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Southwest Research Institute

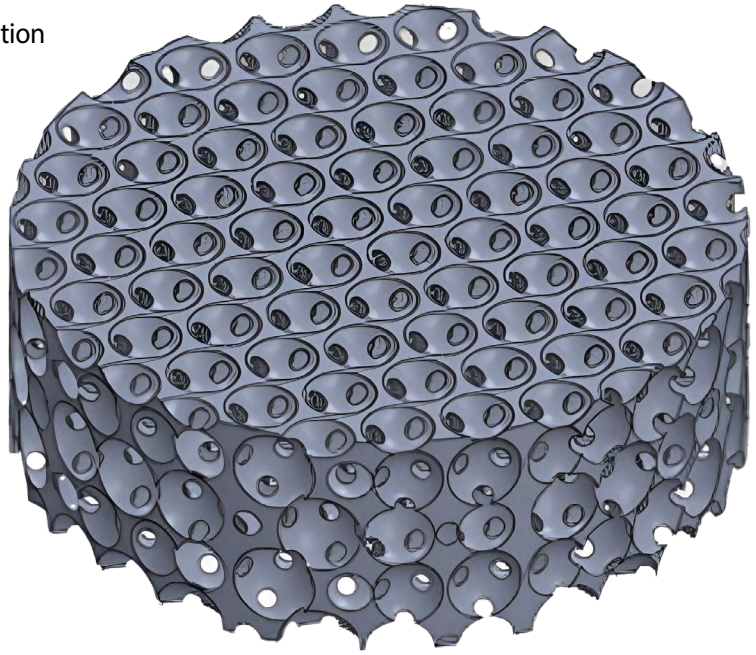
Portable, 3D-Printed Bioreactor Enabling Rapid, Automated, Closed, and Scalable Cell and Gene Therapy Manufacturing

Cell and gene therapy (CGT) represents a cutting-edge medical approach to treating or curing various diseases including cancer, diabetes, rare genetic disorders, and infectious and autoimmune diseases. An urgent need exists for next-generation manufacturing platforms that can deliver high-quality, standardized, scalable, and affordable CGT production at the point of care.

Bioengineering scientists at Southwest Research Institute® (SwRI®) are committed to advancing revolutionary pharmaceuticals to the clinic. Supported by our internal research and development (IR&D) program, SwRI has developed a novel bioreactor system designed for CGT applications that require consistency, sterility, and scalability. Our 3D-printed system offers a closed, automated solution in a compact, portable format that reduces costs, minimizes contamination risk, and accelerates translational research to clinical manufacturing.

Key Features & Advantages

- Maintains a low-shear monolayer cell culture environment
- Enables efficient cell differentiation and high-efficiency transfection
- Supports high-yield cell and biologic harvesting
- Portable benchtop design with programmable controls
- Fully automated and standardized CGT manufacturing process
- Reduces reagent and labor costs by at least 50% vs. traditional 2D culture
- Minimizes product variability and contamination risk
- Scalable design for seamless transition from R&D to clinical production



A novel, single-use 3D-printed bioreactor enhances surface-to-volume ratio and cell culture capacity.

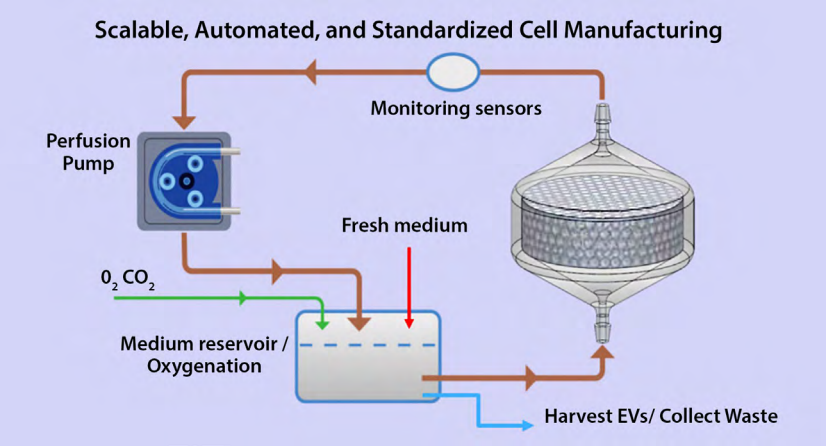
Application Areas

- Mesenchymal stem cells (MSCs)
- CD34+ hematopoietic stem cells (HSCs)
- Induced pluripotent stem cells (iPSCs)
- CAR-T cells
- Exosomes & cell-derived biologics
- Viral vectors
- Vaccines

Development Stage

A laboratory-scale prototype has been completed and evaluated in various cell and gene therapy applications including MSC expansion, CAR-T cell selection, activation, transduction and expansion, iPSC expansion and differentiation, and cell-derived biologics (exosome, viral vector) production.

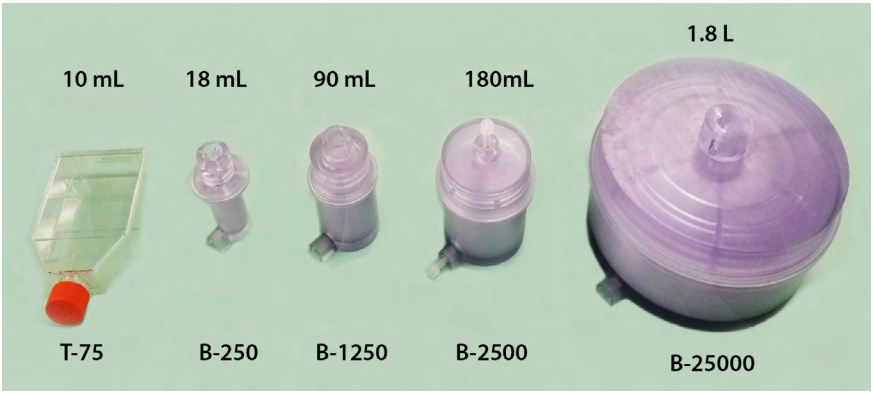
Five U.S. patents have been awarded. The 3D-printed bioreactor has reached Technology Readiness Level (RTL) 6 and Biomanufacturing Readiness Level (BRL) 4. The alpha-prototype was successfully tested in a cGMP environment.



The structure supports automated, circulation-based cell culture driven by a pump, with a media reservoir utilized to maintain optimal levels of O_2, CO_2, and nutrients.

Next Step

SwRI aims to commercialize this novel bioreactor technology into a next-generation portable, versatile, and automated biomanufacturing platform for research, development, and clinical manufacturing of personalized cell and gene therapies. We are actively seeking collaborations, including investors, strategic biotech/pharma partners, co-development, or licensing partners.



The bioreactor is easily scalable, as demonstrated by various bioreactor sizes fabricated, ranging from 250 to 25,000 cm^2 of cell culture surface area.

We welcome your inquiries. For more information, please contact:

Jian Ling, Ph.D., Institute Engineer
Manager, Bioengineering
210.522.3953
jian.ling@swri.org

Pharma & Bioengineering Department
Chemistry & Chemical Engineering Division

bioengineering.swri.org

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