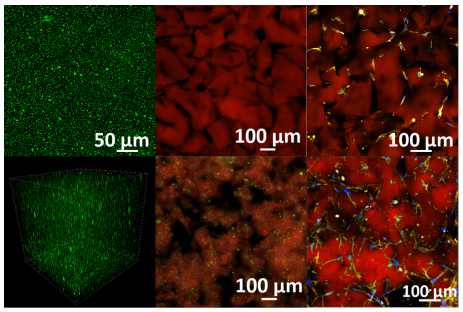
An injectable hydrogel scaffold that delivers gene therapies locally

Unmet Need

Gene therapy has applications ranging from tissue engineering to vaccine development to infectious disease. Most approaches to deliver nucleic material involve the systemic intravenous delivery of condensed nucleic acid (e.g., within a virus or a synthetic particle). However, this approach suffers from immune recognition, accumulation in first pass organs, and rapid clearance. To circumvent these limitations, local delivery approaches that inject and retain the nucleic acid cargo at desired locations are beneficial. For example, the FDA approved gene therapy voretigene neparvovec delivers AAV directly into the eye by subretinal injection, bypassing immune recognition, first pass organ accumulation, and rapid clearance. While the eye is an enclosed environment and has low risk for gene therapies diffusing to the rest of the body, this is not the case for most organs, which requires an alternative delivery method. There is a need for alternative technologies that enable safe and effective delivery of gene therapies.

Technology

Duke inventors have reported a hydrogel scaffold that delivers gene therapies. The scaffold is meant to be pre-loaded with nucleic acids and then injected into the patient to administer gene therapies locally, such as for tissue regeneration and stroke treatment. Specifically, this is a therapeutic polymer gel system created using irregularly shaped microgels that are annealed together to form a porous, granular scaffold, referred to as a flowable linked irregular particle (FLIP) scaffold. Nucleic acids, more stable nucleic acid nanosized particles, or viruses are incorporated inside the FLIP scaffold for prolonged, localized delivery. This technology has been



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Publication(s)

External Link(s)

• From the lab of Dr. Tatiana Segura

demonstrated to encourage rapid cell infiltration and spreading within a 3D culture and successfully sustain transfection over a month.

Advantages

- Can potentially address temporal limitations of gene therapy by providing a localized, sustained transfection to nearby or infiltrating cells at the implantation site
- Overcomes challenges, including reduced transfection efficacy and the requirement for cell degradation, associated with other scaffold-based gene delivery systems
- Offers a tunable platform to combine hydrogel particles with different therapeutic payloads for spatial control