Engineered Synthetic Virus-Like Particles and Their Use in Antigen Delivery

Javier Rodriguez, Vasiliki Daikopoulou, Oliver Rassek, Markus Heck, Lilli Stergiou

Virometix AG, Wagistrasse 14, 8952 Schlieren, Switzerland, javier.rodriguez@virometix.com

Virus-Like Particles (VLPs) are nanoscale structures that can serve as carriers for the delivery of antigenic epitopes. To optimize antigen delivery by offering controlled immune epitope presentation, and a low cost- and of scalable manufacturing platform, we have developed SVLPs (Synthetic Virus-Like Particles). SVLPs constitute a fully synthetic, modular nanoparticle platform, highly immunogenic and able to elicit both antibody- and cell-mediated immune responses in a self-adjuvanted manner.

The SVLP is composed of self-assembling lipopeptidic monomers carrying elements to activate innate and adaptive immune responses. A Toll-Like Receptor (TLR) agonist with adjuvant properties that also drives particle formation due to its lipidic nature, coiled-coil (CC) repeats for monomeric bundle assembly, and universal T-helper (Th) epitope(s) comprise exchangeable functional components of the backbone.

The antigenic epitopes are synthesized using solid-phase peptide synthesis and are selectively conjugated to the backbone through orthogonal chemistry. The antigens can vary in length and nature, encompassing long linear peptides or structurally constrained peptides derived from pathogenic proteins, peptides with post-translational modifications, glycans, or small-sized recombinant proteins. Moreover, single or multiple antigenic peptides can be presented on the surface of one particle. The SVLPs exhibit uniformity in size (25-30 nm in diameter) and low polydispersity, with each particle displaying 60-90 antigens, ensuring high epitope density.

The SVLP platform lends itself to several applications, ranging from vaccines against viral and bacterial infectious diseases and cancer immunotherapies, to allergy therapeutics. An RSV vaccine candidate has already been tested in a clinical setting, proven to be safe and immunogenic, whereas the planning for a Streptococcus pneumoniae prophylactic vaccine candidate is currently underway.

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