Docket #: S24-194

Albumin-Shielded AAV Vectors for Repeatable and Safer Gene Therapy

Stanford researchers have developed a novel gene therapy vector, AAV-capGL to overcome immune barriers that currently limit the efficacy and safety of adeno-associated virus (AAV)-based gene therapies. By cloaking AAV capsids with albumin, this technology enables safer, repeatable dosing and broader patient eligibility.

A major limitation of AAV gene therapy is immune interference. Antibodies binding of pre-existing antibodies in many individuals or antibodies generated after a first dose to AAV vectors will neutralize them and prevent effective delivery to target cells. This not only excludes many patients from treatment but also limits re-dosing, posing a significant barrier in chronic or progressive diseases. Additionally, antibody-AAV complexes can trigger complement activation, leading to serious adverse events, including rare but life-threatening conditions like thrombotic microangiopathy (TMA).

Current solutions including patient screening or immunosuppression are limited by logistic complexity and infeasible for repeated treatments. This invention provides better solution by engineering a class of AAV vectors with albumin-binding domains (ABDs) on the capsid surface. These domains non-covalently attract and bind circulating albumin, forming a dynamic protective shield that masks the AAV vector from immune recognition while still allowing cell transduction. By tuning ABD affinity to achieve a strong enough to block antibodies and weak enough to allow cellular uptake, AAV-capGL vectors offer a promising, generalizable platform for safer, repeatable gene therapy.

Stage of Development
Proof-of-concept

Applications

- Gene therapy for patients with pre-existing anti-AAV antibodies
- Repeat dosing of AAV-based gene therapies
- Enhanced systemic delivery of AAV vectors

Advantages

- Enables treatment of anti-AAV seropositive patients
- Supports repeat dosing
- Reduces risk of complement activation and serious immune-related adverse events

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