CellFiber® : An encapsulation technology reimagined for your cell culture

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Background

Clinical accessibility of cell therapies is primarily driven by validating cell products across diverse perspectives, including efficacy, productivity, quality, and the broader ecosystem. Productivity is largely determined by the manufacturing process, which must be sufficiently developed to generate adequate dosages within a feasible batch scale. Insufficient batch yields of high-quality cells often lead to excessive manipulations and increased process complexity—challenges shared with conventional culture techniques. Here, we introduce a novel technology aimed at addressing the need for an optimized manufacturing process.

CellFiber® technology

CellFiber® is an **encapsulation** technology that utilizes medical-grade alginate to construct a protective tubular structure, establishing a stable biomimetic environment for **high-density cell culture**. The Fiber is fabricated through the continuous laminar flows of three components: crosslinker, alginate solution and cell solution (Figure 1). The formation of an alginate hydrogel shell protects cells while permitting vital elements to permeate.
This technology is **applicable to culturing adherent and suspension cell types**, and the confluency of cultures could be observed via microscope (Figure 2).

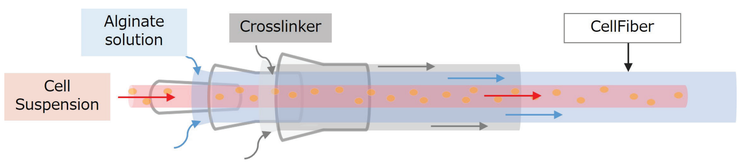


Figure 1.

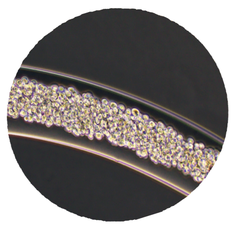


Figure 2.

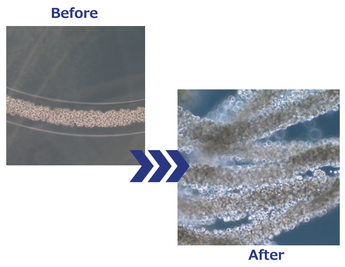


Figure 3.

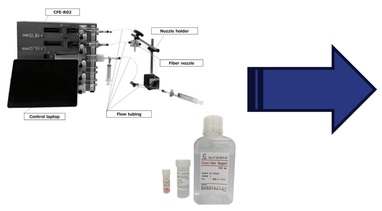
Based on the principles of gel formation, the alginate hydrogel fiber can be **dissolved non-enzymatically**, allowing cells to detach completely after expansion culture (Figure 3.). The alginic acid can then be washed out using typical methods or an automated harvesting system. This demonstrates the potential for integrating CellFiber into manufacturing platforms for clinical cell products.

Key Benefits

- **Improved Efficacy**
- **Intensified Manufacturing**
- **Improved Process Development**

Fiber Fabrication system

Proo-of-Concept
Pump system



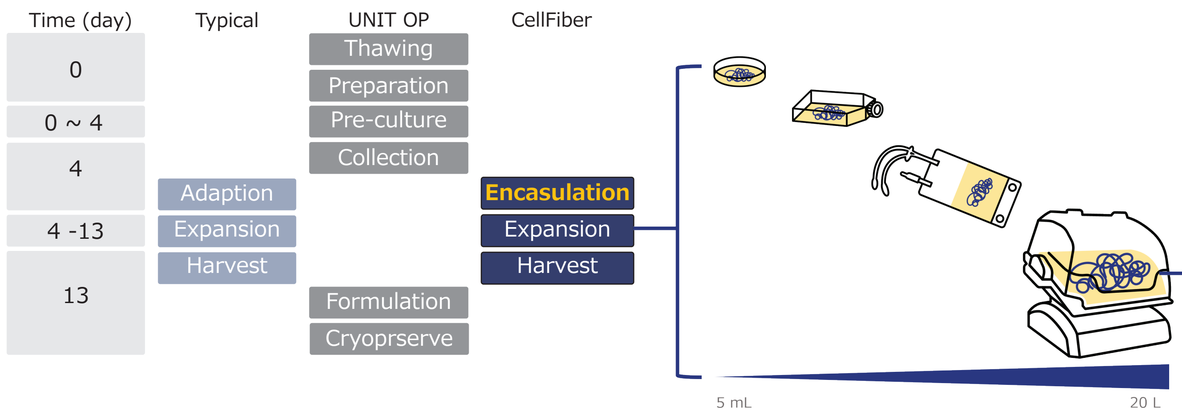
Manufacture
CellFiber® Extruder system

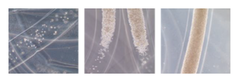
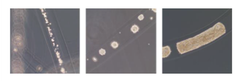
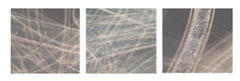
To address the distinct necessities and limited resources during the gradual development phases of the pipeline, we support research efforts with designated products ranging from proof-of-concept and process development to manufacturing scales. Fiber characteristics, including diameter and length, are controllable via programmed settings to meet specific investigation aims and expansion scales.

The pump system is a semi-automated piece of equipment designed for initiating feasibility tests with a low initial investment in preparation.

CellFiber® Extruder system equipped with single-use kit, which is sterilely connectable to reagent bags and bioreactor cellbag. Cells can be encapsulated directly into cellbag in the manner of sterile manipulations.

Workflow with CellFiber



	T Cells	iPSC	MSC
Expansion Rate Increase	620X	54X	50X
Benefit Compared to Typical Platforms	15X reduction in required number of seeding cells	10X increase in Viable Cell Density	80% reduction in manufacturing cost/doses
Cell Growth Characteristics			

Compared to typical cell therapy manufacturing workflows, CellFiber incorporates the encapsulation step immediately prior to expansion culture. This process is highly scalable and compatible with diverse culture vessels, ranging from well plates, dishes, and flasks to large-scale bioreactors. Such flexibility enables an easy transition from early-stage studies to industry-compliant manufacturing processes, effectively meeting various phase-dependent goals.

CellFiber addresses the inherent challenges of diverse cell types and existing market techniques. The biomimetic inner environment concentrates cells, eliminating the need for high initial inoculation numbers. Additionally, it increases footprint efficiency by enabling higher viable cell densities at production scales, significantly decreasing costs related to labor, time, facility maintenance, and physical space.

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