Engineering Protein Nanoparticles for Enhanced Vaccine Delivery

Tech ID: 33944 / UC Case 2025-787-0

BRIEF DESCRIPTION

A revolutionary vaccine platform enabling the co-delivery of multiple toll-like receptor agonists and an antigen for potent immune responses.

FULL DESCRIPTION

This technology utilizes engineered protein nanoparticles (NPs) to co-deliver toll-like receptor (TLR) agonists and a protein antigen, aiming to elicit stronger, broader, and more efficacious immune responses. This approach allows for stable vaccines that can simultaneously deliver active components in a consistent and uniform molecular orientation, enhancing the immunogenicity of vaccines against infectious diseases. As a result, this platform overcomes the limitations of conventional subunit vaccines, such as rapid draining kinetics and reduced immunostimulatory capacity.

SUGGESTED USES

- Development of next-generation vaccines for infectious diseases.
- Prophylactic vaccines offering broader protection against emerging pandemic pathogens.
- Modular vaccine platforms for rapid response to seasonal and pandemic influenza strains.

ADVANTAGES

- Simultaneous delivery of multiple adjuvants and an antigen on a single nanoparticle.
- Enhanced immunogenicity through consistent and uniform molecular orientation of components.
- Improves the strength, breadth, and bias of immune responses against infectious diseases.
- Offers a modular approach, allowing for the customization of vaccine formulations to target different pathogens.
- Potentially reduces the need for annual vaccine reformulations and improves protection against emerging pathogens.

PATENT STATUS

Patent Pending

RELATED MATERIALS

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OTHER INFORMATION

CATEGORIZED AS

- **Materials & Chemicals**
  - Nanomaterials
- **Medical**
  - Delivery Systems
  - Disease: Infectious Diseases
  - Vaccines

RELATED CASES

2025-787-0

» Ramirez, A., et al. Davies, D. H., Wang, S.-W. (2023). Engineering Protein Nanoparticles Functionalized with an Immunodominant Coxiella burnetii Antigen to Generate a Q Fever Vaccine. Bioconjugate Chem. 34 (9).

» Badten, A. J., Ramirez, A., et al. Davies, D. H., Wang, S.-W. (2023). Protein Nanoparticle-Mediated Delivery of Recombinant Influenza Hemagglutinin Enhances Immunogenicity and Breadth of the Antibody Response. ACS. Infect. Dis. 9 (2).

» Ramirez A, Hernandez-Davies JE, Jain A, Wang L, Strahsburger E, Davies DH, Wang SW. Co-Delivery of Multiple Toll-Like Receptor Agonists and Avian Influenza Hemagglutinin on Protein Nanoparticles Enhances Vaccine Immunogenicity and Efficacy. Adv Healthc Mater. 2025 Feb 9:e2404335. doi: 10.1002/adhm.202404335. Epub ahead of print. PMID: 39924738.

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