

## A plant-based nanoplatform for enhancing peptide and protein biological functions

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Viruses can be considered as nano-objects due to their size, monodispersity and symmetry. Plant viruses are produced with a low cost and hereby are presented as a possible biocompatible support for protein immobilization.

*Turnip mosaic virus* (TuMV) is a plant virus included in the genus Potyvirus. The viral particle has a flexuous tubular structure, approximately 720 nm long and 12-15 nm wide. Previous work carried out in our lab showed TuMV suitability for peptide and protein immobilization using chemical conjugation protocols and genetic fusion.

Recent advances have allowed the development of virus-like particles (VLPs) from TuMV, based on the CP self-assembling ability. These VLPs are structurally similar to native viruses but lack any genetic material. As a consequence they are not able to infect hosts plants, therefore providing a significant step towards using bio-safe viral derived particles in several applications.

VLPs can be exploited as nanoplatforms for the presentation of foreign epitopes and/or targeting molecules. This can be achieved through modification of the VLP coding sequence, such that fusion proteins are assembled into VLPs during de novo synthesis. Using plants as biofactories would definitely raise their production, especially when using systems that increase the expression of proteins. Now if we portray this production on a rod shape virus the possibilities are notably enhanced. This is because the area for peptide display is greater; hence the amount of peptides that fused to the CP is much larger than that in icosahedral viruses.

This nanoplatform is suited for the fusion of several peptides which could be used as diagnostic tools, antibody generation, immunization or biomaterials. This is promising for the biomedicine and nanotechnology fields, confirming that potyviruses can be used as nanoplatforms for epitope fusion. In addition, we validate that plants constitute excellent biofactories for this emerging technology and most importantly, the broad (and expanding) spectrum of possibilities where it could be applied.

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