VIRAL NANOPARTICLES (VNPs): TOOLS FOR APPLICATIONS IN BIOMEDICINE

Nicole F. Steinmetz, Ph.D.
The Scripps Research Institute
La Jolla, CA 92037, USA

The use of nanomaterials has the potential to revolutionize materials science and medicine. Currently, a number of different nanoparticles are being investigated. Viral nanoparticles (VNPs) derived from plant viruses, such as the *Cowpea mosaic virus* and *Potato virus X*, can be regarded as naturally occurring nanomaterials. From a materials scientist's point of view, VNPs are attractive building blocks for several reasons: the particles are monodisperse, can be produced with ease on large scale, are exceptionally stable, and biocompatible. VNPs are "programmable" units, which can be modified using genetic modification or chemical bioconjugation methods.

Viral nanotechnology is a young and emerging discipline. VNPs are promising candidate materials for the development of "smart" devices for applications in medicine. VNPs are of tremendous interest for applications in tissue-specific imaging or targeted drug-delivery. Chemotherapy for cancer and vascular disease is generally not targeted, thus many undesired side effects occur. Targeting drugs specifically to sites of disease while avoiding healthy tissues, is expected to reduce toxic side effects, improve quality of life, and is an important goal in biomedicine. I will highlight examples that demonstrate the feasibility of targeting VNPs to sites of disease *in vivo*. VNPs can be interlinked with targeting ligands, imaging modalities, and therapeutic moieties. Such 'smart' multifunctional devices are expected to find applications in targeted chemotherapies.