MAKE TODAY'S RESEARCH TOMORROW'S CELL THERAPY

Products and Services for Your Research

STEMCELL™ TECHNOLOGIES

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PDF

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Introduction

The path you take when translating a cell therapy from the research lab to the clinic is unlikely to be straightforward. As the range of cell types and tissues being investigated for their therapeutic potential continues to evolve—from immune cells to hematopoietic stem and progenitor cells (HSPCs), to human pluripotent stem cells (hPSCs)—so too are the specific challenges facing cell therapy developers and manufacturers. Beyond the need for specialized tools and tissue-specific protocols, developing and testing safe and efficacious cell and gene therapies also involves navigating material qualifications, process validations, and regulatory requirements that can seem as complex as the diseases that scientists are working to treat.

Partnering with a reliable, supportive supplier can ease the bench-to-clinic journey for your cell therapy in development. Whether you need their recommendations for products and tools that best meet your specific research needs, or assistance with fulfilling regulatory and compliance requirements, an experienced and knowledgeable supplier can be an asset when translating your cell and gene therapy research to the clinic.

From our specialized products to our expert educational resources and services, STEMCELL Technologies can support your cell therapy development from the research lab to the clinic. Manufactured under a strict quality management system, our high-performance, standardized media and reagents can be used to consistently maintain, activate, expand, or differentiate cells for use in cell and gene therapy research and development. In addition to helping you build a complete workflow for your research, we also offer customized solutions through our Services for Cell Therapy Program, such as higher compliance product manufacture, regulatory support, and customer documentation.

Explore the sections below for an overview of some of the tools and workflows we have to support your cell therapy development, including products for cell isolation, expansion, gene editing, differentiation, and cell characterization. For detailed or specific information about our product offerings and support, please visit **www.stemcell.com** or contact your STEMCELL sales representative.

Try Products That Support Your Cell Therapy Development

Finding products that meet both the needs of researchers and the requirements for cell therapy applications can be challenging. That's why it's crucial to use products that meet both your research and regulatory requirements. Try our products in your own lab—we offer a range of high-compliance cell culture media, primary cells, and reagents for your cell therapy research and development.

Request Introductory Offer

www.stemcell.com/try-cgt-products

Ease Your Path to the Clinic with Our Services for Cell Therapy Program

Whether you're working in a small biotech, a large pharmaceutical company, or a contract development and manufacturing organization (CDMO), developing a robust ancillary material (also known as raw material) strategy is critical to success as you enter the clinic and progress toward commercialization. However, developing such strategies can be challenging because of the lack of a standardized regulatory framework for ancillary materials and the need to work closely with suppliers to meet your specific needs. At STEMCELL Technologies, we are committed to supporting your company's vision to create groundbreaking cell and gene therapies for patients living with cancer and other diseases. That's why we created our **Services for Cell Therapy Program**, a team of specialists that can work with you as a reliable partner from the clinical process development stage to commercialization. Through the Services for Cell Therapy Program, STEMCELL has enabled the use of a wide range of our products as ancillary materials in many active clinical trials across a broad range of applications and indications.

After working with you to gain a detailed understanding of your clinical timelines and requirements, your STEMCELL sales representative will introduce you to a Services for Cell Therapy Program manager, who can support the qualification of our products as ancillary materials and provide customized solutions to meet your specific clinical needs, including:

- Letters of Authorization (LoA) to reference FDA Master Files for GMP products
- Custom quality services, including enhanced manufacturing and QC testing controls
- Custom product modifications (e.g. formulations, packaging, dedicated manufacturing runs)
- Quality and Supply Agreements

STEMCELL-Supported Clinical Trials

STEMCELL has a growing portfolio of products that have been featured in clinical trials. Some of these products are manufactured under GMP guidelines and can be directly used for clinical use.

Our dedicated Services for Cell Therapy Program can help to identify custom solutions that enable the use of non-GMP products in clinical trials.

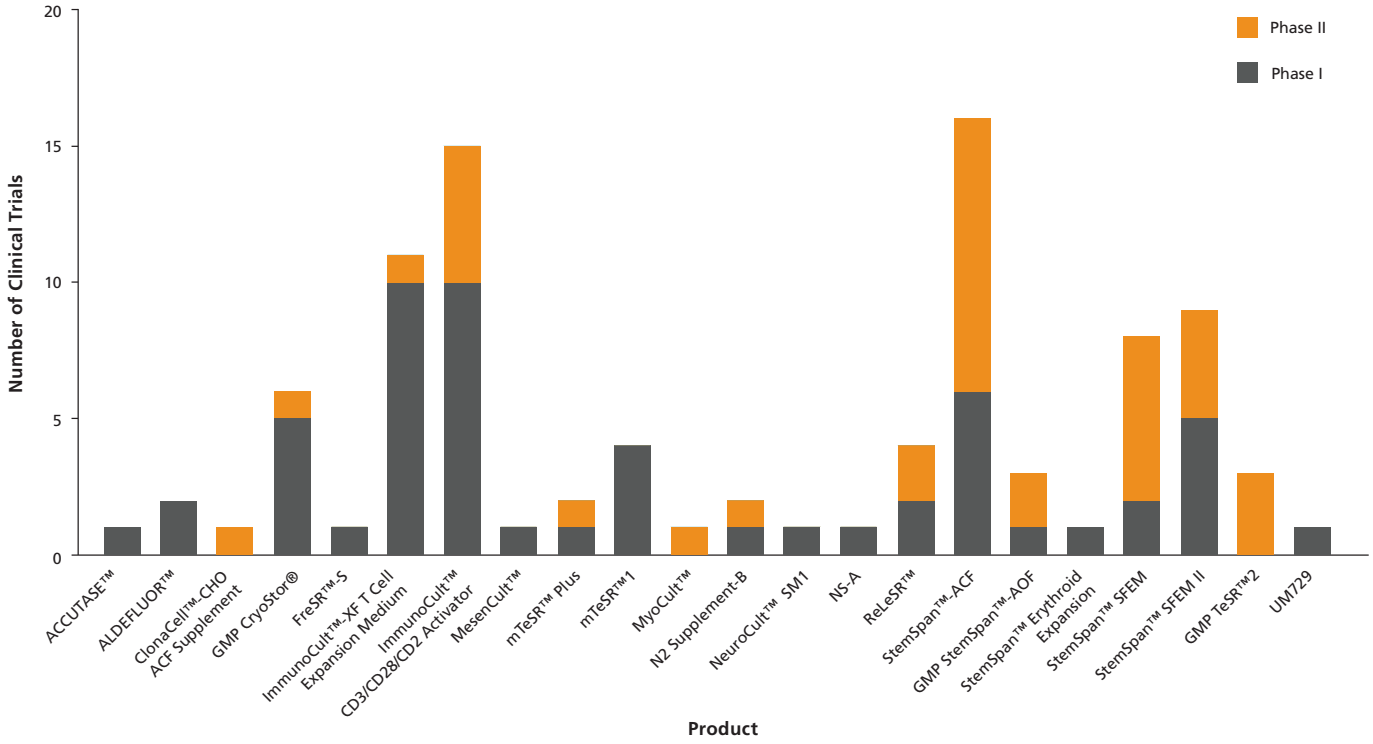


Figure 1. Overview of STEMCELL Products Used in Clinical Trials

Customer Case Study

Recently, a TCR-T cell therapy developer was preparing an Investigational New Drug (IND) application for a cell therapy product manufactured using one of STEMCELL's non-GMP immune cell expansion media. By following a stringent ancillary material qualification process, the developer identified additional quality and regulatory requirements for the medium. Specifically, they determined that the product formulation would need to be shared with their FDA reviewer, and that a human-origin raw material in the product formulation must be sourced according to 21 CFR 640.

The developer was put in touch with a Services for Cell Therapy Program Manager, who worked across STEMCELL departments to deliver the required solutions:

1. An abridged FDA Master File for the T cell expansion medium was put in place for the sponsor to reference.

2. Custom product manufacturing runs were arranged using specific raw materials sourced in accordance with 21 CFR 640.

Through the sponsor's proactive risk assessment and support from the Services for Cell Therapy Program, their IND was cleared by the FDA with no further information required, with several subsequent INDs also gaining clearance.

"During a recent IND submission, we were challenged with a fast-approaching deadline. Our solution-oriented program manager helped us navigate the complex regulatory requirements to support us through our clinical journey by providing quality documentation and customized reagents for use in our clinical trial. By leveraging STEMCELL's global experience and knowledge, we were able to meet our regulatory commitments and achieve a successful IND filing."

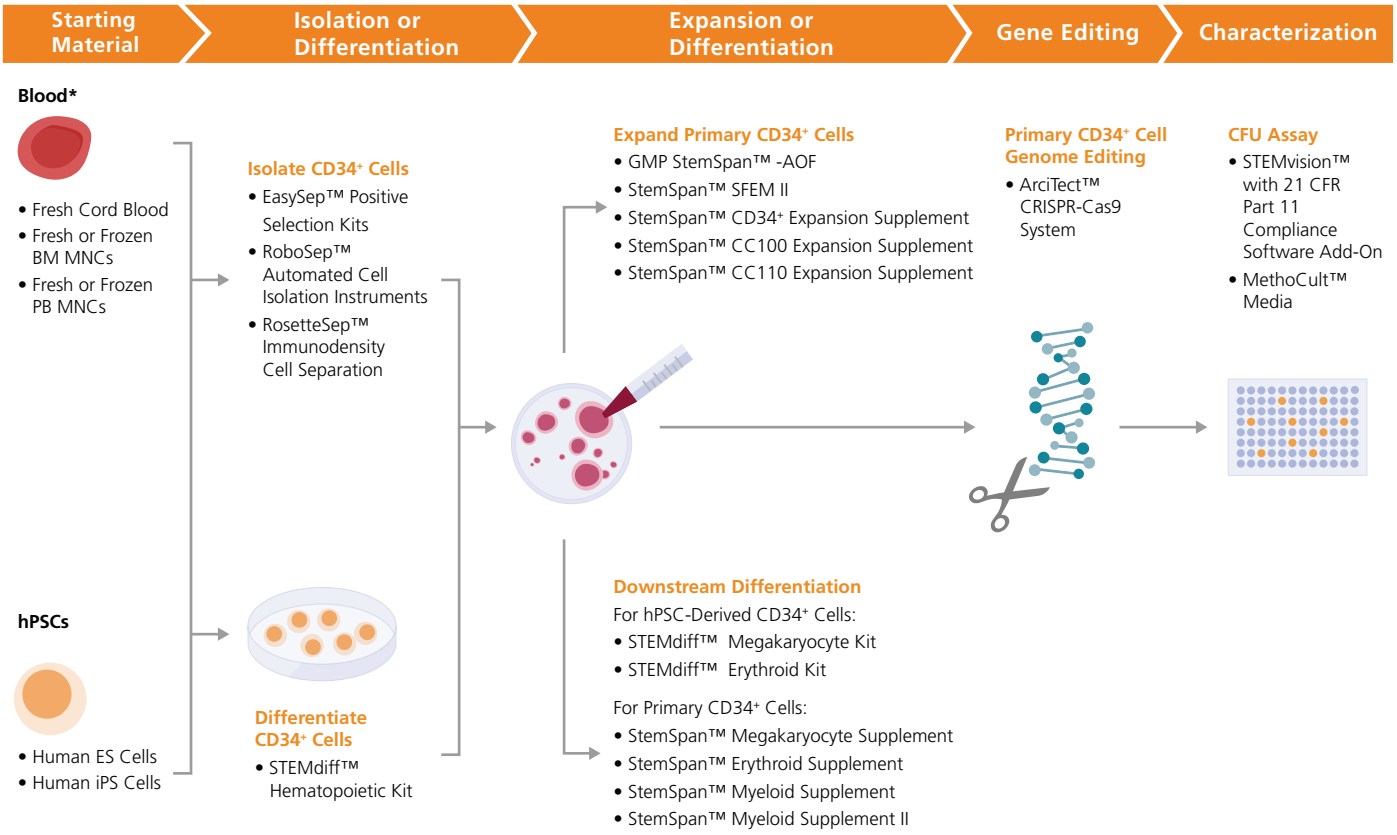
Senior Manager, External Manufacturing
A biotechnology company developing TCR-T cell therapies

Download Now

Services for Cell Therapy Flyer
www.stemcell.com/services-for-cell-therapy

Tools for Hematopoietic and Blood-Related Cell Therapy Research and Development

As for all cell therapy research, it is important when working with HSPCs to minimize risk and experimental variability and ensure consistent, reproducible performance and safety. Whether you are looking for reliable sources of CD34⁺ cells, GMP HSPC culture medium, or efficient gene-editing tools, STEMCELL has products to support every step of your hematopoietic cell and gene therapy research workflow.



**Certain products are only available in select territories.*

Figure 2. Example of a Complete Product Workflow for Hematopoietic Cell and Gene Therapy Research and Development

Start with a reliable source of HSPCs by using our fresh or frozen human blood products, including MNCs. CD34⁺ or other cell subsets may be isolated from these samples by using our immunomagnetic EasySep™ cell isolation kits. Alternatively, you may start with our ready-to-use human primary CD34⁺ cells or differentiate CD34⁺ cells from hPSCs using the STEMdiff™ Hematopoietic Kit. Human CD34⁺ cells can be reproducibly expanded or differentiated in serum-free conditions with StemSpan™ media and supplements—such as GMP, animal origin-free StemSpan™-AOF medium—or with lineage-specific STEMdiff™ kits. Primary cell-derived CD34⁺ cells may be efficiently gene edited using the ArciTect™ CRISPR-Cas9 System. Unmodified and gene-edited CD34⁺ cells can be cultured in MethoCult™ media and analyzed using the STEMvision™ instrument, which is now available with a software add-on for use in high-compliance environments. BM MNCs: bone marrow-derived mononuclear cells, ES Cells: embryonic stem cells, iPS Cells: induced pluripotent stem cells, hPSCs: human pluripotent stem cells, PB MNCs: peripheral blood-derived mononuclear cells.

Key Technologies for HSPC Cell Therapy Research

CD34$^+$ Cell Expansion

Reproducibly expand HSPCs in serum-free medium, such as GMP StemSpan™-AOF, customizable with CD34$^+$ expansion supplements.

www.stemspan.com

Standardized HSPC CFU Assays

Characterize HSPCs in high-compliance environments by using STEMvision™ and MethoCult™ media.

www.stemvision.com

Contract Assay Services

Obtain timely and relevant data for your studies by outsourcing your standard or custom hematopoietic assays to our scientists.

www.contractassay.com

Viral-Safe HSPC Expansion

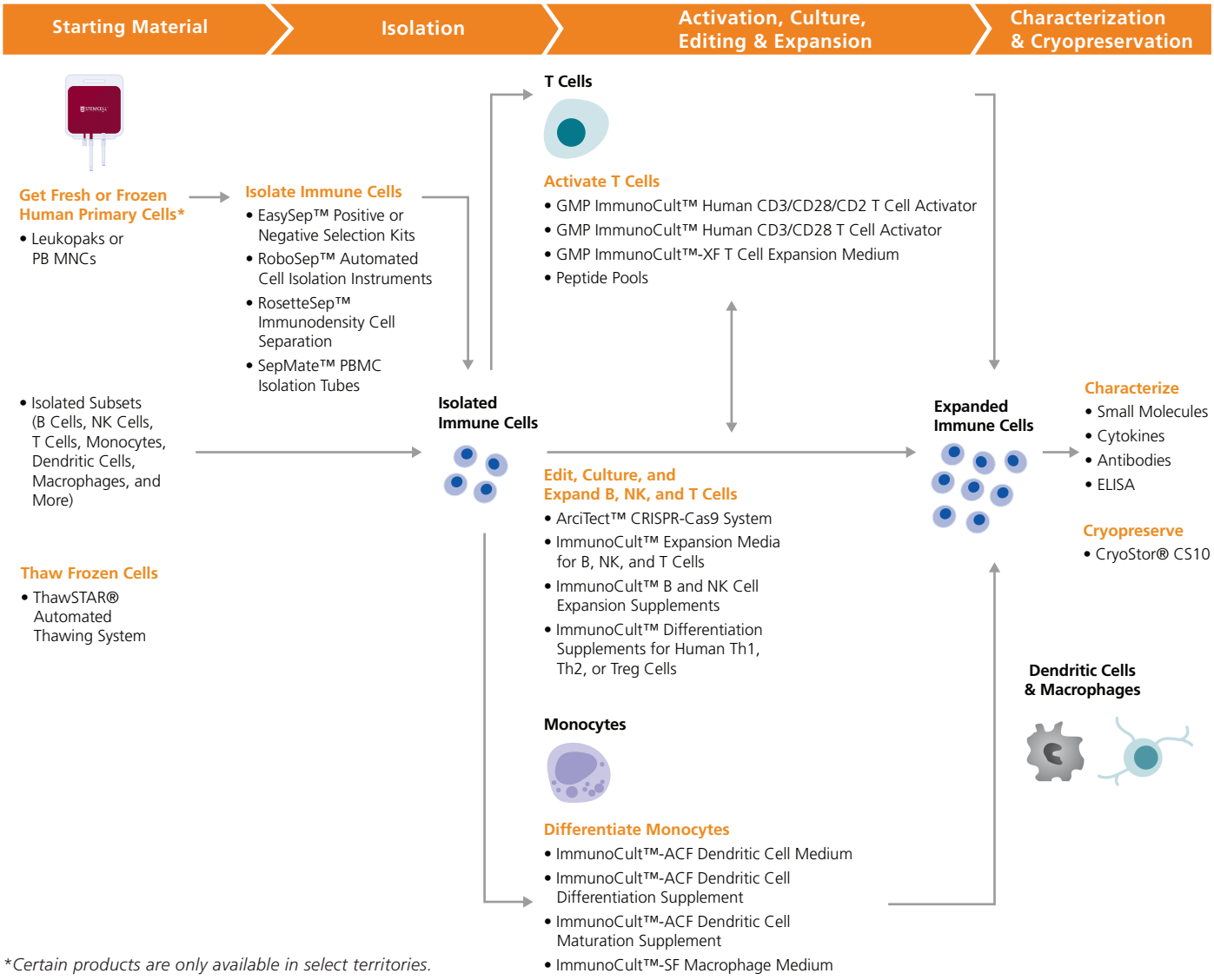
How would your cultures perform in GMP StemSpan™-AOF, the only truly animal origin-free HSPC expansion medium? Request an introductory offer and find out.

Try StemSpan™-AOF

www.stemcell.com/trystemspan-aof

Immune Cells, Tools, and Reagents for Cell and Gene Therapy Research and Development

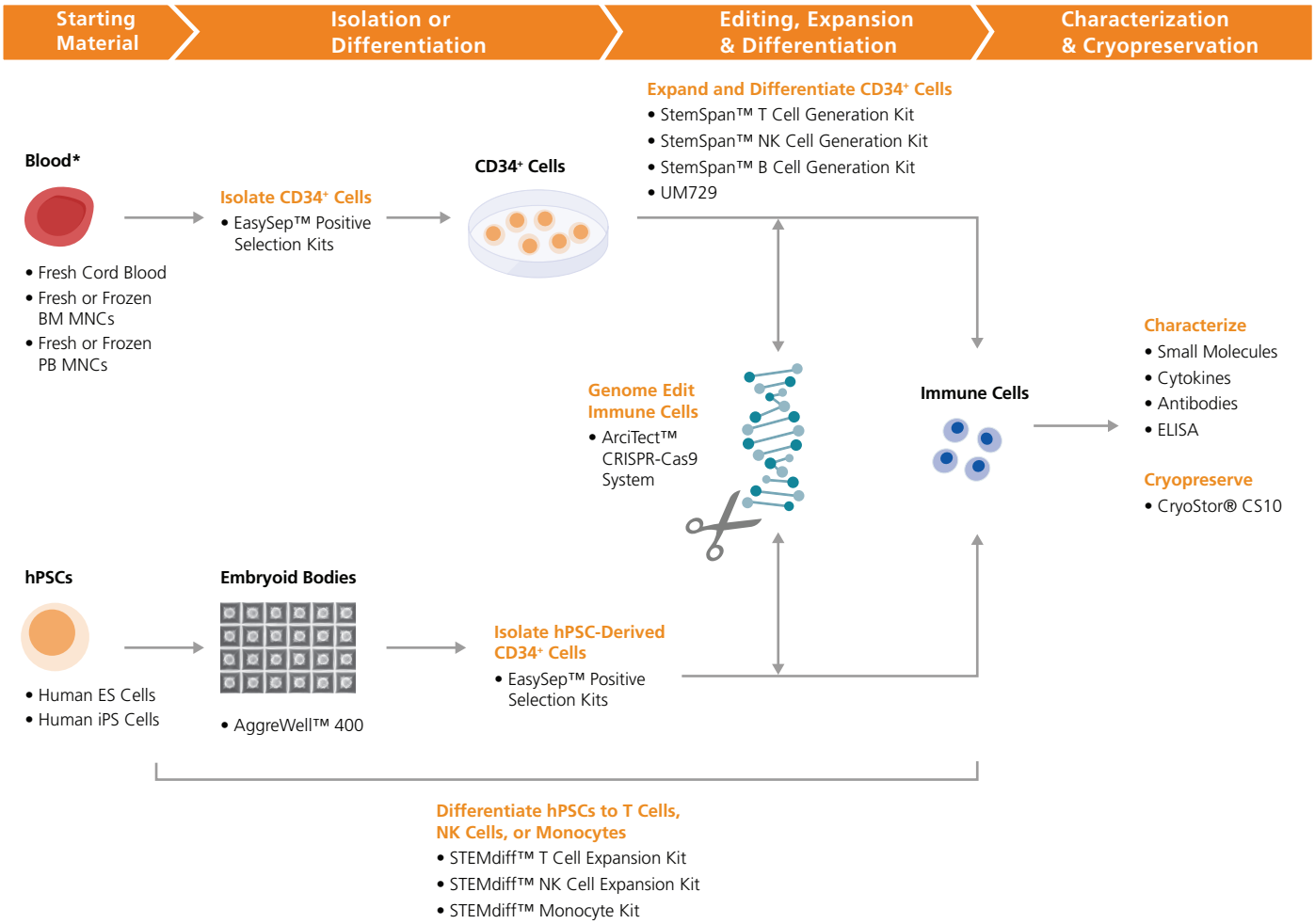
Generating high yields of immune cells historically required the use of serum or feeder cells, but this approach can be problematic for immunotherapy development. Although these components facilitate immune cell differentiation and expansion, they can also introduce cell culture variabilities that jeopardize the safety of the therapy in development. Fortunately, serum-free and feeder-free methods for generating high yields of immune cells are now available. Depending on your starting material, research application, and type of cell therapy (allogeneic or autologous), there are multiple ways that STEMCELL can support your immune cell generation for downstream cell and gene therapy research applications (Figures 2 and 3). Moreover, STEMCELL's Contract Assay Services can assess your cellular therapy products for potential toxicity that may arise in the bone marrow compartment. See the CAS section below for more information about our services.



*Certain products are only available in select territories.

Figure 3. Example of a Complete Product Workflow for Generating High Yields of Immune Cells

Start with a reliable source of fresh or frozen human primary cells, available in various formats to fit your needs. With STEMCELL's efficient cell isolation technologies, you can enrich for the cell subsets you need—at small- or large-scale as required. For optimal cell yield and frequency, use serum-free ImmunoCult™ cell culture media and supplements, which are fully compatible with our cell isolation products, to activate, expand, or differentiate cells to use in your downstream applications. ImmunoCult™ may also be used with the ArciTect™ CRISPR-Cas9 System to gene edit immune cells with high efficiency. Expanded cells can be cryopreserved for future use or characterized with our broad porfolio of cell processing and analysis reagents. PB MNCs: peripheral blood-derived mononuclear cells, NK cells: natural killer cells.



**Certain products are only available in select territories.*

Figure 4. Example Workflow for Generating Immune Cells from CD34+ Cells or hPSCs

For researchers developing allogeneic cell therapies, hPSCs and HSPCs can be great options as starting materials. Reliably source HSPCs from our human primary cell products, including fresh cord blood and fresh or frozen mononuclear cells derived from peripheral blood or bone marrow. CD34+ cells can be isolated from these samples by using immunomagnetic EasySep™ positive selection kits. The isolated cells may then be immediately expanded or differentiated into immune cells using StemSpan™ media and supplements. For researchers using human ES or iPS cells as their starting material, STEMdiff™ immune kits provide complete, standardized protocols for generating immune cells from hPSCs. Immune cells may be efficiently gene edited using the ArciTect™ CRISPR-Cas9 System, cryopreserved for future use, or characterized with our broad porfolio of cell processing and analysis reagents. BM MNCs: bone marrow-derived mononuclear cells, hES Cells: human embryonic stem cells, hiPS Cells: human induced pluripotent stem cells, hPSCs: human pluripotent stem cells, PB MNCs: peripheral blood-derived mononuclear cells, NK cell: natural killer cell.

Key Technologies for Immunotherapy Research

Immune Cell Generation

Generate immune cells from either CD34$^+$ cells or hPSCs with StemSpan or STEMdiff™, respectively.

www.stemcell.com/immunecellculture

T Cell Activation

Activate T cells without the use of beads by using GMP ImmunoCult™ T cell activators.

www.stemcell.com/t-cell-gmp

Immune Cell Expansion

Avoid the use of serum and reproducibly expand immune cells by using ImmunoCult™ media and supplements.

www.stemcell.com/immunecellexpansion

Immune Cell Activation with Peptide Pools

Stimulate antigen-specific T cells and other immune cells with peptide pools. Choose from more than 50 viral antigens.

www.stemcell.com/peptidepools

Streamline Your T Cell Therapy Development

Achieve robust T cell activation and expansion by combining high-performance GMP ImmunoCult™-XF with GMP ImmunoCult™ Human T Cell Activators.

See the data, and learn how to transition your cell therapy development from bench to bedside.

Try GMP ImmunoCult™

www.stemcell.com/try-immunocult

Tools for Developing Pluripotent Stem Cell-Derived Cell and Gene Therapies

When developing hPSC-derived cell and gene therapies, it is critical to ensure that your culture workflow will generate human cells that are safe for clinical use. This means considering both product performance and regulatory compliance when selecting your supplier for culture reagents. Addressing both of these requirements, products and reagents from STEMCELL are optimized to yield high-quality cells at each stage of your workflow and are manufactured under a strict quality management system, enabling you to develop safe and effective hPSC-derived cell and gene therapies. From obtaining or reprogramming your initial hPSC line, through to large-scale cell expansion or differentiation, we have tools to support the full breadth of your hPSC-derived cell therapy research.

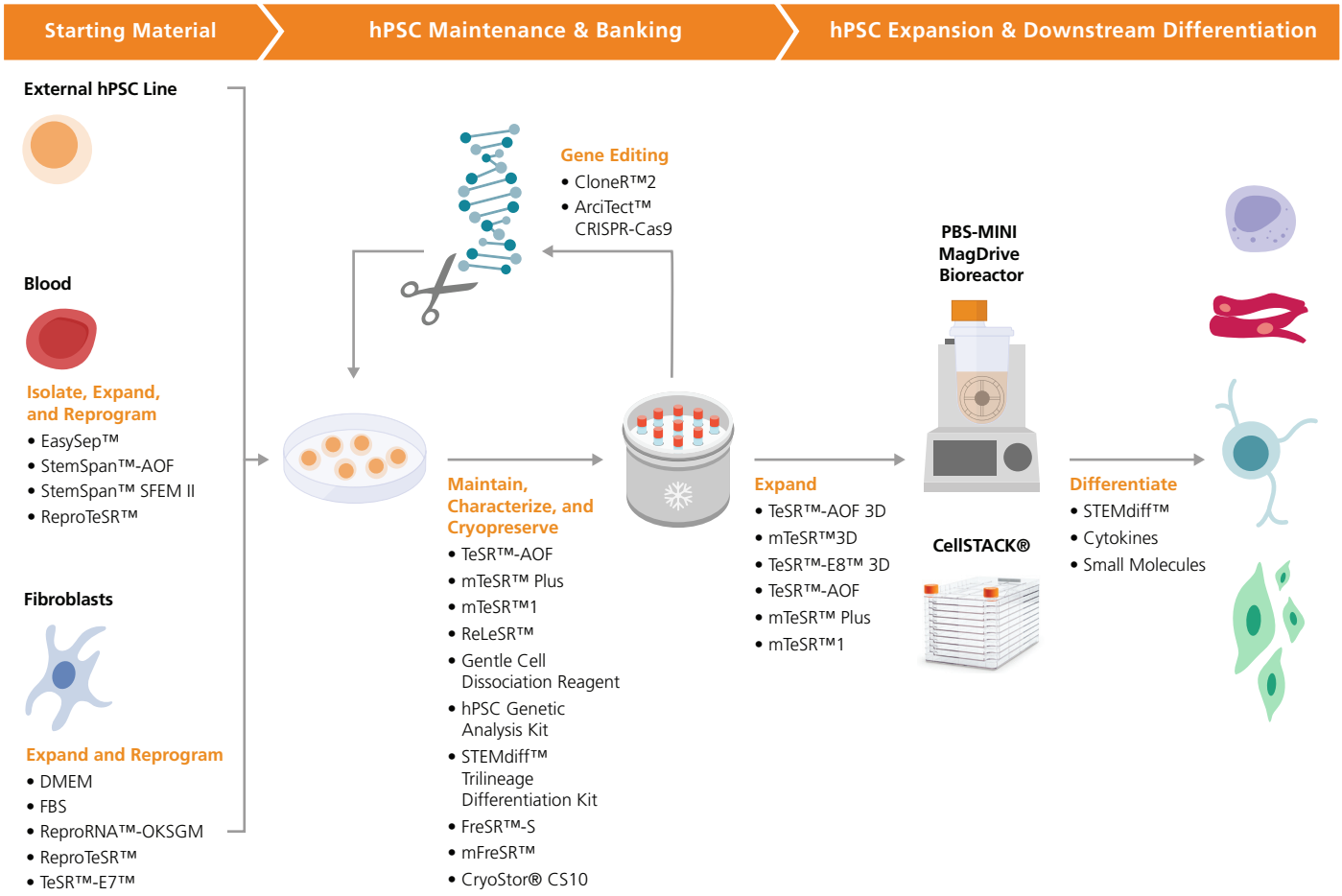


Figure 5. Example of an hPSC-Derived Cell and Gene Therapy Workflow

Whether you are working with a ready-to-use hPSC line or reprogramming iPSCs from isolated human primary cells, STEMCELL has the specialized tools to help you get started. Regardless of their source, hPSCs may be maintained and expanded using our TeSR™ family of feeder-free culture media, available in a variety of formulations to fit your specific culture requirements, format, and scale. Efficiently gene edit your cells with the ArciTect™ CRISPR-Cas9 System, and use CloneR™2 supplement for improved cloning efficiency and survival, even under high-stress conditions. Reproducible and efficient differentiation of multiple hPSC lines to various cell lineages can be achieved with our standardized STEMdiff™ kits and protocols, which are compatible with TeSR™ media. We also offer reagents and services for cryopreserving, banking, and characterizing your cells to ensure hPSC quality. DMEM: Dulbecco's modified eagle medium, FBS: fetal bovine serum, hPSC: human pluripotent stem cell.

Key Technologies for hPSC-Derived Cell Therapy Research

Animal Origin-Free hPSC Culture

Reduce risk and obtain more high-quality hPSCs by using TeSR™-AOF medium, manufactured under relevant GMPs and animal origin-free to the secondary level of manufacturing.

www.stemcell.com/tesr-aof

hPSC Passaging

Easily generate optimally-sized aggregates without scraping by passaging your hPSCs with enzyme-free ReLeSR™, manufactured under relevant GMPs.

www.stemcell.com/relesr

hPSC Cryopreservation

Maximize post-thaw cell recovery and viability following cryopreservation at very low temperatures (-70°C to -196°C) with ready-to-use CryoStor® CS10, manufactured under relevant GMPs.

www.stemcell.com/cryostor-cs10

Animal Origin-Free Maintenance Medium for hPSC Culture

For your hPSC cultures, choose a medium that allows for restricted feeding schedules, enabling you to get more of the cells you need while minimizing the time spent maintaining them. Request a free sample of TeSR™-AOF media.

Try TeSR™-AOF

www.stemcell.com/forms/why-tesr-aof

Human Primary Cells for Cell and Gene Therapy Research

A reliable source of human primary cells ensures continuity in your research and enables you to start experiments according to your schedule, without compromising on quality. Avoid the challenges associated with obtaining human biological material by choosing ready-to-use and ethically sourced fresh or cryopreserved cells* from a supplier you can depend on.

Primary Cells from STEMCELL

Learn more about our primary cell products, and browse our complete product listing.
www.stemcell.com/primarycells

Request a Free Wallchart

This valuable reference lists the frequencies of human cell types in blood-related sources.
www.stemcell.com/wallchart-cell-frequencies

Why Use Human Primary Cells from STEMCELL Technologies?

PHYSIOLOGICALLY RELEVANT. Choose cells that are more physiologically representative of cells in vivo.

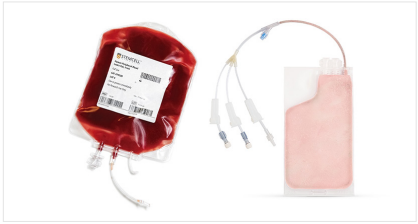
ETHICALLY SOURCED. Access donor samples collected using regulatory authority-approved consent forms and protocols.

CUSTOMIZABLE. Request custom products for non-standard cell types or collections with specific requirements.

FLEXIBLE. Reserve large numbers of cryopreserved cells and start experiments on your schedule with cells you've already tested.

EFFICIENT. Reduce time spent collecting and culturing primary cells.

Key Primary Cell Products for Cell Therapy Research



Fresh (Mobilized and Non-Mobilized) or Frozen Leukopaks

Get large numbers of fresh or frozen mononuclear cells from a selection of leukopak sizes. Choose mobilized leukopaks for a large number of $CD34^+$ cells as a starting point for your research.
www.stemcell.com/leukopaks

Human Cord Blood Cells

Streamline your cell-based assays with ethically sourced, frozen human cord blood $CD34^+$ cells.
www.stemcell.com/cd34cells-frozen

Human Peripheral Blood Mononuclear Cells

Start experiments at your convenience with ready-to-use, frozen human peripheral blood mononuclear cells.
www.stemcell.com/pbmc-frozen

Certain products are only available in select territories. Please contact your sales representative or the Product & Scientific Support team at **techsupport@stemcell.com for further information.*

Contract Assay Services for Cell and Gene Therapy Products

Contract Assay Services is a contract research organization established within STEMCELL Technologies that performs assay services based on in vitro and in vivo primary stem cell assays. Since 2000, Contract Assay Services has performed such studies for over 250 pharmaceutical, biotechnology, government, and academic life science organizations worldwide. As your drug discovery partner, get the data you need by choosing from our portfolio of standardized assays using pre-qualified primary stem cells or discussing your customized needs with our in-house experts. These assay services have been used in published therapeutic genome editing studies.[1]

View a complete catalog of our assays or talk to our specialists about creating a custom assay.

Learn More

Contract Assay Services
www.stemcell.com/contract-assay-services

Why Use Contract Assay Services?

CUSTOMIZATION. Design and execute studies that are customized to your therapeutic development objectives.

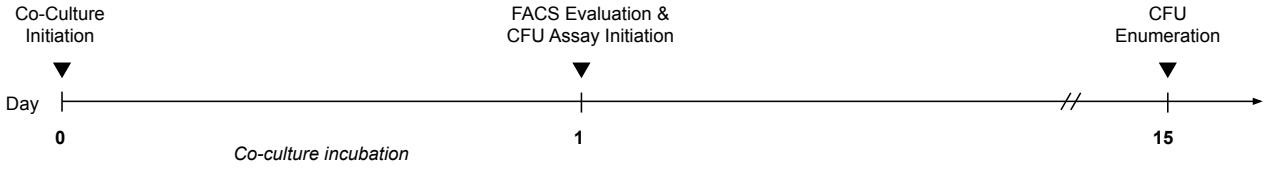
EXPERTISE. Work directly with in-house experts for many cell types, media, and assays.

COMMUNICATION. Receive clear and frequent communication throughout the study process.

QUALITY. Obtain high-quality data with STEMCELL's highest standards for methods, materials, and processes throughout the study process.

CAR T Cell-Mediated Hematopoietic Toxicity Assessment

Service for evaluating on-target off-tumor or off-target effects of cellular therapeutics on bone marrow progenitor cells:



Day 0
Liquid Co-Culture Initiation

- Incubation of test or control CAR T with target cells or controls
- Co-culture incubation time can be varied from 4 - 24 hours

Day 1
(or after desired co-culture duration)

- FACS evaluation on target cell viability and marker expression
- CFU assay initiation

Day 15

- Counting of CFU colonies

Note: Client to provide test CAR T, control CAR T, and the positive control cell line expressing the target of interest

Figure 6. Example of a Workflow for CAR T Cell-Mediated Hematopoietic Toxicity Assessment

Our hematopoietic toxicity assessment service can provide preclinical information on the potential toxicity that may arise in the bone marrow compartment. Assays such as co-culture of CAR T cells with bone marrow CD34$^+$ cells can provide insight into neutropenia or anemia that occurred during the cellular therapy. In acute myeloid leukemia (AML), CAR T cells can be highly active against patient-derived AML blasts but also show on-target activity against a subset of human HSPCs, as AML-associated antigens such as CD33, CD123, CLL-1, and FLT3 are also expressed in normal myeloid progenitors and/or mature hematopoietic cells.

1. McGaw, C. et al. (2022) Engineered Cas12i2 is a versatile high-efficiency platform for therapeutic genome editing. Nat Commun 13(1):2833.

Hematopoietic Potential of Genetically Modified HSPCs

Ex vivo gene correction of HSPCs has emerged as a promising treatment for various genetic blood disorders. STEMCELL offers services for assessing the differentiation potential and viability of edited CD34$^+$ HSPCs. The in vivo functionality of human gene-edited HSPCs can also be assessed using the immunodeficient mouse model. In addition, the engraftment of human cells can be assessed for each mouse with flow cytometry by staining cells for both anti-human and anti-mouse CD45 antibodies.

Sample Workflow for Hematopoietic and Blood-Related Contract Assay Services

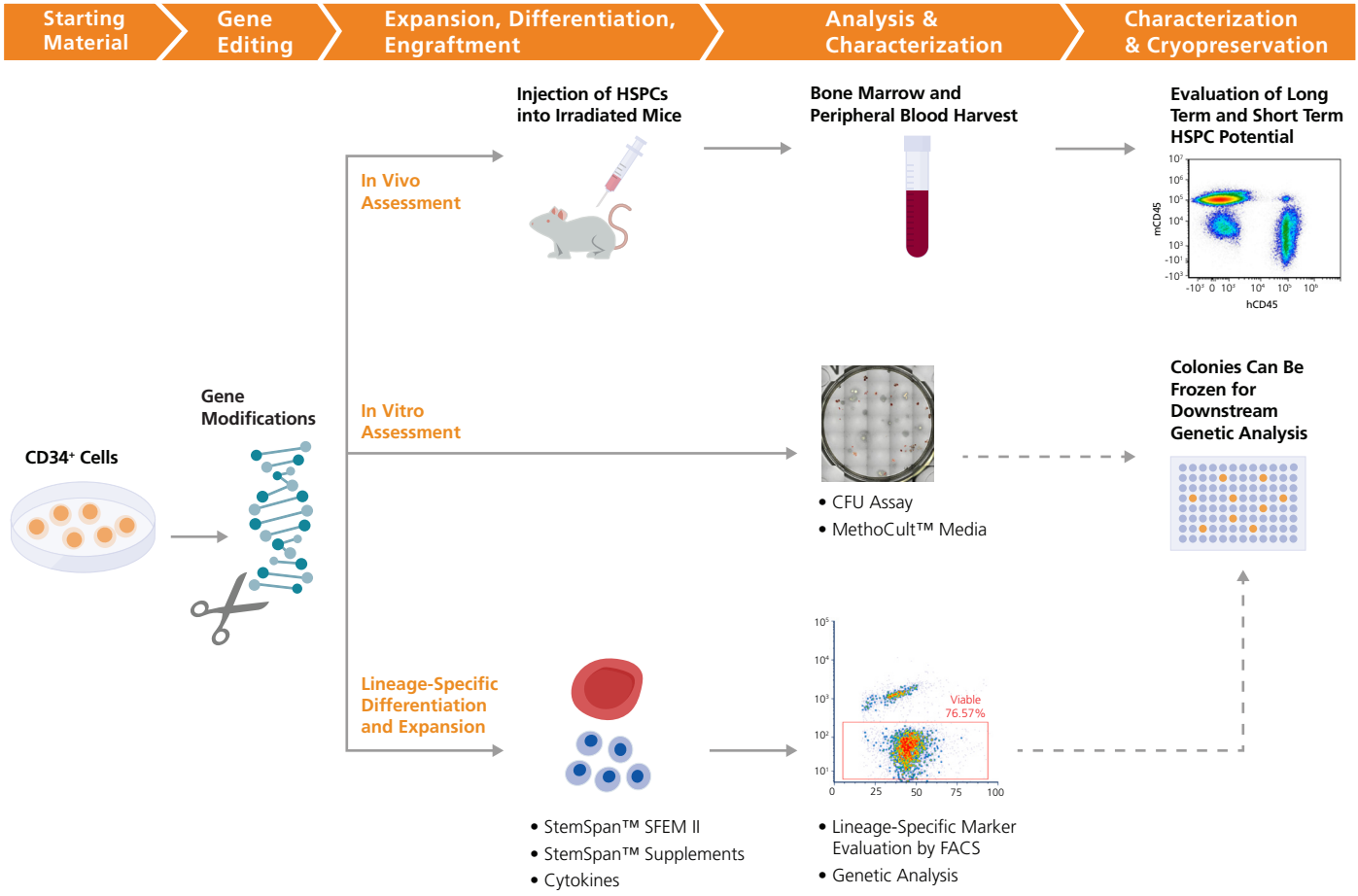


Figure 7. Contract Assay Services Example Workflow for Assessment of Genetically Modified HSPCs

Potency is a key consideration when selecting candidate therapeutics for advancement through the development pipeline. By partnering with STEMCELL's Contract Assay Services, you can incorporate assays that are better at evaluating the engraftment potential and functionality of genetically modified HSPCs in your development process to select successful candidates. We can help generate and/or assay genetically modified human CD34$^+$ cells for viability and functionality. We also offer in vivo assay services, including assessing engraftment potential of genetically modified HSPCs. Short- and long-term engraftment potential can be assessed at desired time points by fluorescence-activated cell sorting (FACS) analysis for the presence of lineages and populations of interest, including myeloid, lymphoid, and erythroid cell populations. The in vitro assessment of the cells can be conducted by performing the CFU assay in MethoCult™ media and imaging them using STEMvision™ for erythroid and myeloid differentiation evaluation. The cells can also be differentiated in a liquid culture with lineage-specific cytokine supplement cocktails for surface marker and genetic analyses, expansion, or cryopreservation for other downstream applications.

Additional Products to Support Your Cell Therapy Protocols

For a complete listing of products to support your cell therapy research, development, and manufacturing, visit **www.stemcell.com**.

Media and Reagents	Description	Size	Catalog #
MethoCult™ SF H4636	Serum-free methylcellulose-based medium with recombinant cytokines for hPSC-derived hematopoietic progenitor cells	100 mL	04636
STEMdiff™ Megakaryocyte Kit	Serum-free and feeder-free medium for differentiation of human ES or iPS cells to megakaryocytes and platelets	1 kit	100-0900
mTeSR™ Plus, GMP	GMP, stabilized feeder-free maintenance medium for human ES and iPS cells	1 kit	100-0276
MesenCult™-ACF Plus Medium	Animal component-free medium for human mesenchymal stem cells	500 mL	05448
CryoStor® CS10, GMP	GMP, animal component-free, defined cryopreservation medium with 10% DMSO	100 mL*	100-1061
BloodStor® 100	Biopreservation reagent for cells and tissues	50 mL*	07951
BloodStor® 55-5	Optimized biopreservation reagent for hematopoietic cells and tissues	16 x 7.2 mL*	07937
HypoThermosol® FRS	Animal component-free, defined hypothermic (2 - 8°C) preservation medium for a range of cell and tissue types	100 mL*	07935
Vitronectin XF™	Defined, xeno-free cell culture matrix that supports the growth and differentiation of hPSCs	2 mL*	07180
CellAdhere™ Laminin-521	Defined, xeno-free, feeder-free matrix that increases single-cell attachment and survival of hPSCs without apoptotic inhibitors	500 µg*	200-0114

Supplementary Products	Description	Size	Catalog #
PBS-MINI MagDrive Bioreactor	Compact bioreactor with single-use vessels for high-throughput, 3D suspension culture of hPSCs and other cell types	1 Unit	100-1005
ThawSTAR® CFT2 Automated Thawing System	Automated cell thawing system for consistent thawing of cryogenic vials	1 Unit	100-0650
ThawSTAR® CB Automated Thawing System	Automated cell thawing system for consistent thawing of cryobags. Compatible with most major cryobag sizes and manufacturers	1 Unit	100-1151
Healthy Control Human iPSC Line, Female, SCTi003-A	Human pluripotent stem cell line, frozen	1 Vial	200-0511
Human Mobilized Peripheral Blood Leukopak, G-CSF, Fresh	Obtain large numbers of single-donor $CD34^+$ hematopoietic stem and progenitor cells.	1 Collection	200-0600
Human Platelet Lysate	Fibrinogen-depleted and xeno-free supplement for the expansion of cells in vitro	50 mL*	200-0360

Various sizes and formats are available; visit **www.stemcell.com to see all options.*

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Products and Services for Your Research

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