Plant virus nanoparticles based on *Tomato bushy stunt virus*: a multifunctional tool for nanobiotechnology

Francesca Imperatori[1], *Simone Grasso*[2], *Chiara Lico*[3] *and Luca Santi*[1]

1. DAFNE, University of Tuscia, Viterbo - f.imperatori@unitus.it

2. CIR, University of Campus Bio-Medico, Roma

3. Department UTBIORAD-FARM, ENEA C.R. Casaccia, S. Maria di Galeria, Roma

Viral nanoparticles are molecular cages derived from the assembly of viral structural proteins. They bear several peculiarities as proper dimensions for nanoscale applications, size homogeneity, an intrinsic robustness, a large surface area to mass ratio and a defined, repetitive and symmetric macromolecular organization. Recently, plant viruses derived nanoparticles have received much attention as molecular tools in different technological fields.

We will present the development of a novel viral nanoparticles system based on *Tomato bushy stunt virus* (TBSV), that we have functionalized using different strategies of modification. Genetic modification of the viral coat protein gene has allowed protein fusions up to 56 amino acids in length, leading to correctly assembled chimeric virus particles that display the peptide of interest on the virus outer shell. Moreover, the system has shown an extreme versatility also regarding chemical modifications: N-hydroxysuccinimide ester based chemistry has been successfully employed to biotinylate lysine residues on the TBSV surface. Finally, a method has been developed to entrap little exogenous molecules inside the viral nanoparticles cavity by reversible opening of virion gated pores, a structural transition induced controlling physicochemical parameters such as pH and concentration of metal ions.