recognition. Spherical shaped particles, with size of 266±32 nn, positive charge of +30±1 mV and good stability profiles in simulated nasal fluids (up to 24 hours) were achieved. PsaA association rates were three times higher compared to nanocapsules without covalent polymer-protein conjugation.

The maturation of pre-incubated inmature DCs in the presence of antigen-conjugated nanocapsules, and subsequent studies of lymphocyte activation after this antigen presenting cells (APCs) presentation showed a higher capacity of nanocapsules to activate CD4 (CD4+/CD25+, 19% activation) and lower to CD8 T lymphocytes (CD8+/CD28+, 17% activation) compared to immature DCs (CD4+/CD25+ 16% and CD8+/CD28+, 18% activation). The evaluation of antigen-specific responses and cytokine profiles are currently underway to further evaluate the potential of these nanocapsules as vaccine delivery systems.

References

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Figures

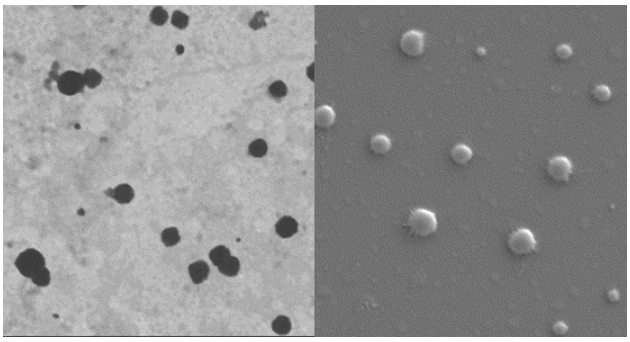

Figure 1: TEM and SEM images of Chitosan-maleimide PsaA-SATA nanocapsules.