Hydrogel Microparticle Generation via Soft Robotic Micromold

Overview
Current microparticle production methods limit the ability to produce microparticles with specific properties, such as complex geometries and tailored compositions. This soft robotic micromold technology allows for generation of hydrogel microparticles with highly reproducible characteristics, such as shape and size, and is able to produce collagen microparticles without damage.

Technology
A flexible chamber with an interior air channel is topped with a thin film containing an array of customized molds. When air is injected into the channel, the chamber and mold layer deform, allowing a solution to lift the hydrogel microparticles out of the mold to be collected. These molds can create highly customizable 2D or 3D shapes from a broad spectrum of materials that can be enhanced with various components including, but not limited to, cells, biomolecules and pharmaceuticals.

Advantages
- Able to produce semi-aligned collagen microparticles without damage to structure
- Highly reproducible generation of customizable 2D or 3D shapes
- Very low variability between microparticle size and shape (dimensions between 100 μm to 1,000 μm)
- Applicable to all biopolymers
- Easy and reliable extraction of soft and fragile hydrogels

Applications
- Tissue regeneration
- Drug delivery
- Cancer microenvironment study
- Artificial organ or animal for drug screening

Stage of Development
- Collagen particles are made and implanted into mice.
- Collagen particles demonstrate better cell performance than other hydrogel materials.

Patent Status
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Publications