



# Microgel Paste – Collagen Composites for Injectable, Dynamic Regenerative Biomaterials

Chapman Case # 2026-002

## Market Need

Regenerative medicine scaffolds often face a tradeoff between mechanical integrity and biological integration: materials that are strong enough to maintain structure can restrict cell infiltration, while permissive collagen-only matrices are frequently too weak or lack the handling properties needed for real-world use. The need is for injectable, conformal biomaterials that enable fast cell entry and nutrient transport without relying on large pre-formed pores or “degrade-first” behavior. The near-term market pull is substantial: global wound care at ~\$20B and tissue engineering at ~\$19B.

## Chapman Solution

[Dr. L. Andrew Lyon](#) and his research team developed a biosynthetic composite where type I collagen self-assembles directly inside a highly crowded, shear-thinning microgel paste (nanostructured microgel paste), forming a 3D collagen network throughout the paste volume. The paste is optically transparent and injectable/extrudable, while the collagen phase provides natural sites for cell attachment; together, the composite supports robust cell invasion and spreading in 3D culture despite the material’s dense, tissue-like structure.

## Competitive Advantages

Feature	Chapman’s Microgel	MAP Gels	Collagen-only Hydrogels
<b>Cell invasion mechanism</b>	Cell invasion observed without requiring scaffold degradation first	Typically relies on engineered void space/annealing to create pores	Dense networks can limit infiltration; often mechanically weak
<b>Processability</b>	Injectable, shear-thinning paste; conformal placement	Requires assembly/annealing steps	Injectable but typically low mechanical strength
<b>Structure</b>	Nanoscale porosity + dynamic reconfigurability; collagen forms in situ	Larger pore/void architecture by design	Fibrillar network, limited mechanical tunability alone
<b>Biological Functionality</b>	Collagen provides adhesion; matrix supports rapid invasion/spreading	Often requires added cues; performance varies by formulation	Bioactive but often not robust enough for load/handling needs

## Applications

- Injectable scaffolds for soft tissue repair and conformal defect filling
- Wound healing matrices (chronic wounds, burns, surgical sites) that support rapid cellular ingress
- Bioinks / cell culture matrices for 3D tissue models, organoids, or regenerative bio-fabrication

## Key Publication

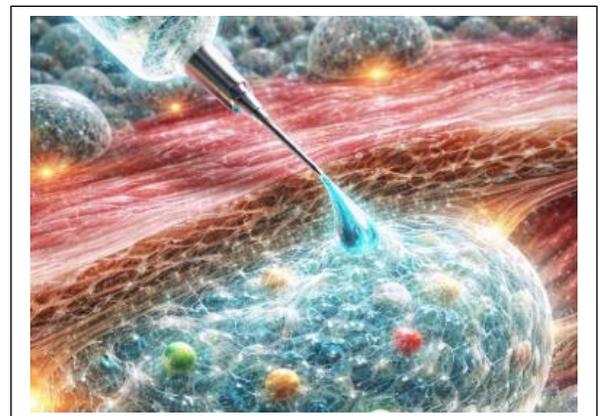
- [Dynamic, Reconfigurable, and Hierarchical Biosynthetic Composites via Collagen Self-Assembly within Highly Crowded Microgel Pastes](#). Advanced Materials. December 2025.

## Intellectual Property

- Patent application filed

## Stage of Development

- Validated in vitro: 3D cell culture shows fibroblast invasion, spreading, and proliferation within the composite
- Demonstrated materials performance: injectable/shear-thinning handling, optical transparency, and robust in situ collagen network formation within the paste



## Contact

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