Development and immunological characterization of synthetic nanovaccines based on the self-assembly of novel β-peptide sequences

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Vaccination remains the key strategy to control infectious diseases afflicting humans and animals. Owing to their biocompatibility and straightforward characterization, peptides have emerged as essential components of subunit vaccines. Over the last years, we reported a strategy to generate synthetic nanovaccines based on a chimeric peptide comprising a self-assembling sequence and an antigen, with the resulting nanoassemblies acting as an immunostimulator and a delivery system. In this study, we compared the 10-mer self-assembling peptide (I_{10}), originating from a naturally occurring amyloid peptide, to a *de novo* peptide sequence to conceive a nanoplatform for the delivery of a T-cell epitope model derived from ovalbumin, $OVA_{253-266}$. After synthesis, cleavage and purification, self-assembly was initiated by suspension of the lyophilized peptides in aqueous buffer. To characterize the supramolecular architecture of the resulting nanostructures, we used transmission electron microscopy and atomic force microscopy. Circular dichroism validated the secondary organization and the kinetic of self-assembly was followed using the fluorogenic probe ThT . Following the confirmation of the supramolecular assemblies, we immunized BALB/c mice intramuscularly with the nanoplatforms. Our results revealed the robustness of this novel supramolecular platform and confirmed that fully synthetic cross-beta-sheet nanoparticles can elicited strong antigen-specific immune response.