Docket #: S22-243

TLR agonists Comprising Saponin Nanoparticle Vaccine Adjuvants Improve Immunomodulation

Stanford researchers have developed saponin lipid-based nanoparticles in which both toll-like receptor agonists (TLRas) and other potent molecular adjuvants can be encapsulated to improve vaccine potency, increase antibody titers, and induce more robust neutralizing antibody responses.

Vaccine development to combat severe infectious diseases is essential to human survival. An ever-present threat of new pandemic viral strains like the SARS-CoV-2 virus and its related variants necessitates the development of more potent and protective vaccines. Scientists favor subunit vaccines that use representative pathogen fragments as antigens for their higher safety. Unfortunately, these subunit vaccines are hampered by their weak immunogenicity. Immune stimulating-adjuvants such as toll-like receptor agonists (TLRas) are usually added to elicit stronger antibody responses and better immune memory. Subunit vaccines can also be packaged in nanoparticles which contribute to vaccine potency, quality, and durability.

Stanford inventors have therefore designed saponin lipid-based nanoparticles (SNPs) to encapsulate TLRas and other potent molecular adjuvants concurrently. SNPs have improved potency, producing higher antibody titers and stronger neutralizing antibody responses when different adjuvants are co-presented in the same nanoparticle construct. The inventors used three different TLRas adjuvants, namely Monophosphoryl Lipid A (MPLA, TLRa 4), Pam3CSK4 (TLRa 1/2), and lipid based R848 derivative (TLRa 7/8).

Stage of Development
Research - in vivo

Applications

- TLRas-SNPs can be used as vaccine adjuvants.

Advantages

- Stable at 4°C for several weeks.
- Result in a stronger immune response in the body compared to clinically used adjuvant systems.
- Inventors developed two novel formulations of TLRas comprising SNPs.

Patents

- Published Application: WO2023235592

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