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Self-Assembling Bacterial Lipoprotein Nanoparticles for Small Molecule Encapsulation and Delivery

Researchers at Stanford have developed a new method for using bacterial lipoproteins as nanocarriers for small molecule drugs, opening the door to a novel class of biodegradable, protein-based drug delivery vehicles.

Drug delivery remains a major challenge in medicine. Many small molecule therapeutics are difficult to administer effectively because they are rapidly cleared from the body, fail to accumulate at target tissues, or require complex formulation processes. Existing nanoparticle delivery platforms, such as liposomes and polymeric micelles, can address some of these challenges, but are often expensive and difficult to manufacture at scale.

This technology offers a simpler alternative. Bacterial lipoproteins naturally self-assemble into stable, nanosized structures in solution. Stanford researchers have shown that these structures can encapsulate small molecule payloads using a streamlined process, enabling controlled release and improved delivery compared to unformulated drugs. The production process is compatible with standard bacterial expression systems, requiring no specialized manufacturing infrastructure.

Stage of Development
Proof of concept

Applications

- Nanoparticle-based delivery systems for small molecule drugs and therapeutic agents
- Drug delivery components for oncology and photodynamic therapy products

- Potential vaccine adjuvant and antigen delivery platforms for next-generation immunotherapies

Advantages

- First reported use of bacterial lipoproteins as nanocarriers for small molecules
- Simpler and more cost-effective to produce than conventional lipid nanoparticle or liposome systems
- Naturally biodegradable with potential immunostimulatory properties, supporting drug delivery and, potentially, vaccine applications

Publications

- Peer review in progress

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