

Dynamic Silk Matrices for Tissue Ageing

2026-025



Medical Research Tool



> TRL 4
> Validation

Problem

Current *in vitro* research models fail to accurately reproduce the dynamic physical environments found in human tissues. Most cell culture systems are static, two-dimensional, and unable to mimic progressive changes in tissue stiffness that occur during ageing, injury, fibrosis, and cancer. Animal models also have significant limitations, with low translation rates to human clinical outcomes due to biological differences between species. These shortcomings contribute to poor prediction of therapeutic efficacy and high drug failure rates during clinical development. Researchers and pharmaceutical companies lack practical tools to study how changing tissue mechanics influence cell behaviour, disease progression, and treatment response.

Solution

This technology uses engineered silk-based biomaterials to create dynamic *in vitro* environments that progressively change stiffness over time, better reflecting physiological and pathological tissue conditions. The platform can be tailored to model healthy tissue, ageing, injury, fibrosis, and tumour progression while supporting long-term cell culture and compatibility with multiple cell types. Unlike conventional static culture systems, the material provides controllable mechanical evolution, enabling researchers to investigate how cells respond to changing physical environments. The platform can also be integrated with advanced biofabrication approaches to generate more sophisticated tissue models for biomedical research, therapeutic development, and disease modelling.

Intellectual Property Status

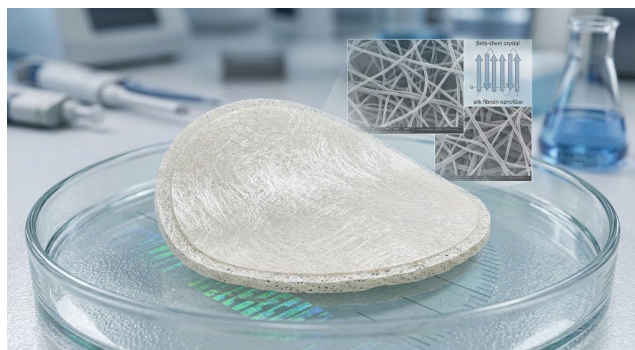
This invention is the subject of a provisional patent application AU: 2026900812

Potential Commercial Applications

- Drug discovery and high-throughput therapeutic screening
- Oncology models for evaluating drug performance in stiff tumour microenvironments
- Fibrosis research and anti-fibrotic therapy development
- Ageing and longevity research platforms
- 3D tissue engineering and biofabrication workflows
- Mechanobiology research investigating cell responses to dynamic physical environments
- Preclinical human-relevant testing alternatives to animal model

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